Blockchain Technology and Project Control

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Abstract: Integration, accuracy, transparency, speed of transfer and trustworthiness of project data is very important for projects and key to decision making. It is only very recently that current technologies started accommodating one or maybe two of these requirements.

On the other hand, blockchain technology, which provides security, trustworthiness, transparency and irreversibility, is progressing rapidly in a number of industries, like banking, insurance, shipping, etc. Blockchain drives operational efficiencies by removing intermediaries, minimizing time and effort spent on admin, record keeping and transaction reconciliation.

Many of the technology characteristics could be used to support the management and delivery of projects and therefore project control. Combined with other initiatives, such as storage of design / drawings on the cloud, common data environment, smart contracts, collaborative working, standard project management structures, etc., it can support the efficient delivery of projects and generally Project, Programme and Portfolio Management (P3M).

With material from two cases studies, the author will present the benefits, challenges, implementation requirements and how the technology can be used to improve project monitoring and control processes and the delivery of projects / programs.

Keywords: blockchain; project control; program control; ERP systems; integration of systems; transformation.

1. Introduction

The human race's movement through the 'ages' – stone, bronze, …, 3rd Industrial Revolution (IR) and now in the 4th IR (4IR), was not because of any lack of materials but rather because humans evolved, innovated, progressed and developed new technologies. In fact, we know that this progression is happening at a much faster pace in 4IR. Moore's Law [1] stated that the number of transistors on a microchip doubles every two years (exponential increase – 2n). However, this has now been superseded with Neven's Law, which stares that the growth in power is increasing in a double-exponential rate (2(2n)) [2].

Technological achievements now move much faster and a number of industries are now playing catch-up. In project delivery and in particular construction projects, implementation of technology is even slower; due to certain corporate requirements, financial (levels of margins, etc.), biases [3] and managing the effects of complexity [4]. Several of the points that will be discussed in this paper were developed decades ago and some others in the last few years.

In addition to managing the technological changes that are ‘trickling’ through to the project profession the project world is changing and we as professionals must deal with not only large-scale projects but also a large number of medium to small projects. Taking this into consideration, a professional could be looking at a significant number of projects to handle as Project Manager (PM) or Project Controller (PC). Therefore, we need to transform and streamline processes and technology to enable PMs and PCs to successfully deliver projects.

Considering the above and using two case studies the author will demonstrate the challenges, how these can be managed and how blockchain, as one of the latest technologies, be used advantageously by project professionals.

The author, through the first case study, will present how a major transformation program, which he co-led for the Capital Programme and Procurement (CPP) Directorate for a major Utilities organization, integrated data and software tools which served not only the organization but also the four alliance partners. Then the challenges, not only of the transformation program but also of the general environment, will be presented together with the integration of all the project control software tools. Having described the transformation case study, the basics of blockchain will be presented leading to the second case study with the implementation of blockchain and the Proof of Concept (PoC) project. The author contributed extensively to the set up of the PoC and will demonstrate the requirements and how the technology can be used in construction project management / control.

2. Literature Review

The author will conduct literature review on the topics of transformation programs of work and blockchain giving more emphasis to the latter as concepts on this technology will require further consideration when applied in the project control / management environment.

2.1. Transformation

For a number of years software tools serve the delivery of projects, programs and portfolios (P3) and their management (P3M). With the increasing pressure for faster, more flexible delivery and the need to capture all work efforts in real time the use of software tools is no longer optional.

The individualistic and disparate approach to using software tools is no longer optional as it ‘often leads to intolerable levels of inefficiency’ [5]. Additionally, the use of ‘grey IT’ [6] introduces further problems in the monitoring and control processes of P3. Data integrity, integration, real time visibility, transparency and accessibility is paramount for accurate decision making. However, as, in most of the organizations, P3 do not exist in isolation there is a need for P3M tools to integrate with those of the rest of the company.

With the development of Enterprise Resource Planning (ERP) software tools, that serve the whole of the organization, companies embarked and are still embarking on major transformation programs of work with one of the main objectives to integrate the tools that support P3M with those of the other company departments – finance, asset management, procurement, human resources, etc.

Kaplan and Haenlein [7] state that former Cisco CEO John Chambers remarked 5 years ago that at least 40% of all businesses will die in the next decade if they are unable to transform themselves in the light of new technologies.

The drive to review all processes, procedures and integrate all software tools within a major utilities organization in UK culminated in the organization embarking on a major transformation program of works for all its divisions. However, in this article the author will focus on those processes and outcomes directly relevant to project control; how these can be linked directly to the latest developments in technology and more specifically to blockchain because of the advantages it provides, which will be discussed in the next section.

2.2. Blockchain

Blockchain technology, in addition to the widely known use in Bitcoin / digital money, is considered by some authors e.g., [8] and [9] as important as the internet.

In the project world, when blockchain is combined with other technologies such as for example ‘smart contracts’ [10] it creates what academic papers refer to as blockchain economy [11], [12].

Let us look in high level at the theory of blockchain.

2.1.1. Briefly about blockchain

In simple terms, blockchains are networks of nodes (blocks) that communicate securely with each other, allow for the transaction of data and ensure that parties in the chain are synchronized and hold / see the same data.

It started as a means of transferring digital moneys over the internet, outside financial institutions, but now has expanded to include other type of data and serving a number of industries.

It is a secure, trustworthy, transparent and irreversible way of transmitting data over the internet.

Individual blocks contain data that are time and date stamped, placing them in sequence. Cryptography ensures that the blocks / data cannot be copied, or other data be inserted and break the history of the chain.

Blocks have their own unique signature. Each block validates independently all other blocks within the blockchain and when stored creates a ledger. (Blockchain is also referred to as Distributed Ledger Technology (DLT)). The blockchain is completely transparent and gives the full history of the data users are working with.

