Disrupting Project Controls – Fast Forward 20 Years

Kevin Mattheys
August 2018

Introduction

Sitting in the OTC office in Wellington, Western Cape (near Cape Town, South Africa), I was looking out of the window at the welcome rain falling gently to the ground and providing the trees and vegetation some much needed sustenance. I was also thinking about how the world has changed over my lifetime. It was then that my weekly issue of MindBullets popped up in my email account. MindBullets is a free weekly publication from Future World where they try and predict future events based on current knowledge and technology.

This MindBullets article discussed 'disruption', the rate at which it is happening and some of the technologies creating the disruption. Whilst reading the article, I thought it prudent to write this article on where the project controls industry will find itself 20 years from now as a 'conversation starter'. Twenty years might sound like a long time, but it could also happen sooner, so I have been somewhat conservative. I suspect not much work has currently been done on topic, as there still appears to be a proliferation of spreadsheet and in-the-drawer databases being used.

This phase in the ongoing advancement of humanity is what is commonly referred to as the '4th Industrial Revolution'. Some of the questions that will need to be asked are:

- Can machines and /or technology help us implement projects better?
- Will project controls even exist in future and, if so, in what shape or form?
- How much automation will take place? and
- What skills will be required to get the best from technology?

These are some of the questions that will need to be tackled in almost all organisations involved in projects and project controls activities. There will no doubt be advantages and disadvantages, but will the advantages outweigh the disadvantages?

I guess the question can be asked for project management and other disciplines as well, but for now let us focus on project controls.

Background

Innovations in technology and technology related applications continue to proliferate at an astonishing pace. Moore's law certainly seems to be playing out in this field. What was considered revolutionary a few years ago has had its head overturned and is now outdated.

I have been receiving the weekly articles from Future World since 2011. What tweaked my interest in 2014 was their prediction for a concept called 3D printing (sometimes referred to as additive manufacturing) and ever since then I have been intrigued by this technology. Of course, this is not the only technology that is causing disruption, but the advances made in the past four to five years in this field have been staggering.

By implication one can probably assume that similar strides are being made in other technologies. Let us look at each of the technologies out there currently that I am aware of and dissect them a little. They are not addressed in any particular order but provide a sample for the reader to better understand what is happening behind the scenes so that they can be factored into the conversations.

Current Disruptive Technologies

3D Printing (additive manufacturing)

Essentially this technology uses filaments of various type e.g. plastic, metal, nylon, wood filler, carbon fiber, etc. The filaments are then passed through a heating nozzle which essentially reduces the filament to a liquid type of substance which is then applied layer by layer to the object being produced.

Houses have been produced in some areas of the world using 3D printing (Byttner, 2016). In Holland, the architectural firm Dus Architects has already printed a 'Canal House' with 3D-printers. Another example is that the Chinese company Yingchuang New Materials in Shanghai is already 3D-printing 10 houses per day. Recently, a 3D-printed office building was unveiled in Dubai.

Unconfirmed reports state that NASA no longer sends spare parts with their space ships. If needed, they can simply print a spare part in space. Other applications have already been developed in the medical, manufacturing, healthcare, optics, education and food industries.

Drones

Drones are a relative newcomer to the scene. To the American military, they are UAVs (Unmanned Aerial Vehicles) or RPAS (Remotely Piloted Aerial Systems). However, they are more commonly known as drones. Drones are used in situations where manned flight is considered too risky or difficult.

Areas where drones are currently being used is in agriculture, recording of live events, surveying dangerous areas, delivery of small items, tracking wildlife, law enforcement and shooting of commercials and movies. Agriculture is also adapting to this technology to monitor crops, watering patterns and soil suitability. This is an area that will continue to grow as more and more creative uses are found for these machines.

As a practical application why not use drones to view a project being built and the images sent back to a central location where further analytics, project progressing, etc. can be done without having to go to the site? Furthermore, if cameras on drones are fitted with appropriate lenses, then e.g. welds can be analysed for cracks, or hot spots can be detected. The opportunities go on and on.

Artificial Intelligence (AI)

Artificial intelligence (AI) is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals. AI strives to replicate human thinking and analysis, but via the machine. Apart from being adept at playing chess, other areas where AI is currently used is in voice recognition, speech recognition, medical diagnosis and search engines.

If recent predictions are to be believed, then this is a huge growth area. According to a new market research report*, Artificial Intelligence (AI) in Construction Market - Global Forecast to 2023* (MarketsandMarkets™, 2018), the global market is expected to grow from US$ 407.2 Million in 2018 to US$ 1,831.0 Million by 2023, at a compound annual growth rate of 35.1% during the forecast period.

