Unlocking Operational Excellence in Your Operations and Projects

Developed from the *Going Beyond the Digital Twin with Smart Digital Reality™* blog series by Hexagon's Senior Industry Consultant

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Introduction

Hexagon's Smart Digital Reality™ is a powerful data rich environment powered by Hexagon's SDx2 platform that consolidates and contextualizes data and leverages automation and analytics to transform industrial projects and operating assets into intelligent, autonomous entities. This evolution represents a crucial step toward more efficient, profitable, safe and sustainable industrial operations.

This eBook explores the three foundational aspects of true digital transformation:

1. Data and document management
2. Smart project execution
3. Operations

It delves into Hexagon's technology enables the SDR by helping customers to leverage data throughout the asset lifecycle to better manage industrial assets, data and documents and key project execution value drivers.

Going Beyond the Digital Twin with Smart Digital Reality

Owners, operators and engineering, procurement and construction (EPC) firms continue to face challenges when implementing projects. They're also loaded down with pressure from stakeholders demanding projects be delivered on schedule, within budget and with limited resources. Because complexities of project execution increase as projects grow, the need to efficiently package work to meet schedules and budgets is crucial to limit downtime as capital expenditure increases for existing facilities.

The digital twin approach has been growing to address these challenges.

- IDC predicts the digital universe will grow to 175 zettabytes by 2025 (2018).

- Gartner defines digital twin as "a software design pattern that represents a physical object with the objective of understanding the asset's state, responding to changes, improving business operations and adding value" (2019).

The above illustrates how quick access to the most up-to-date and accurate information in digital twins facilitates better decisions, improved business processes, enhanced productivity and reduced operational risk.

Smart Digital Reality

Hexagon's Smart Digital Reality moves beyond digital twins to the next level of global industrial assets data management. The digital, data-driven solution enables customers to leverage data at a global level throughout their assets' lifecycles. This next level manages data from conceptual design to decommissioning, transforming industrial facilities into lean, efficient and safe operations that improve bottom lines while contributing to sustainable futures.

Way beyond a mere virtual representation of a physical asset, this leap forward fuses the physical and digital worlds in real time. Smart Digital Reality is embedded with intelligence to automate processes and incorporate analytics, removing human intervention on the path to a fully autonomous future.

