BSI Workshop report - Building for the future with Digital Twins

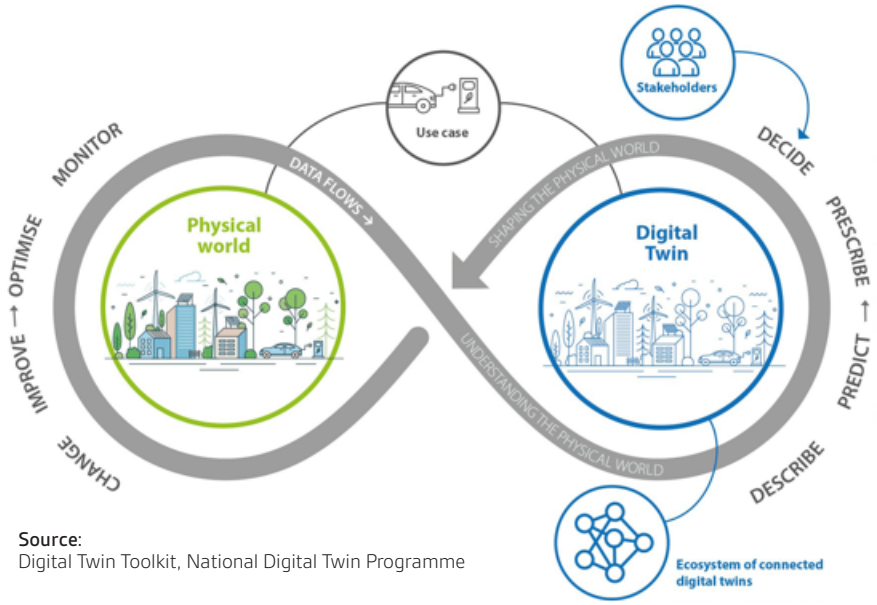
A recent workshop enabled by BSI to gain a better understanding of the potential for digital twins in the built environment.

By Royal Charter

Introduction

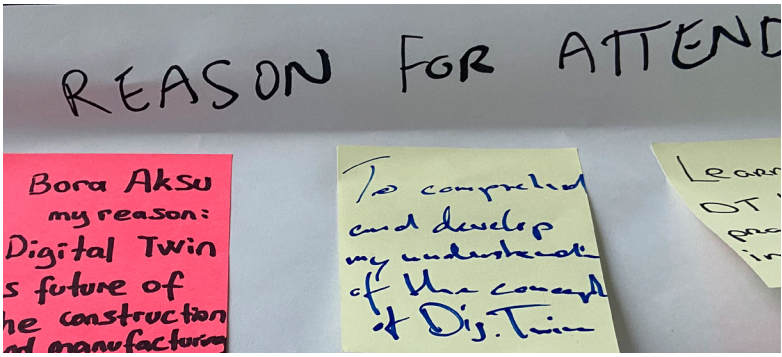
BSI recently welcomed a number of clients from the built environment sector to an in-person, interactive workshop in Dubai, where they considered the important issue of 'Digital Twins for the Built Environment'. This was the first workshop dedicated to Digital Twins in the Middle East region. For some participants, the prime objective was "to learn what is possible with digital twins", while others prioritized "practical advice on implementation".

The workshop began by establishing what digital twin means: "a digital representation of an observable element with a means to enable convergence between the observable element and its digital representation", (source Flex 260) as illustrated below:



Source:
Digital Twin Toolkit, National Digital Twin Programme

While the workshop participants could envisage many potential applications for digital twins in their organisations, they shared the same understanding of how they work. Typically, a physical asset is fitted with sensors that monitor vital areas of its functionality and feed information back to the digital twin, which can run simulations, study performance issues, and look to generate insights and ideas for improvement that can be applied back to the physical asset. The aim is to achieve better interventions and unlock more excellent value from the physical asset by improving its performance and services.



Quote: Rahul Shah

Sector Development Director EMEA, Built Environment - BSI

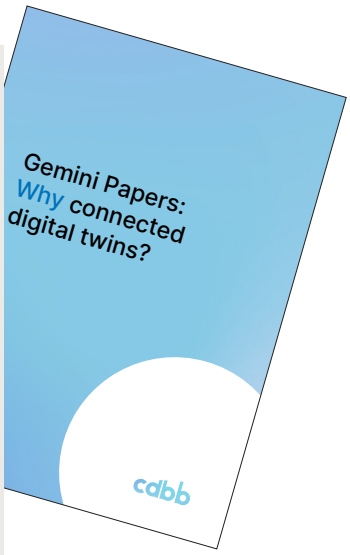
“Digital twins in the built environment can deliver better societal, environmental, and economic outcomes by enabling better insights and decisions across planning, delivery and whole-life asset management.”

