IndustryWeek

EXECUTIVE SUMMARY

The Digital Transformation's Impact on Industrial Machinery

Giulio Camauli, Director of Industrial Machinery Industry Solutions, Siemens Digital Industries Software
Rahul Garg, Vice President of Industrial Machinery, Siemens Digital Industries Software
Brent Robertson, Co-Founder, Fathom

KEY TAKEAWAYS

- IndustryWeek conducted research on digital transformation in manufacturing.
- Modeling and simulation technology in industrial manufacturing contributes to better performance.
- Modeling and simulation technologies can help manufacturers ease supply chain challenges.
- In driving digital transformation, companies are investing heavily in cloud, SaaS solutions, and other advanced technologies.
- Modeling and simulation technologies enable multiple use cases.
- Siemens fully integrates modeling and simulation throughout the production cycle.

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The Digital Transformation's Impact on Industrial Machinery

OVERVIEW

According to IndustryWeek research, modeling and simulation technologies are an instrumental part of the manufacturing design process, allowing for better processes, products, and systems that help lower costs. These technologies are a key component of digital transformation; companies investing in them tend to be at the top of the industry in terms of performance, investment, and innovation.

Siemens' integrated simulation solution brings together functions of design, validation, supply chain, and more to offer a cost-effective path to digital transformation. With over 50 years of experience in the industrial manufacturing software space, providing software solutions for the industrial manufacturing space, Siemens brings the expertise and knowledge to help manufacturers move toward the future of modeling and simulation.

CONTEXT

Experts from Siemens Digital Industries Software and Fathom discussed challenges faced by the industrial machinery industry and how software solutions can help companies succeed.

KEY TAKEAWAYS

IndustryWeek conducted research on digital transformation in manufacturing.

Digital transformation—using digital means to improve business and system operations to lower costs and increase productivity—is a major part of the evolution of the manufacturing industry. In mid-2022, in partnership with Siemens Digital Industries Software, IndustryWeek conducted research on industrial manufacturers for its State of the Market Report: "Modeling and Simulation Technologies are Accelerating Digital Transformation." The purpose of this research was to gain deeper understanding of where manufacturers are in the digital transformation journey, especially in modeling and simulation technologies.

Figure 1: IndustryWeek's State of the Market Report

Modeling and simulation technologies help manufacturers design, verify, and validate the intended function of a product or process with a virtual, non-physical model. Through these technologies, companies can reduce costs, experiment with and test innovations in a low risk/cost environment, increase the quality and lifespan of products and systems, accelerate time to market, and document and archive lessons learned.

Researchers spoke with and observed respondents from a cross-section of manufacturers in North and South America, ranging in size and scope. Most companies fell in the manufacturing equipment and machinery, automation, motion products, and robotics spaces and had 1,000 or more employees.

Modeling and simulation technology in industrial manufacturing contributes to better performance.

In the past, industrial manufacturers used modeling and simulation technologies primarily to improve product quality and reduce time to market. As a result, technology providers focused their standard simulation offerings around pre-build validation capabilities.

The Digital Transformation's Impact on Industrial Machinery

In the future, companies are looking to bring simulation to the forefront of design and innovation, with 65% of respondents indicating that the use of and continued investment in modeling and simulation technologies was important or mission critical. The research also found that higher-performing companies are farther along on the digital transformation journey than their lower-performing peers.

> "There's a correlation between that digital transformation journey, modeling and simulation technology, and bottom-line organizational performance."
>
> *Brent Robertson, Fathom*

Looking ahead, modeling and simulation will work in tandem with operations to help businesses stay competitive. For example, the unique and emerging focus on system simulation will further enable digitalization for manufacturing companies. Advances in system simulation technologies allow users to connect library components to create the architecture, combining electrical components with mechanical components, applying thermal physics principles, and considering concurrent performance of all.

With more than 5,000 validated libraries, Siemens system simulation technology uses an executable digital twin approach to enable users to prove the control strategy and actuation systems of a new or retrofit project. Performing a virtual commissioning reduces cost and resource risks inherent in physical commissioning. Those models can be embedded into the industrial edge to monitor the performance of the machine in operations and bring valuable information back to the designer, and to train operators before a physical machine arrives in-house.

