FORRESTER®

Low-Code Unlocks Agile And Integrated Industrial Manufacturing

Enterprise Application Development Platforms Fuel Collaboration And Efficiency

A FORRESTER CONSULTING THOUGHT LEADERSHIP PAPER COMMISSIONED BY MENDIX, A SIEMENS BUSINESS, NOVEMBER 2022

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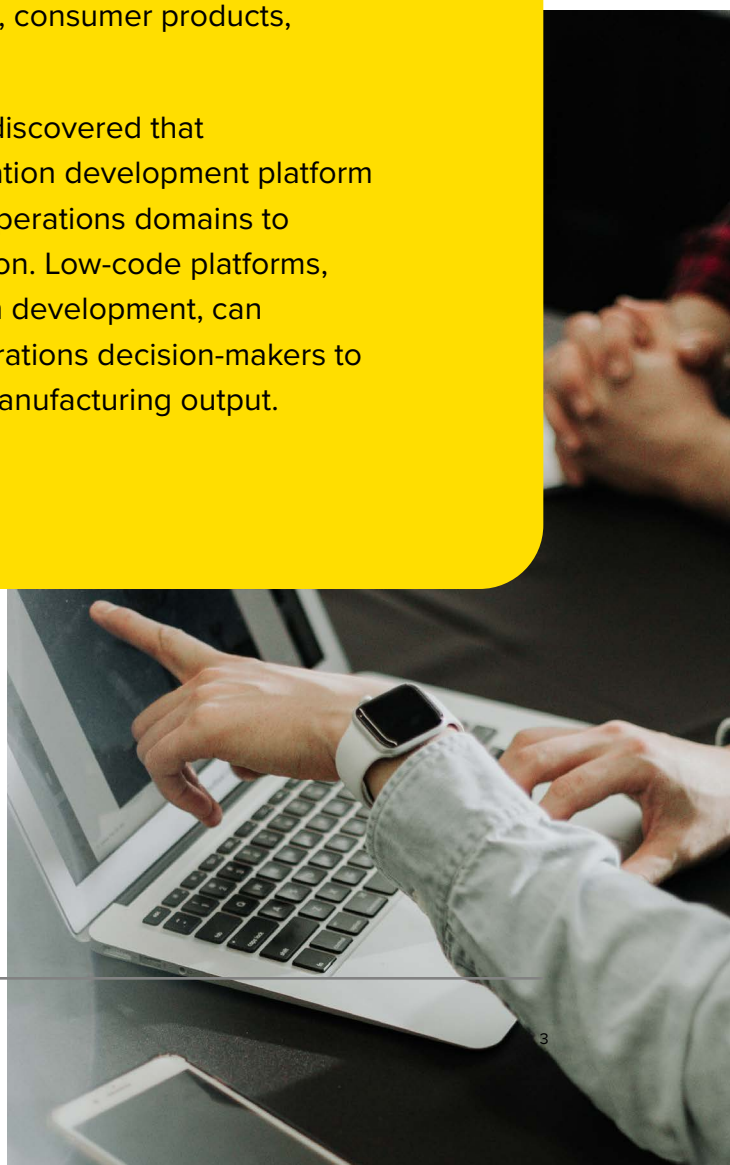
Executive Summary

Agility and efficiency are critical to industrial manufacturing. Producing a high-quality product requires an application development platform that is flexible, saves time and cost, and is integrated across IT and operational domains.

Organizations are challenged by high costs, siloes, and rigid infrastructure lacking centralization. These issues threaten product quality and the efficiency of the holistic value chain. They require a digitally evolved platform with the agility and integration necessary to quickly respond and adapt to issues while remaining cost-efficient.

In July 2022, Mendix, a Siemens business, commissioned Forrester Consulting to examine the needs of IT and non-IT decision-makers in industrial manufacturing to assess and understand the potential benefits of using a low-code platform. To do so, Forrester conducted an online survey with 405 IT and operations decision-makers who work at companies of 1,000 or more employees within manufacturing, technology, retail, automotive, transportation and logistics, healthcare, consumer products, telecommunications, and other industries.

To accomplish their strategic and digital goals, we discovered that respondents would benefit from a low-code application development platform that can synergize the unique strengths of IT and operations domains to create a more adaptable and cost-effective operation. Low-code platforms, when built on a democratized system of application development, can provide the optimal benefits needed by IT and operations decision-makers to holistically improve the quality and agility of their manufacturing output.



Key Findings

Cost, quality, and time define manufacturing strategy. Organizations use budget (49%) as a key metric for their success. Improving product quality (43%) is their most critical near-term strategic priority in addition to digitizing the app development process (42%) and speeding up manufacturing cycles (38%). To meet these objectives, respondents recognize the need for an agile and efficient application development platform.

Blurred visibility, decentralization, and high costs threaten application development. Eighty-nine percent of respondents say their organization is siloed to some degree. Visibility is further challenged by infrastructural/technological inflexibility (49%) and outdated legacy systems (45%). The evolution of infrastructure is further hindered by high inflation (77%) and the challenging cost of traditional software and integration projects (38%).

