

The future of the digital customer experience in industrial manufacturing and construction

Deloitte Center for Energy & Industrials

To better lead in the future, Deloitte research suggests companies may need to put the customer at the heart of digital transformation



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02 . . . Key takeaways

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to enhance their digital customer experience and seem to
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KEY TAKEAWAYS

- A desire to improve operational efficiency, the pace of digital transformation, changing customer expectations, and competitive pressures seem to be driving a shift toward an enhanced digital customer experience in industrial manufacturing and construction.
- An enhanced digital customer experience is now considered “table stakes” according to industrial manufacturing and construction companies surveyed, and offers the potential to add value across the organization, from presales, design, production, and delivery to aftermarket and operate services.
- Among the industrial manufacturing and construction companies surveyed, 93% are experimenting with, or implementing at least one digital customer experience use case, and on average, they are implementing four.
- An exceptional digital customer experience that encircles the customer with the personalized experience that they need—when they need it—is likely to be a key differentiator for industrial manufacturing and construction companies in the future.
- To help seize the opportunity of establishing an exceptional digital customer experience, key success factors seem to be organizing around customer needs, overcoming interoperability challenges, prioritizing data security, and developing talent with a blend of technical knowledge, digital skills, and soft skills.

The pace of digitalization is transforming traditional business models and operating processes for industrial product manufacturing, aerospace and defense, and engineering and construction companies. (Deloitte refers to these companies collectively as “industrial manufacturing and construction.”) Despite economic uncertainty, companies across the globe have continued their investments in technology and push toward smart operations. According to a 2023 Deloitte survey of over 800 manufacturers, 98% of respondents have started their digital transformation journey, compared to 78% in 2019, driven in part by the need to improve customer experience, optimize cost, develop or enhance existing products, and improve operational efficiency.

At the same time, a shift toward customer centricity over the past two decades, the challenges laid bare by

the COVID-19 pandemic, and the growth of digital technologies have given rise to new services offered by industrial manufacturing and construction companies that can enhance the customer experience, such as aftermarket and “operate” services. The goals of this evolution have been to create new and stable sources of revenue, build brand loyalty, and gain competitive advantage. This development is particularly timely, as reduced product development and project delivery cycles have made it increasingly difficult for companies to compete on product and asset design differentiation alone. Meanwhile, customer expectations have also evolved with the proliferation of personalized, seamless, and omnichannel digital e-commerce experiences commonly found in business-to-consumer (B2C) interactions in the retail sector.

OPERATE AND AFTERMARKET SERVICES SEEM TO BE A GROWING OPPORTUNITY

Driven by the changes in customer expectations and supply chain disruptions following the COVID-19 pandemic, digital tools have helped enhance customer centricity in the engineering and construction, and aerospace and defense industries.

As customer expectations and technology evolve, for example, E&C companies are increasingly leveraging digital tools such as AI/ML, IoT, and cloud solutions to enhance customer interactions and service delivery. There has also been a shift toward operate services, which refer to a suite of offerings designed to support and enhance the building or industrial structure after it becomes operational. These services can include warranty support, performance monitoring, asset and life cycle management, energy management, and others.

Some digital solutions that E&C companies are experimenting with to help enhance customer experience include:

- Generative design to provide customers with more options to choose from in the design phases based on their specific needs and critical constraints

- Customer-facing dashboards to offer real-time insights into important project metrics like progress, safety, and cost, and to enhance stakeholder engagement
- Digital twins and common data environments to boost information management and to help ensure accurate, timely, and secure data-sharing across multiple stakeholders
- Predictive analytics to proactively address customer needs and optimize delivery

Collectively, these digital strategies underscore a transformative shift in E&C operations toward greater customer centricity, which can help ensure more responsive and transparent services.

There has been a similar evolution in the A&D industry toward enhancing customer experience with aftermarket services. Despite a rapid decline in new aircraft orders during the COVID-19 pandemic, the A&D industry has rebounded with increasing demand for air travel, which has contributed to robust demand for new aircraft. However, scaling up production for new aircraft has been challenging

due in part to persistent supply chain disruptions, which impact manufacturing rates and delivery schedules. This has contributed to increased demand for maintenance and aftermarket services for existing aircraft fleets to help extend their lifespan and minimize downtime. Digital tools have become important for effective inventory management and visibility into spare parts availability, which can help aircraft operators plan their maintenance activities effectively. Digital technologies can also play a key role in strengthening relationships through enhanced collaboration and establishing long-term service contracts. For instance, digital tools can be leveraged to inform maintenance, repair, and overhaul providers, parts and spares manufacturers, and operators about supply, demand, and availability. Meanwhile, cross-information-sharing can help them plan operations and scale effectively.

In short, an enhanced digital customer experience (DCX) may be a necessity for companies in these industries to differentiate themselves from their competitors in the digital age. However, those companies that are striving to deliver a leading DCX are often challenged by the complex nature of their products, projects, delivery models, and value chain partner network. And the customer landscape can be complex, comprising consumers (B2C), businesses (B2B), and governments (B2G). Projects are delivered and products are often sold and serviced through a network of distributors, dealers, subcontractors, and other partners. Each customer, partner, and even delivery model can have unique needs and requirements, and it can be essential for companies to comprehend these needs to optimize the experience for the end customer, while also working to ensure the success of partners across the value chain.

To understand the common barriers and benefits of an enhanced DCX, and to establish a benchmark for implementation, the Deloitte Center for Energy and Industrials conducted a survey of 250 executives in the US industrial product manufacturing (IP manufacturing), aerospace and defense (A&D), and engineering and construction (E&C) industries in June 2024. *The Future of the Digital Customer Experience* survey (hereafter, “the survey”), included questions on technology and use case adoption, business drivers, benefits, and expectations for a DCX. The survey findings were supplemented with 15 interviews with executives and subject matter specialists in these industries.

The article and findings are organized to show both the commonalities between the IP manufacturing, A&D, and E&C industries and the unique results. In cases where

there is commonality, we refer to these industries collectively as the “industrial manufacturing and construction” sector or “companies,” unless otherwise noted.

The survey results demonstrate that surveyed industrial manufacturing and construction companies seem to have a strong digital foundation in place and they are moving forward with DCX initiatives using two fundamental approaches.

1. Enhancing the digital connection to customers and value chain partners to collect important customer behavior data, facilitate collaboration, and share key insights that can improve the customer experience.
2. Enhancing the digital connection to products, facilities, and delivered projects to collect usage and operational performance data and improve performance and serviceability.

