

THE BENEFITS OF INTEGRATING SMART CONTRACTS AND BIM DURING CONSTRUCTION

Helder CARDEIRA

Abstract

The benefits of BIM to the construction industry have been object to extensive research, but scarcely ever about the benefits of integrating BIM with Smart Contract, hence this discussion paper. Due to the lack of literature on the topic the purpose of this paper is to mainly highlight the possible benefits of integrating BIM with Smart Contracts and make recommendations for further research.

Keywords: *smart contracts, construction industry, BIM, integration*

Paper type: Discussion paper

BACKGROUND

Projects to the built and natural environment are often documented through sets of 2 Dimensional (2D) drawings, such as plans and elevations, drafted with the assistance of Computer Aided Design, also known as CAD.

During the design stages of a project sometimes the design is not well coordinated between consultants resulting in sets of drawings with conflicting information. With the advent of Building Information Modelling (BIM) computer prowess and faster internet connections, the construction industry is now able to work off the same model in order to produce drawings free of human errors.

According to a new survey by Timetric's Construction Intelligence Center (2016), momentum is growing behind the implementation of BIM across the construction industry, with the highest percentage of respondents claiming that it will be the future of the industry.

However, in Australia, the implementation of BIM has been slow. In 2016, the New South Wales (NSW) chapter of Consult Australia created a Task Group to assist the NSW government and the industry to collectively create and implement a common vision for BIM. If BIM will ever become the standard form to design and document a construction project is still hard to say, nevertheless, it can be argued that BIM is here to stay.

The benefits of BIM have been fully researched and documented (see Azhar 2011) however, research regarding the benefits of integrating BIM with Smart Contract is scarce, almost inexistent, hence this discussion paper.

The purpose of this discussion paper is to highlight the benefits of integrating BIM with Smart Contracts. Due to the little information available on this topic this paper also proposes recommendations for further research.

INTEGRATING BIM WITH SMART CONTRACTS

Smart Contracts are self-executable, self-enforceable computer protocols that can retrieve information from a database in order to automate contractual agreements. Smart Contracts can also ensure payment security, which has numerous applications to the construction (Cardeira 2015).

BIM is a centralized repository of project information that is built, and maintained, by the members of a design team. Rather than storing information among various project files, BIM allows the design team to work off the same model, or project file.

Project information is therefore stored in one location only, which can be retrieved by other applications; such as Smart Contracts in order to automate contractual agreements based on the most up to date project information.

Integrating BIM with Smart Contracts is therefore inevitable as the Internet of Things becomes part of our society.

BENEFITS TO THE CONSTRUCTION INDUSTRY

Construction contracts that can retrieve information from a 3D model to automate contractual agreements sounds like stuff from a science fiction movie, but the technology is available today to make it possible. The following is a list of foreseeable benefits that the integration between BIM and Smart Contracts will be capable to deliver during construction:

1. Automation – construction administration is a daunting and laborious process, however as Smart Contracts retrieve information from a BIM model the following contractual terms can be updated automatically:
 - a. Contract Sum - can be adjusted according to variations to the scope of works. Notifications can be sent out to the relevant parties seeking approval.
 - b. Program – can be adjusted accordingly. Contractor can be notified if ahead or behind program
 - c. Variations – can be identified early during construction and priced accordingly. Notifications can be sent out to the relevant parties seeking approvals
 - d. Payments – progress claims can be issued automatically. Notifications can be sent out to the relevant parties seeking approvals
2. Lower administration costs – automation will reduce the number of property professionals operating in the construction industry
3. Transparency – the flow of information, leaves an auditable trail which make the process more accountable, and therefore less prone to litigation
4. Accuracy – the information contained in a BIM model will render brick by brick the quantities necessary to the built form without human error
5. Speed and real time-updates – construction administration should occur at the speed of thought. Progress Reports can be issued as-needed for decision making and financial risk management
6. Marketing opportunities for early adopters – as the industry will be learning and listening from the ones “doing” it
7. Further opportunities not yet foreseen by this discussion paper but likely to occur as the technology evolves.

RECOMMENDATIONS FOR FURTHER RESEARCH

Integrating BIM with Smart Contracts will be beneficial to the construction industry, but it won't happen unless the benefits to all parties involved are tangible and secured. As such, we recommend the following for further research:

1. Cost savings - although contract automation is going to lower the cost of construction administration. Contractors and developers won't adopt BIM, or even consider Smart Contracts

without knowing the real cost savings of doing so. Further research needs to be carried out to identify the cost savings tangible value.

2. Responsibilities – as the BIM model is updated it is fair to assume that both principal and contractor are biased towards the information the model is updated with – as the contract sum is adjusted accordingly. Who should be responsible for updating the model could become a legal issue and further research needs to be carried out to identify and define the best strategy to approach it.
3. The data – depending on the complexity of the project, not all data generated by a BIM model is useful for a Smart Contract, whilst information such as site establishment and contractor overheads won't be included in the BIM model. Smart Contracts can retrieve data from a BIM model, but further research needs to be carried to define the parameters how information is generated, or retrieved, to allow for seamless integration and automation during construction.

We believe that as further research is released about the integration between BIM and Smart Contracts, the industry will perceive Smart Contracts and BIM as an opportunity to extend the services set offered by property consultants rather than a threat to their business.

CONCLUSION

Research regarding the integration of BIM with Smart Contracts is scarce, almost inexistent, hence this discussion paper.

This paper identified several benefits that the integration between BIM and Smart Contracts is capable to deliver to the construction industry and makes three recommendations for further research.

REFERENCES

Azhar, S (2011) *Building Information Modeling (BIM): Trends, Benefits, Risks, and Challenges for the AEC Industry*. Reston: American Society of Civil Engineers

Cardeira, H (2015) *Smart Contracts and their applications to the construction industry*. Bucharest: Romanian Society of Construction Law

Construction Intelligence Center (2016) *Market Insight - Building Information Modeling (BIM) in the Global Construction Market*. London: Timetric