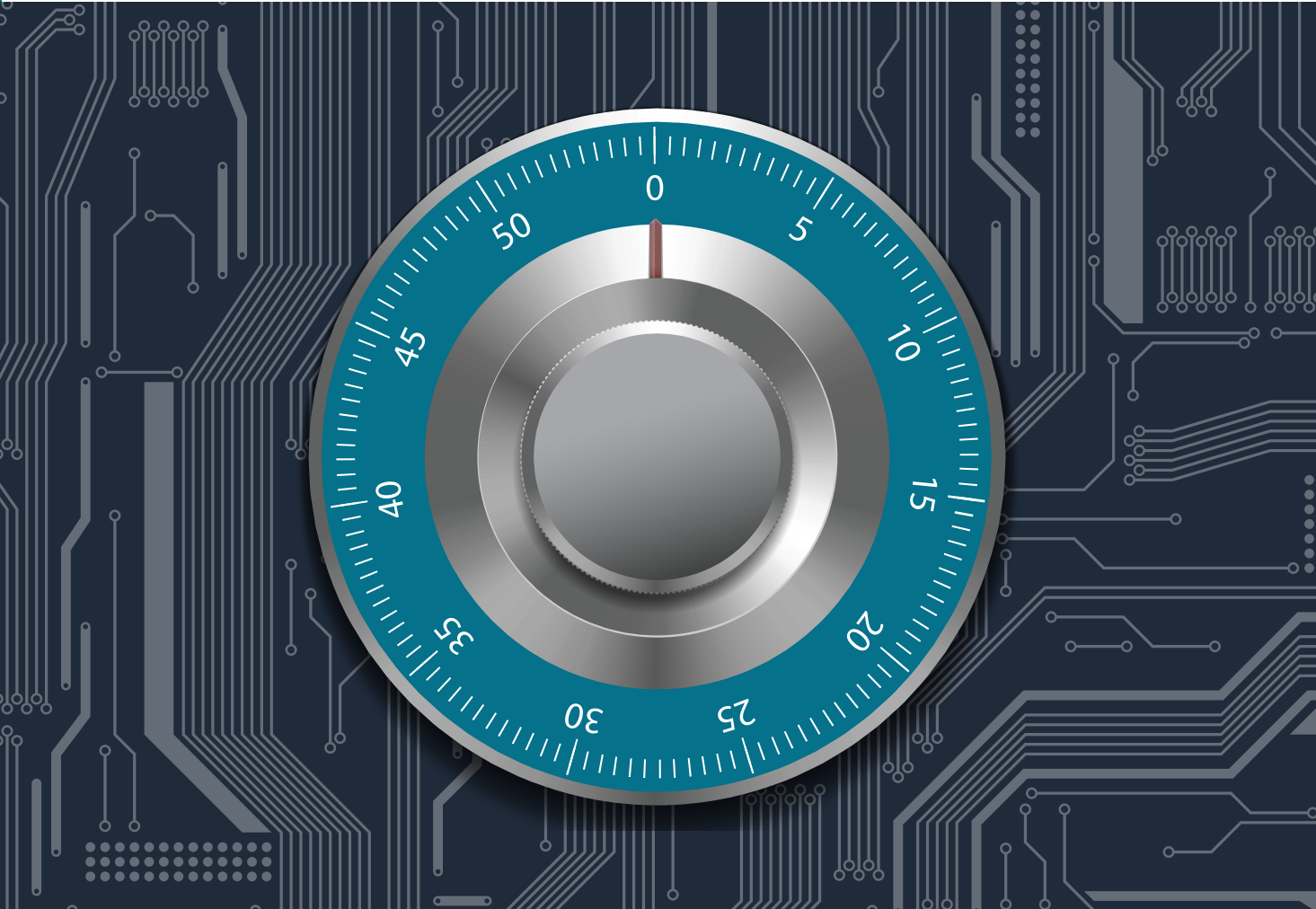


# Five Keys to Unlocking Digital Transformation in Engineering & Construction

A **global industry council** report



A joint initiative of

**aconex**

**BCG**  
THE BOSTON CONSULTING GROUP



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# Introduction

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Rapid technological change is displacing traditional processes, disciplines, and ways of working across all industries. Specifically, in engineering and construction (E&C), technology is moving to the strategic center of activities and business models due to the need for greater productivity and improved financial outcomes. Because E&C supports infrastructure, energy, industrial facilities, and other built assets, success is integral to global development.<sup>1</sup>






However, E&C is often regarded as lagging behind other industries when it comes to the digital transformation of their business processes. Many in the sector struggle to consolidate fragmented platforms, standardize processes, or attract digital savvy talent. This creates barriers to change and slow adoption of innovation. Additionally, productivity in E&C has not kept pace with the rest of the economy<sup>2</sup>, or has even fallen in recent years.

With rapid investment projected – the industry is expected to grow to \$17.5 trillion by 2030<sup>3</sup> – the E&C sector will need to harness modern technology now. The advantages of investing and implementing digital project delivery for E&C companies are numerous, including: remaining competitive, helping to retain/grow market share, lowering costs, increasing productivity, ensuring safety, delivering projects on time and on budget, while delivering better assets for end user purposes and service provision. The nominal benefits of digital transformation are expected to be huge. Within 10 years, annual global cost savings are estimated to be up to \$1.2 trillion in the engineering and construction phase for non-residential projects alone.<sup>4</sup>

Although progress has been slow, there are early adopters in the E&C industry that are leading the digital transformation. To understand how these organizations are successfully making the transformation, Aconex established the Global Industry Council (GIC). This council includes global senior leaders sharing their expertise and industry knowledge together. The goal? Uncover the challenges faced by the E&C industry on the digital transformation journey and identify practical solutions to help accelerate the process.

The first task for the GIC was to identify five key challenges that the industry currently faces and propose solutions based on their experience. Globally, the entire E&C industry faces these challenges. Therefore, practical solutions must be implemented throughout the industry to increase adoption of digital transformation.