Low-code platforms lay the foundation for agility, speed, cost-efficiency, and integration. The top benefits of low-code platforms include a quicker and more agile response to resolving issues (53%) and a lowered cost of traditional software and integration projects (50%). In addition, 77% of low-code application development platform users prioritize its ability to connect with commercial off-the-shelf (COTS) software to start/scale application development. With these benefits, low-code can mitigate key challenges and fuel strategic improvements in cost, quality, and time.

Cost, Quality, And Time Are Critical Strategic Drivers

Improving quality and efficiency are top strategic focuses for manufacturing organizations. To enhance the quality of their end products while keeping a focus on time and cost, IT and operations decision-makers recognize the need to implement an integrated and agile application development platform. Current use of COTS software is scattered and siloed throughout organizations, but low-code application development platforms can be leveraged to form a connective thread across IT and operations domains — creating a potential opportunity for a more integrated and efficient manufacturing value chain.

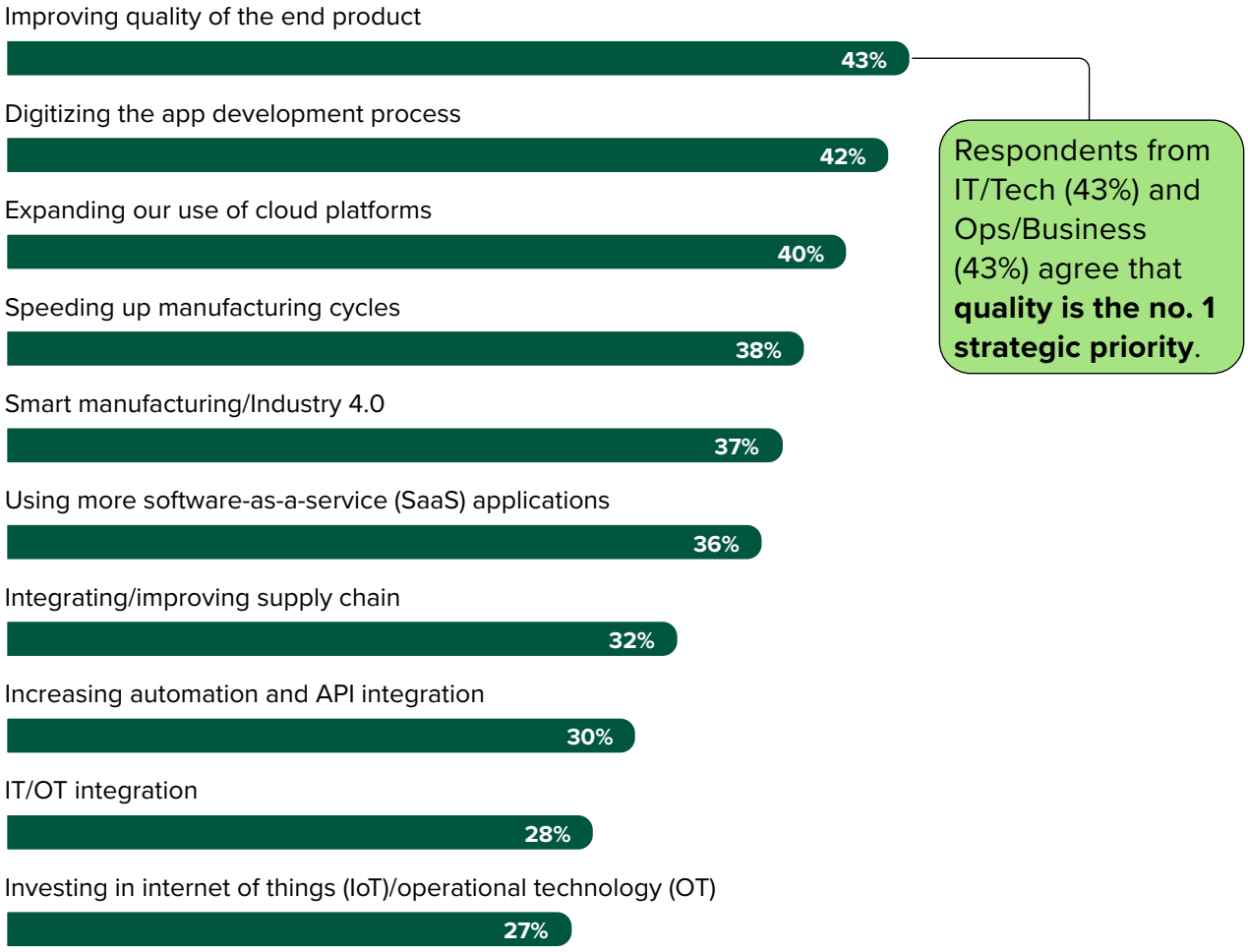
> "Conventional development takes a lot of time compared to low-code development."
>
> **C-level IT/Tech executive, Germany**

The results from surveying 405 IT and operations decision-makers in industrial manufacturing about their application development inform us about their near-term strategic and digital initiatives, the COTS technology they are using, and what drives their use of certain development methods over others. Our key takeaways are:

- **Cost and quality are key strategic inputs to manufacturing.** Improving product quality (43%) is the most critical near-term strategic priority for all respondents, regardless of their roles in IT or operations (Figure 1). To successfully navigate their strategic roadmap and measure success, IT and operations decision-makers use budget (49%) as one of their primary metrics — second only to security (51%) (Figure 2). For manufacturing organizations, this heightens the importance of using an enterprise-grade, agile, and efficient application development platform.
- **Inconsistent application of COTS tech contradicts the need for faster and more efficient operations.** Digitization — the advancement of technology to enable more efficient operations — is a key priority for respondents when it comes to application development. Forty-two percent of respondents say that digitizing (advancing) the application development process is a top objective, followed by expanding the use of cloud platforms (40%) and speeding up manufacturing cycles (38%) (Figure 1). However, the actual application of COTS software contradicts these initiatives.