Single Source of Truth

Hexagon provides enterprise solutions for different phases of the asset lifecycle to help companies achieve all the benefits of a digital reality. SDx2 is connecting solutions and data on one platform, ultimately serving as a trusted, single source of truth. HxGN SDx2 is at the heart of the Smart Digital Reality making it far superior to any digital twin. HxGN SDx2 is a modular, cloud-based, data-centric platform empowering our customers to design, plan, build, operate and maintain critical assets more efficiently, profitably, securely and sustainably.
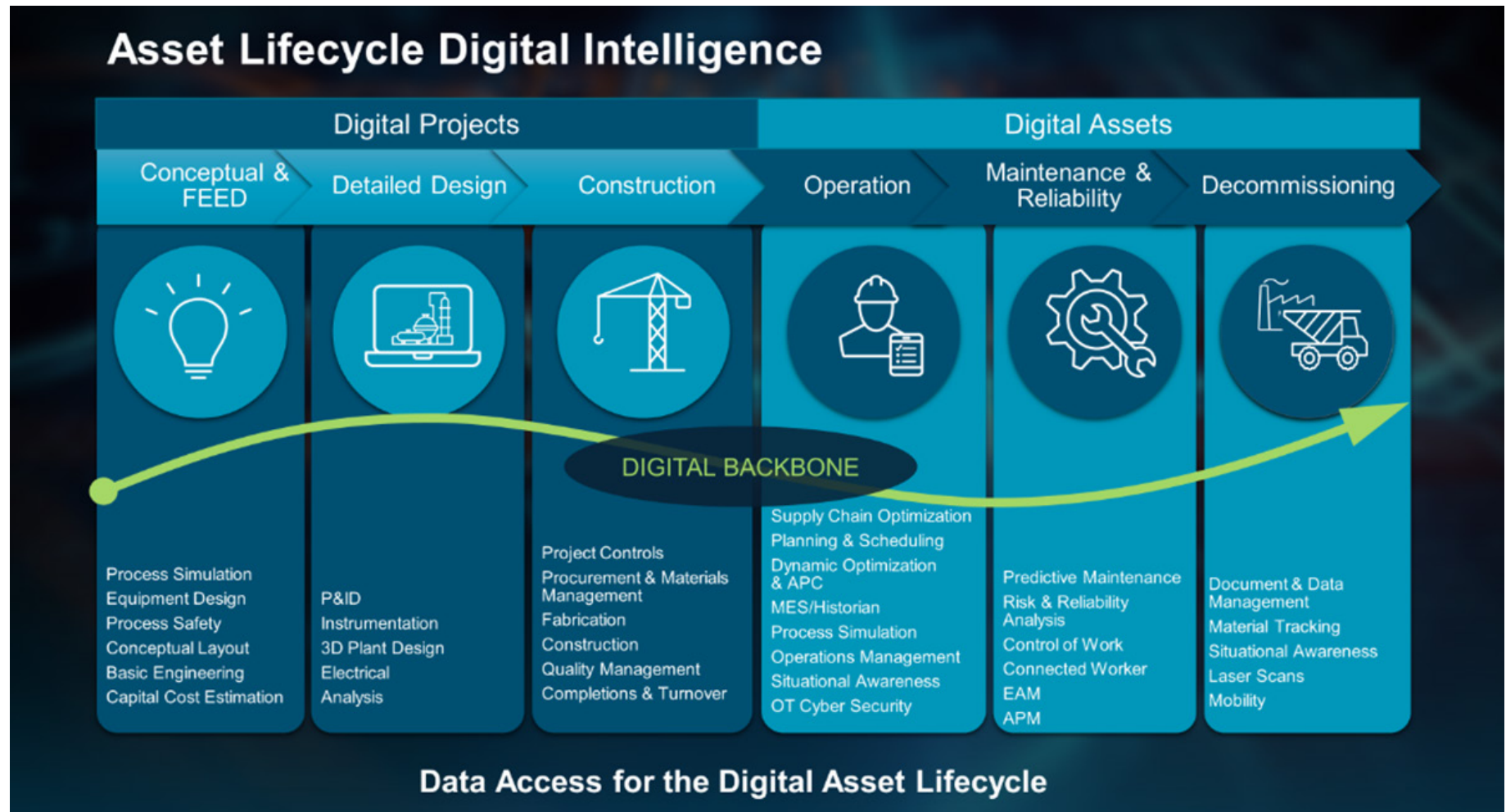
Digital Maturity

Owners, operators and EPCs in manufacturing and process industries are often at different stages of digital maturity. To prevent barriers to adoption, Hexagon delivers solutions for every asset lifecycle stage.

For example, a company's digitalization journey could begin with a brownfield (i.e., existing) facility teeming with structured and unstructured data and documents defining the facility's configuration. Alternatively, its transformation could begin with a project leveraging HxGN SDx2 and Hexagon's complete suite of smart design tools. The former is a collaborative platform that streamlines project data management and correspondence between client, contractors and vendors to simplify the handover process to operations.

In yet another example, a company may already be digitally mature, only requiring a platform to consolidate all its data to facilitate intuitive viewing, navigation and decision-making. No matter where a company is along its path to digital maturation (including the three above examples), Hexagon is ready and able to help it achieve its next-level goals.

Data and Document Management

So what are the advantages of implementing an intelligent Smart Digital Reality to manage industrial assets and data and documents (for structured and unstructured data) throughout the complete facility lifecycle?

