The world preparing for climate change

Nathan Marsh, Senior Vice President and Regional Executive Leader, EMEA, Bentley Systems, on the importance of sustainability considerations when investing in infrastructure projects and how the digital twin can support those approaches.

Nathan, do you see substantial investments being made in strengthening infrastructure? What is the expected impact of climate change?

Well, it is great to answer this first question with a yes. Indeed, we are seeing a visible increase in investment in sustainability and reducing the carbon footprint in the E&C industry and in the asset operations supply chain. These improvement opportunities are targeted not only by governments but also by private equity funds focused on designing, delivering, and operating sustainable infrastructure assets.

It is one thing to find ways to qualify and reduce the carbon footprint, the next step is actually reducing it – to get to the point: Once you are able to identify carbon emission you can get rid of, because you must actually reduce it. And, when we do this, we have to evidence the reduction. And therefore we need data that shows what we are reducing over time.

Data is the keyword in your answer. What is the role of the digital twin in this context? And: Are the investors aware of the potential of digital twins?

A lot are aware of it. There are a few examples where a digital twin is being used to acquire, hold, or present business case data as well as planning and construction data to manage time, cost, quality issues together with digital-proof of readiness when it comes to handover to operations.

From Bentley's perspective, digital twins provide an end-to-end and open view of an asset's full lifecycle. With the help of a digital twin, data can be stored in a consistent way, in a consistent operating environment, across the full lifecycle of the infrastructure asset. The digital twin brings also the possibility to audit and track where the components come from, how and where they have been assembled. Of course, a digital twin doesn't provide all the answers but rules out excuses and statements like: I don't know. A digital twin provides awareness, certainty, order and control in a previous chaotic situation.

This image from Copernicus Sentinel-3A shows the temperature at the top of Hurricane Matthew at 03:13 GMT (05:13 CEST) today, as it approached Florida in the USA.

Source: www.esa.int/ESA_Multimedia/Images/2016/10/Eye_of_the_storm. Sentinel-3A is a European Space Agency Earth observation satellite dedicated to oceanography which launched in 2016

At Bentley Systems, do you use the term 'digital thread'?

Yes, we do. There are very similar terms in this context, which essentially means one consistent data flow resulting in one picture of the asset in data form at every stage of planning, construction, commissioning, and handover to asset operations. If you have a digital twin, it provides that continuity and stability, and it acts as a 'golden' (digital) thread telling us what planning, design, engineering, construction and asset operations methodology is associated with a particular asset. It can add value to the construction because it records all the lessons learned. In other words: That digital twin has an economic value in itself.

Speaking in euros or US dollars: What is the value of a digital twin?

It depends on the project. It won't be zero and it won't be a hundred million – it could be worth a six- or seven-figure sum, depending on the asset capital value, and the costs of maintenance, for example. That is really exciting because it is evident that it has an economic value as well as supporting the active performance in the construction phase.

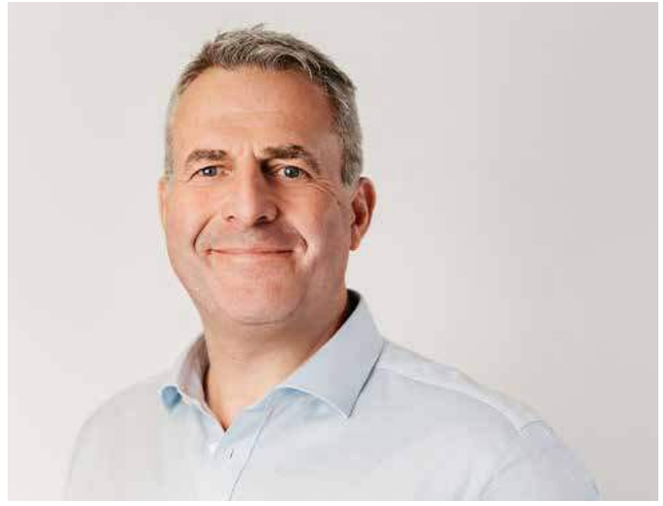
Do your contacts in industry discuss these values?

It is quite a new conversation because industry is just starting to adopt digital twins as a value-creation concept, e.g. in some of the bigger private equity firms. One of the questions I ask in such conversation is: What is your strategy in creating value in the digital twin? It could be in the construction phase in terms of proofing: Have we got efficiency gains by using robotics or pre-assembly offsite? That is important. When the asset is created an important question also is: Who owns the digital twin at each phase? How can it create value as it builds it digital picture of the asset?

What we observe in respect of funding and investors is that their assessment of the value of a physical asset goes up when a digital twin exists, , for instance, when a fault occurs or is scheduled to occur, and needs either replacement or repair. This saves costs on routine asset management, showing how a digital twin keeps creating value through lower asset maintenance costs. For regulators and governments there is a full-lifecycle value for them that helps to approve permissioning or funding. To conclude, I am really excited about the progress we are seeing in the economic value of digital twins.

How does Bentley Systems position itself in this new debate? Does it make sense to describe it with the rather old term 'trusted advisor'?