Blockchain is a decentralized database which transfers securely and records by means of time stamp transactions. Transactions, as in cryptocurrency (like Bitcoin and therefore its architecture) can represent the transfer of value on systems such as Ethereum. For projects this could mean an efficient, easy way of sharing items such as contract for approval (see Smart Contracts), application for payment for approval, invoices, reports, or design/drawings, etc. In fact, blockchain has the potential to significantly improve project management / monitoring and control more widely since it can deliver so many of these requirements e.g., transparency, ease of transfer, full data history.

Focusing on the types of the blockchain transactions and the systems within which these can 'operate', we have two types of transactions:

A) Public

B) Private

Within these two types we have different levels of transaction validation permissions, and in terms of project and project control this is where companies – networks of – will have to decide which approach to take.

Within a 'Public' set up we have:

1) Transaction validation with permissions, where all nodes/'participants' can read and submit, but only authorized nodes can validate.

2) Transaction validation without permission, where everyone can read, submit and validate. An open environment.

Within the 'Private' set up we can only have transaction validation with permissions, where only authorized nodes/'participants' can read, submit and validate.

In the case study and the Proof of Concept (PoC) that will be presented in section 3.2 we considered the latter – 'Private' set up – with, therefore, only authorized participants been able to read, submit and validate.

The quotes below, from two separate reports emphasize even further how blockchain technology can support the delivery of projects, including construction.

- As per [13] Blockchain or Distributed Ledger Technology (DLT) system needs to be capable of ensuring the following four properties:
- Shared recordkeeping: enable multiple separate entities to provide data inputs and participate in the creation of new records.
- Multi-party consensus: require multiple separate entities to collectively reach agreement over the ordering of transactions in the absence of a central authority.
- Independent validation: enable each participant to independently verify the state of their transactions and the integrity of the system. This also involves detecting unauthorized changes applied to records in a trivial way.
- Tamper evidence: allow each participant to detect on-consensual changes applied to records trivially.
- Tamper resistance: make it hard for a single party to unilaterally change past records (i.e., transaction history).

It is worth noting that DLT systems are dynamic and constantly evolving'.

The ARUP report on Blockchain Technology [14] states:

Blockchain could help turn around stagnating output in construction, relative to employment, by improving contract management, enabling more transparency in supply chains, and providing the technological backbone needed to combine aspects of the Circular Economy, BIM, IoT systems and smart sensors. It adds a new layer on top of internet infrastructure for the tamper-proof exchange of value and information.

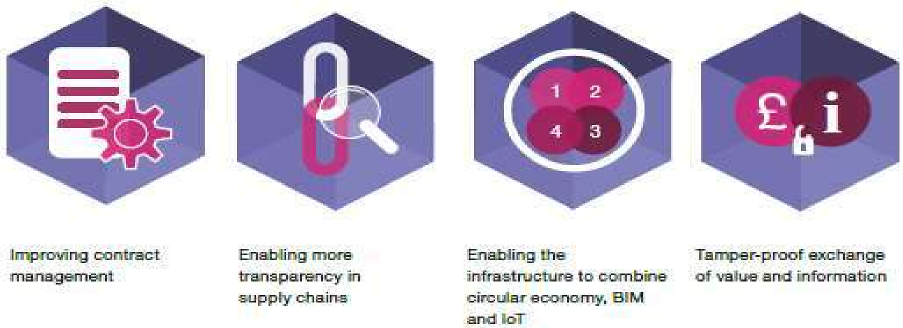

Figure 1: Key benefits of blockchain for the built environment (Figure 6, [15])

Benefits and initiative drivers

Reflecting on the above, some key benefits and the initiative drivers are:

- Benefits:
  - Common standards,
  - Automated workflow,
  - Adopting good practice throughout the program delivery,
  - Use of Common Data Environment – enabling BIM,
  - Use of 'smart contract',
  - Drives operational efficiencies, removing intermediaries, reducing admin effort and reconciliation of transactions.
- Who are the initiative drivers:
  - The UK Government through its policy papers 'Construction Sector Deal' [16] and 'Government response to data for the public good' [17],
  - Major software and other utilities / project-oriented organizations.

Flyvbjerg [18] states that speed and modularity in mega projects is important. The author will also add that speed is important in all projects, especially at when we are dealing with high volumes, and we have to deal with it.

2. Method

Two case studies from the experience of the author will be used to illustrate how blockchain technology can be used and support project control.

With the first case study – transformation program in a major utilities organization, the author will demonstrate how project control requirements needed to support the management of P3 from the PMO / Project Control side can strengthen the case of the use of blockchain technology for the management of P3.

With the second case study – blockchain PoC, the author will demonstrate how with the current P3 standards the technology can be easily implemented. As this case is the main focus of the article, the author will describe in some more detail the context.

To address the question 'can blockchain technology support the construction project management' a forum of experts from various sectors, including the author, was set up. Expertise included client, IT infrastructure, IS as well as services, construction and consultancy, academia, project director level practitioners, etc.

An agenda and a schedule were set up for a number of meetings, presentations and in depth analysis of the various areas that needed to be investigated. Having developed a general concept a smaller group was formed to specify which specific process could be used that will be used of the Proof of Concept (PoC). The team identified the process 'Placement of an Order' as the best scenario for testing the blockchain, as this involves a number of different companies as well as different departments within each organization.

Figure 2 below depicts the high level steps from '0' to '9' that were performed by each organization.