## The five key challenges include:

-  **Integration Across the Ecosystem:** Organizations are grappling with complex digital ecosystems that have multiple platforms creating and duplicating data.
-  **Rationalization and Standardization:** Complex and non-standard processes and systems need to be rationalized across projects.
-  **Building Digital Talent:** Organizations not only lack teams of IT experts but also senior leaders who can lead the change, as well as a broader workforce that is digitally savvy.
-  **Securing Digital Adoption:** Workforce apprehension arises from cultural and technical challenges and can slow IT adoption and value realization.
-  **Establishing Value and Return on Investment (ROI):** Organizations find it difficult to measure and communicate the benefits gained from large digital investments.

In this report, we examine these interconnected challenges in detail, outline organizational solutions, and offer examples of lessons learned and best practices, both from within E&C as well as other industries. Of course, these solutions may not all be implemented at the same time. Organizations should selectively choose actions that will have the biggest impact on their strategy and operations rather than trying to adopt all solutions at once.

By prioritizing areas for action, organizations can leverage digital project delivery to increase their efficiency, improve their productivity, boost competitiveness, enhance performance, and shape the future of the industry. The message is clear: embark on the digital transformation journey now, or get left behind.

# Challenge 1: Integration Across the Digital Ecosystem

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As E&C organizations undergo digital transformation, the challenge is to integrate a range of systems, software, hardware, and applications across the enterprise and ensure that there is interoperability between new and existing systems. By reducing duplication, smoothing the flow of data and permitting different systems to communicate with each other, interoperability is an essential means of increasing workflow efficiencies and improving collaboration between project teams.

Leading E&C organizations are focusing on digital technology as part of their core strategy. In the process, they are increasingly building out their business operations across a network of platforms, tools, and devices. These collectively create a digital ecosystem. Whether for collaboration, mobility, predictive analytics, monitoring, or operations, organizations are now expanding their digital ecosystems across the project life cycle so they can capture more data, reduce construction time, or improve safety and quality.

At the same time, owners and operators are becoming increasingly involved in influencing E&C organizations — and by extension their subcontractors — in their selection of technology by establishing project, delivery and operations guidelines, as well as standards to which they expect their supply chain partners to adhere. Owners are increasingly demanding that projects use a Common Data Environment (CDE) so that an electronic record can be captured and maintained at all stages in an asset's lifecycle.

Meanwhile, governments are implementing policies that drive E&C organizations to undertake further digital transformation. For example, the UK government's PAS1192 standard<sup>5</sup> is designed to drive BIM (building information modeling) implementation across the construction sector. The standard requires organizations to create digital 3D models with documents that have data attached (some are still working with 2D architectural drawings).

While the benefits of accelerating digital adoption are clear, the diversity of contractors and platforms across the value chain results in data being generated in a dispersed way, increasing the volume of information handled and creating risks associated with system interdependencies and poor integration. These challenges can cause roadblocks and increased costs. Disconnected processes and systems (with data for different parts of the process captured by unconnected systems — meaning the entirety of the process is never recorded in one place) increase resource and labor requirements, reducing competitiveness in an industry where returns are already diminishing.



## Solutions:

- **Defining a Strategy:** Increasing an organization's digital agility starts with a decision to embark on digital transformation and adoption of a clear strategy on how to execute this transformation. Organizations need to establish why technology is important, what value they expect from it, and how it will affect their businesses. Digital integration requires more than just implementing software platforms or moving to cloud computing. It means embracing technology as a whole and using the Internet of Things (IoT), drones, sensors, augmented reality, and data science. These and other innovations will redefine production processes, improve project delivery, asset operations and management, and increase productivity<sup>6</sup>.
- **Understanding the Ecosystem and Architecture:** Not all technology provides the same value, so having a clear view of internal systems (those operating behind an organization's firewall) and how they currently operate will help to establish what is working and what is not, how systems connect to each other, the flow of information, and what needs to be rationalized. Often organizations adopt new technology over time in response to changes in strategy or the need to remain competitive, or as a result of mergers and acquisitions, which in turn adds to the complex and disconnected ecosystem.

- **Open APIs and File Formats:** Through open APIs (publicly available software enabling applications to interact with each other and share data), an organization can build out its digital ecosystem and accelerate IT integration. This avoids the inefficiency of solving individual problems with point solutions that do not communicate with other systems, thereby creating multiple, disconnected sets of information – and even creating new problems. Given the rise of IoT technologies, artificial intelligence (AI), mobile and on-site devices (such as drones), closed solutions are no longer beneficial<sup>7</sup>. Information flow now needs to be bi-directional so that new insights can be gathered and various data sets can be combined. The same can be said for file formats. For example, the effectiveness of BIM relies on open, interoperable formats such as IFC (Industry Foundation Classes) and BCF (BIM Collaboration Format), which enable smoother workflows and communication between project teams, regardless of what software they are using. In process industries, such as oil and gas, it is still commonly understood that using interface management within de-facto standard software is the most practical approach to date rather than specifying such as ISO 15926.
- **Interoperability and Usability:** To ease the transition to digital technology, new solutions should work with the existing digital ecosystem and be easy to implement. Purchasing hardware or software that delivers the required benefit but does not work well with the existing ecosystem will diminish returns and increase resourcing requirements. In addition, overly complex solutions may hamper adoption. The user experience must be consistent and intuitive for all those deploying the technology, including the smallest subcontractors. A user-friendly system will allow people to do their jobs more easily and effectively. This speeds implementation and helps the organization reap the benefits of IT investment faster.
- **Integration Service and Support:** Not only should software or hardware be fit for purpose and work with existing tools in the ecosystem, it should also be purchased from a vendor that can become a partner able not only to support the organization and its users during the integration stage, but that also can provide guidance on what lies ahead and the next steps to take to accelerate the digital transformation. The vendor should also provide a vision for the future and be able to guide customers through the next stages of innovation. When choosing a vendor it is important to think long term and select providers that have proven track records, credibility in implementation, robust support systems, and global support networks.
- **Investment in a Data Lake:** A data lake is a storage repository that holds raw data until it is needed. Given the vast amount of information that can be captured across an E&C ecosystem, a data lake is an important component of a big data strategy. It allows enterprise information to be collected and stored in a uniform way, regardless of the source or whether the data is structured or unstructured. A data lake is also flexible enough to allow specialists such as data scientists to unlock new insights. A data lake is typically easy to design and deploy and allows an organization to take control of its enterprise data, even if the analytics and insights requirements have yet to be defined.