The workshop was organised around the Gemini Principles. Published by the Centre for Digital Built Britain (CDBB) in 2018, they are effectively the conscience of connected digital twins – nine guiding values to build consensus for their ongoing evolution, as listed below:

The Gemini Principles

Purpose: Must have clear purpose	**Public good** Must be used to deliver genuine public benefit in perpetuity	**Value creation** Must enable value creation and performance improvement	**Insight** Must provide determinable insight into the built environment
Trust: Must be trustworthy	**Security** Must enable security and be secure itself	**Openness** Must be as open as possible	**Quality** Must be built on data of an appropriate quality
Function: Must function effectively	**Federation** Must be based on a standard connected environment	**Curation** Must have clear ownership, governance and regulation	**Evolution** Must be able to adapt as technology and society evolve

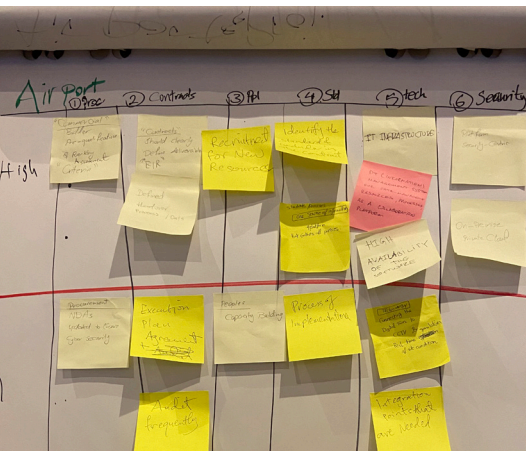
Source: Gemini Papers, CDBB

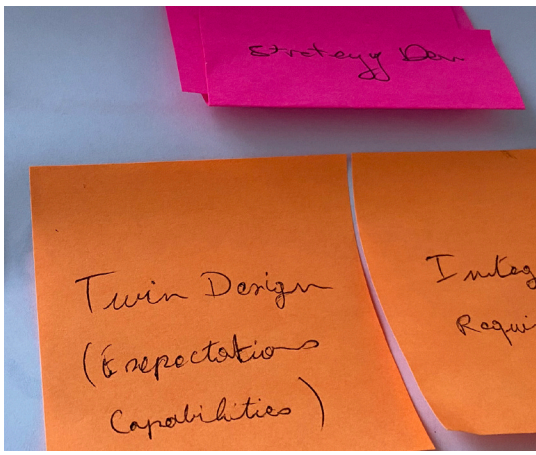


Three key workshop topics:

1. Standards, processes, and policies
2. Business value and opportunities
3. Implementing digital twins

The 50-plus participants were divided into 10 discrete groups, and these groups were then asked to spend approximately an hour on focused activities and discussions around each of the topics. The groups recorded their thoughts on whiteboards (as pictured), and here we offer a summary of the issues they addressed.





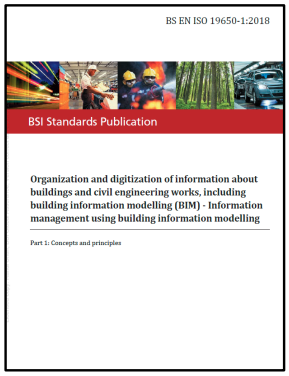
Topic 1: Standards, processes, and policies

The adoption of standards forms a framework for any process and allows industry to be guided by an agreed process.

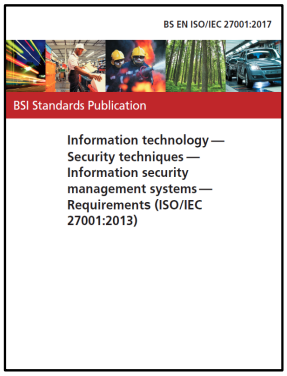
By reducing the need for separate organizations to invent their own solutions to a common problem, standards are one aspect of implementing Lean thinking as they reduce wasteful duplication.