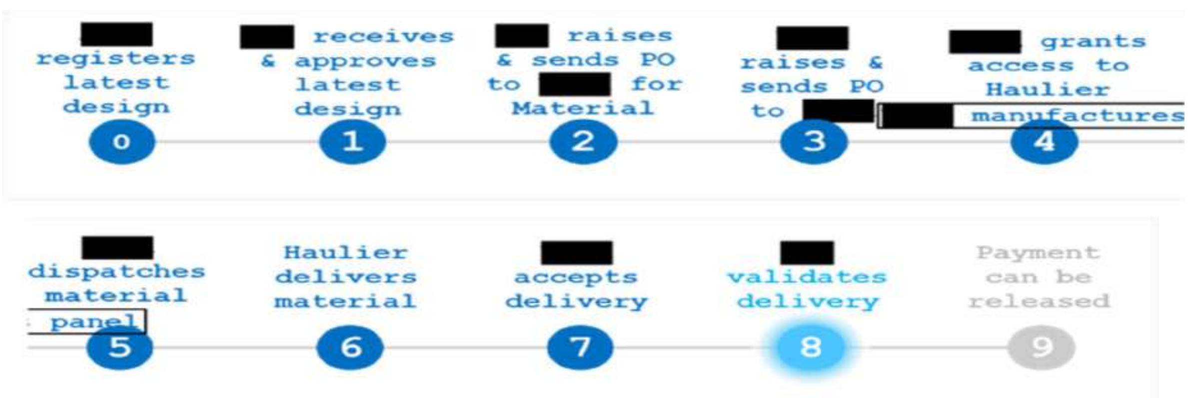

Figure 2. PoC steps for placing an order for delivering a panel.

For each step the team identified core data to be transferred between each organization and the relevant 'approvals' / authorizations to be performed. The time taken for each step to be performed as well as other criteria were developed which then became the basis for setting up criteria for measuring the blockchain PoC benefits. An extract of these can be seen in Appendix A.

The paper describes the Proof of Concept (PoC) undertaken by the working party and, although when presented at the client Board received considerable support and funding to continue with implementation, from the academic perspective it needs to be considered as exploratory in nature. The results could provide a useful vehicle for further research and expansion in other areas of not only monitoring and control processes but all other P3M process.

3. Results

3.1. *Transformation – The case study*

The first case study involves a major transformation program in a power utilities organization and in order to put this into context the author will briefly describe the 'environment' with its challenges – external and internal. We will then look at the approach to delivering the project control relevant part of the transformation program.

3.1.1. The environment and the need

The major power utilities organization covers three geographical locations serving 19M people. As all utility organizations in UK, it is regulated by Ofgem and their eight-year program of works, outputs, level of services, etc. is approved by the regulator before commencement of the works. In addition to the regulated program of work the organization also has a non-regulated program of works serving directly clients, such as building developers, solar and wind power farms, etc.

The size of annual expenditure, on the capital program side, is in the hundreds of millions of GBP (£) and more importantly the number of projects per annum for the regulated and non-regulated sides is also in the hundreds with Project Managers (PM) managing between 10 to 15 projects each and Project Controllers (PC) supporting a similar number of projects. (Due to confidentiality issues values cannot be disclosed). Therefore, the level of requirements was very high.

The work was delivered by nine program managers, a PMO, which included the project control department, and all other relevant departments (e.g., Supply chain, Commercial, etc.). The organization had established an alliance with four power construction organizations who covered all the geographical locations and there were a number of other commercial contracts with suppliers, etc. So, the whole setting involved many interconnections, not only internal (inter-directorate) ones but also with the four alliance organizations and other suppliers at various tiers.

The 'environment' in collaborative working is challenging, as has been described widely in project management literature. We are looking at socio-organizational systems [19] that come together to deliver various parties' long term strategic objectives through a number of programs of work and at the same time serve their own 'purpose of existence'. In addition to the obvious interconnections, there are also hidden interconnections between and within the 'systems' that need to come together and form collaborative environments [20].

With this background and to address the large number of challenges the Board decided to embark on a major transformation program, which will be described in more detail in section 3.3.

However, first we need to look at the challenges project practitioners are facing in general as well as in the case of the transformation program.

3.1.2. The challenges

Project environments are Volatile, Uncertain, Complex and Ambiguous (VUCA) and project management institutions like the PMI, APM and IPMA aim to address and support practitioner through various initiatives. APM in UK has launched one such an initiative which is called 'Projecting the Future'.

3.1.3. The generic challenges

In one of a series of APM articles [20] on 'projecting the future' they demonstrate the challenges practitioners will face in the near future due to technology. Figure 3 below demonstrates some of the very interesting numbers.

Figure 3: The generic challenges – APM Projecting the Future report [21].

Therefore, we should anticipate and be prepared for these changes and not only from Artificial Intelligence (AI), Machine Learning (ML), etc.

3.1.4. Challenges in the case study

From the case study side some of the company-wide challenges were described earlier. The PMO/Project Control side needed to address both the company-wide challenges alongside managing the overall review of the project management / project control processes and systems. Therefore, there was a need to address:

- Drivers for significant efficiency and innovation,
- Improvement in quality and service,
- The difficult competitive landscape,
- Skills shortage and appropriate level of resource management,
- Collaborative working and management on the internal as well as external interfaces,
- Geographical program of works diversity,

- Varying work practices within the company and the partners,
- Rolling out a set of common integrated project management software tools which will link up to the ERP company-wide software tool.

3.1.5. The approach to the transformation program

As an initial step towards the major transformation program the author together with other Senior Management team members redrafted and communicated widely the asset management project lifecycle, see Figure 4 below.

This set up a common base not only for the Directorate but also for all the other internal and external parties.