## Case study:

### Lendlease and Information Management



Lendlease has a strong Information Management capability embedded within the enterprise architecture function of its Global ICT (Information and Communications Technology) operation. Its role is to analyze any technology – new or current – in order to understand fully the flow of information within a defined ecosystem. The analysis, which includes people, processes, and other core requirements, aims to determine how a technology “fits” within the current Lendlease architectural network. Within each defined ecosystem, it also determines what connections are needed to optimize the technology.

When a new technology is considered, a thorough state-of-play analysis is carried out. This enables the company to understand not only the impact of the change on people and processes, but also ensures that the required integrations are identified and included in either the planning and delivery of the technology or in the strategic roadmap for the development of the ecosystem.

A pre-requisite for any new technology is that it has open API specifications. An open API approach would be supported by a set of industry-level data standards for information systems and integration, such as vendor-agnostic standard APIs for the retrieval, integration, and storage of data.

An increasing focus for the company is how Lendlease integrates current systems and makes use of the information within those systems, as opposed to implementing a new dedicated system and double-handling the data.



## Challenge 2: Rationalization and Standardization

The construction industry has much to gain from implementing standards, whether in processes, data management, or methodology. System and software standardization not only minimizes costs, it also reduces the need for specialized expertise to support the various tools, consolidates vendor management, reduces incompatibility, and streamlines the infrastructure and the ecosystem. However, given the fact that standardization is most beneficial to mass production, the question is how to apply it in an industry where market variations exist and where projects can be unique across markets.

Standards in E&C are driven by the need to improve safety and quality, to gain efficiencies in resource allocation, budget or time, to harmonize data, and to control risk. Although standardization is often the focus, it involves more than simply putting the right processes in place. Organizations should begin with a process of rationalization and simplification. From there, tackling simple, easy-to-implement processes will help build momentum for a more thorough transformation.

Some organizations procure software and platforms for business operations in the office or in the field. Others adopt legacy systems through acquisitions and mergers or business transformation programs. Whichever way they are obtained, most large enterprises have hundreds of systems across their businesses. Rationalizing these systems eliminates unnecessary, duplicative technology that consumes valuable time and resources. Reducing old or redundant systems and focusing on those that provide the most value will ensure greater efficiency and productivity, and reduce costs while creating the foundation for standardization.

Standardization also ensures that, from start to finish, data is captured in a uniform way. For all stakeholders, standardization reduces the effort needed to plan and execute work and permits the development of a consistent approach, allowing project teams to track to their processes and improve information quality.

### Solutions:

- **Audit and Rationalize:** A key step in the rationalization process is to understand which systems are in use in delivery, operations, and maintenance across the organization and the broader value chain and why those systems were chosen. This process often reveals the fact that many systems duplicate functions or processes.

- **Standardize Across the Project Life Cycle:** Regardless of the nature of the project, it is important to ensure a transparent flow of information, a good structure for data capture, and a clear view of operational processes. A thorough understanding of the ecosystem is essential to working with external stakeholders and across the project life cycle. To address data standardization and quality, a comprehensive master data management (MDM) plan should be implemented. The MDM plan includes processes, governance, policies, standards, and tools that define data management within an organization and across stakeholders. Organizations should focus on three key areas:

- **Process review:** Key processes, including project management, should be assessed and reviewed (See Figure 1). In technology development, organizations tend to apply agile methodology, a process in which teams can focus on creating solutions within time-boxed iterations (fixed time periods that are allocated to each activity). This approach means project development and changes can be more responsive and efficient. Cross-functional teams applying the agile methodology have the authority to define, develop, and test processes and solutions. This autonomy allows them to implement changes faster than traditional teams. Not all processes take the same time and resources to build, so reviewing, and developing the easiest processes first allows more time and resources to be devoted to more complex processes.

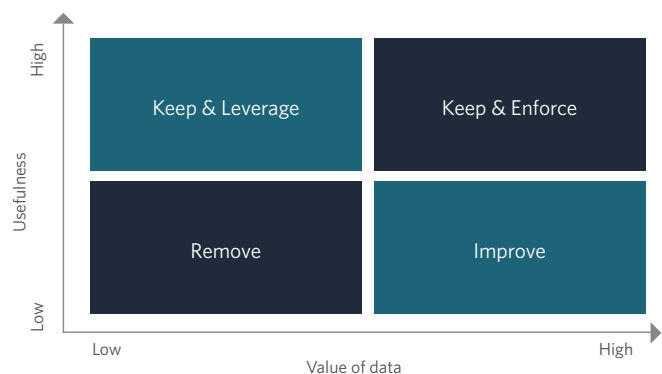


Figure 1: When assessing standards, systems or processes, it's important to measure them in terms of capturing meaningful data and delivering value. The quadrant analysis tool is a simple way to evaluate usefulness and value.

- Data capture and harmonization: Ensuring that metadata is captured consistently will allow data to be more easily managed, verified, and deployed. Metadata provides the underlying information or description about data. For example, when you take a photo, it will typically have information saved with it such as time, date, file size and geolocation. Data harmonization involves establishing clear objective-based protocols, along with an approach to data quality that harnesses both machine and human management. By establishing parameters, data harmonization can enhance the value and utility of business data in analytics, benchmarking, and visualization.
- Internal innovation group: Establishing an internal innovation group or center of excellence (CoE) will help focus an organization's digital strategy. The CoE can support digital transformation by offering best practices and industry research to achieve business objectives. The team, typically comprising of individuals from various disciplines, can ensure that the technology selected is fit for purpose, works within the existing ecosystem, and is flexible enough to accommodate future needs.