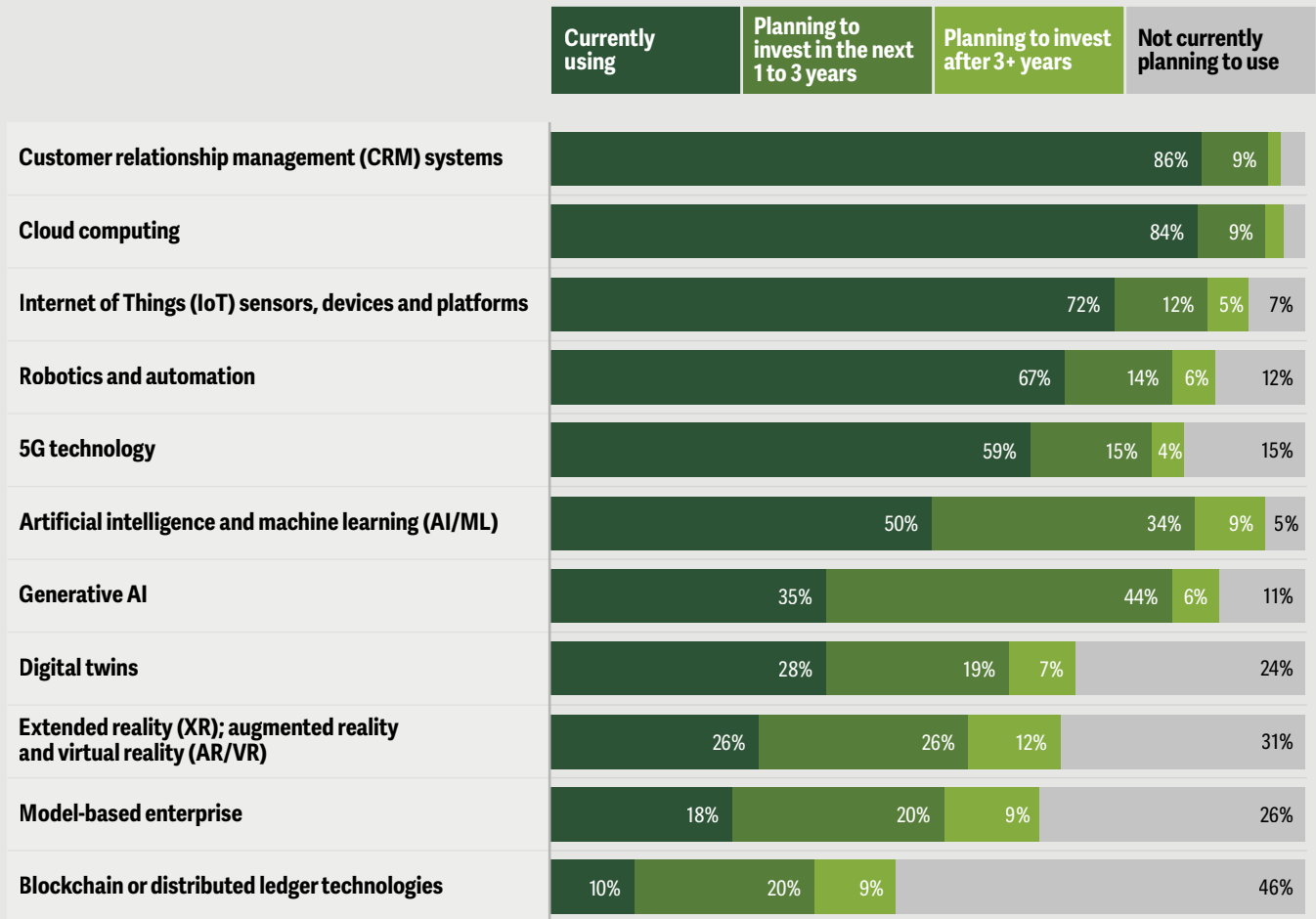
● **Surveyed companies are leveraging their digital foundation to enhance their digital customer experience and seem to be reaping the benefits**

More than 80% of respondents reported that their company is currently using or plans to invest in digital technologies such as customer relationship management systems, cloud computing, Internet of Things (IoT), as well as robotics and automation (figure 1). Respondents also indicated a shift toward investments in emerging technologies such as artificial intelligence and machine learning (AI/ML), generative AI, and extended reality over the next three years, underscoring the sector’s ongoing commitment to embracing innovative digital technologies.



Figure 1

Surveyed companies are leveraging a range of digital technologies



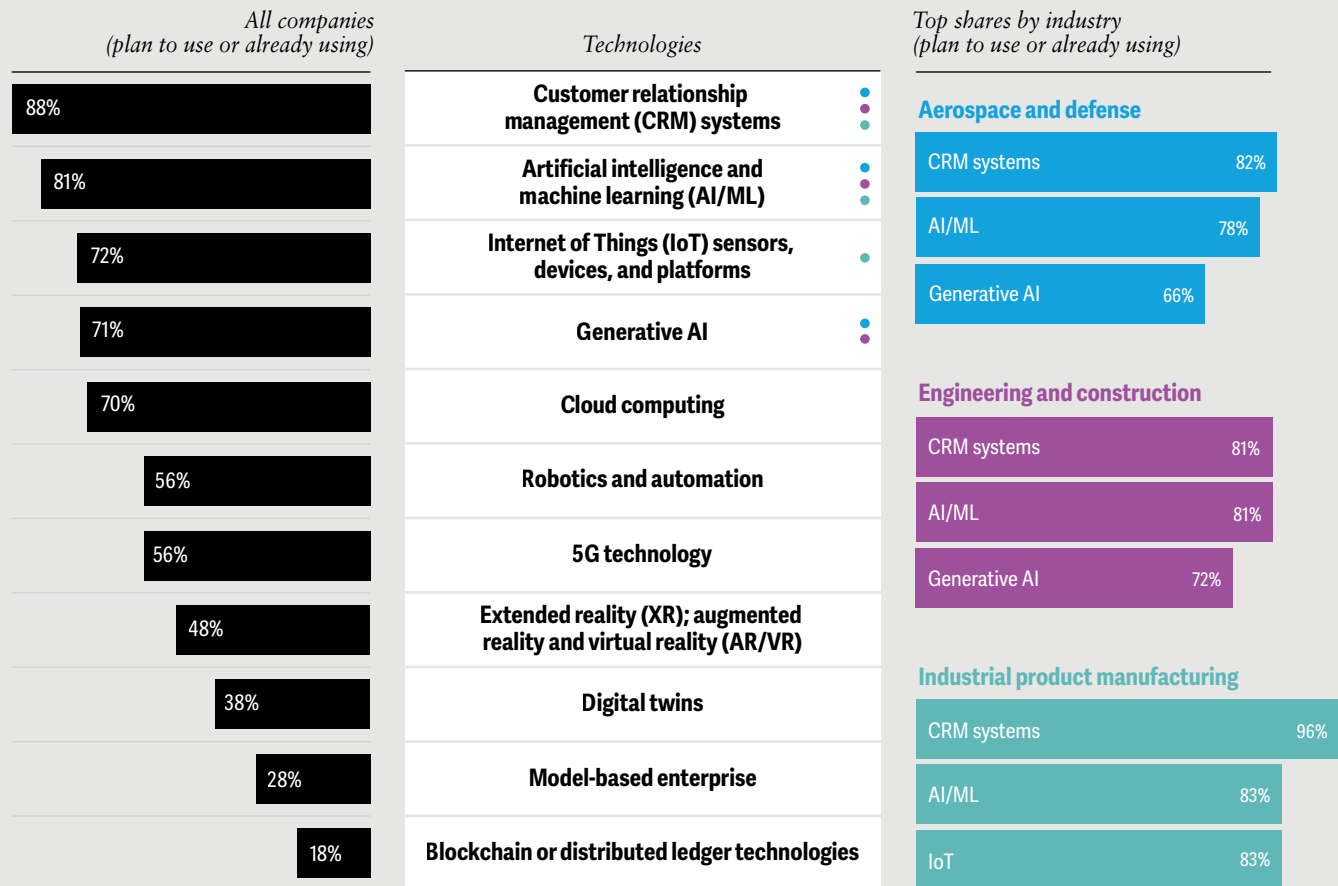
Source: 2024 Future of the Digital Customer Experience survey.

Surveyed companies seem to be leveraging these technologies to improve their DCX: For example, more than 70% of respondents plan to use or are already using AI and ML, IoT, and gen AI technologies to enhance customer experience (figure 2). Customer relationship

management systems were chosen as the top technology to boost customer experience by companies in all three industries, closely followed by AI and ML, IoT, and gen AI.

Figure 2

Survey respondents are leveraging digital technologies to enhance their digital customer experience



Source: 2024 Future of the Digital Customer Experience survey.