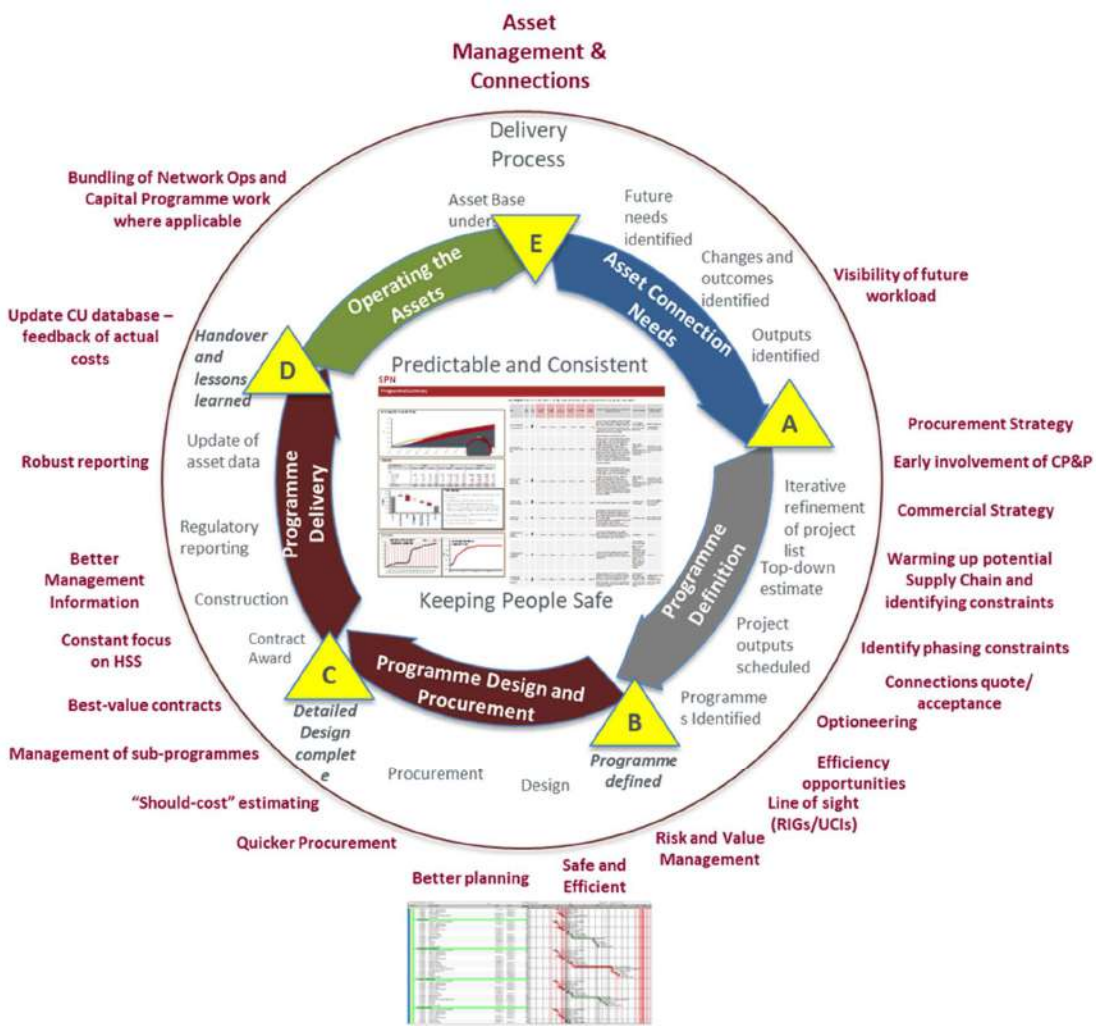

Figure 4: The Asset Management lifecycle and Programme / Project Delivery

Following on from that the standard project management structures (WBS, OBS, CBS, etc.) were set up and which linked up to the Asset Management Plan. The structures not only ensured the linking of data through the different software tools but also enabled the alliance partners to map their level of operations.

Processes and procedures from the lowest to the highest level – project to program and portfolio levels, where re-drafted (to accommodate interlinks and use of the software tools), reviewed widely and communicated. Figure 5 provides an indication of how the scheduling, cost / contract management and estimating software tools were integrated. All project control processes were served by a software tool, therefore minimizing duplication of effort and the use of 'grey-IT' (as in unconnected software packages, usually Excel). Additionally, through a number of 'set ups' the system was future-proofed to accommodate further developments, such as Building Information Modelling (BIM), ML for reporting through Analytics and as in the case of this paper, blockchain.