> **Structured Data** = Data formatted and defined to a set structure
>
> **Unstructured Data** = Data in whatever native format it was created and not yet processed

Electronic Document Management Systems

Digital or electronic document management systems securely manage storage of documents in a digital format. However, it comes with limitations:

- Often document-centric, even when digital
- While a few have basic data management capabilities, most are limited to structured data
- Many lack the comprehensive functionality required to leverage advanced digital reality solutions for industrial assets

In contrast, a Smart Digital Reality environment provides all necessary document management functionalities and more (e.g., document check-in/-out, automated revision management, requests for information, submittals, transmittals, electronic signatures and workflows).

Support the **entire lifecycle** of the documents

Edit
Check-in/-out,
Revise, Sign-off

PDF
Rendtitions

View and Markup

Bulk
Upload

The true value is in the data relationships and management capabilities that consolidate all asset information into a single, user-friendly view. This reduces (by as much as 47%, according to a recent Gartner study) the extensive time users waste trying to locate information. Instead, users input known data points to search for information and quickly access all related data and documents associated with the searched object.

Data Management

HxGN SDx2 is an advanced, object-based data management platform that automatically creates data relationships based on preset rules. These rules don't just apply to the file itself, but also to its content and embedded metadata.

By managing data on an object level, it's updated as revised, ensuring users always have the latest version. Users can graphically view the data (e.g., documents, 3D models, laser scans) without native applications. This eliminates information silos and provides users a single source of truth for actionable insights and decision-making.

Workflows

A key feature of Smart Digital Reality is its ability to create and configure automated workflows. These workflows can be customized to send notifications that require approval steps and progress tracking, as well as for other specific needs (e.g., submittals, transmittals, quality assurance/control, document reviews and work packages).

Smart Project Execution

Project execution, typically considered the third phase of a project (after initiation and planning phases) is when all project plan elements are set in motion, including front-end engineering design (FEED), detailed engineering, procurement, construction and commissioning.

So, how does one create an accessible, single source of truth for asset information tailored for each stakeholder role? Smart Digital Reality is the answer as it consolidates diverse data sources into a unified platform, enabling seamless access to information and empowering stakeholders to make informed decisions and keep projects on track. Furthermore, it fosters real-time collaboration, enhances visibility for all involved parties and optimizes automated workflows to maximize efficiency.

FEED and Detailed Design Phase

The FEED phase includes conceptual design and feasibility studies to assess costs and technical issues, identify potential risks and producing preliminary design basis deliverables for bidding contracts. A successful FEED package establishes the project's budget, timeline and scope.

A Blackridge Research study revealed a "FEED study can consume two percent of the project budget" and that "a well-executed FEED can reduce the overall project cost by 30%."

A large volume of data is created during this project stage. By integrating it into the Smart Digital Reality environment, it becomes an integral part of the asset's digital twin and accessible to all stakeholders. This stage is followed by the design phase, where conceptual/basic design is completed and procurement commences.

In today's engineering environments, projects are executed around-the-clock using global workshare technology. Hexagon delivers fully integrated, rule-driven, intelligent technologies to environments across engineering disciplines, strengthening collaboration amongst all teams and stakeholders and reducing time wasted from miscommunications and data discrepancies.

Procurement and Materials Management

Procurement and materials management represent critical phases of any project, often entailing complexities like material shortages or surpluses that escalate costs. Additionally, managing suppliers and verifying their qualifications to meet performance expectations pose a significant challenge. To proactively tackle these issues and prevent potential project disruptions, Hexagon offers a comprehensive suite of products that includes Intergraph Smart® Materials, Intergraph Smart Construction and Jovix®.

Integrating lifecycle material with supply chain management solutions is crucial for effective collaboration between EPCs and their partners. It increases flexibility and scalability, lowering project costs via reduced material shortages, surpluses and labor hours. It's also beneficial to provide a portal where suppliers may interact with each other to better manage logistical workflows.

Visibility across the entire supply chain is equally essential to properly identify bottlenecks and understand statuses and current situations so informed decisions can be made faster. Hexagon's Smart Materials provides this and more to help increase efficiency and maximize visibility and control, while decreasing project costs and managing the supply chain end-to-end.