Figure 1

"Which of the following strategic and/or digital initiatives is your company prioritizing within the next 12 months?"

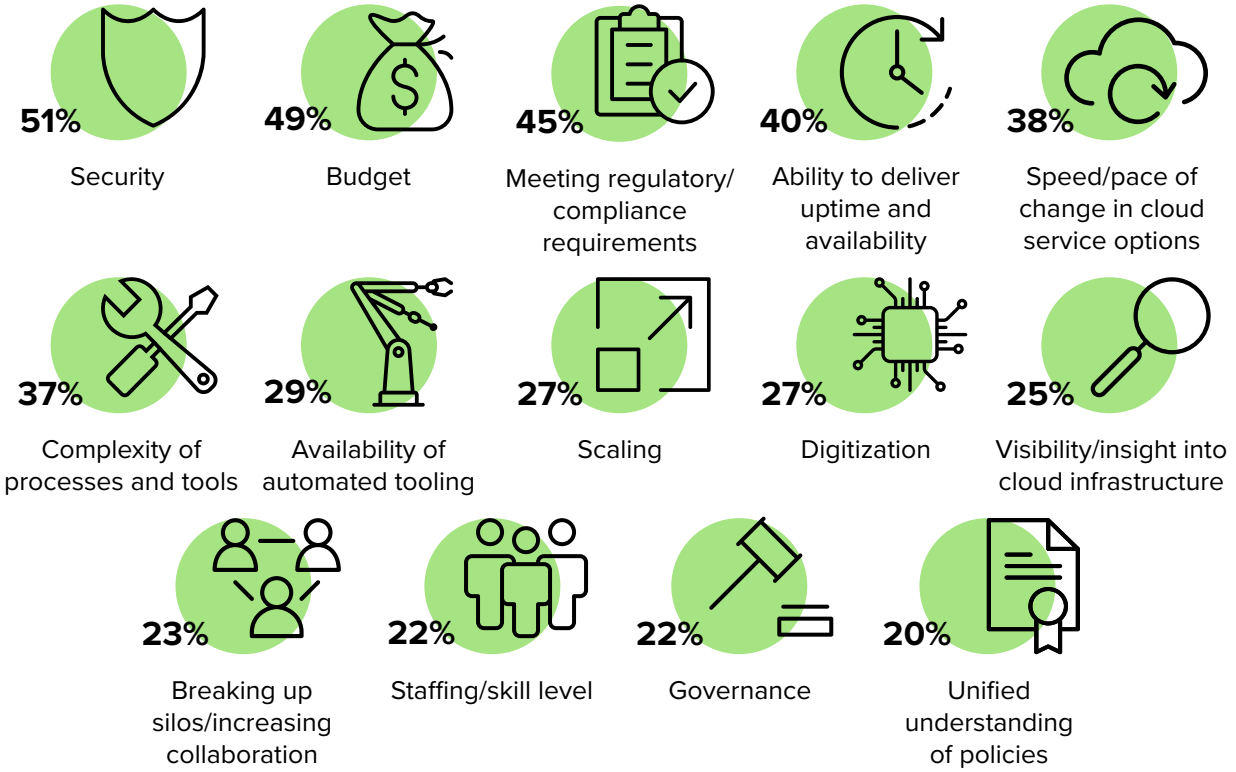


Base: 405 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Note: Showing top 10
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

Manufacturing organizations are using a wide range of enterprise software, but only within and across specific domains — not throughout the holistic organization. This is especially true for human capital management (HCM) (92%), quality management systems (QMS) (86%), supply chain management (SCM) (79%), and product lifecycle management (PLM) (74%) (Figure 3). The siloed nature of COTS software highlights the opportunity for a more democratized development process, which not only facilitates integration but is used to drive quality, efficiency, and adaptability.

Figure 2

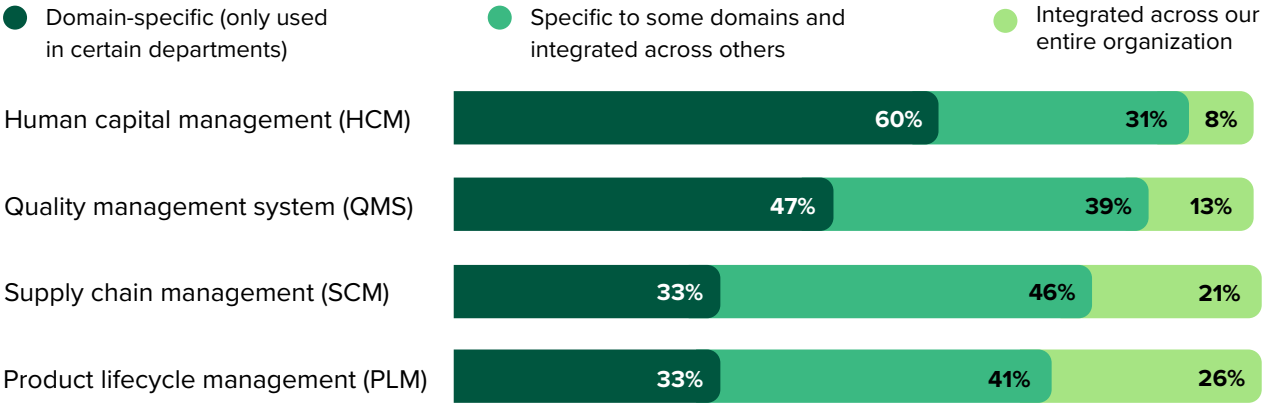
"Which of the following metrics does your department use to measure your success?"