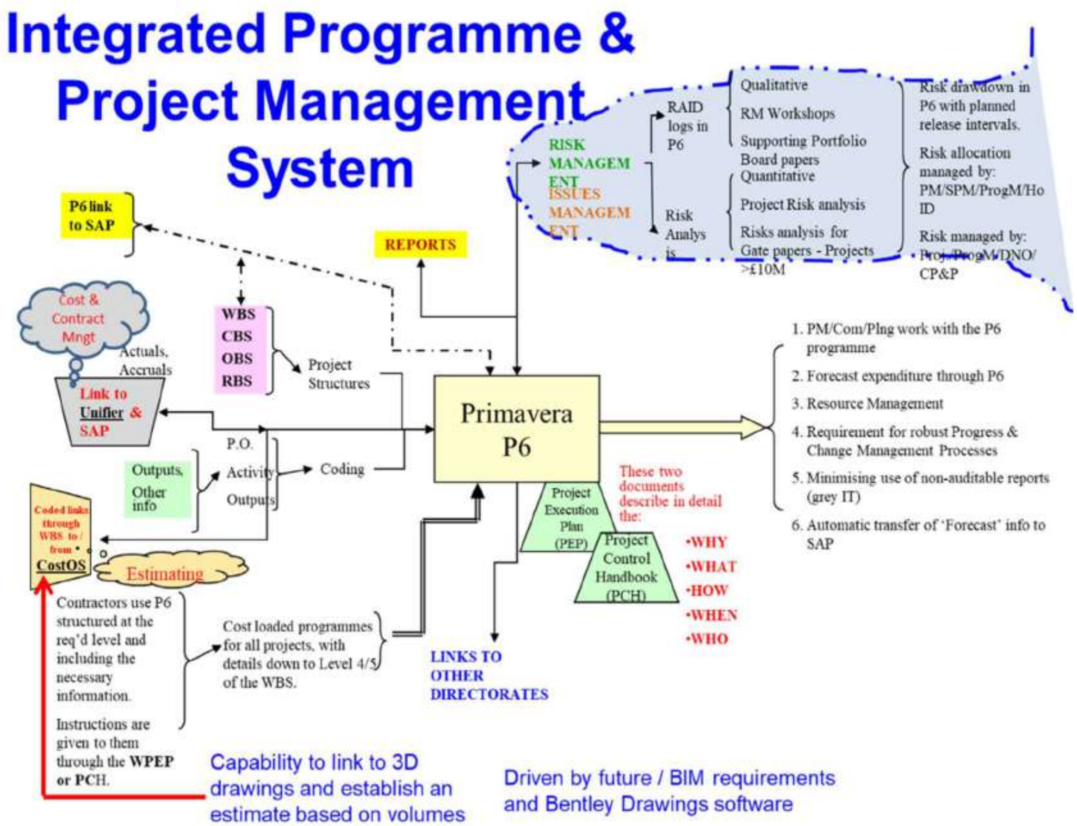

Figure 5: Integrated Program & Project Management System

In parallel with the development on the processes within the project control software tools, and with the transformation program team, it was ensured the interfaces between the delivery tools and the ERP software will be viable and working. Figure 6 gives a pictorial view of the company-wide ERP system and how the delivery side interfaced with the asset management side.

The transformation program was delivered on time and all the CPP processes delivered the required integration of data between all the parties.

Unavoidable challenges were overcome through perseverance from staff at all levels – from the lowest to the most senior, with communication, training and other means.

However, the speed of transactions, movement and validation of data (from hard copies to soft data, e.g., application for payment), approvals, etc. took their conventional time to be completed despite the integration of software tools.

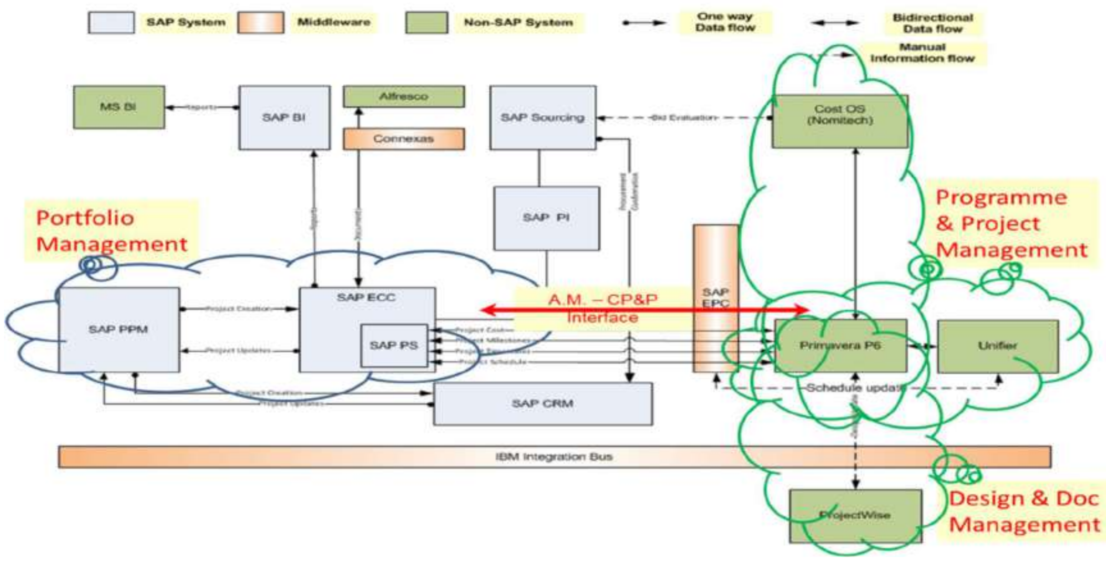

Figure 6: Transformation Delivery - Interfaces Diagram

That is the reason the author, together with a group of other individuals working for organizations such as Nomitech, IBM, SAP, ARUP, TATA Steel, HS2, WOOD Group, Network Rail, CISCO, and others, formed a group and investigate the use of blockchain in the delivery of projects. The main aim was to investigate the viability, design the case study and then proceed with a Proof of Concept (PoC) rather than deliver a feasibility report / theoretical output.

However, before we proceed with the case study of the PoC we need to look at some basics regarding blockchain.

3.2. Blockchain – The case study

Between the period of 2017 and 2020, a team of P3M and IS experts was formed in order to explore the requirements for implementing blockchain in the delivery of construction projects. The author contributed as expert on the Programme Management Office / Project Control side.

Focusing, for the purpose of this paper, purely on the project control requirements the author will provide high level of details of these requirements, which are also based on the efforts and lessons learnt from the transformation program described earlier.

The importance of structuring data and how these are used to circulate data between the different parties of a project were and are obvious and this was agreed by all team members. It was the case in the transformation program as well as what needed to be followed in the PoC. Standard project management structures not only provide the ability for rolling up of data from project to program and portfolio levels but also an efficient delivery and transfer of data between parties in a structured approach. Therefore, the coding of these structures, as well as other relevant coding, can and should become an identifier in a blockchain 'block'. Coding of data was considered in the wider case, as in not only coding of activities, etc., but also drawing numbers, raising of order(s), control account coding, invoices, etc.