Construction Phase

A project's construction phase is the building and installation of the asset/facility. Ideally, constructability of the asset was thoroughly considered during the design phase. However, it's often overlooked, leading to on-site challenges and construction delays. Design changes, expected or otherwise, cause costly rework and can lead to:

- Complications managing subcontractors
- Inaccurate progress reporting
- On-site material readiness and waste issues

The industry is shifting to new technologies to address these common construction phase issues, as reported in a recent KPMG study stated that:

> **The construction industry is starting to embrace the power of technology to transform performance – with 81% of E&C firms adopting mobile platforms, 43% using robotics process automation (RPA) and 40% adopting artificial intelligence (AI) – although many are in the early stages ... VR has doubled from 28% to 56%."**

As this shift continues to accellerate, more construction contractors (of all sizes) realize they need to adopt new technologies to stay competitive.

One such technology is Hexagon's modern work package planning platform, Intergraph Smart Construction. It provides real-time forecasts, statuses, reservations and visualizations of materials through integrations with Hexagon's Smart Materials platform (or third-party systems). Users view 3D models and drawings with enhanced 4D animations and gain mobile capabilities (so digital work packages can be brought into the field).

Another important aspect, and major risk to projects in the construction phase, is knowing when and where materials are at on a site (i.e., material readiness). This is made possible with robust, proven material readiness applications like Hexagon's Jovix. It delivers real-time visibility to all stakeholders, ensuring they know exactly when and where materials arrive and are staged on-site.

Completions Commissioning Phase

Completions and commissioning is the last phase of a project before final client handover. This phase includes:

- Defining commissioning systems and tags
- Creating test work packages and inspections
- Managing punch list and non-conformance items
- Providing accurate certification for turnover and startup

Each one of these tasks can be a struggle for projects that use manual processes and project information residing in multiple information silos. By using an integrated digital solution, like Hexagon's Integraph Smart® Completions, projects can expect average savings of 45%-50% on resources and time spent.

Automated Workflows

Another critical element essential to each project execution phase is the ability to leverage automated workflows across Hexagon technologies. Smart Digital Reality enables users to create and configure these workflows with parallel or sequential steps, facilitating streamlined collaboration amongst internal and external stakeholders.

Automated workflows help:

- Standardize task steps
- Ensure workflow steps are tracked and overdue task notifications sent
- Create visibility into workflow bottlenecks

Operations

Owners and operators are implementing digital twins to leverage data and better operate and maintain facilities. As this trend grows, they've realized the importance of setting data requirements required at handover from their contractors during early project planning stages.

These requirements are crucial to make sure owners and operators receive all necessary information to efficiently operate and maintain facilities and execute ongoing capital projects and turnarounds. Smart Digital Reality becomes a comprehensive solution for managing this throughout the project lifecycle. Additionally, it streamlines the handover process by automatically updating data statuses when ready.

Handover costs for owners often amount to as much as 10% of total project cost. By leveraging Smart Digital Reality, many manual tasks are eliminated, automation is optimized and costs are reduced.

Single Source of Truth for Operations and Maintenance

Hexagon classifies operations, maintenance and security of assets as a digital asset within Smart Digital Reality. The approach improves safety and productivity by fostering interconnectivity and contextualizing data from different sources within the digital asset framework. This provides users a web-based, single source of truth where they can instantly access the asset information required for their role.

Gone are the days of sifting through flat files, paper documents and isolated CAD storage databases, or navigating multiple systems, to find crucial information. Smart Digital Reality ingests data from varied sources (e.g., engineering, reality capture, IIoT, sensors, operations). This unified access to contextualized information tailored to user roles boosts efficiency and heightens safety and productivity. Users gain access to a comprehensive data overview so they can make rapid, informed, on-site decisions.

According to a study by McKinsey & Company, "Users can spend between 30% to 40% of their time searching for data if a clear inventory of available data is not available, and they can devote 20% to 30% of their time to data cleansing if robust data controls are not in place."

Moreover, the efficiency gained by leveraging Smart Digital Realty is substantial. By reducing the time needed to find and validate information, stakeholders can reclaim a significant portion of their working hours for more critical tasks… up to 50% more!