Base: 405 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

Figure 3

"Which of the following best describes how this technology is used across the organization?"



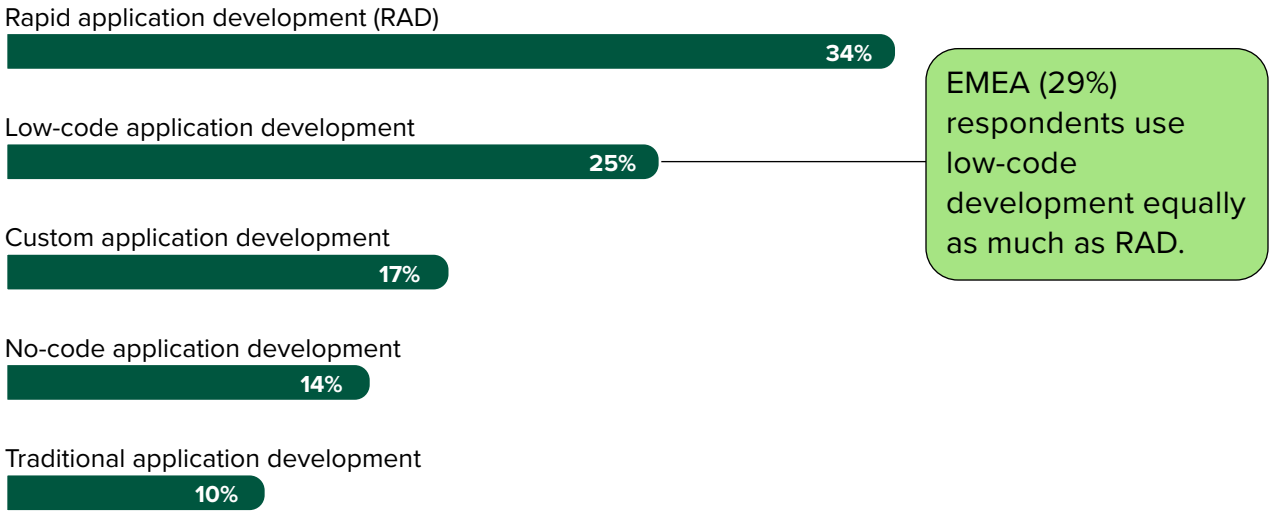
Base: Variable decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Note: Showing top 4 responses
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

- **Organizations leverage low-code development platforms for their connectivity.** Rapid application development (RAD) (34%) and low-code application development (25% within overall sample and 29% in EMEA) are the most popular methods of application development used by IT and operations decision-makers. This is compared to other forms of development such as custom (17%), no-code (14%), and traditional (10%) (Figure 4). Seventy-seven percent of low-code users cite its connectivity with COTS software as the way they start/scale their application development. Additionally, 70% of low-code users inherently use it as a separate software stack, further contextualizing its ability to integrate with third-party platforms. For IT and operations decision-makers, this spotlights low-code as an opportunity for centralization and efficiency.

> "The need for a user-friendly platform encourages the use of low-code."
>
> **Ops/Business manager from the US**

Figure 4

"Which of the following methods best describes your organization's approach to developing applications?"



Base: 405 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

Rigid, Costly Technology And Organizational Siloes Put Development At Risk

Organizations are under pressure from internal and external risks that threaten to dilute the quality and efficiency of their manufacturing processes. Rigid and costly infrastructure, market inflation, and internal siloes are critical challenges that suppress the ability of IT and operations domains to connect, adapt, and evolve their manufacturing value chain, but identifying them is the first step to preventing them.

> "[Low-code helps us] foster a strong business and IT partnership by breaking down siloes."
>
> **IT/Tech VP, Canada**

According to the survey, these are the biggest challenges impacting the success of IT and operations decision-makers' application development processes:

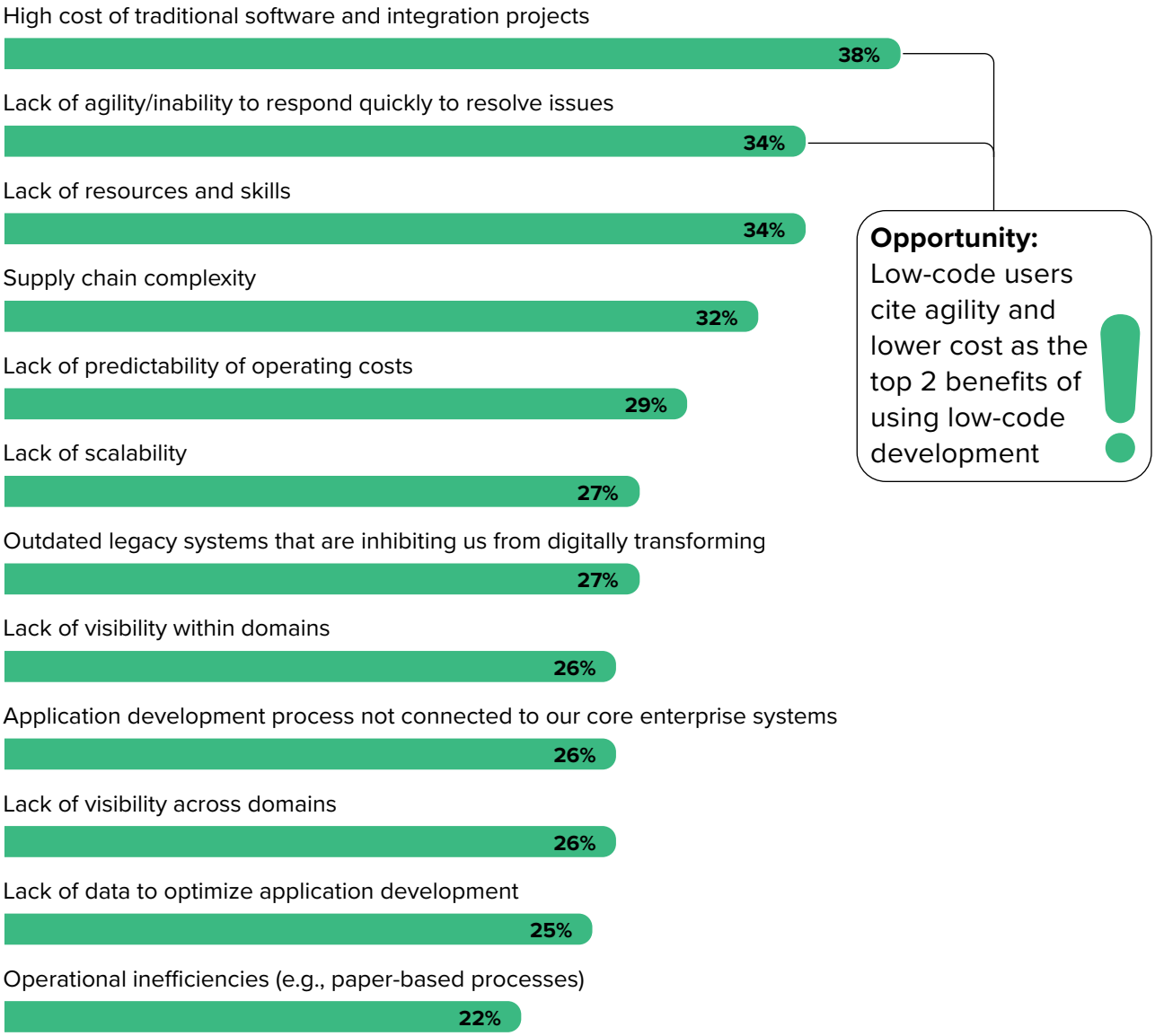
- **Costly software and lack of operational agility are suppressing evolution.** Budget and digitization are both key components of the holistic success and strategic objectives of IT and operations decision-makers. These objectives are being inhibited by organizational challenges like the high cost of traditional software (38%), lack of agility/inability to respond quickly to issues (34%), lack of resources and skills (34%), and lack of predictability of operating costs (29%) (Figure 5). The current macroeconomic environment is also exacerbating the importance of budget, as 77% of respondents state that market inflation is the most challenging factor weighing on their organization's success. Internal and external cost pressures, combined with the lack of ability to adapt to operational challenges, is putting the efficiency of the holistic manufacturing value chain at risk.
- **Siloed domains and rigid, decentralized technology blur visibility.** Eighty-nine percent of respondents say that their entire organization is siloed to some degree, and a similar proportion feel the same about the relationship across business and IT departments (85%) and their own domains (83%) (Figure 6). Collaboration is further challenged by infrastructural/technological inflexibility (49%), outdated legacy systems that inhibit digital transformation (45%), complexity of systems across too many domains (40%) and use of siloes (37%) (Figure 7). This is exacerbated by the lack of core application development capabilities like a center of excellence (44%) and cross-domain workflow collaboration (40%), leaving IT and

operations decision-makers in critical need of an integrated and agile development platform (Figure 8).