In addition, 93% of survey respondents indicated that they are experimenting with, or implementing at least one DCX use case, and on average, they are implementing four. And investment in an enhanced DCX is expected to continue—81% indicated that they plan to invest in at least one additional use case in the next one to three years, and on average, they plan to invest in three.

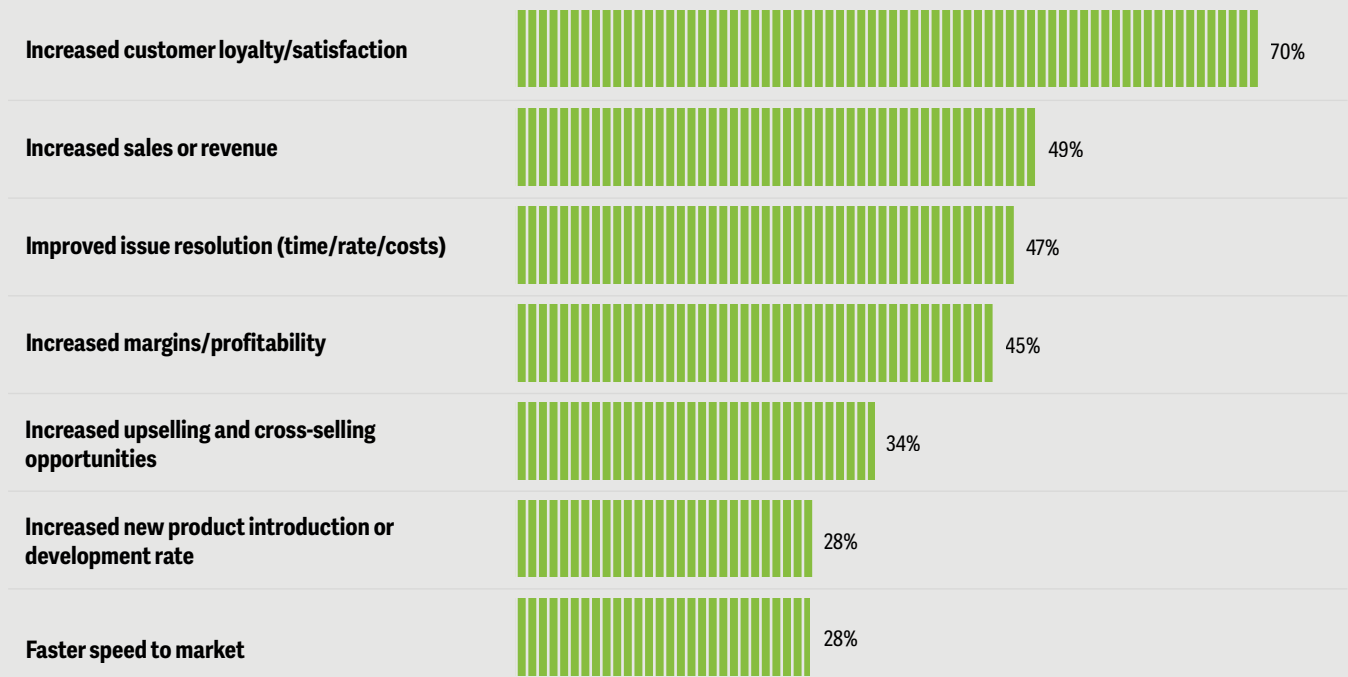
The majority of surveyed executives also reported significant business benefits gained from enhancing their DCX,

with increased customer loyalty and satisfaction, higher sales or revenue, improved issue resolution time, and greater margins ranking at the top of the list (figure 3).

Apart from the potential benefits, however, there seem to be other important factors driving a shift toward an enhanced DCX in industrial manufacturing and construction.

Figure 3

Benefits respondents gained by improving their digital customer experience



Source: 2024 Future of the Digital Customer Experience survey.



Evolving customer expectations and competitive pressures seemed to have changed the customer landscape in industrial manufacturing and construction

In addition to improving operational efficiency and advancements in digital technologies, nearly half of surveyed respondents included changing customer expectations and competitive pressures as two of the top drivers shaping their DCX strategies over the next five years (figure 4). An enhanced DCX no longer seems to be optional in industrial manufacturing and construction. One industry leader from a heavy equipment manufacturer noted in an interview that “A digital customer experience is becoming table stakes and just one of the things that you have to do to compete. It seems like it’s made the premier brands stronger.”

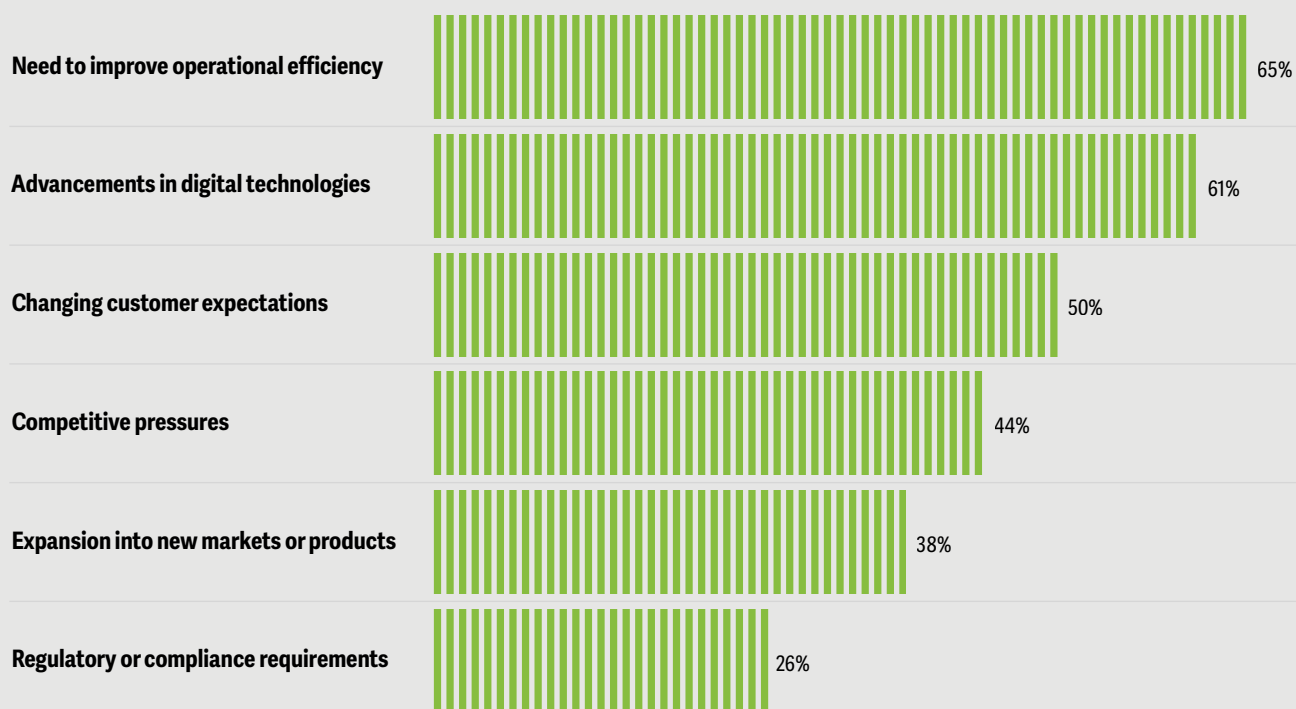
The growth in simplified digital purchasing processes and enhanced user interfaces, which have become ubiquitous in consumer interactions, may be raising customer expectations in industrial manufacturing and construction.