As mentioned earlier, with current systems, data communication and transfer is not as efficient and effective as that of the Blockchain and additionally (in many cases) introduces an increased level of administrative tasks.

Having set up the structures and data coding to be used to set up the PoC, the team considered and implemented a full cycle process for the design approval, placement of orders (through various organizations) and delivery of a building facia panel. The steps below indicate the approach taken:

1. The design organization submits the drawing for the building panel to the client for approval,
2. The client reviews and accepts the design organization's drawing,
3. The client places an order for the delivery of the panel to the main contractor,
4. The main contractor raises an order to the building contractor,
5. The building contractor places an order to the steel manufacturer of the panel,
6. Steel manufacturer completes the panel and all relevant data are stored in their database,
7. Upon completion the steel manufacturer places an order to the haulier who will deliver the panel on site,
8. Haulier delivers the panel on site,
9. Panel is checked against the requirements and accepted by the building contractor.
10. PoC closes team evaluate speed of approvals, process, etc.

It should be noted that at each step, in addition to the transmission of the relevant data, the required validation and authorization was carried out.

Figure 7 below is an illustrative example of the PoC and blockchain steps.

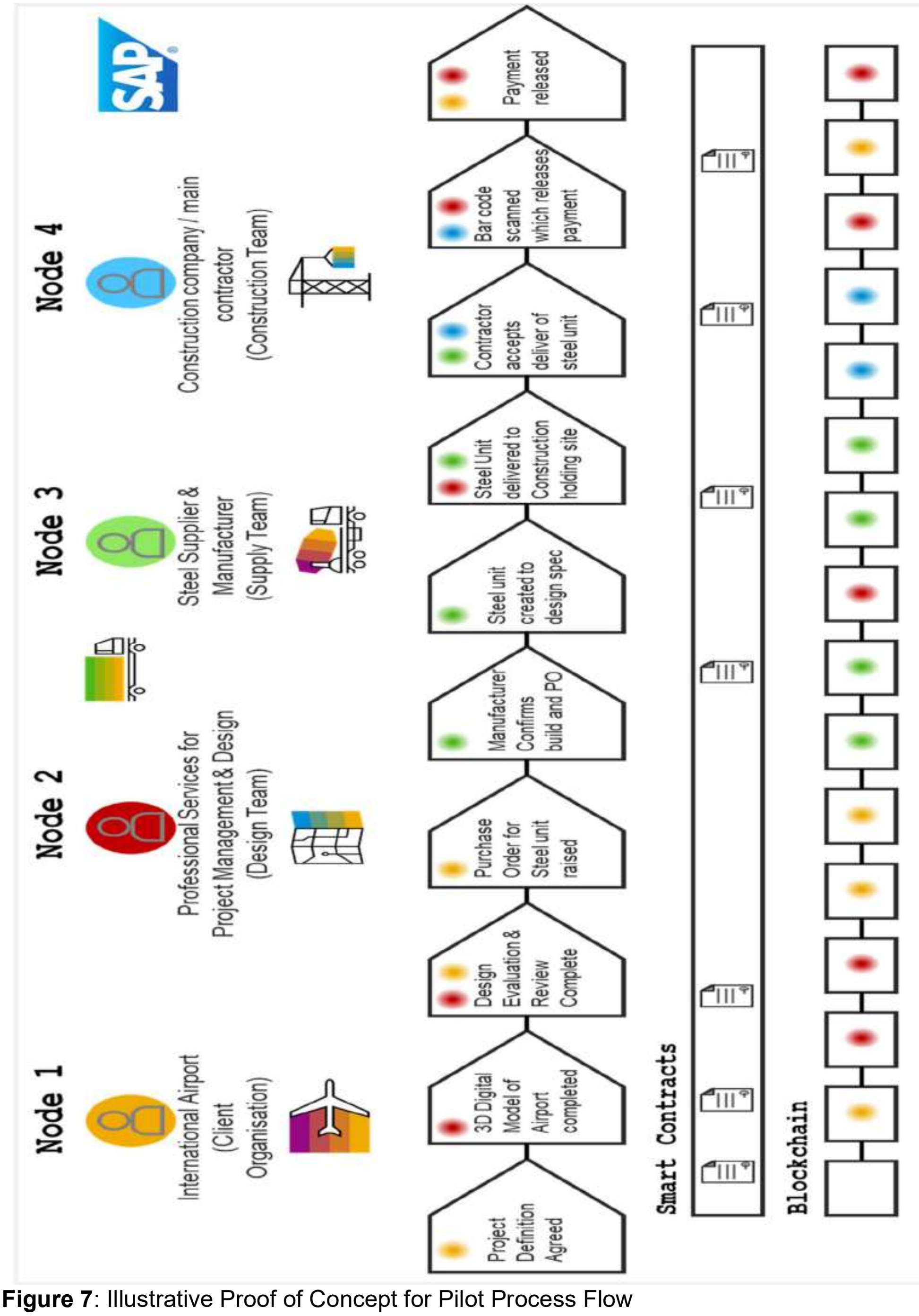

Figure 7: Illustrative Proof of Concept for Pilot Process Flow

The process steps and the PoC was presented at client Senior Management levels with detailed description of value delivered at each step and the business benefits. Following further discussions, the team, as well as other parties, including the client, estimated that the implementation of blockchain could deliver a 2%-4% Tangible Benefit on Construction Project Costs.

Figure 8 below shows how using the swim-lane approach helped set up the process steps and in Appendix B the author indicates the Blockchain Architecture Overview and Key Business Values delivered.