## Case study:

### Chiyoda - Standardizing Across Joint Venture Projects and the Industry



In a joint venture, shared risk and accountability makes it critical to secure project-wide collaboration with other participants. These projects tend to have higher levels of complexity and more globally dispersed project teams. As a result, vast amounts of data may be generated and each entity will have its own internal systems and processes, making data standardization essential to successful delivery of the project.

Asset information handover preparations were often treated as an afterthought. For the owner-operator it is critical to have a single, accurate, and complete digital source of information that is meaningful and useful to the operations and maintenance of the asset.

In the process industry, various industrial level information standardization efforts have been made for a long time, such as STEP (Standard for the Exchange of Product Model Data), ISO 15926, FIATECH, and so forth, however, they are not widely used yet.

Chiyoda, a Japanese engineering company, has been working on several unique projects that involve different clients, joint venture partners and sub-contractors.

In recent years, Chiyoda have been actively watching a movement, where owner-operators, manufacturing and E&C leaders within the process industry, are approaching data collection across the supply chain in a more methodical way. It is called the Capital Facilities Information Handover Specification (CFIHOS). This framework originated from the owner-operator's specifications to standardize the data that flows into operations and maintenance. Chiyoda is in the review process of CFIHOS as a member of Engineering Advancement Association of Japan (ENAA).

The CFIHOS intends to generate benefits for all parties involved in the project, whereby the:

- Contractor, sub-contractors, and suppliers will gain clarity about what needs to be included at information handover as part of operations and maintenance.
- Owner-operators will receive higher quality information in a timely manner, ensuring that they can confidently operate their asset and reduce ongoing associated costs over time.

From projects experiences, Chiyoda also has been providing requirements to several software suppliers to improve functionalities so that process industry focused E&C companies can enjoy common de-facto standard software and functionalities.

## Case study:

### TAV Airports' Data Model



Technology now makes it possible to collect massive amounts of information throughout the design and construction process. This information, delivered at handover to owner-operators, opens new possibilities for improving the operational efficiency of facilities throughout their life cycle and helps increase their return on investment.

However, clearly defined, objective-based contractual requirements are needed in order to deliver this information in a useable format. During the construction phase, defining data requirements with operations and maintenance in mind ensures higher quality information output for the asset management team.

On large-scale projects, information managers must work alongside BIM managers to handle the large amounts of information generated during construction. Rather than creating new workflows, the challenge is to use existing construction tasks to gather and validate information.

At airports, for example, seemingly trivial tasks such as identifying room numbers during the design and relating them to operations can be difficult. In dynamic facilities such as airports, schedules can change when areas are re-appropriated for other uses.

This means managing facility information to ensure it remains relevant – something that requires clear execution plans that are developed with feedback from all stakeholders. Being able to access information on site and update it with mobile devices ensures the content is up to date.

TAV Airports is combining construction and operation know-how to build BIM and GIS (geographic information system) data models for airport facilities that contain information that is relevant to asset and facilities management.

Integrating these models with the digital infrastructure used by facilities management – such as Computerized Maintenance Management (CMMS) and Building Management Systems (BMS) – and day-to-day operations can foster improvements in areas such as analytics, performance, and energy management.



## Challenge 3: Building Digital Talent

To take advantage of the expanding digital landscape, existing roles will need to evolve while new roles, such as that of the Project Information Manager or BIM manager, are emerging. Most importantly, ownership of the digital strategy needs to be pushed up the corporate hierarchy, moving away from the “project manager is king” mentality to one where senior leadership directs a substantial IT program that can drive change throughout the organization.

Once this is in place, organizations should assess their human resources at every level to ensure they have the right talent in place to execute the digital strategy. Existing talent must be adaptable. Traditional engineers will need to become digital engineers, for example. This adds another layer of pressure on an industry that is already impacted by labor and skills shortage for established roles<sup>8</sup>.

Moreover, digital talent needs to be understood and developed at different levels. It goes beyond simply learning new systems or understanding the latest trends and technological advancements. Digital talent ranges from people with basic understanding, to specialized experts, people who can adapt to technological changes, and leaders able to support transformation and explore and invest in new technological developments.

And as a new generation enters the workforce – those who have grown up surrounded by digital technology – the emphasis of training will shift from training staff in the operation of new systems to empowering them to innovate and apply technology to new industry challenges.

Due to the pace of digital adoption and a highly competitive marketplace, the pipeline of digital talent is currently limited. Even so, with leadership driving the change and with appropriate strategies in place, there are measures organizations can take to build a digital workforce.

### Solutions:

• **Segment Digital Talent:** To harness employees’ capabilities and understand their requirements, organizations need to gain an understanding of the talent that exists in the current structure. Not all employees need to be at the cutting edge of technology. A few will require deep technical understanding while others can help advance the digital transformation at an organizational level. Organizations need to segment talent in the following categories (See Figure 2):

- **The C-Suite:** Organizations need to elevate the digital transformation to C-level, with substantial R&D budgets put behind the technology program. Only with senior leaders driving the change can an organization demonstrate its commitment to technology. Organizations must move away from a culture where IT staff are seen as supporting technicians to one where the digital strategy is led by senior-level talent.
- **Experts:** These include data scientists, analysts, and infrastructure architects. These highly skilled specialists are needed to construct the organization’s technology framework, make sense of its data and advise on digital needs. Given their level of specialization and expertise, these people can be either outsourced or actively recruited.