Quality ISO 9001

Safety ISO 45001



BIM ISO 19650



Information Security ISO 27001

Facilitators Sara Guinand of ALEC and Rahul Shah of BSI introduced the first topic by noting the global prevalence of recognised standards, business processes and government policies. All are a fact of business life, and many are highly beneficial. The adoption of standards, for example, forms a framework for any process and allows the industry to be guided by agreed principles and benchmarks. By reducing the need for separate organisations to invent their own solutions to a common problem, standards are one aspect of implementing 'Lean' thinking as they reduce wasteful duplication.

Topic 1 highlights – Standards (top standards to enable Digital Twins)

- Flex 260
- ISO 19650
- ISO 27001
- EN IEC 62443
- ISO 8000 series for data quality etc..

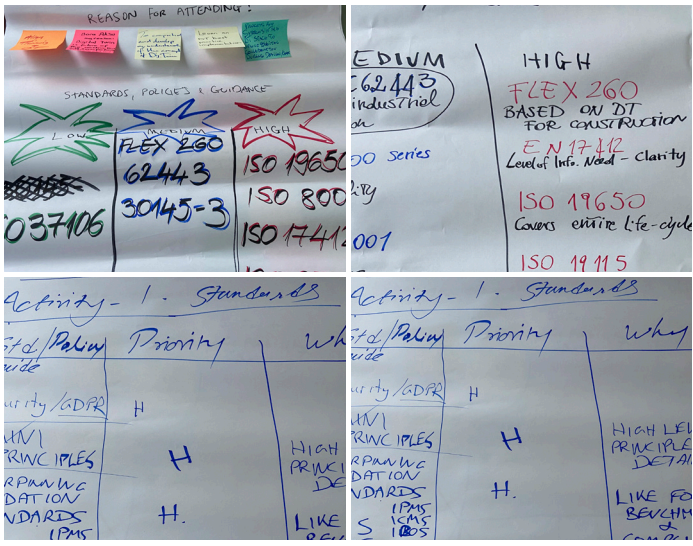
Quote: Sara Guinand

Senior Digital Construction Coordinator - ALEC

“Standards are the expression of skilled and experienced professionals on a specific field/topic. They often are also innovators and through their efforts to build a standard also enablers of change. Standards can drive awareness inside and outside an organisation, drive the change and finally can contribute to the creation of the identity of a specific sector.“

The workshop groups were asked to list standards, policies, and guidance material most relevant to them to implement digital twins in their business – giving each a ‘high’, ‘medium’ or ‘low’ priority, along with their reasons. This activity, together with group discussion and feedback, saw the emergence of several ‘high priority documents.

It was not surprising to see that many groups prioritised the Flex 260 – Built environment – Digital twins overview and general principles because this standard was developed specifically to ease the adoption of digital twins and, ultimately, accelerate innovation in the built environment.



BSI Flex 260 provides a common language, enabling organisations to align stakeholder expectations and mitigate friction when information is exchanged between digital twins. It counters any lack of alignment on key concepts and approaches that could risk slowing the adoption of digital twins and reducing their value by establishing the key terms, concepts, and principles related to creating, managing and using digital twins.

Other high-priority standards for many were ISO 19650 for managing information over the whole lifecycle of a built asset using building information modelling (BIM), ISO 27001 for information security management, and ISO 8000 series for data quality.

Other standards and guidance documents were mentioned as priorities by some groups, including:

- EN IEC 62443 – Security for industrial automation and control systems
- EN 17412 – Level of information need
- ISO/IEC – 30145-3 – Smart city engineering framework
- ISO 37106 – Guidance on establishing smart city operating models for sustainable communities.

Topic 2: Business value and opportunities

Facilitators David Glennon of Red Sea Development Company and Wajdi Mereb of Miral introduced the second topic by highlighting how digital twins in the built environment can deliver better outcomes for the economy and society, for example, by improving public sector efficiency, commercial effectiveness, productivity, quality of life and public wellbeing.