Speaking from the perspective of their own experience as B2B customers, 86% of surveyed respondents either agreed or strongly agreed that they want an improved digital customer interface from their suppliers. They also chose a seamless experience, clear information, and faster response times as their top desires for improved B2B digital interfaces (figure 5). The availability of digital models, which can aid customers in areas such as design and service, is also a top priority for nearly one-third of survey respondents in their role as a B2B customer.



Figure 4

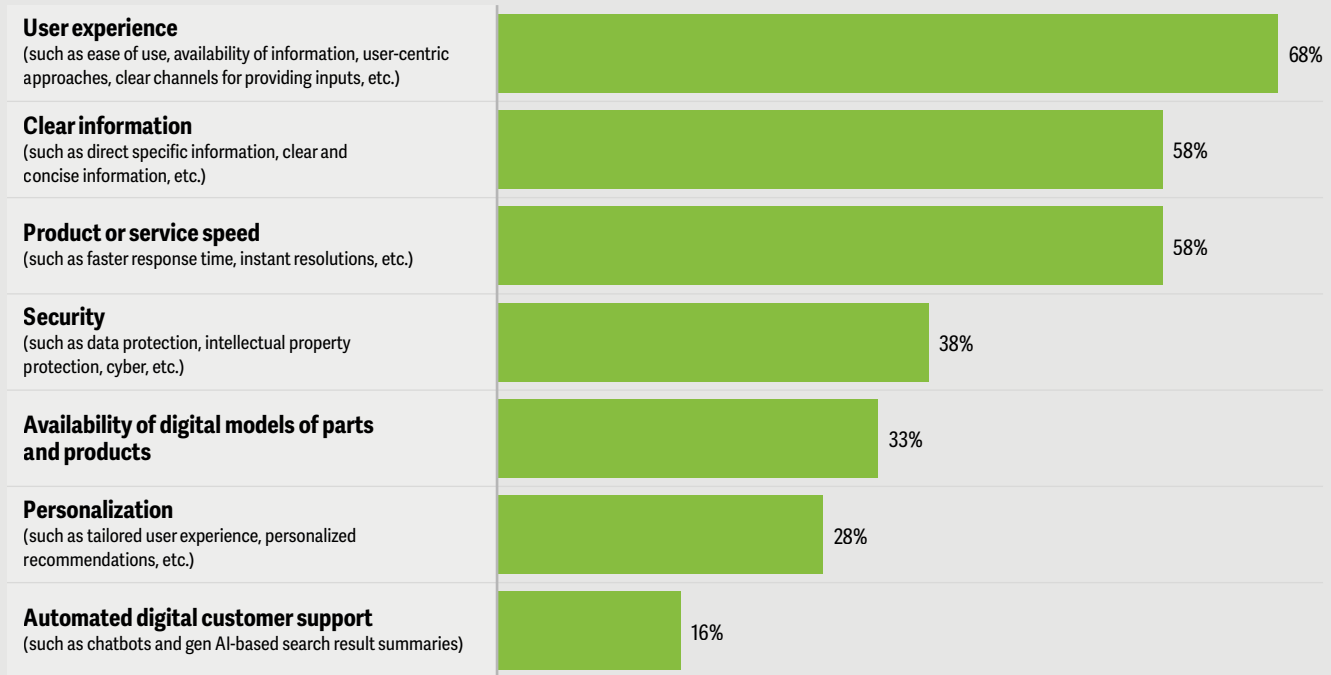
Top drivers for digital customer experience strategy over the next five years, according to surveyed respondents



Source: 2024 Future of the Digital Customer Experience survey.

Figure 5

In their role as B2B customers, respondents identified several factors that could improve their suppliers' digital interfaces



Source: 2024 Future of the Digital Customer Experience survey.

GOVERNMENT REQUIREMENTS ARE CONTRIBUTING TO INCREASED DIGITAL B2G INTERACTIONS IN A&D

The digital integration of processes, people, business areas, and data is revolutionizing product development and transforming how stakeholders communicate, collaborate, and make decisions within the B2G digital landscape. For instance, the US Department of Defense (DoD) is embracing digital engineering practices to develop defense systems that maintain a competitive edge. Additionally, enhancing the customer experience across various departments has become a top priority for the US DoD, leading to the establishment of a new Customer Experience Portfolio Management Office earlier this year. Such evolving government priorities are also driving government suppliers to move toward a model-based enterprise and model-based systems engineering which can enable digital testing and

validation, and increased sharing of digital models for the products and systems that they produce for governments. The objectives mirror those in other segments, namely efficiency, transparency, accessibility, and enhanced service delivery.

The DoD's acquisition policy for fiscal 2024 aims to improve the process of developing new capabilities and accelerate their development and deployment. Digital collaboration between the DoD (the customer) and prime contractors can help to meet these goals. For instance, the use of digital twins for simulating defense systems throughout various stages of design can help ensure the product meets all requirements and can even provide customization options—helping to deliver the

right product the first time. Designing, prototyping, testing, and verifying a new defense system is generally a time-consuming and iterative process. Simulation can help to expedite each step in the process. Furthermore, simulation can be used to evaluate product performance at the design stage to determine whether the desired output can be achieved, which is particularly beneficial for custom-built products or systems. However, original equipment manufacturers and prime contractors often have to follow DoD requirements for the systems or platforms they can use in a program, thereby limiting their ownership, and sometimes their ability to select the best tools for the project.

Digital customer experience use cases: Current and future investments



The wide range of digital customer experience (DCX) use cases implemented by industrial manufacturing and construction companies (figures 6 and 7) offer the potential to add value across the organization, from presales, design, production, and delivery through after-market and operate services.