> "When you think about system simulation, especially for manufacturing companies, there are multiple layers and levels . . . Being able to take advantage of simulation technologies available at these multiple levels becomes crucial in this world of digitalization, where you can model all of these different aspects and ensure that what you're producing is eventually going to get you the results."
>
> *Rahul Garg, Siemens Digital Industries Software*

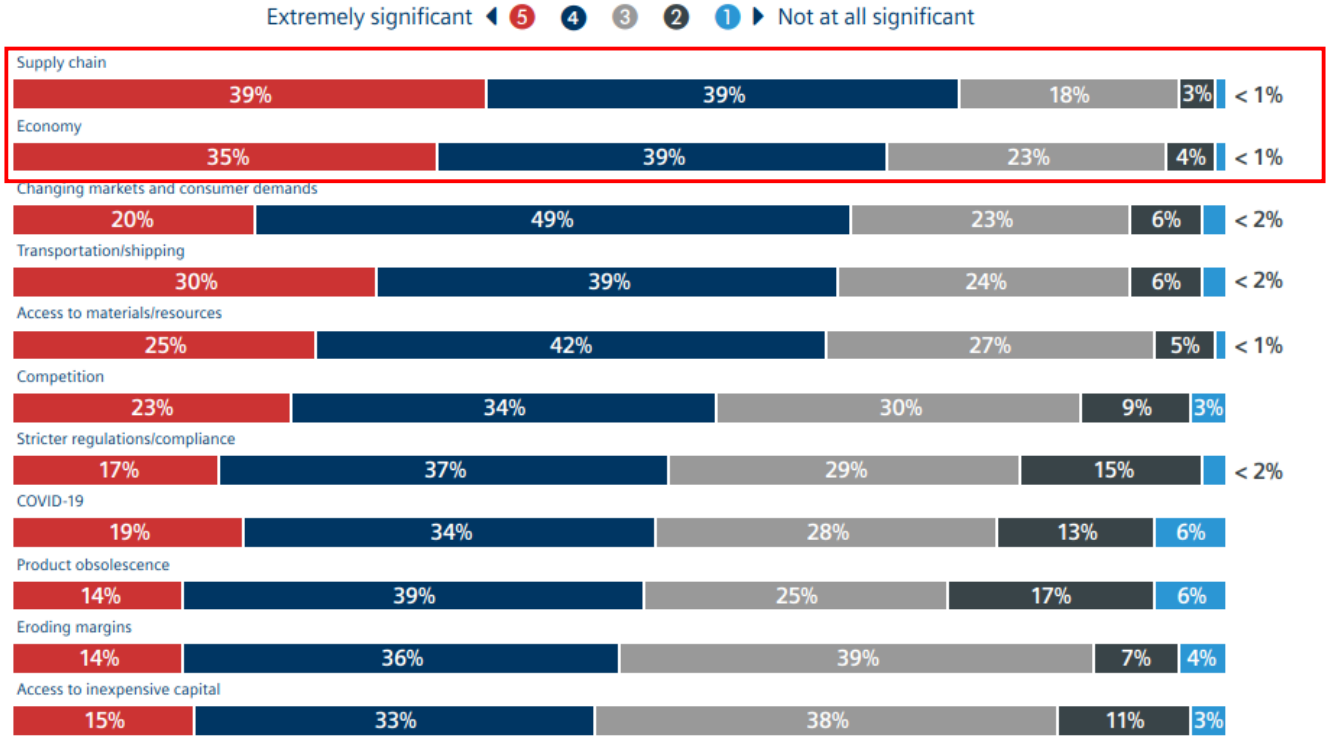
Modeling and simulation technologies can help manufacturers ease supply chain challenges.

Global supply chain disruptions are ongoing, in terms of inventory availability and on-time delivery for manufacturers, parts suppliers, and partners. While supply chain was previously viewed as a purchasing ffunction, today it is increasingly critical that suppliers become partners. Simulation and modeling tools can help support manufacturers and their supplier partners in working toward delivering on specifications by proving successes early on and allowing manufacturers to be in constant exchange and collaboration with suppliers. In this way, suppliers are incorporated into operations, and manufacturers can more closely manage supplier logistics and work around supply chain challenges in a faster, more efficient way.