> "Lack of visibility within domains is the motivation for using a low-code platform."
>
> **IT/Tech director, US**

Figure 5

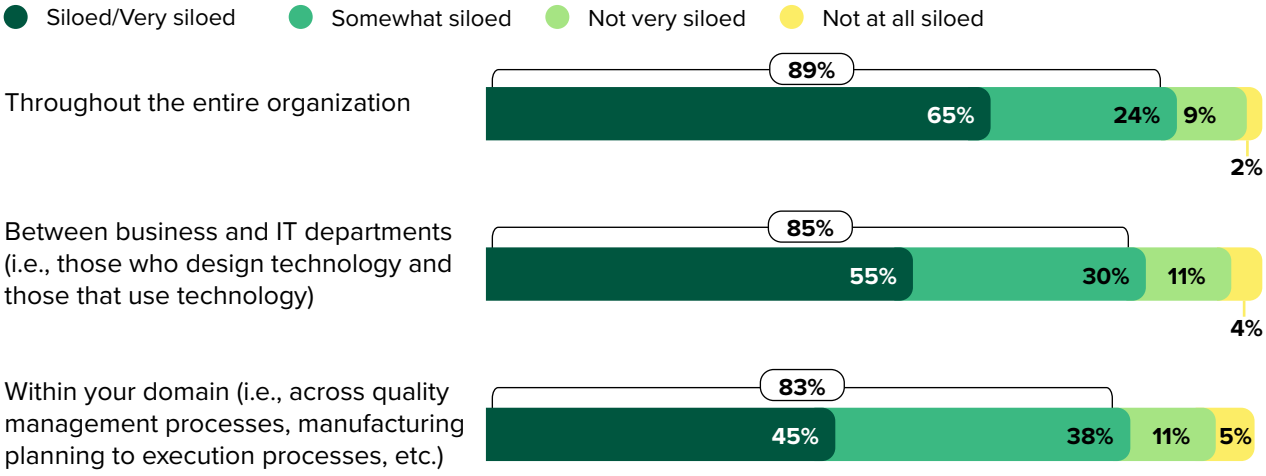
"What are the biggest challenges currently impacting your organization's application development process?"



Base: 405 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

Figure 6

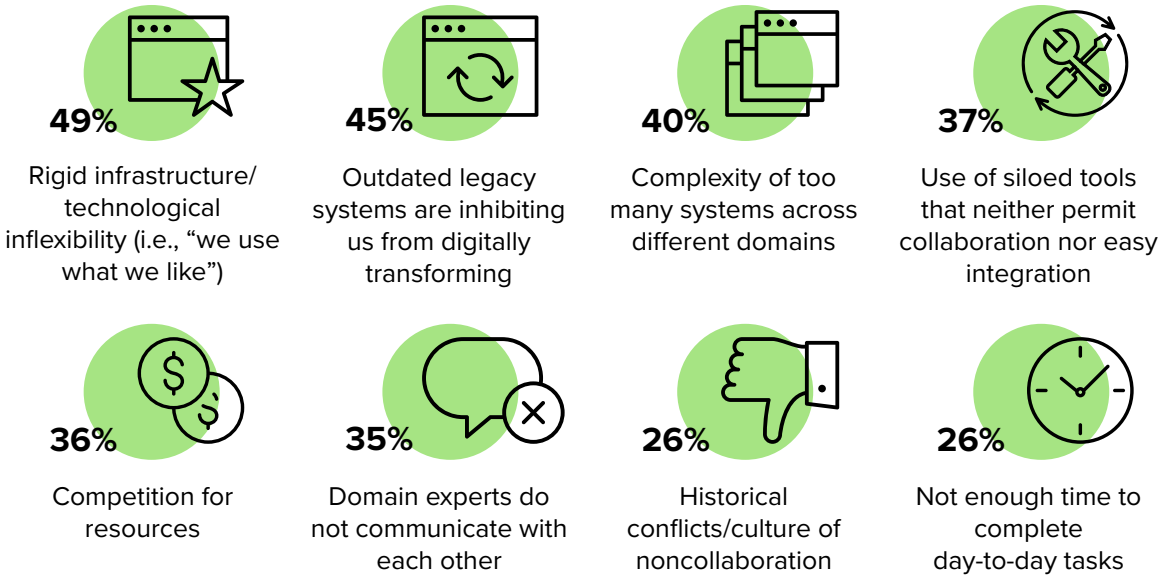
"When thinking about the application development process at your organization, describe the relationship at each of the following levels."