Having been a Bentley Systems' client in various companies in the past, I have realized that trust has to be earned and I am convinced that Bentley is uniquely placed as a leader when it comes to a trusted advisor for digital twins. Why do I say this? Infrastructure digital twins for major asset projects like nuclear power stations or strategic high-speed rail are highly complex – the volume, sources, types, use-cases, and fidelity and



Nathan Marsh

accuracy of the data is profound, and keeps growing across an asset's lifecycle. For 40 years, Bentley has been focused on the infrastructure sector. We have applied this heritage to embracing cloud and open applications, growing our relevance for major programme needs.

This makes us unique and a 'trusted advisor'.

Apropos cloud computing: What is the status with regard to using cloud applications for infrastructure projects?

We are seeing an increasing move to the cloud. And this is part of our clients' multi-vendor,and in some cases, hybrid strategy. Cloud-based applications can help improve data governance and control to a higher level, (faster backups, earlier detection, consistent protocols, etc.) and that is the reason why multi-cloud applications are welcomed across the infrastructure supply chain. The challenge now is to achieve a program-wide level of fidelity and consistency that allows us to manage collaboration at this higher level.

I think an entry point for this within the operational environment and for the digital twin should be positively controlled for good reason: to meet security requirements, execute data handling protocols, and maintain proper data structures within the cloud environment. Safety enables scalability.

Is there a specific portfolio of projects that Bentley Systems is undertaking with regard to AI?

Yes, there is. We have some lighthouse AI projects. Associated with this are some basic principles. What we see is that there is no shortage of capabilities in machine learning within organizations. Our core principle,

that we apply to our portfolio, is one of trust and data integrity. Evidence that you trust the source code, software engineering and any adaptations made to the code, so you are confident of its capabilities. Also that data the AI ingests is equally validated, trusted and well-organised. That means you get a better-quality answer far quicker rather than a really fast answer – it's about trusting quality, not relying on more speed. Bentley is in the business of better quality, with better considered and tested answers. That is the foundation of our approach; we offer a very controlled environment where we can successfully bring in machine learning in a very transparent way. We are convinced this approach and our portfolio makes a difference by bringing trust, order and quality into major infrastructure lifecycles.

What do you think about the term 'intelligence-as-a-service'? I think Bentley Systems is able to provide services to climb up the knowledge ladder with the help of data contextualization.

If you take our AI approach, which is the grounded in good quality organized data, with faster access to qualified answers, you move from storing data to analyzing it to supporting ultra-fast optioneering presentations of different models. Then you're probably going to become more of an insight-as-a-service company anyway because it's more than a natural evolution – it's a conscious move on our part. I suspect as we continue our good work on AI we will become the preferred market leader in intelligence information for programmes because we have the right AI and data fundamentals .

You can take the opportunity to transform yourself from a software vendor to a 'partner', with an integrated offering in order to serve your clients with better connectivity and more insights through close collaboration powered by cloud computing?

Yes. We see, particularly in mega programs that run 10+ years or are worth 10+ billion, that global program ecosystems are complex, multi-tier and have inherent fragility. Traditionally, you have two or three global engineering firms competing on contracts or partnering on programs. This approach is now required across the full program – an integrated partnering ecosystem, digitally enabled, secure, AI powered and data driven, positioning people to make the best and most value creating choices possible. We are perfectly positioned as the market leader for digital in major complex infrastructure programmes, and asset operations.

Just to wrap up our conversation: What are the success factors for running a mega project in time and in budget?

At the highest level, you have to adopt a corporate or business mentality rather than a pure project mentality. And think big and think integrated. We are doing business together, so we may need to put some competitive activities on hold to achieve a single program outcome together:. Working as one team, with shared goals, over many years and

across multiple ecosystems and cultures. As I mentioned earlier, we need to focus on unprecedented levels of supply chain fidelity to deal with the additional risks around the globe. For example, steel will come from a different part of the world than where the construction site may be located, and me purchasing that in volume could distort commodity pricing. So how do I manage to pool skills and materials over 10+ years? It's a business over a very long period of time! I can maybe think of technology trends for the next five years – but not those that will be relevant in ten. So planning for the long term, but executing tactically, is a sensible approach.

Do you have a favorite project?

I do have one and I built a personal connection to it. I think you are familiar with Oystercard scheme of tokenized travel across London. I was very lucky to find myself as Program Director of Manchester's equivalent – the digital, integrated ticketing scheme. The underlying merging of data, technologies and processes across a global supply chain, and a complex multi-modal network, was fascinating and stressful – I got a lot of grey hairs at that time. We had to manage a supply chain right the way to China and wait for commodities from Latin America (in particular machines like scanners). All this led to Manchester's public transport system becoming more accessible, affordable, and attractive for citizens. It got more people traveling on the network, so ticket prices could be lowered. For me, the impact on society has probably been my proudest moment, as well as seeing congestion and emissions reduce, while and witnessing more people being connected to employment. This is why I love infrastructure!

Thank you for talking to us!

Questions: Dr Bernhard D. Valnion

Bentley's software solutions prepare cities and municipalities to manage climate challenges and become more resilient *Picture: Bentley Systems*