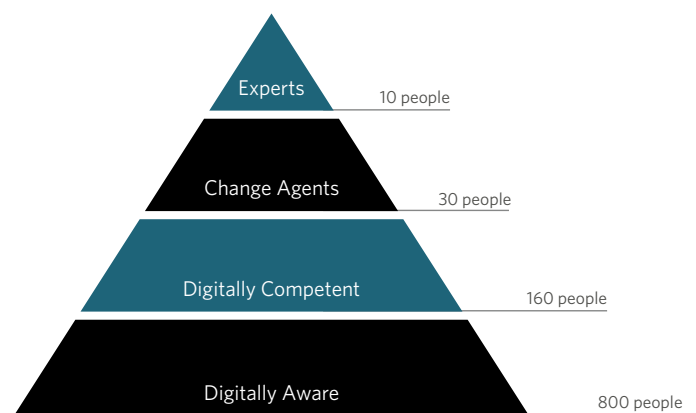


Figure 2: As a simplified measure, for every 1,000 people within an organization, the level of digital competence and technical skills could be distributed accordingly, +/-.

- **Change Agents:** These are people who implement the digital strategy at an organizational level. They have a detailed understanding of the business and how to get things done. Change agents have a combination of skills that allows them to learn and understand technical detail, translate that into business operations, and drive change throughout the organization. They may occupy conventional roles and can be reallocated to other positions as new digital needs arise.
  - **Digitally Competent:** Project teams, whether internal or external, need a level of digital competence in systems operations and must understand the impact digital technology has on their responsibilities. As they become familiar with new systems, these users can suggest improvements. They exist in the organization and across the value chain. If processes are simple and standardized, tools are available, and training and support is provided, it is relatively easy to ensure this group acquires digital competence.
  - **The Digitally Aware:** While they may have limited or no interaction with the systems and standards in place, everyone in the organization or supply chain needs to be aware of them and understand how they work. Further training and support is required if these people are to become digitally competent.
- **Standardize Across the Project Life Cycle:** Regardless of the nature of the project, it is important to ensure a transparent flow of information, a good structure for data capture, and a clear view of operational processes. A thorough understanding of the ecosystem is essential to working with external stakeholders and across the project life cycle. To address data standardization and quality, a comprehensive master data management (MDM) plan should be implemented. The MDM plan includes processes, governance, policies, standards, and tools that define data management within an organization and across stakeholders. Organizations should focus on three key areas:
- **Recruit the Right Talent:** To acquire the technology skills they need, organizations can build on internal and existing talent. However, recruitment should also be a key focus. Digital capabilities should be included as part of hiring requirements and should become a focal point for HR teams. Given the complexity of E&C, organizations need to recruit people who also have an understanding of the industry. For example, some IT engineers, CAD administrators/operators or BIM users may understand the technology but not the fundamentals of plant design or material procurement. Organizations need to balance digital talent with industry knowledge.
  - **Empower Employees:** Organizations should find ways to encourage employees to come up with improvements and pursue innovations. Those who show an interest should be given career development opportunities within the digital talent pipeline. A review of current team structures can also unlock valuable talent by identifying people who have an understanding of the business, the strategy, and culture and so can help implement change.
  - **Offer Certification Programs:** Certification is an investment in digital skill and quality assurance, while preparing employees to get the most out of the technology. It also provides a measure of competence and knowledge. Learning and accreditation programs offered by solution providers or affiliates should be a requirement for existing employees during the digital transformation. Learning modules as part of the certification program should vary based on levels of use to support the onboarding of new hires.

## Case study:

### Bechtel's Future Fund

The explosive growth of technologies has created a unique opportunity for significant advances across industry sectors. Organizations are investing in innovation and empowering employees to test, validate, and implement ideas that accelerate the digital transformation.



Bechtel, the US construction and engineering company, is embracing innovation to increase productivity and reduce costs. Managed by their Chief Innovation Officer, Bechtel established The Future Fund, a multi-million-dollar internal investment, to find and resource new, disruptive ideas from their employees, suppliers, and customers— inside and outside of their industry. The Fund finances the ideas to develop technologies and approaches that can dramatically improve project design and execution, quality, and safety. The Fund unleashes ideas and enables them to mature from concept to prototype before they are deployed as project pilots, effectively de-risking exploration and innovation.

Bechtel believes the key to innovation is to fail safe, fail fast, and fail forward. They achieve advances by testing assumptions, integrating solutions, and ensuring a steady stream of diverse ideas. Velocity of maturation, level of adoption, and impact on project delivery are the measures of success. Bechtel's goal is to rapidly deliver the best services and products for their customers and create a rewarding and engaging experience for their teams.

To-date, Bechtel's employees around the world have submitted more than 2,000 ideas, with over 500 approved for further development and exploration, and dozens have already been deployed. Examples include wearable devices for employees to improve efficiency, drones to increase site accuracy and safety, high-risk training delivery via virtual reality, and virtual reality applications to improve cargo logistics, to name a few.

The Fund's crowdsourcing method helps accelerate the move from innovation to implementation by removing layers of approvals. By engaging people to drive innovation and value for their individual functions, the organization as a whole benefits.



## Spotlight:

### Boeing-Caltech Digital Talent Partnership

As a leading aerospace and engineering firm, Boeing needs a steady supply of well-trained engineers. It is also working to stay at the forefront of aerospace technology and is researching ways to make its systems more efficient. To meet these goals, Boeing embarked on a partnership with the California Institute of Technology (Caltech), an institution whose capabilities matched Boeing's long-term strategic technology needs.

First, Boeing hosted a workshop in which Caltech faculty could review the company's projects and access its research. After identifying the technology challenges that were of importance to both organizations, Boeing prepared a strategic agreement for a research partnership, addressing key issues for both parties, such as intellectual property and funding.

Boeing selected Systems Integration Technologies as the initial research focus and signed a five-year agreement with Caltech, allowing the university to make long-term investments in key faculty and experts. The relationship has given Boeing access to key faculty, administrators, and researchers at Caltech, and given the university greater ability to bring in funding from outside sources.

A relationship such as this, with institutions whose researchers and students are at an early stage in their education, provides companies with access to a strong pipeline of talent and potential recruits at various skill levels. Moreover, working with a university on common goals and technologies allows target recruits to see whether they are a fit for the company.

Case Study supplied by The Boston Consulting Group.