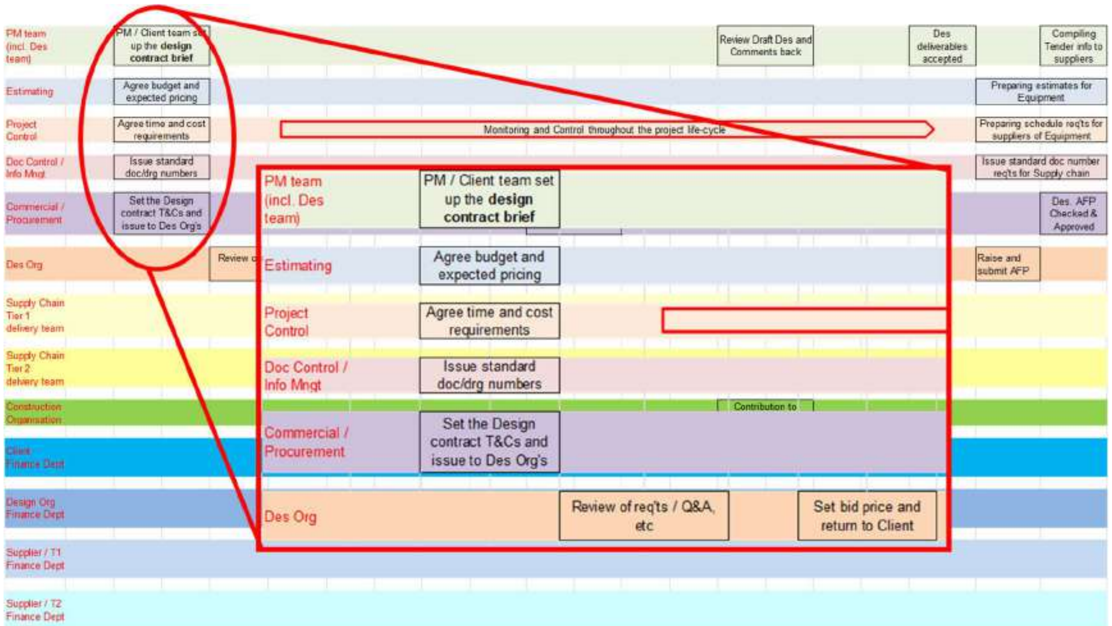

Figure 8: Swim-lane Process Flow

4. Discussion

The results from the two cases studies will be discussed in the following two sections. The first section will consider the approach and the project control requirements for implementing blockchain. The second section will consider what is the change driver which incentivizes (should incentivize) the use of the technology.

4.1. The approach and blockchain requirements for project control

The two case studies provide the basis for several points that need to be considered by organizations for setting up their project control processes which will enable the implementation of blockchain technology.

These are:

- Consider the whole picture early – having a holistic system view.
- Accept that the project delivers an asset and therefore belongs to a hierarchy – the client asset management hierarchy. Therefore, work with the client to incorporate the asset management hierarchy in the project coding.
- Understand the standard project management structures.
- Understand how the structures interface and in many cases how to interlink these – especially Work & Cost Breakdown.
- Standardize and use asset and project management structures throughout the project parties. By standard project management structure the author means – Work Breakdown Structure (WBS), Organisational Breakdown Structure (OBS), Cost Breakdown Structure (CBS), Project Breakdown Structure (PBS), Risk Breakdown Structure (RBS), etc.
- Position the structures in a standard ledger. This will enable the basic blockchain requirement.

- Supported by the standardization of project management structures integrate the software tools that support project monitoring and control processes. This will not only enable ease of integration of data, which will roll-up to various levels and enable decision making, but also integration of the software tools leading to the project management tools linking to the Enterprise Resource Planning (ERP) corporate software. As demonstrated in the transformation case study.
- Use of Common Data Environment (CDE) which in addition to digital drawings will also hold project documentation in a standard structure.
- Digitization of drawings and therefore implement BIM requirements.
- Set up how the technology can and should support authorization and validation of data.
- Accept that other functions, as well as corporations, need to receive accurate data from interconnected software tools. Therefore, minimize the use of grey IT.
- Management of behaviors.
- Management of the change.
- Build trust and collaboration – not just the relationship plan.

In terms of additional requirements / contributions from the blockchain side to P3M and control, the technology / software used, as well as the organizations, need to:

- With the appropriate parties support the decision-making process of selecting the blockchain 'type of transaction' and the 'validation permission' processes.
- Incorporate all common structures / standards,
- Enable 'smart contracts', and therefore streamline:
    - Commercial processes
    - Procurement / supply chain
- Enable digitization of assets / Asset Management,
- Enable CDE and therefore improved Design Management and BIM,
- Streamline Monitoring and Control processes,
- Through Machine Learning (ML) ease of reporting, which is supported by the standardization as well as proper utilization of the structures.

Several points raised above are very closely linked to governance, assurance as well as some other fundamental project management / control processes. Therefore, the PMO department will be ideal to oversee the flow and that timely authorization from the appropriate role is carried out.

4.2. What has changed to incentivize people to use the technology

To secure the most benefit from using blockchain and for it to have an impact, it must be implemented on a wide scale across organizations. Blockchain has created a catalyst for this change because it offers: the structuring of the data, the automated workflow, the transparency derived from the blockchain and the various other developments, e.g., legal smart contract, cloud technology, etc.

Another catalyst is that all designs now have to be digitally stored in the cloud to prevent loss of crucial documents as well as enable BIM.

Generally, there is a central directive to follow process, but needs something to enforce adherence to these and the contracts. This does not exist at the moment.

Supply chains on big projects are international.