Figure 6

Capabilities that a digital customer experience could unlock

Business area for primary benefits

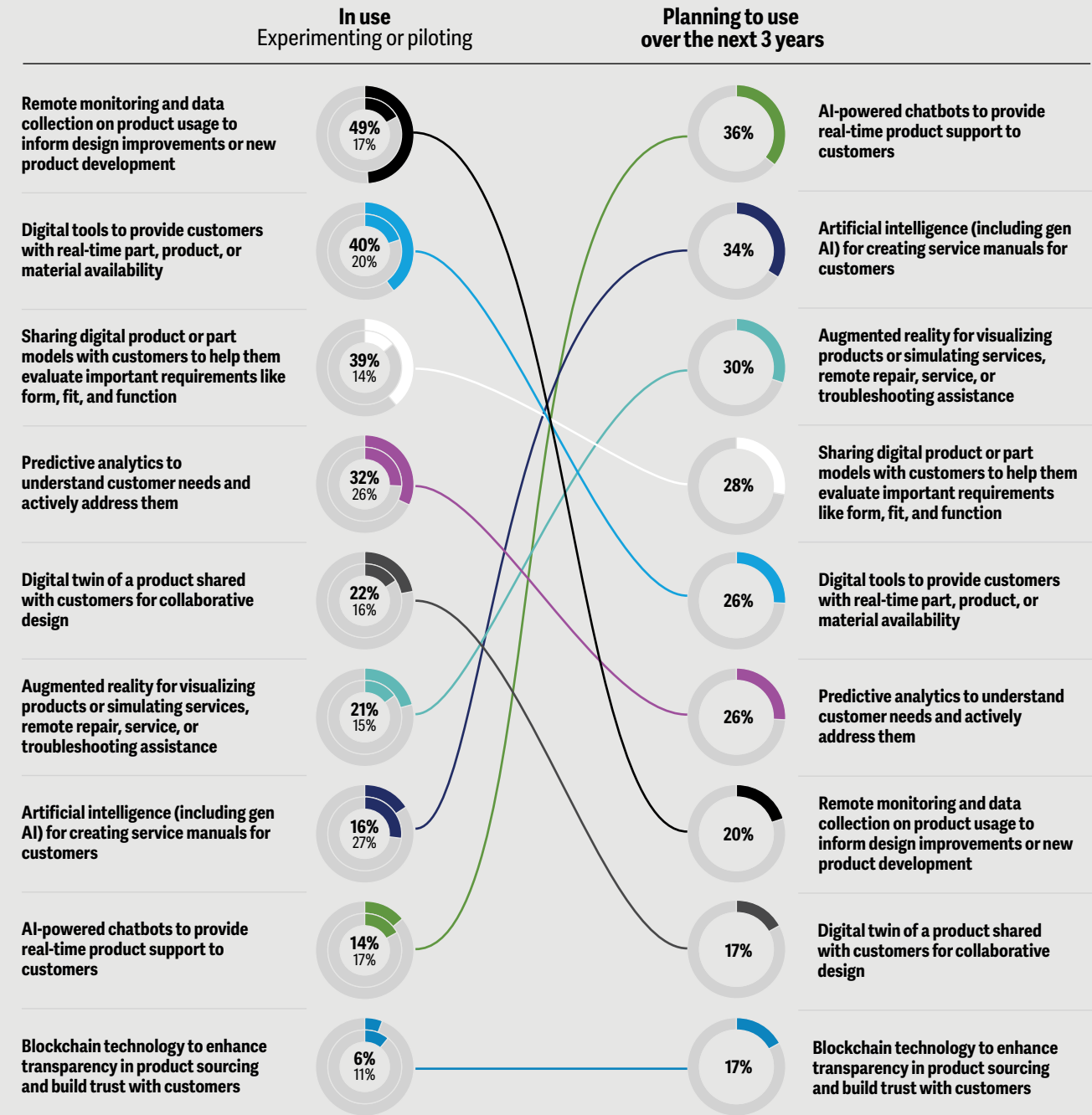
Capability

Design	<ul style="list-style-type: none"> • Digital twins for customers to visualize the product or project and provide design input • IoT sensors and devices to collect customer or equipment usage data and onsite conditions • AI-based “design feedback loop” from product or facility usage and customer data • Generative design based on the design feedback loop
Presales/ proposal/ sales	<ul style="list-style-type: none"> • AI-powered search engines to research and reserve products • AI analysis of customer behavior • AI-based customer segmentation—new personalized product, project, or service recommendations • Gen AI virtual chatbots for exploring product or project specifications • AR/3D/digital models of products, projects, and assets for customers to explore form, fit, and function
Production/ project delivery	<ul style="list-style-type: none"> • Parts and materials forecasting optimization from AI-based predictive maintenance, operational, and failure data analytics • Data from IoT devices on the production line or at the construction site to inform customers of lead times for products, materials, and project milestones • Leveraging AI/ML tools to efficiently design products, projects, and processes (for example, modular product or building architecture) to meet unique customer preferences
Inventory management	<ul style="list-style-type: none"> • Customer visibility into inventory systems by linking enterprise resource planning systems • AI analysis and optimization of product, part, or material inventory levels necessary to meet customer demand (based on order, operational, and failure data analytics)
Aftermarket/ operate services	<ul style="list-style-type: none"> • Data and service subscriptions • AR-based expert operation, service, maintenance, or repair assistance • 3D exploration of a product, facility, structure, or assembly for self-repair purposes • AI-based predictive maintenance • Gen AI-based virtual chatbots for product and facility support • Gen AI-based service manuals

Source: Deloitte analysis.

Figure 7

Respondents are implementing, experimenting with, and plan to use a wide range of digital customer experience use cases



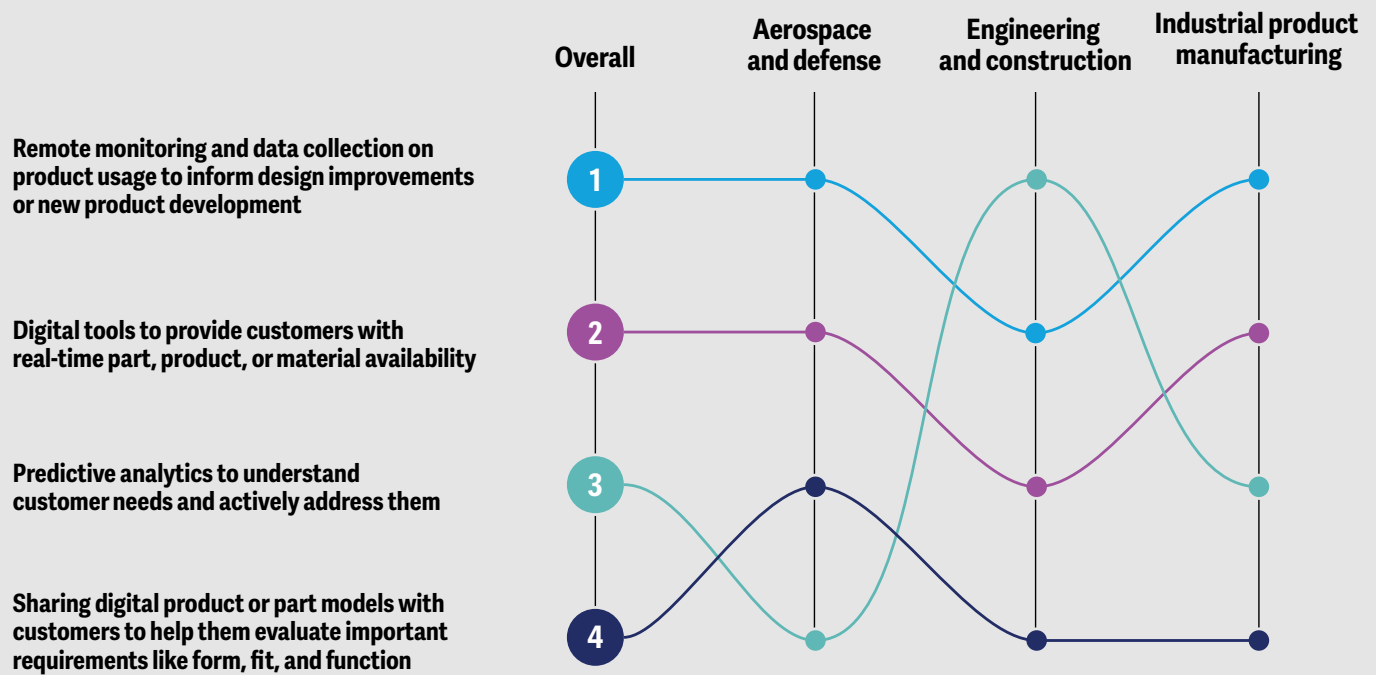
Source: 2024 Future of the Digital Customer Experience survey.

For example, while a product or structure is in use, real-time monitoring systems and predictive analytics can help customers maximize uptime and reduce the life cycle costs of ownership. These systems can also help companies create a dynamic design feedback loop with their customers. Companies can leverage their operational data to improve existing products and facilities and inform the design of new assets and products tailored to meet specific requirements. Remote monitoring and data collection ranked as one of the top two use cases for all three industries (figure 8).

Digital tools like chatbots or augmented reality-based interfaces (remote assistants) can enable companies to support customers with updated product manuals, specifications, and specific requests. They also serve as guides for customers who prefer to undertake maintenance independently. According to the survey, the use of AI for customer service manuals was more prevalent in A&D and IP manufacturing, whereas the use of augmented reality (for example, for visualization of projects, installation procedures, and services) was more common in E&C.