## Challenge 4: Securing Adoption

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Digital transformation is guided by the prospect of increasing productivity, quality, safety and reducing risk. While establishing a digital unit with the autonomy to invest in innovation and experimentation can help drive the digital transformation, organizations also need to focus on fostering digital adoption across the business.

In some parts of the enterprise, the introduction of new technology – bringing with it changes to processes and business models – can be met with a combination of enthusiasm and apprehension. Even for those who are familiar with digital technology, frustration can arise if the new systems are not able to talk to each other, making it important for organizations to invest in integration and interoperability.

Resistance to adoption may also result from employees' lack of clarity about the benefits of the technology or their perceptions that it will increase rather than decrease their workload. If this is the case, some may revert to the old systems and processes, which will hinder data management and collaboration.

When dealing with industry partners, agreements on data sharing may be hard to obtain and smaller organizations may resist adoption because of the cost. Clients may dictate the type of technology used, making it impossible to implement a new system when working for them. Additionally, cost-plus or time-and-materials contracts create a disincentive for productivity gains as the owner assumes the risk of cost overruns and the contractor typically benefits from the uncertainty of the final project cost.

Moreover, when a new system is implemented, people may try to make the old ways fit the new platforms, creating a "culture of customization." Change management is therefore needed not only to implement the technology itself but also to enable users to find ways of executing tasks in the new format.

Adoption outside the organization is also critical. For example, on a joint venture, subcontractors may be expected to upload operations and maintenance information into a platform. However, convincing them to adopt a new way of working can be challenging so simplifying the process and helping them understand the long-term value of the new system can accelerate adoption.



### Solutions:

- **Invest Time and Resources:** Digital transformation requires the investment of appropriate resources to support employees during and after implementation. Preparing a readiness and change management plan that can be adapted to different functions and business units will help them understand how technology will make their jobs easier, driving adoption. It can take time to persuade users to embrace change. However, having the right tools, talent, and training can help speed up this process.
- **Secure Executive Support:** Driving change within any organization requires the support of senior management. Senior teams should define the overall digital strategy, make it clear that digital transformation is a priority for the business, and demonstrate how it is part of the company's core strategy.
- **Offer Robust Training:** To drive adoption of technology, employees should be given different forms of training at the point of use. Different types of training may be needed to be deployed for different generations or, regardless of age, employees who have different levels of exposure to technology and different ways of working. For example, Just-In-Time (JIT) training enables users to access helpful resources anywhere, at any time. Responsibility for training lies not only with the organization but also with its vendors. When acquiring technology, the support and training it offers should be a key consideration when selecting a vendor. In addition, general training is needed for trainers, as they become the advocates and subject matter experts for the technology.

- **Create Autonomy and Flexibility:** Create a digital center of excellence (CoE) as a separate unit to encourage risk taking and to foster decision-making that is independent from the business. Partnering with start-ups or creating new entrepreneurial ventures within the organization can also help increase digital innovation and enable ideas to be tested before they are implemented across the enterprise.
- **Track and Measure:** When increased efficiencies and cost savings can be measured and these benefits demonstrated to stakeholders, it is easier to convince them that the digital transition is in their interests, in turn making it easier to drive adoption. Typical measures include:
  - Project efficiency including time and budget
  - Performance cycle times, quality and total improvement
  - Technology adoption across the business unit or enterprise
  - Long term dimensions such as preparation for future projects and technological infrastructure

## Case study: AECOM Teams



Setting up a specialized, objective-based team with organization-wide experience and understanding is a way to ensure that technology innovations can be scaled across the business, enabling consistent delivery of tools that support the business strategy.

To enable more efficient transformation, AECOM, a premier, fully integrated global infrastructure firm, set up a specialized team in the UK. This team helps project teams plan for and implement the right tools, take advantage of innovations and resources elsewhere in the organization, improve data management by connecting to the data lakes, and cultivate digital skills.

The team generally has time-boxed involvement with key project teams. The team does not run the software for projects but helps with setup, training, and strategy. This approach sets the general corporate direction for digital transformation and the team's work on the frontline with clients and projects enables it to provide invaluable input.

## Spotlight:

### Coca-Cola HBC's Digital Adoption Strategy

Coca Cola HBC, a leading bottler of The Coca-Cola Company, operates in 28 countries with more than 36,000 workers across Europe and Africa. As a result of acquisitions and organic growth over decades, the company's IT infrastructure was a patchwork of different technologies. The infrastructure had complex collaboration tools and operations, which required robust IT support and led to high training costs.

The company decided to move to a cohesive cloud solution for collaboration. Ahead of full migration, it began with a test migration and gained feedback from test users. It then implemented the migration incrementally, with full support services available for any problems during roll out. Senior executives used the platform to encourage the rest of the enterprise to welcome the migration and become active on the new system.

The company completed a full migration and realized business advantages from the technology investment in five months, with 90% daily use of the new communication systems.

The company's approach demonstrates how executive support for the implementation of a new digital technology can encourage uptake and speed up the adoption process. Moreover, technical training and support from both within the organization and from technology vendors can facilitate the smooth rollout of a new system.

Case Study supplied by The Boston Consulting Group.



## Challenge 5: Establishing Value and ROI

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When making a purchase, considering its potential ROI and running a cost benefit analysis is fundamental to the decision. But how do you effectively measure ROI for technology investments? A lot of organizations measure their qualitative aspects but struggle with the hard metrics.

Part of the problem is a lack of alignment in the way the value of individual solutions is measured as well as their collective value across the enterprise. Additionally, lack of executive sponsorship to support the investment often leads it to be viewed as a cost rather than something with the potential to cut expenditure and enhance efficiency.