Topic 2 highlights – Business value and opportunities

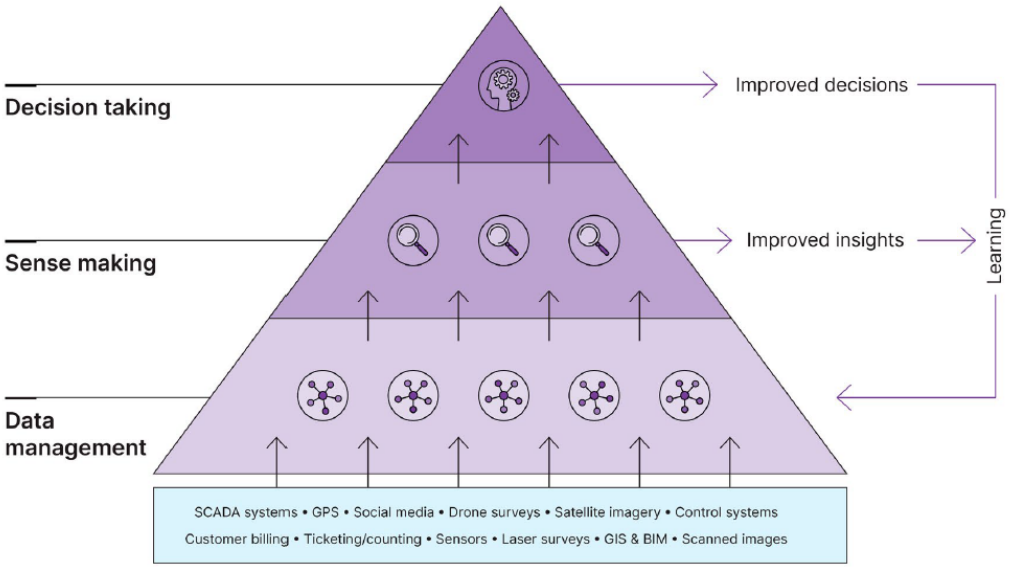
- Realtime performance and clear understanding of how assets behave
- "Digital thread' with relationships for CapEx and OpEx insights
- Optimized operations through data analytics and trends
- Compare financial sustainability performance
- Cross industry alignments (water, energy, infrastructure)

Quote: David Glennon

Senior Digital Delivery Director – The Red Sea Development Company

"It was interesting to explore the business goals of the participants in the room and identify and tangible business outcomes in the workshop. The prioritisation session saw differences between organisations and generated good discussion. The feedback on creating a framework to allow participants to build their business case when back in their organisations was very encouraging."

These outcomes are achieved through the 'information value chain' (illustrated below), which enables better insight and decisions with data which support the planning, delivery, and whole-life management of built assets:



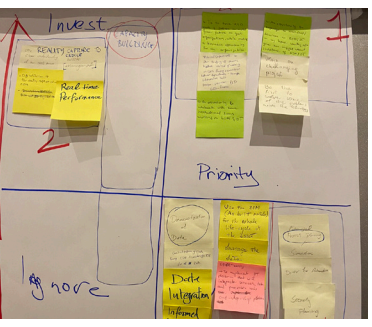
Source: The Gemini Principles, modified (1)

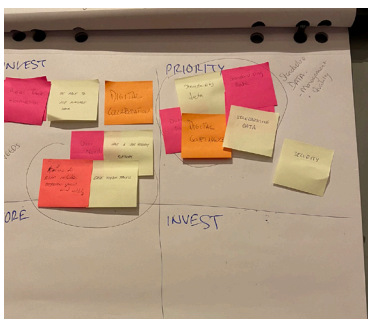
Quote: Wajdi Mereb

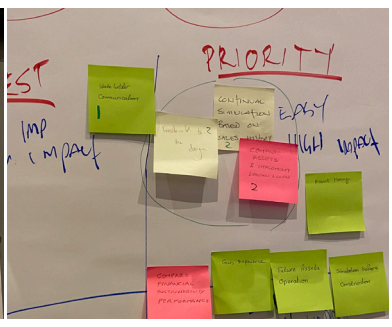
Senior Manager - Miral

“ Digital Twin in the built environment provides a dynamic process for constructive digital-to-physical collaboration associated and persistent throughout all the assets’ lifecycle stages, which begins at the ideation stage of a new asset/project and continues throughout the full lifecycle, that is evolving to maintain well-structured and reliable real-time information & analysis and also empower the decision-making process.