Figure 8

Comparison of the top four use cases for digital customer experience across industries



Note: The A&D and IP manufacturing survey respondents reported 'artificial intelligence (including generative AI) for creating service manuals for customers' as the fifth use case for digital customer experience, whereas the E&C respondents indicated 'augmented reality for visualizing products or simulating services, remote repair, service, or troubleshooting assistance' as the next best use case.

Source: 2024 Future of the Digital Customer Experience survey.

Similar tools can also be deployed in the presales, proposal, or sales phases to better understand customer priorities and behaviors and promote agility in responding to personalized and evolving customer needs. Using predictive analytics to understand customer needs was the top use case in E&C and one of the top five for both

A&D and IP manufacturing respondents. Sharing digital product and part models with customers was also a top-five use case for all three industries. This can allow customers to evaluate a product or structure for form, fit, and function before the sale is completed.

IN E&C, REMOTE MONITORING, PREDICTIVE ANALYTICS, AND EXTENDED REALITY CAN DELIVER CUSTOMER BENEFITS THROUGHOUT THE PROJECT LIFECYCLE

Leveraging digital tools for predictive maintenance can enhance facility management and improve the customer experience for E&C customers. By installing IoT sensors for remote monitoring and integrating maintenance records into a centralized repository, building managers can identify patterns and common issues. Interactive dashboards can provide real-time monitoring and insights. Predictive models forecast potential facility issues, enabling proactive maintenance scheduling. This can reduce outages and lower maintenance costs.¹⁸

Another way to deliver customer value is through augmented reality and virtual reality technologies, collectively referred to as extended reality (XR). These technologies provide immersive experiences during the entire project life cycle. According to the survey, 42% of surveyed E&C respondents said that they are already using or experimenting with AR technologies to visualize projects or simulate services, and 25% plan to invest in XR technology within the next one to three years.¹⁹

VR can be utilized for project walkthroughs, allowing clients to visualize the final project outcome, and to make informed decisions on design and materials. AR can enable real-time customization during the construction phase, allowing clients to select materials and designs directly on-site, aiding them in monitoring progress. Integrating AR and VR can help streamline design and construction processes, elevate client interaction and satisfaction, and help identify potential design issues early.²⁰

DIGITAL TOOLS HELP ENABLE PERSONALIZED DESIGN, SPEED, AND INNOVATION IN A&D

Digital tools are being used to create new digital experiences that can engage customers in the design of their products. For instance, one of the aircraft manufacturing executives that Deloitte interviewed explained that their company is leveraging digital models to involve customers in the design phase for personalized product development.

“Customers can sit side by side with a designer to make design choices like picking interior materials and specifying how the seats are going to be laid out in the cabin. They can see a high-fidelity digital representation of the product in real time that matches what will eventually come out of the manufacturing facility.”—Interview with an industry leader from a commercial aircraft manufacturer.²¹

Collaborative engagements through digital platforms can enhance customer experience in the A&D industry by helping to meet compliance, regulatory, quality, and market expectations, and by accelerating new product development. For instance, developing a new product in the A&D industry can be a complex and challenging task. Emerging products such as electric vertical take-off landing aircraft, developments in supersonic and hypersonic technologies, and innovations in engines and structures, require continuous collaboration between governments, suppliers, users, and manufacturers right from the design stage. Digital models and technologies can be leveraged to create efficient designs, improve communication and design feedback among stakeholders, and expedite product development.

Digital technologies are also being leveraged to help meet traditional and important customer priorities, such as faster deliveries. One of the aircraft manufacturing executives that Deloitte interviewed explained that, by embracing digital technologies to speed up their manufacturing process, over the past two decades, the company has more than doubled the number of planes that it delivers per year.

“This move to digital is all about speed. Customers increasingly ask: ‘How can I get my product faster?’”—Interview with an industry leader from a commercial aircraft manufacturer.²²

Stronger digital connections between companies, their products, project deliverables, and customers can also improve forecasting of demand. This can aid production and delivery planning, which can lead to optimized inventory levels and improved supply chain performance. This can not only create operational efficiencies for the company, but it can also enable customers to gain visibility into the status of their requests, complete projects on time, or receive the parts they need faster, thereby

enhancing the reliability and trust of the brand. This can be especially important when customers need a rapid response to ensure product or facility uptime or timely project delivery. The survey results show that digital tools that provide customers with real-time updates on parts, products, installation status, or material availability was one of the top five most prevalent use cases in all three industries.

THE BUSINESS BENEFITS OF IMPROVING DCX IN IP MANUFACTURING

Deloitte's research identified several examples of the business benefits to implementing DCX for industrial product (IP) manufacturing companies. The following use cases illustrate some of the ways these primary benefits are being realized.

- **Customer-centric product design:** Products fitted with IoT sensors can help companies collect field usage and performance data, enabling a design-feedback loop based on real-world insights. This can help guide the development of new, customer-focused product lines and can help customers enhance asset management and utilization. One executive shared that their company used field usage data to justify a product redesign that removed features that customers weren't using. This ultimately lowered cost while providing a less complex product with only the functionality customers want.²³
- **Targeted marketing strategies:** AI-powered virtual assistants deployed on company websites can help address customer queries about products. Companies can then analyze this conversational data to identify frequently asked questions. This can allow them to proactively make the relevant information readily available to customers, improving the overall user experience. The virtual assistants can also help customers reserve a product at the dealership for a small fee.²⁴

Integrating AI in e-commerce, enterprise resource planning (ERP), and CRM systems can help allow for responsive communication across multiple channels, provide personalized product recommendations, and automate routine tasks to improve sales team efficiency. By analyzing product usage data through interconnected systems, companies can enable targeted marketing strategies and guide customers through data-driven, value-optimized choices. This integration can enhance data accuracy and centralize information access among all departments and even value chain partners, thereby breaking down organizational silos and offering a unified, optimized customer experience.²⁵

- **Honing production forecasting:** Using AI to collect and analyze usage trends and failure rates of products in the field can enable more accurate forecasting and manufacturing of the parts the customer is likely to need. This can help ensure that important components are available, when required, and can reduce downtime for customers. It can also help improve operational efficiency, and reduce costs associated with breakdowns and emergency part ordering.²⁶
- **Simplifying inventory management:** AI integrated with supply chain technologies can help internal teams, value chain partners, and end users monitor shipments and simplify the tracking process to a streamlined

operation. The AI capabilities can manage exceptions and predict potential disruptions, boosting customer satisfaction by ensuring timely and informed delivery updates.²⁷

Building online platforms can help customers access product availability at local dealerships. These platforms could also serve as networks to help companies track product velocity across dealerships, and to access information on parts availability, service needs, and sales data. This dual approach can streamline customer access and improve operations and inventory management.²⁸

- **Optimizing aftermarket services:** AI can optimize service operations by determining the appropriate type of engineer needed for a job, and ensuring they arrive with the necessary parts to ensure a first-time fix to preserve margins and improve customer satisfaction. This can improve manufacturers' key performance indicators and enhance competitive edge.²⁹

The integration of AI and IoT into products, combined with customer access to a company portal, could allow customers to view product and fleet status, location, warranty information, upcoming service, and chat with company representatives to resolve issues. This real-time data can enable predictive maintenance, prevent outages, boost customer satisfaction, and even help the company provide personalized new product recommendations to the customer.³⁰



Organizing for an exceptional DCX: Lessons learned from leaders

Establishing a digitally enabled customer-centric approach that encircles the customer with the personalized experience that they need—when they need it—is likely to be a key differentiator for industrial manufacturing and construction companies in the future.³¹ The study found that there seem to be four key ingredients to success in reaching this goal.