In part to manage supply chain issues, there is a trend toward reshoring, where companies bring production capacities closer to where they are being consumed. In the process of building out a new factory, manufacturers want to ensure they are taking advantage of every relevant automation capability to remain efficient and price-competitive. Modeling and simulation technologies provide excellent value in support of these goals.

The Digital Transformation's Impact on Industrial Machinery

Figure 2: External challenges to the growth of respondents' organizations



Through the integrated scalable environment that Siemens offers, it is easy to connect the supply chain to share design and models both internally and externally with intellectual property protection in place. Connecting the design internally with simulation, automation, and manufacturing, then extending that connection with the supplier, combines the experience and knowledge of a specific technology to create a competitive advantage.

> "This is . . . the future that the digital journey can bring to the customers [and] to the market, just making the supply chain a more functional and efficient ecosystem."
>
> *Giulio Camauli, Siemens Digital Industries Software*

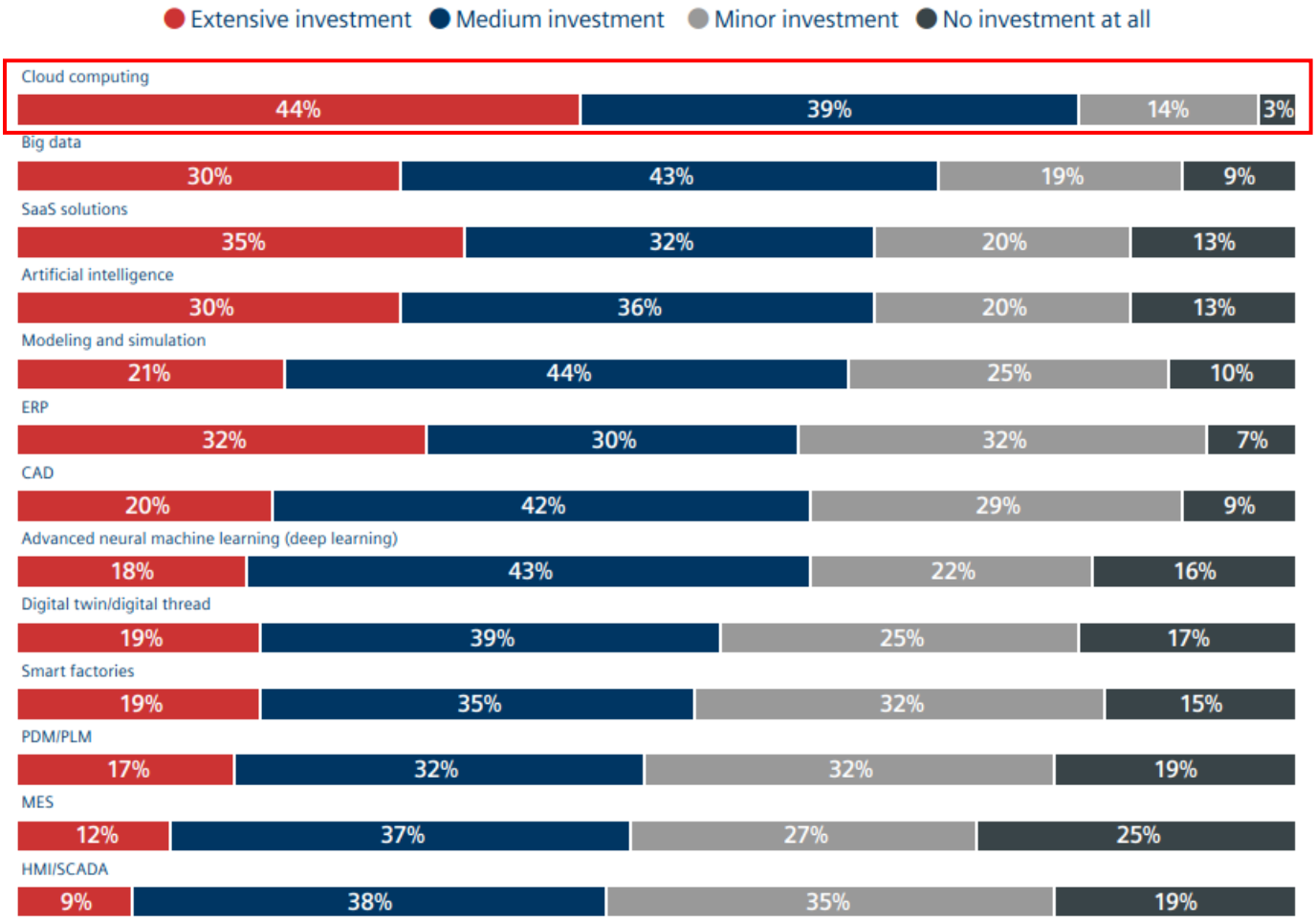
In driving digital transformation, companies are investing heavily in cloud, SaaS solutions, and other advanced technologies.