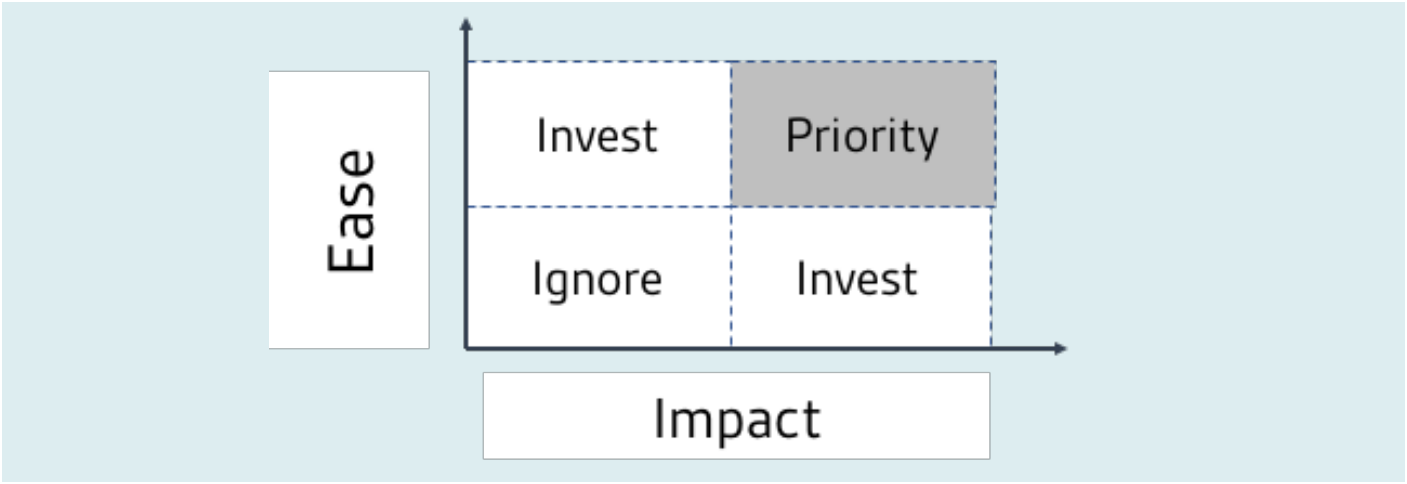
The aim of this session was for participants to better understand what business value and opportunities they could derive from using digital twins, so the groups were asked to identify and prioritise areas of business value and opportunity, highlighting any differences among the various stakeholders.







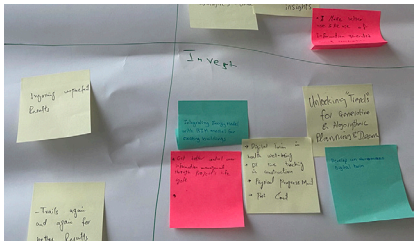
Participants were encouraged to build a high-level business case for their organisation, using a variety of tools, including brainstorming, silent sorting, SWOT (strengths, weaknesses, opportunities, threats) analysis, and '4-box' prioritising, as illustrated here:

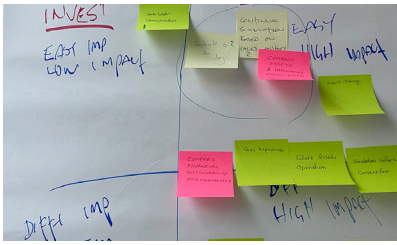


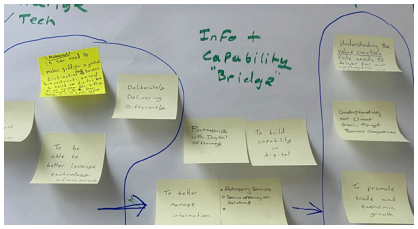
With participants attending from a wide selection of organisations, it was not surprising to find many different ways in which they could envision increased value and new opportunities for their own business from the successful implementation of digital twins. These ranged from the application of digital twins in health and wellbeing, and for time tracking in construction, to their use in building management (integrated with BIM), and airport baggage handling systems.

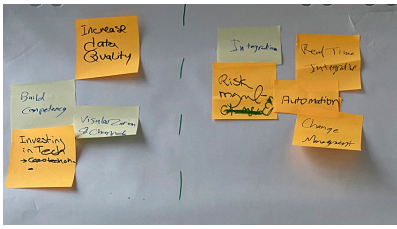
Various groups summed up the overall potential of digital twins as "optimised operations through data analytics and trends", "better measurements for better management" and, quite simply, "improved efficiency" and "reduced costs".

The accompanying pictures of crowded flip charts give an added flavour of the animated discussions within the groups – a great example of engagement and collaboration in action!