Data Analytics

Data analysis is a process of inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making. In the past large companies used relational databases to extract information for decision making, but this was somewhat limited. With the vast amounts of data available both inside and outside the organization, it has now become necessary to analyse this information quicker and more reliably.

Cloud Data Storage

Cloud storage allows world-wide storage and retrieval of any amount of data at any time. You can use cloud storage for a range of scenarios, including serving website content, storing data for archival and disaster recovery, or distributing large data objects to users via direct download. I think this is also an area that is going to improve greatly.

Most of our work at OTC is based on working in the cloud and the benefits are not difficult to see.

Internet of Things (IoT)

The Internet of Things is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data.

We already see widespread application of this technology, but what will the future hold for project controls practitioners? Working from home, always available, data at the touch of a button.

Blockchain

Blockchain refers to a type of data structure that enables identifying and tracking transactions digitally and sharing this information across a distributed network of computers, creating in a sense a distributed trust network. The distributed ledger technology offered by blockchain provides a transparent and secure means for tracking the ownership and transfer of assets.

What will this technology bring to the procurement processes of companies? It will almost certainly ensure the integrity of materials and equipment delivered to site.

Cryptocurrencies

Bitcoin, Ethereum, EOS, Ripple, Litecoin, Bitcoin Cash, Binance Coin, IOTA, TRON and NEO. Do you recognize these terms? If you do not, then I suggest you find out what they are. A good place to start is the article, *Bitcoin for beginners* (Mayer, 2017).

According to Wikipedia (2018), a cryptocurrency is a digital asset designed to work as a medium of exchange that uses strong cryptography to secure financial transactions, control the creation of additional units, and verify the transfer of assets. A cryptocurrency is a kind of digital currency, virtual currency or alternative currency. Cryptocurrencies use decentralised control as opposed to centralised electronic money and central banking systems. Who knows how many other 'currencies' will pop up in future to challenge the current crop of cryptocurrencies.

Now the questions get interesting. What does this mean for projects and companies who use traditional payment, financing and procurement currencies? Are cost controllers and estimators able to control and estimate costs with this technology? How will the financial reports be prepared and presented? Remember with this technology it is possible that many traditional transaction fee costs, interest rate costs and other costs associated with lending institutions could be rendered for 'free'.

Facial / Object Recognition

A facial recognition system is a technology capable of identifying or verifying a person from a digital image or a video frame from a video source. There are multiple methods

in which facial recognition systems work, but in general, they work by comparing selected facial features from a given image with faces within a database.

John Holland is an Australian construction company who are actively embracing technology. In the field of safety, they use facial recognition technology to identify workers who are not wearing the appropriate personal protective equipment (PPE) on site (McLean, 2018).

Other disruptive technologies

Other disruptive technologies which are out there, and which we haven't even touched on, are clean energy, self-driving vehicles and biotechnology. It seems as if 'disruption' is the new way of the world. The more it can be done, the better it seems.

I sometimes wonder about whether it is always a good thing…

Generic Skills for the Future

The generic skills listed below will remain essential in the future work environment:

- **Complex Problem Solving:** The skill to see relationships between industries and craft creative solutions to problems that are yet to appear;
- **Critical Thinking**: People who can turn data into insightful interpretations will be sought after due to the complexity and interconnectedness of fields such as computer science, engineering and biology;
- **Creativity:** The ability to build something out of ideas is a skill that will pay off now and in future;
- **People Management:** Robots may acquire analytical and mathematical skills, but they cannot replace humans in leadership and managerial roles that require people skills;
- **Coordinating with others:** Effective communication and team collaboration will be a top demand in any company;
- **Emotional Intelligence:** Qualities such as empathy and curiosity for future managers;
- **Judgement and Decision-Making:** The ability to condense vast amounts of data with the help of data analytics into insightful interpretations and measured decisions;
- **Service Orientation:** People who know the importance of offering value to clients in the form of services and assistance;
- **Negotiation skills:** Deriving win-win situations with businesses and individuals will be extremely important; and

- **Cognitive Flexibility:** The ability to switch between different persona as the situation demands.

Do your corporate training programs address these areas? Will you need to upskill yourself?

My View on Project Controls in 20 Years

I am of the firm opinion that all the above technologies, as well as others which will still be developed in the future, will in some way, shape or form impact on project controls.