Among the top internal challenges identified by survey respondents was access to workforce and technology infrastructure. Investing in cloud-based solutions allows manufacturers to increase that access. In fact, the major technology investments made by manufacturers in the past two years indicate an emphasis on cloud technology and a continued move toward digital transformation.

Cloud-based/SaaS solutions:

1. Reduce the total cost of ownership and capital expenses (e.g., licensing costs, computing resource consumption), lowering the barrier to entry.
2. Make adoption easier, as the skills requirements to learn and adopt the technology are less intensive.

Figure 3: Technology investment over the past two years



Base: All respondents (n varies from 133 to 136).

3. Facilitate collaboration through ease of access. Technologies that enable modeling and simulation ranked among the top investments, which include cloud computing, SaaS solutions, ERP, big data, and AI. Collectively, these technologies make it easier for manufacturers to take advantage of more advanced modeling and simulation capabilities.

Modeling and simulation technologies enable multiple use cases.

Modeling and simulation technology, specifically, is applied in use cases across a range of functions in manufacturing. Examples include:

- **Production and manufacturing.** Modeling and simulation technology supports digitalization of the entire process of how a robotic arm functions, from the arm to the rest of the cell, including the speed and capacity at which goods will come in, and how the arm transitions from one step of the function to the next step.

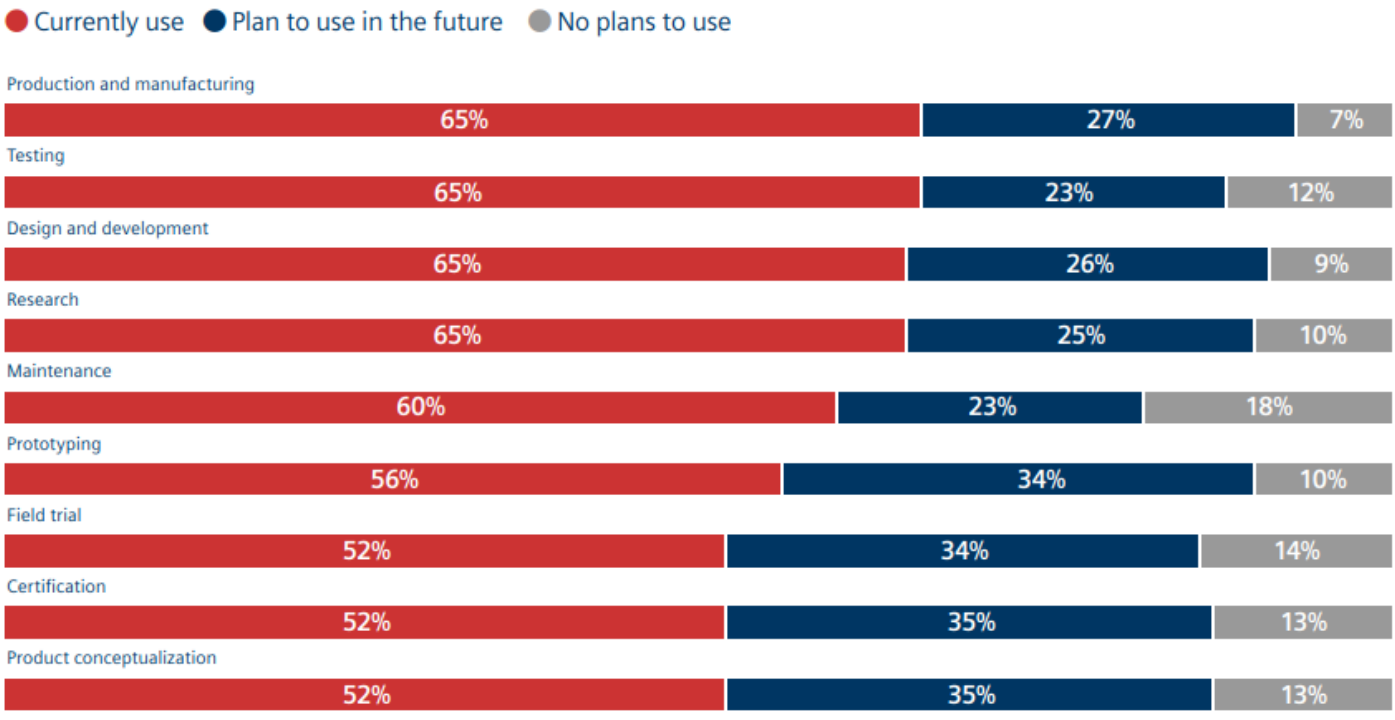
The Digital Transformation's Impact on Industrial Machinery