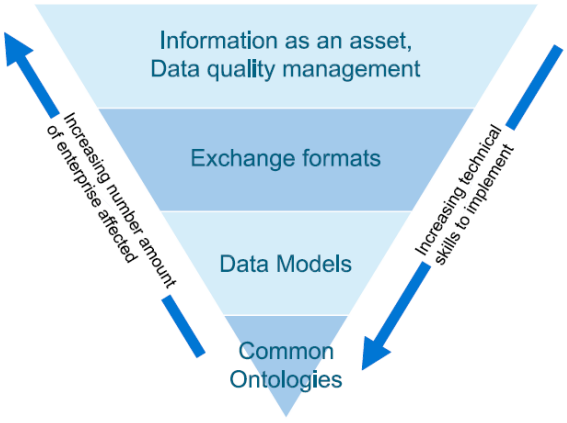


Topic 3: Implementing digital twins

In this session, facilitators Andy Boutle of ALEC and Amr Saad of ROSHN Real Estate introduced the issues participants would need to consider when implementing digital twins in their own organisations. In particular, they focused on the steps in information management outlined in BSI Flex 260 and illustrated below:

They also highlighted the requirements of digital twins for the built environment outlined in BSI Flex 260.

The groups were then asked to brainstorm what factors their own organisations would need to consider in implementing digital twins for an existing or new built asset, again also providing a judgement of the importance of each.



For many groups, issues such as education/training, culture, and behaviours, were a high priority, with new skills required for the effective use of digital twins. Some noted that there were lessons to be learnt from BIM implementation.

Topic 3 highlights – Implementing Digital Twin (top considerations)

- Procurement and legal contracts
- People and skills
- Supply chain engagement
- Quality of data
- Security of data

Quote: Andy Boutle

Head of Digital Construction - ALEC

“Many of the challenges faced when implementing BIM are also apparent for digital twinning, and information management using BIM is a core pillar for facilitating any digital twin. We must not lose sight of the fundamentals and get them consistently right before moving on to the next shiny concept. “

Quote: Amr Saad

Head of Digital Engineering - ROSHN Real Estate

“We need a paradigm shift while thinking about digital twins’ implementation. Currently, the industry is trying to digitise the built environment by implementing BIM and other processes to optimise the delivery of assets and near future operational outcomes. More importantly, the industry should consider the asset’s prospective users and operators. Future generations will use and operate these assets; these generations may not have the same constraints we are considering now. The industry should invest in digitising its current practice; lessons learned while encouraging broader collaboration across stakeholders to build a strong foundation for future generations to build on.

Another area of high priority was standards/processes, particularly around data security and resilience, with high-level considerations for sensor feedback connectivity, and triggered interventions.

Other issues mentioned as important by some groups included:

- Procurement routes, contracts, and commercial agreements to capture digital workflows – what needs to change, can existing contracts and procurement models facilitate effective digital twinning?
- Legal considerations, such as: responsibility, liability, IP rights, data restrictions, technical specifications, and security
- Technology – hardware (types of sensors, assets to be monitored), software, analytical tools etc.

Digital Twin Hub

The workshop concluded with a summary of the key points and a vote of thanks to all the workshop participants and their organisations – which we are pleased to credit below – for freely sharing their knowledge and experience. BSI firmly believes that effective industry collaboration of this sort will ultimately enable digital twins to fulfill their potential for the built environment. Participants were encouraged to take part in the online 'Digital Twin Hub' (DT Hub), a free-to-join online community, now 3,000 strong, where we foster ongoing collaboration between major asset owners and other built environment organisations.

Connecting these stakeholders to agree on good practices and identify areas that unlock value is an essential step toward accelerating the benefits of digital twins in the built environment. For example, the DT Hub was a key catalyst for Flex 260, hosting a series of webinars and informal online discussions to develop a roadmap of common positions around significant opportunities and challenges for the industry. The DT Hub generated insights and recommendations on digital twin concepts and definitions, skills and culture, and value and priority use cases, creating the roadmap that led to the development of Flex 260.

For more information, visit:
www.digitaltwinhub.co.uk

Acknowledgements

BSI is grateful to our guest facilitators:

Rahul Shah, Sector Development Director EMEA, Built Environment
David Glennon, Senior Digital Delivery Director, Red Sea Development Company, Saudi Arabia
Wajdi Mereb, Senior Manager, Miral, UAE
Andy Boutle, Head of Digital Construction, ALEC, UAE
Sara Guinand, Senior Digital Construction Coordinator, ALEC, UAE
Amr Saad, Head of Digital Engineering, ROSHN Real Estate, Saudi Arabia

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