1. Prioritize and organize around customer needs

Gaining an understanding of customer behaviors, needs, and expectations from a DCX can be an important first step toward creating an enhanced DCX.³² Segmenting customers based on these criteria can then help companies align their offerings and capabilities to focus on how they can best serve each segment.³³ However, to help maximize the benefits of these changes, leadership should establish an enhanced DCX as an organizational priority, and then work to break down organizational silos to facilitate strategic alignment and the required flow of information across all stakeholders.

A 2019 Deloitte study of over 50 customer success leaders in the technology industry revealed that 80% of organizations that prioritize customer success maintain well-defined, consistent processes for collaboration with key business areas, including product development, sales, renewals, and support.³⁴ Such interdepartmental coordination and value chain partner integration can help streamline business operations, enhance decision-making processes, and provide customers with a unified cohort that is ready to deliver the unique and personalized experience that customers want at the moment they need it in the customer journey.³⁵ If, for example, a customer downloads a brochure

and contacts a sales representative for further information, the representative should have access to that context, and be prepared to advance the customer seamlessly along their buying journey as opposed to having the customer retrace their steps and rehash knowledge they have already gained.³⁶

Effective coordination, communication, and data-sharing between stakeholders, including suppliers, distributors, dealers, subcontractors, and internal departments, can help provide a cohesive, seamless DCX. To achieve this, it is important to cultivate a deep understanding of what the customer wants and needs, as well as the needs of value chain partners and internal departments.³⁷

“Making the experience better for our customer relies on us having a really tight connection with our dealers—we have to make sure that the handoff of the customer—between our systems and process and theirs—is seamless.”
—Interview with an industry leader from a global industrial equipment manufacturer³⁸

An incentive structure can then be designed to foster strategic alignment and enable all stakeholders to share in the benefits of an enhanced DCX.³⁹ This can be especially important if internal teams or value chain partners express initial reluctance or concern about the shift to a more digital customer experience. Digital technologies can be leveraged to help empower internal teams and value chain partners with the tools to access the data they need, measure and optimize the success of DCX initiatives, and ensure that all stakeholders remain informed on operational and financial performance.⁴⁰ However, while digital tools can

serve as a backbone for an enhanced DCX, it is also important for companies to continue to prioritize in-person interactions with customers during moments that matter.⁴¹

2. Start small and think big to overcome interoperability challenges

While customers demand increasingly personalized interactions, a study of over 100 companies showed that only 37% of customer experience leaders believe their organizations have the data architecture they need to support data-driven experiences, such as those that can enable an enhanced DCX.⁴² And despite customers' expectations for consistent interactions across departments, the majority of the 11,000 consumers and over 3,000 business buyers surveyed for another 2023 report feel they are dealing with siloed departments rather than a unified business.⁴³

For example, companies can face substantial challenges with the interoperability of systems and data, which can hinder their ability to deliver an optimized customer experience. A 2024 report that surveyed over 1,000 enterprise IT leaders found that less than a third (28%) of the average 991 applications in use at a given company are interconnected.⁴⁴ This challenge stems in part from the need to integrate a complex landscape of new and legacy technologies across the value chain, from online customer portals to dealer systems and enterprise resource planning systems. A common obstacle to DCX is often siloed data across various systems, which can result in an incomplete view of the full customer journey, making it difficult for the company to provide the customer with the information they need—when they need it.⁴⁵

“On the one hand, we’ve got tremendous legacy systems. However, for AI technology and digital technology more generally, the speed at which they’re operating is far greater than the speed of the life cycle of our business. So our challenge becomes: How do you integrate new technology to be able to make those products that you designed 50 years ago better?”
—Interview with an industry leader from a global aerospace manufacturing company⁴⁶

To tackle these challenges, several interviewed executives mentioned that, rather than starting with broad sweeping, companywide DCX implementation, their company started by investing in programs with a strong return on investment potential that also aligned with internal and partner capabilities.⁴⁷ Doing so helped them address interoperability challenges on a smaller scale, making them easier to overcome. However, thinking big and scaling fast were also identified as important goals to drive toward a differentiated future DCX.⁴⁸ In addition, closer collaboration with partners and suppliers across the value chain often plays a crucial role in tackling interoperability challenges, according to interviewed executives.

3. Prioritize data privacy and security to mitigate risk

Delivering a personalized and seamless customer experience requires industrial manufacturing and construction companies to collect, manage, and analyze vast amounts of data from diverse sources. This demands sophisticated data management processes and the need to secure customer and partner data while complying with stringent privacy regulations. Companies face the challenge of balancing customer access to necessary data while protecting sensitive information such as intellectual property, export-controlled data, and confidential personal information. The increase in digital access can also heighten cybersecurity risks. There is a continuous need for vigilance against cyberattacks to help maintain the integrity and security of both the systems and the data they contain. Prioritizing cybersecurity and data protection during implementation, working with partners to develop standardized security policies, and implementing layered access to sensitive data are all leading practices for minimizing cyber risk.⁴⁹

4. Take an ecosystem approach to help build the required skills

The transition to an enhanced DCX may be helped by having employees with a blend of technical knowledge, digital skills, and soft skills. According to a 2019 Deloitte study of 50 customer success leaders in the technology industry, companies that have already established customer success as a strategic priority have established teams with the

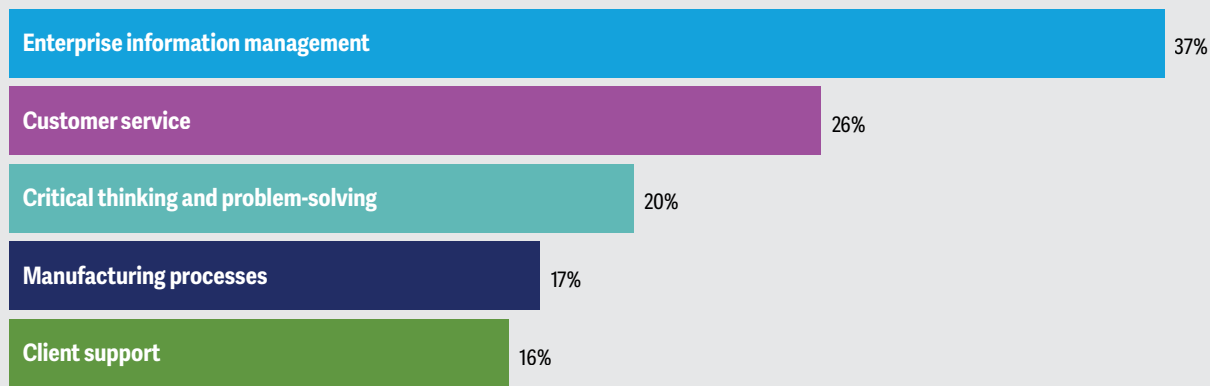
right skill sets and face fewer challenges in talent acquisition compared to companies where it is not a strategic priority.⁵⁰ An analysis of job postings in the manufacturing industry over the last five years, conducted by the Deloitte Center for Energy and Industrials, revealed that companies are not only prioritizing candidates with technical manufacturing knowledge: They increasingly seek a breadth of skills that may be necessary for delivering an enhanced DCX, including client service, customer support, critical thinking, and problem-solving (figure 9).

Multiskilled teams are also becoming more common in customer service because they can offer personalized customer approaches and help achieve faster resolution times.⁵¹ In addition, new approaches for existing roles, such as design engineering, may be needed. For example, with the rapid pace of advances in digital technologies, products should be designed such that the useful life of the software and technology matches the expected life of the physical asset.⁵²

Figure 9

Manufacturers seek skill sets that can support growing digital interactions with customers

Compound annual growth rates of major skill categories from 2019 to 2023



Examples of specific skills listed under each major skill category

Enterprise information management	Customer service	Critical thinking and problem-solving	Manufacturing processes	Client support
Customer data integration	Customer engagement	Analytical skills	Additive manufacturing	Aftersales
Corporate data management	Customer experience strategy	Change agility	3D printing	Client services
Enterprise content management	Customer experience improvement	Creative and complex problem-solving	Machining	Customer empowerment
Information governance	Customer relationship building	Innovation	Manufacturing execution systems	Customer success management
Knowledge management	Rapport building	Strategic thinking	Smart factory	Product support

Source: Deloitte analysis of data from Lightcast database.