Data Analytics (or what is sometimes referred to as 'Big Data') will play a large role in project controls enabled by cloud computing. Modelling of plants or facilities will become the norm, and everything will be planned and modelled to the finest detail before any work is done on site. Schedules will be automatically produced by the modelling software along with cost estimates, etc. from standardised templates.

Imagine a world where statistical simulations (possibly Monte Carlo or some other disruptive application) are the norm on cost estimates and schedules and then live data is used to track and monitor progress related to engineering, procurement, construction etc. This data is then used to provide an almost real time statistical forecast on the end of job cost and schedule which means a narrowing of the conventional distribution curves of today. The data is then fed back automatically into the respective data engines leading to significant productivity and forecasting gains for future projects. What then are the implications of a company managing multiple projects concurrently

and all this data is available real time? Astonishing to say the least.

There will be fundamental change in procurement (Blockchain) and construction practices (3D printing and recognition software for permitting, site access, etc.). Collection of as built drawings will no longer be an issue as all drawings are attached to their correct repositories and updated online for immediate storage back into the database.

Project controls in its current format will change and may even merge with the project management function or just become a data engine feed, but with analytical capabilities. The availability of real time data will increase the project controllers' productivity enormously as the required data will be online and not in some obscure place where it is difficult to find. Collecting, updating and storing data will continue to ensure decisions can be made easier and faster. Transparency of data will be enhanced. No more in-the-drawer spreadsheets or databases. No more hiding of data. No more manipulating of data and reports to play to someone's agenda.

Gavin Halse, who is currently a consulting partner at OTC, discusses the impact that product life-cycle management (PLM) may have in an interesting article on the subject. He contends that in the world of future projects he sees a shift from traditional megaprojects towards smaller, more agile projects that involve many more stakeholders / participants in a new networked economy (Halse, 2017). This will have a significant impact on project controls because project complexity will increase exponentially. The long waterfall design, build, commission, hand over to the operator, operate will change.

Multi-purpose factories will adapt product lines to toll manufacture on demand, many of the projects will be to retread plant to produce new products - this is like staying in business, but on a much bigger scale. The owner's role will also change, as will the operator's. This will mean that project controls and business modelling/operations will converge much more and not operate in separate silos.

I think a new change that will emerge from all of this will be in the commercial / legal fields as I do not believe we have thought about this going forward, e.g. how do we write / manage contracts for a digital age and with so much disruption going on?

Concluding remarks

What was very interesting for me while preparing this article was the lack of articles that have been published on the world wide web relating to use of technology in the project controls or project management arenas. It may mean that people are actively working on this in the background, but I doubt it. Another interesting take away is a comment by Byttner (2016) that the construction industry has been somewhat reluctant to get dragged into the digital age and that it is now ready for disruption.

In the article above I have not delved into huge detail, but rather tried to make it light

reading to stimulate the thinking and the conversations which will be necessary in preparing for disruption. It should serve as a starting point for tackling the role that will be required of project controls people (and others) in the future.

Whatever your view of the future of project controls is, be assured it will be different. I would like to convey my thanks to John Hollman and Gavin Halse for providing further insight into this complex topic.

References

- **Byttner, K.-J.**, 2016, *Swedish expert reveals how Google and Microsoft are about to pounce on this huge traditional industry*. Available from https://nordic.businessinsider.com/swedish-expert-reveals-how-google-and-microsoft-surprisingly-are-about-to-take-over-this-huge-old-industry-2016-5. Accessed on 29 July 2018.

- **Halse, G.A.**, 2017, Innovating in the process industry with PLM. Available from http://www.instrumentation.co.za/9080a. Accessed on 27 July 2018.

- **MarketsandMarkets**™, 2018, *Artificial Intelligence (AI) in construction market by technology, stage, component, application, deployment type, organization size, industry type, and region - global forecast to 2023.* Available from https://www.marketsandmarkets.com/PressReleases/ai-in-construction.asp. Accessed on 27 July 2018.

- **Mayer, N.**, 2017, *Bitcoin for beginners.* Available from http://www.sharenet.co.za/views/Bitcoin-For-Beginners/af5a49e238951d20fd8418701a09223c. Accessed on 27 July 2018.

- **McLean, A**., 2018, *Construction in the cloud: The future of John Holland.* Available from https://www.zdnet.com/article/construction-in-the-cloud-the-future-of-john-holland/. Accessed on 27 July 2018.

- **Wikipedia**, 2018, *Cryptocurrency*. Available from https://en.wikipedia.org/wiki/Cryptocurrency. Accessed on 27 July 2018.