### Solutions:

- **Secure Executive Support:** As with adoption, realizing the full value of technology requires executive sponsorship. Measuring ROI needs to be given a business focus. Whether what is being assessed is the adoption of a new technology across multiple projects or the implementation of a new innovation every 12 months, a set of metrics for success needs to be agreed on and given executive team support. This creates data that can be mined to develop proof points that provide irrefutable evidence of the quality and/or value of the innovation.
- **Establish a Baseline:** To measure the ROI of technology, organizations need first to establish the current baseline. While this may create additional work upfront, it will make it easier to assess the impact of the technology after implementation. Specifying the benefits of the solution and presenting a clear business case will drive endorsement and increase understanding of the impact to the business.
- **Develop a Measurement Framework:** To evaluate results, organizations need to establish a process and invest time and human resources in gathering the data. First, however a measurement framework needs to be established that defines:
  - What is to be measured and evaluated
  - The process for collecting the data and managing access
  - How to turn the raw data into insights
  - How these insights will be conveyed to different audiences
  - How information will drive action
- **Share Successes:** When the ROI is realized, this should be communicated to everyone across the business, focusing on those who are most affected by the change. This will give them the impetus to support the implementation and seek their own value in the platform or technology. ROI does not necessarily have to be set out in long or detailed reports; vignettes and use cases that are simple and relevant to individuals will help to generate visibility. Furthermore cross-functional stories can increase relevance and answer the question, “What’s in it for me?” Internal advocates who understand the value of the change should be the first port of call when looking for these success stories.

## Case study:

### Fluor's Structured, Metrics-Driven Approach

# FLUOR

According to research from Arizona State University and the University of Kansas, even when a compelling solution is implemented, there is a 70% likelihood that by the time a fifth project is executed, the innovation will have been forgotten and practices will revert to previous models. And part of the problem is that, in the absence of demonstrable ROI, users will be reluctant to adopt new systems and technologies.

To address this, Fluor, the US construction and engineering company, uses a structured and metrics driven process for innovation adoption. Fluor's structured process addresses areas such as adoption preparedness (including documentation and work process changes), communications, executive sponsorship, training, project mentoring, and coaching to ensure that the projects have all the resources needed to support successful adoption of the innovation.

Critically, Fluor has established metrics to identify and report on the value and success of each project and to track the progress of the innovation throughout the enterprise until it becomes systemic within its operations. The baseline target is a 1:10 ratio - that is, for one innovation to be seen as successfully rolled out, it needs to be adopted and used on at least 10 projects.

Fluor's approach demonstrates the importance of establishing a structured and measurable approach to innovation adoption and ROI from the outset. The company recognizes that successful adoption is a process achieved by changing behavior and practices until they become intrinsic to and supersede previous ways of working.



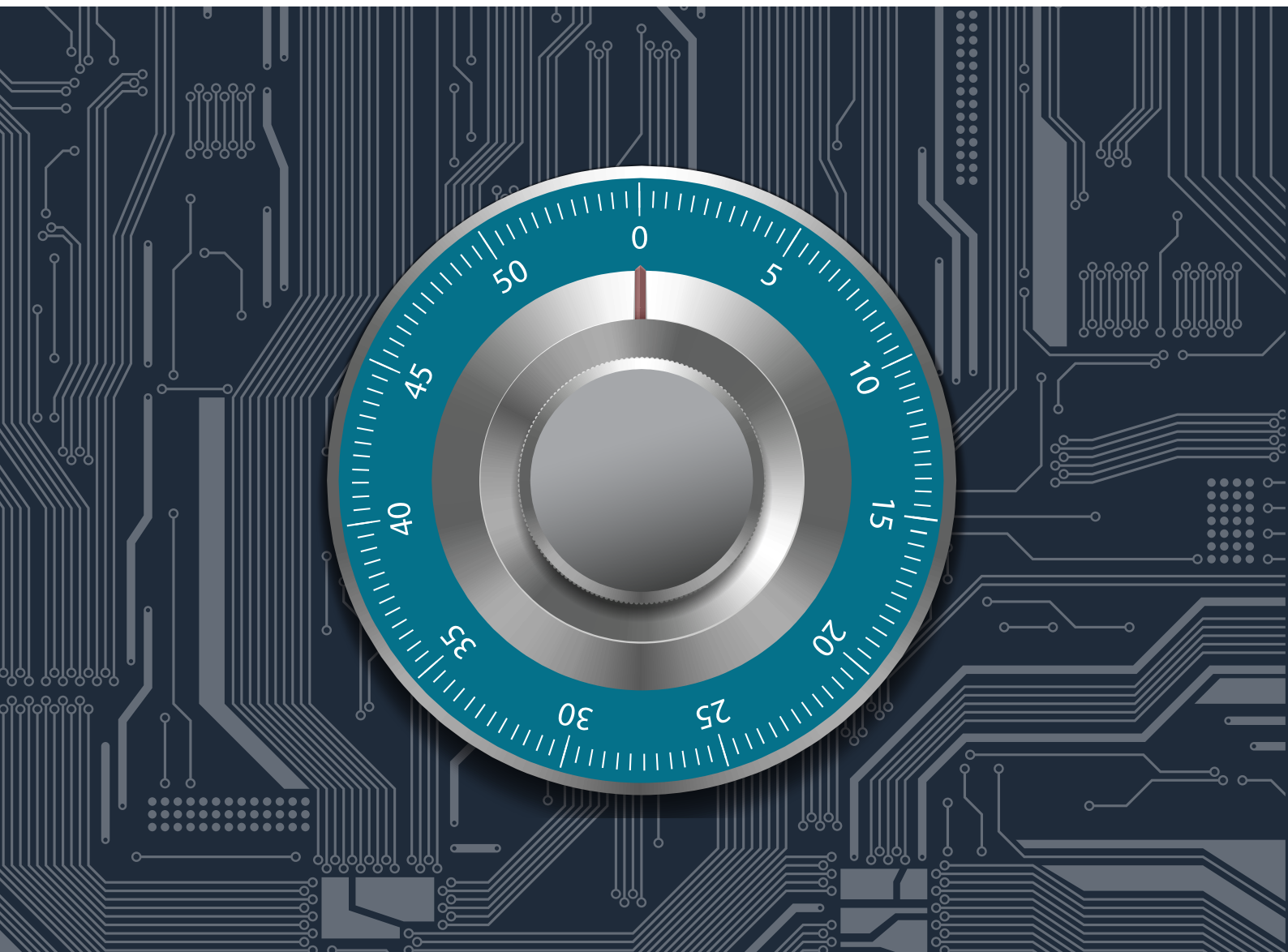
## Conclusion

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The E&C industry is on the brink of a large-scale technology-driven transformation. The change will lower project life cycle costs, increase efficiency, and lead to improvements in time, quality, and safety. Yet achieving this transformation will not be easy. In a fragmented industry, many companies struggle with everything from margins that are already wafer thin and difficulties acquiring the right talent to resistance internally to the adoption of new digital processes and business models.