Integrations

Within the Hexagon technologies that form the Smart Digital Reality are integration capabilities facilitated through web APIs and extensibility that allow users to access information from additional systems (e.g., operational, maintenance, knowledge management) seamlessly, in context, at the right time.

Example:

Step 1 – An operator on rounds and notices a piece of equipment making an unusual sound. They create a new log record from within the round application, documents the noise and attaches a short audio file of it.

The result? They have effectively escalated the issue so it's displayed on the handover. Someone will have to respond, eliminating the chance of the issue getting missed.

Step 2 – The control room personnel sees the entry and researches past log records, trend rounds readings and identifies the equipment's information in Smart Digital Reality.

The result? Comprehensive access to historical data and real-time information enabled the teams to formulate well-informed plans of action.

With seamless collaborations and information exchanged across different systems, Smart Digital Reality enhances efficiency and improves the overall responsiveness of operational and maintenance teams.

Ongoing Capital Projects and Turnarounds

Availability and reliability of asset information are as crucial during the initial operations phase of a facility as they are throughout the rest of it, particularly in the context of ongoing capital projects and their turnarounds and unforeseen events. Here, the practice of integrated project delivery holds particular relevance as it aligns objectives, interests and practices across projects of all scales.

It's all about collaboration, communication and transparency, which Smart Digital Reality facilitates, providing a centralized platform where relevant asset information is accessible and reliable. It enables seamless communication and coordination among different teams and stakeholders, enhancing overall project execution efficiency. With real-time access to accurate information, project teams are enabled to make more informed decisions, improve resource allocation and respond faster to the changes and challenges that arise during project lifecycles.

Decommissioning

While as crucial as other lifecycle stages, decommissioning is often less discussed, especially in industries like nuclear energy, pharmaceuticals, chemicals and food and beverage (i.e., where safety and regulatory compliance are paramount). Decommissioning involves safe disposal and management of various assets, including potentially contaminated materials and equipment that pose environmental risks.

Having accurate and readily available asset information during this phase is essential for many reasons, including:

- Regulatory compliance
- Safety
- Efficient planning
- Cost management
- Environmental impact
- Legacy documentation

Incorporating Smart Digital Reality technologies can significantly improve project efficiency of decommissioning. By centralizing all relevant asset data, it provides a comprehensive overview of the facility's assets, making it easier to identify, track and manage materials and equipment during decommissioning.

Conclusion

Smart Digital Reality delivers a powerful digital environment that consolidates and contextualizes data, leveraging automation and analytics to transform industrial projects and operational assets into intelligent, autonomous entities. This evolution is a significant step toward safer and more efficient, profitable and sustainable industrial operations.

Take the next step toward transformative solutions by gaining an even deeper understanding of the full potential of Smart Digital Reality and how it can benefit your organization. Read the blog series that inspired this eBook now!

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About the Author

Tom Goff, a senior industry consultant with Hexagon's Asset Lifecycle Intelligence division, boasts more than 30 years of experience across multiple industries (i.e., oil and gas, chemical, nuclear) in EPC and information management and has led many operational excellence initiatives. He leads consulting initiatives with Hexagon customers throughout their digital transformation journey. Tom has a bachelor's degree and MBA from Capella University, is certified PMP and LSS Black Belt and is a U.S. Army veteran.

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About Hexagon

Hexagon is the global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications.

Hexagon's Asset Lifecycle Intelligence division helps clients design, construct, and operate more profitable, safe, and sustainable industrial facilities. We empower customers to unlock data, accelerate industrial project modernization and digital maturity, increase productivity, and move the sustainability needle.

Our technologies help produce actionable insights that enable better decision-making and intelligence across the asset lifecycle of industrial projects, leading to improvements in safety, quality, efficiency, and productivity, which contribute to Economic and Environmental Sustainability.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 24,000 employees in 50 countries and net sales of approximately 5.5bn USD. Learn more at hexagon.com and follow us @HexagonAB.