- **Process improvement.** Where manufacturers already measure how operations are running with the aim of optimizing processes, integrating front-end models into the manufacturing execution systems allows companies to compare metrics with the intentions of the original design and make any adjustments to close gaps, such as a lower-than-expected throughput.
- **ESG.** As environmental, social, and governance (ESG) requirements increase and intensify, leveraging simulation to make equipment more energy-efficient is a driver for adoption of simulation technology, as it allows modeling of and reporting on environmental impact of the entire system. Being able to test different materials and changes in water usage or other resources, and including supplier information on metrics such as carbon footprint for various materials, helps manufacturers meet and exceed ESG standards.

Siemens fully integrates modeling and simulation throughout the product life cycle.

It is becoming critical for manufacturers to understand on the front end the key requirements that they need to deliver for customers. Being able to drive those requirements throughout the manufacturing process and making them visible across the entire company requires a comprehensive and high-performing product lifecycle management (PLM) system. A good PLM system will aid manufacturers in their digitalization journey, especially in the context of collaboration and achieving end goals.

Figure 4: How technologies are applied in industrial manufacturing



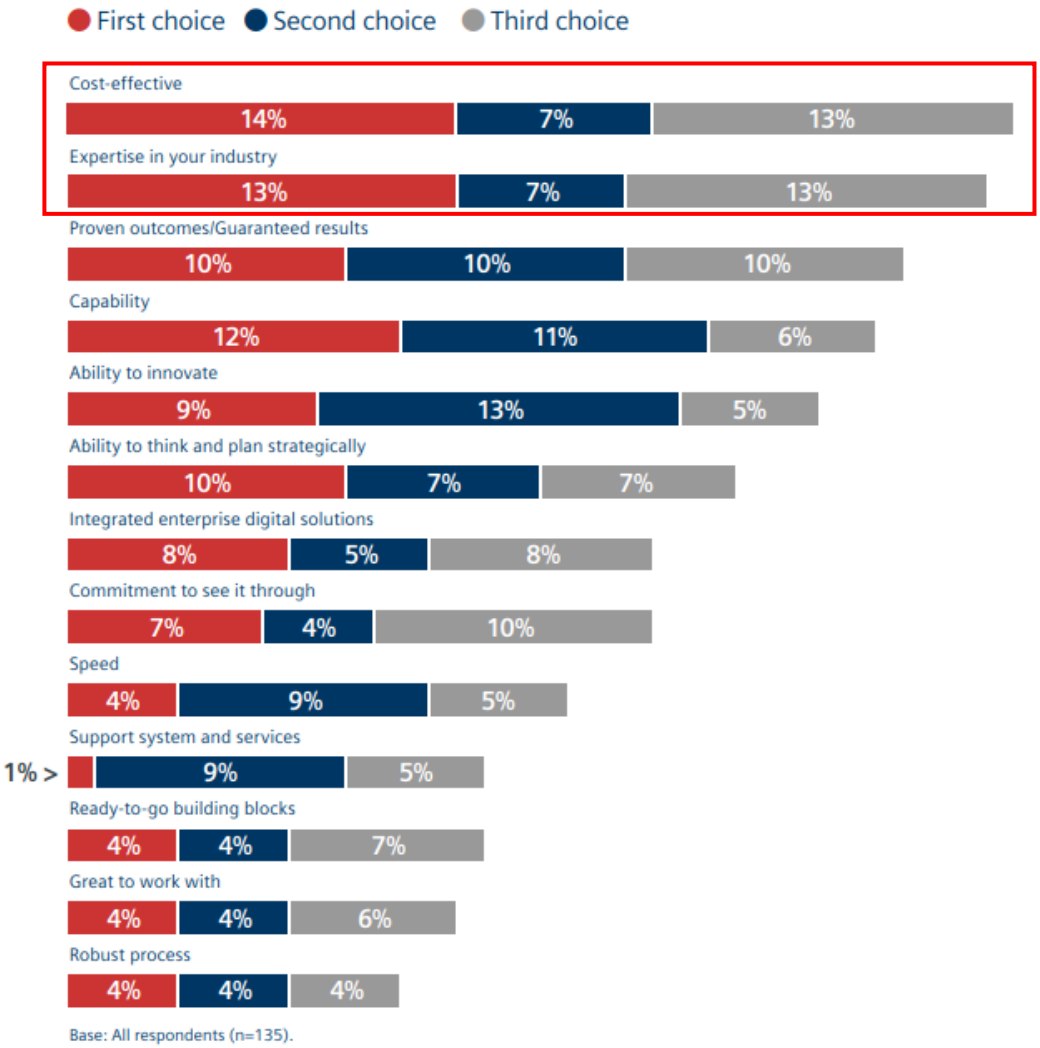
Base: All respondents (n varies from 133 to 136).