For these companies, understanding barriers they face and addressing them with practical solutions is critical. However, they should take a pragmatic approach. Not all changes need to be made at once and companies should be wary of rushing in too fast in an attempt to seize competitive advantage. Instead, they need a clear vision for their digital transformation that will enable them to implement technologies and systems that are relevant to their operations. This will help them secure adoption, foster innovation, and build a foundation for future digital advances.

For E&C companies that can navigate the challenges of rapid digital change, harnessing technology can transform their operations. For those that can integrate technologies across the ecosystem, standardize processes across projects, secure a talented workforce that is ready for change, and measure their return on technology investments, there is much to be gained. For these companies, the opportunities are to increase efficiency, lower costs, and unlock hidden value.



# About this report

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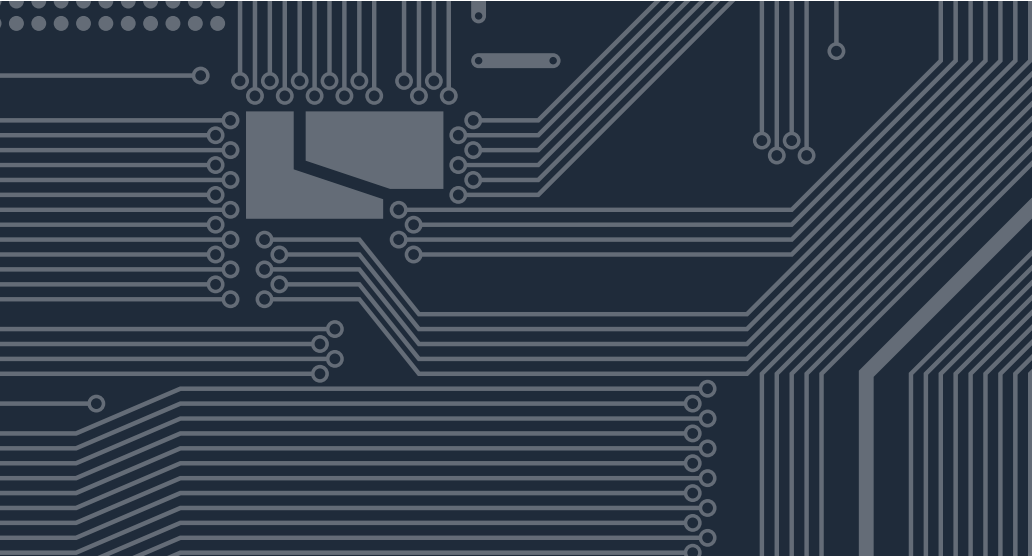
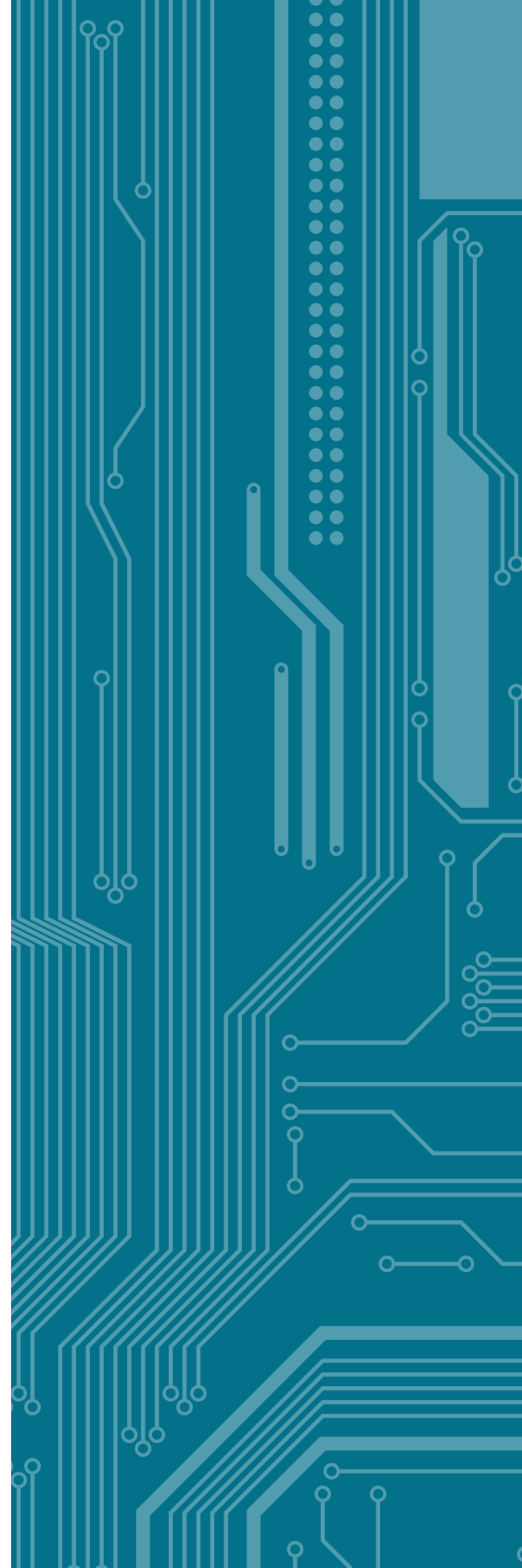
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