However, industrial manufacturing and construction companies face the challenge of bridging a gap between an experienced workforce, who often possesses deep institutional knowledge, and a younger workforce that is generally digitally adept. This intergenerational skills gap requires strategic training, mentorship, and knowledge transfer programs to balance varying levels of expertise. A 2023 Deloitte study of around 300 companies across various industries noted a high correlation between

employee satisfaction and higher customer experience ratings,⁵³ emphasizing the importance of workforce development and employee engagement in driving the success of DCX initiatives. According to Deloitte's 2024 report on the manufacturing workforce, taking an ecosystem approach and focusing on the worker experience can help build a pipeline of workers with requisite skills to help companies advance their DCX goals.⁵⁴

A path forward

As technology evolves and companies continue to advance on their digital transformation journeys, new opportunities to further enhance the digital customer experience are expected to arise. As one executive explained, “Customers will say to me: ‘I know where my pizza is at any moment in time after I order it. Why doesn’t it work that way in our industry?’”⁵⁵ It might not be standard practice in the industry today, but could it be in the future? Taking advantage of such opportunities can provide a competitive edge for industrial manufacturing and construction companies—in fact, it may serve as a

key differentiating factor. Operational models should evolve to seize the opportunity at hand. Identifying targeted applications with the highest potential value and starting small can be important to overcome challenges such as siloed business units, interoperability of new and legacy systems, and shrinking capital budgets, especially when facing headwinds from economic uncertainty. However, thinking big about prioritizing a differentiated future DCX that permeates the organization—and making the investments to create it—may be what’s needed for industrial manufacturing and construction companies to lead in the future.



Endnotes

1. “Smart operations” refers to the use of digital capabilities to drive higher performance outcomes at an enterprise scale. see Deloitte, “Smart operations for energy, resources, and industrials,” accessed Sept. 13, 2024; Deloitte Digital, *Digital Maturity Index Survey 2023*, June 2023.
2. Deloitte Digital, *Digital Maturity Index Survey 2023*.
3. Ibid.
4. Eamonn Kelly and Jason Girzadas, “Recharting our course: The evolving focus of business leaders in a challenging world,” Deloitte, 2020; Denise Lee Yohn, “6 Ways to Build a Customer-Centric Culture,” *Harvard Business Review*, Oct. 2, 2018.
5. When using the term “operate” or “operate services” throughout the paper, we are referring to services provided by engineering and construction companies to support delivered projects and assets (for example, buildings and structures) after they have been constructed and are operational. Paul Wellener, Kerry Millar, Oliver Bendig, and Aijaz Hussain, “Aftermarket services: Transforming manufacturing in the wake of the COVID-19 pandemic,” *Deloitte Insights*, May 14, 2020.
6. Wellener, Millar, Bendig, and Hussain, “Aftermarket services”; Deloitte Digital, “Compete in B2B through customer centricity,” October 2023.
7. Ibid.
8. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
9. Brian Prentice, Sam Sargent, Livia Hayes, and Carlo Franzoni, “After Covid, the global commercial aviation fleet starts to grow again,” *Forbes*, March 3, 2023.
10. Mitsubishi Heavy Industries, “MHI and JAL begin joint exploration of collaboration in aircraft maintenance and aftermarket services,” press release, Aug. 27, 2024.
11. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
12. Office of the Under Secretary of Defense, Research, and Engineering, “DoD advances digital engineering practice,” accessed July 23, 2024.
13. Jordan McDonald, “A reflection on user experience from DOD’s first CXO,” GovCIO Media & Research, Feb. 23, 2024.
14. Department of Navy Chief Information Officer (.mil), CHIPS Articles: The Future of Acquisitions is MBSE (navy.mil); Dar Al Uloom University, “Model-based engineering for product support,” *Defense AT & L Magazine*, accessed September 2024.
15. Deloitte, “The value of model-based systems engineering (MBSE),” May 10, 2024; Deloitte, “Navigating the transition to a model-based enterprise,” 2023.
16. Congressional Research Service, “FY2024 NDAA: Department of Defense Acquisition Policy,” Jan. 16, 2024.
17. Insights gleaned from interviews with industry executives and specialists conducted in July 2024; Defense Innovation Board, “Building a DoD data economy,” Jan. 23, 2024.
18. Deloitte, “Predictive maintenance: Taking pro-active measures based on advanced data analytics to predict and avoid machine failure,” 2017.
19. *2024 Future of the Digital Customer Experience Survey*.
20. Grace Ellis, “Extended reality in construction: A guide to AR, VR, & MR,” Autodesk, March 12, 2024; Cem Dilmegani, “XR/AR in construction: Top 5 use cases in 2024,” AI Multiple, Jan. 11, 2024.
21. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
22. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
23. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
24. Insights gleaned from interviews with industry executives and experts specialists in July 2024.
25. Tech Monitor, “Manufacturers are switching to personalised customer experience amid fierce competition,” Feb 19, 2024; OroCommerce, “4 prominent digital transformation examples in manufacturing,” March 11, 2020.
26. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
27. Uber Freight, “Eaton elevates customer experience, supply-chain efficiencies, and cost-savings with Uber Freight,” case study, accessed August 2024.
28. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
29. *Tech Monitor*, “Manufacturers are switching to personalised customer experience amid fierce competition,” Feb 19, 2024.
30. Wipro, “Manufacturers bet big on customer experience,” accessed August 2024.
31. Deloitte Digital, “Compete in B2B through customer centricity,” October 2023.
32. Deloitte Digital, “Unleashing B2B growth,” October 2023.
33. Deloitte Digital, “From aspiration to action,” October 2023.
34. Deloitte, “2019 Enterprise Customer Success (CS) Study and Outlook”, 2019.
35. Deloitte Digital, “Compete in B2B through customer centricity.”
36. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
37. Ibid.
38. Ibid.
39. Deloitte Digital, “Align CX across channels,” October 2023.
40. Ibid; Deloitte Digital, “Make each B2B interaction better than the last,” October 2023.
41. Deloitte Digital, “Compete in B2B through customer centricity.”
42. Precisely, “How data is driving next generation customer experiences,” accessed July 2024.
43. Salesforce, “State of the connected customer report,” August 2023.
44. MuleSoft, “Connectivity benchmark report,” January 2024.
45. The Smarketers, “How AI-driven insights can transform customer journeys for manufacturers,” accessed Sept. 26, 2024; Deloitte Digital, “Compete in B2B through customer centricity.”

46. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
47. Ibid.
48. Ibid.
49. John Coykendall, Kate Hardin, John Morehouse, and David R. Brousell, “Exploring the industrial metaverse,” *Deloitte Insights*, Sept. 13, 2023.
50. Deloitte, “2019 Enterprise Customer Success (CS) Study and Outlook”.
51. Deloitte Digital, “Customer service excellence 2023”, 2023.
52. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.
53. Deloitte Digital, “Customer Service Excellence 2023.”
54. John Coykendall, Kate Hardin, John Morehouse, Victor Reyes, and Gardner Carrick, “Taking charge: Manufacturers support growth with active workforce strategies,” *Deloitte Insights*, April 3, 2024.
55. Insights gleaned from interviews with industry executives and specialists conducted in July 2024.

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