The Digital Transformation's Impact on Industrial Machinery

Managing the requirements is the first crucial point, but bridging the requirements to physical functions is the second, just as important, step. The translation of the requirements to functionality is fundamental to a successful simulation. To validate a digital twin, there must be a real target against which to calibrate the behavior of the model. Whether this is a product or a standard, the combination of simulation and testing provides value by enabling repetitive, expensive tests for both innovation and certification purposes at significantly lower cost.

When looking for a partner to help achieve these two goals, respondents are most interested in companies with industry expertise, cost-effective solutions, and proven results. As an industrial machinery company first and foremost, Siemens has the industry knowledge and expertise needed to help manufacturers on the digital transformation journey. And Siemens' comprehensive solution provides all the necessary elements, rather than disparate point solutions, in one integrated environment, making it a cost-effective choice for manufacturing companies undertaking a digital transformation.

Figure 5: Partner value-add priorities indicated by respondents



The Digital Transformation's Impact on Industrial Machinery

The integrated Siemens solution brings together physical and virtual sensors, allowing adoption of simulation into the design. By connecting simulation tools to CAD or PLM systems, results are tracked as new versions are tested, allowing reversion as needed and providing an audit trail for certification.

ADDITIONAL INFORMATION

To learn more, visit Manufacturing & Production Machine Performance Engineering | Siemens Software

BIOGRAPHIES

Giulio Camauli

Director of Industrial Machinery Industry Solutions, Siemens Digital Industries Software

Giulio Camauli joined Siemens in 1991, working in many roles ranging from Application Engineer to Customer Services Manager and his current role as the Director of Industrial Machinery Industry Solutions.

Giulio continues to help industrial machinery customers innovate and improve product reliability, quality, productivity, and more using simulation software solutions. He has helped countless customers from around the world learn new engineering processes that incorporate simulation into the design process.

Rahul Garg

Vice President of Industrial Machinery, Siemens Digital Industries Software

Rahul Garg joined Siemens more than two decades ago. In that time, he's held multiple positions, but his primary objective has always been the same—help his customers succeed by delivering powerful, effective solutions that support their business goals.

As Vice President of Industrial Machinery, Rahul delivers Siemens Industrial Machinery software solutions to help manufacturers develop competitive products, fill portfolio gaps, and create effective go-to-market strategies and business practices.

Brent Robertson

Co-Founder, Fathom

Brent works with leaders to create high-performance, purpose-driven teams and organizations. As co-founder of Fathom, he champions an approach to executive coaching, strategic planning, leadership development, succession, and transformation that prioritizes people and relationships. As a result, his clients don't simply plan their futures, they bring them to life through the energy of organization-wide involvement in, and commitment to, generating organizations that perform beyond what their history, or their industry says is possible.