It is a global target and as stated earlier, at least in the case of UK, the Government is supporting such initiatives. Additionally, we see consultancies, such as McKinsey [22], point to the fact that there is need to 'drive operational efficiencies, … removing intermediaries or admin effort of record keeping and transaction reconciliation' and blockchain is one of those technologies.

5. Conclusions

The author, having participated in both case studies, considers that blockchain is the ideal technology to be implemented in support of the project delivery. Efficiencies in data capture, transfer and the efficient and effective processing will deliver considerable business benefits and savings. However, there are still technical issues to be overcome with one of the fundamental ones being the system within which the technology will operate – public or private. There are also the issues with speed, however, as technology improves it is expected that it will become a lesser issue.

Appendix A

Measuring Blockchain PoC Benefits

The table below is a sample for measuring blockchain Proof of Concept (PoC) benefits.

Table A1. Measuring PoC Benefits

Benefit	Description	Issue Addressed	Success Criteria	Measure	Red	Amber	Green
1. Improving payment cycle to supply chain	Enables the improvement and prompt completion of the payment cycle to supply chain	The cycle of payment approval is slow	Reduction of time taken from raising an invoice to the actual payment	How long it takes for the submitted payment to be approved	>3d	<2-3d<	<2d
2. Enables live real time information	Information reviewed at any point in time represents the latest / real time status of the order / project	Current systems do not allow for real time information regarding the status of the order / project	At specific points in the process information is current	Status of order is within 8 hours of the latest stage	>8hrs	<4 - 8hrs<	<4hrs
3. Supports the process of Data and information 'survival' when supply chain businesses stop trading	Blockchain enables the storage and access of data / information even after the contractor has ceased trading	Data / information with entities that ceased to exist is not available	Data / information can be accessed by authorised parties at any stage	Accessibility of data / information about the order	No	N/A	Yes

Appendix B

Blockchain Architecture Overview and Key Business Values delivered.

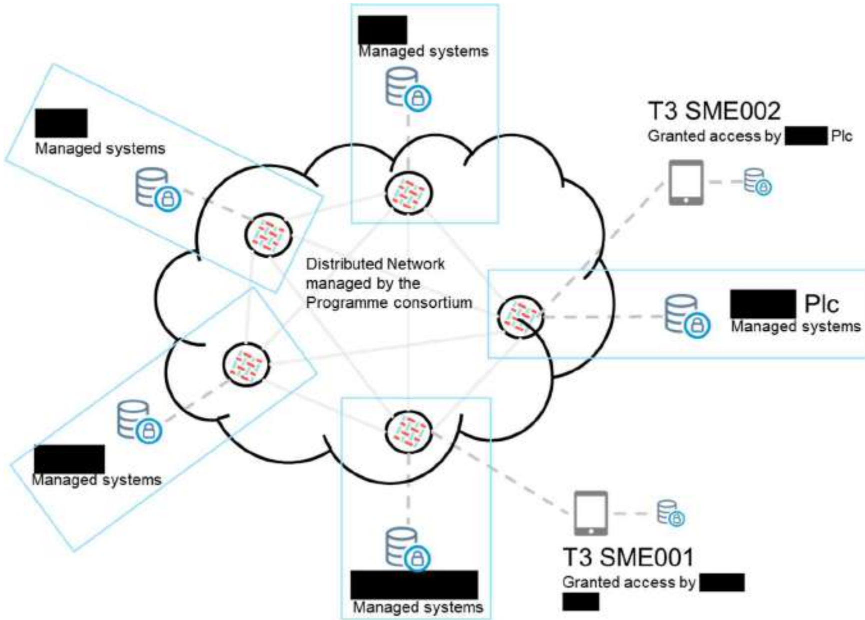

Figure B1. Blockchain architecture overview

Key business values:

- Transparency and trust leading to reduced litigation
- Enable prompt payment
- De-risk the program
- Non-disruptive / open
- Provide data points for Environmental goals and the circular economy
- Ultimately leading to improved productivity

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Dr D. Antoniadis Bio:

Dimitris has 35+ years' experience in Program and Project Management positions having covered project phases from concept to handover and operation/maintenance.

He is currently Director in the Program, Project Management and PMO with Danton Progm, technical advisor to Novacept and Course Leader / Senior Lecturer of the BSc Degrees in Project Control and Project Management at London Metropolitan College. He has set up the B.Sc. Degree in Project Control and supported the College taking it through the approval processes.

He held senior management positions in major utilities, infrastructure, and construction organizations delivering programs of work ranging from £250M to £3.2Bn. As a Senior Manager to regulated businesses such as Thames Water, Southern Water, and UK Power Networks, worked closely with the Strategy Directorates to advice on the generation of the five- or eight-year programs of work. He also advised a major telecoms organization on the £10Bn program of works and set up the PMO. Whilst with UK Power Networks he was a member of the industry working group Infrastructure Project Authority (IPA) advising the UK Government on Program, Project Management and PMO issues and approach to delivering works.
As Head of PMO he has set up and run the departments within challenging partnering environments, setting up all the processes for delivering programs of work and projects. Within these roles he has set up continuing professional development and competencies schemes for the companies and delivered a number of courses to the project practitioners.

He is the author of the book '*Demystifying Project Control*'; contributed chapters in books on complexity, leadership and other project management topics and has written a number of journal and conference papers. The latter, in most cases, were delivered as guest speaker.

He was awarded the PhD, from Loughborough University, UK, for his research on the subject of 'Managing Complexity in Project Teams' for which he has developed a framework.

He is a Chartered Mechanical Engineer and Fellow of the Association for Project Management (APM) and the Chartered Management Institute (CMI) in UK.

Parts of his work can be seen in www.danton-progm.co.uk

The book is available to purchase at:
https://www.amazon.co.uk/dp/1718063091?ref_=pe_870760_150889320