Base: 405 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

Figure 7

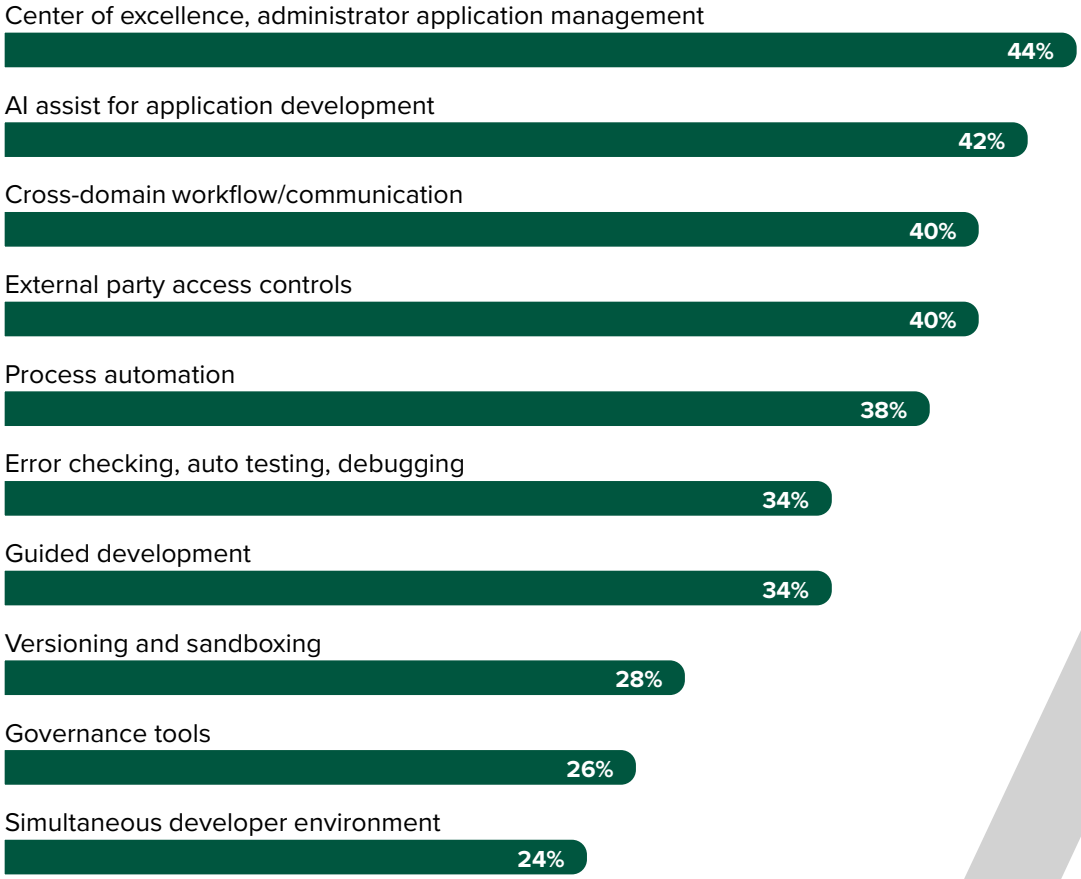
"Which of the following factors prevent better visibility across business and IT teams/domains at your organization?"



Base: 405 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

Figure 8

"When thinking about your current application development platform, which of the following technology features is your organization lacking?"



Base: 405 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

Low-Code Platforms Provide A Foundation For Agility, Efficiency, And Centralization

To ultimately improve quality, IT and operations decision-makers recognize the need to mitigate the pressures of costly technology, siloed operations, and the lack of operational agility. Our research has found that low-code platforms present the opportunity for manufacturing organizations to adapt and evolve their application development to overcome these challenges.

> "In contrast to traditional coding, low-code applications offer speed, agility, and flexibility."
>
> **IT/Tech manager, UK**

A critical part of this improvement is democratizing the application development process, which 90% of respondents find appealing or have already implemented. If achieved, democratization, along with key application development components like startup templates, can enhance the inherent agility and efficiency of low-code.

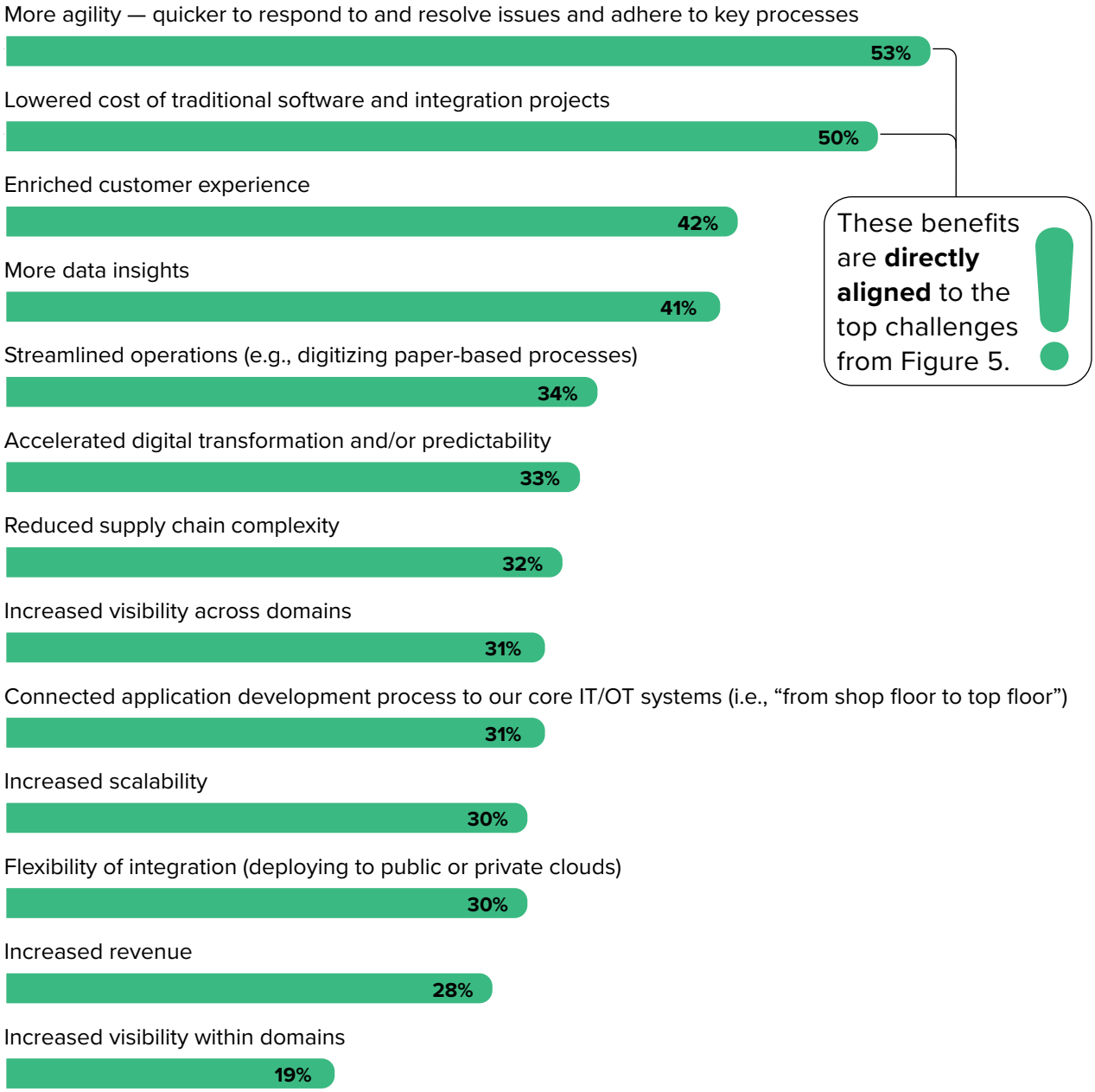
Key points from the survey results about the critical opportunities inherent to democratized, low-code development include:

- **Low-code delivers time and cost efficiency with agility.** Respondents using low-code platforms cite a quicker and more agile response to resolving issues (53%) and lowered cost of traditional software and integration projects (50%) as top benefits, along with an enriched customer experience (42%) and more data insights (41%) (Figure 9). The benefits inherent to low-code are directly aligned to overcome the challenges industrial manufacturers currently face. A manufacturing value chain driven by a more responsive, cost-efficient, and data-rich platform can ultimately drive the creation of a better-quality product.
- **Democratization empowers organizations to improve quality through connectivity.** Ninety percent of respondents think that democratization — which enables different domains to access the COTS data source and infrastructure consistently — is Very appealing (43%), Appealing (21%), or they are already using it (26%) (Figure 10). Respondents seek a democratized development process to improve product quality (52%), increase efficiency (51%), make applications more adaptable (44%), and reduce costs of application development through scale (41%).

The benefits of democratization not only align with the value drivers of low-code platforms, but respondents' top strategic goals — improving quality and efficiency.

Figure 9

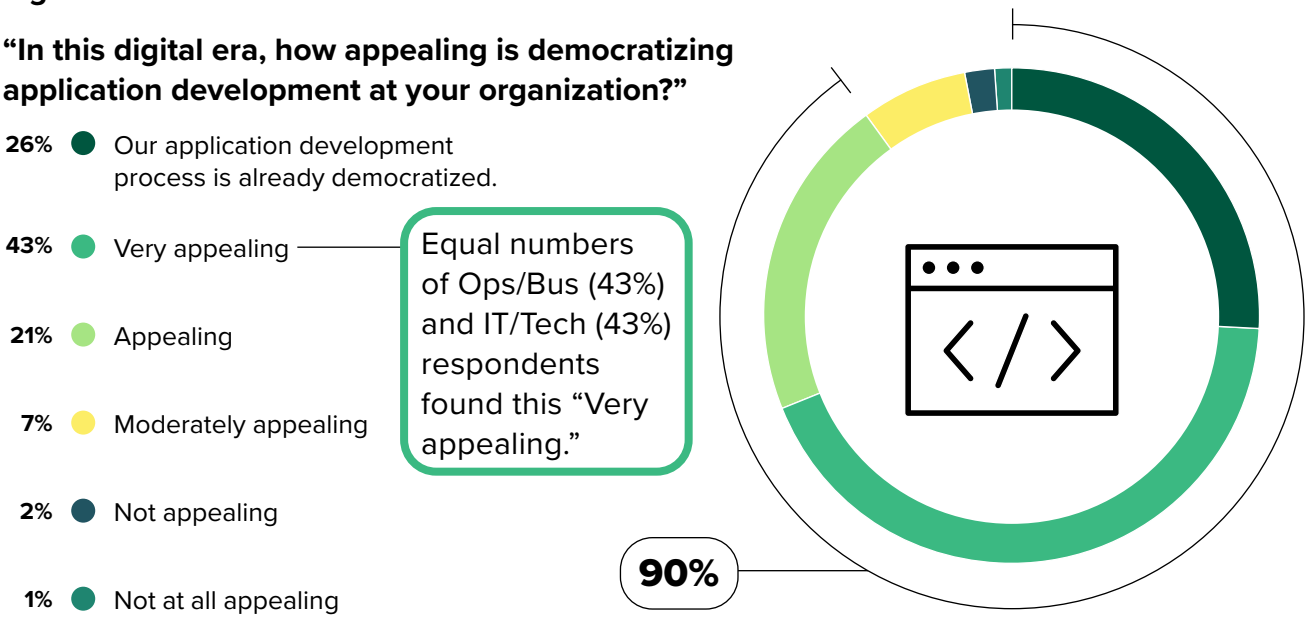
"Which of the following benefits have you received as a result of using a low-code application development platform?"



Base: 103 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

Figure 10

"In this digital era, how appealing is democratizing application development at your organization?"



Base: 405 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

- **Starter templates can help jumpstart the frictionless adoption of application development platforms.** Eighty-seven percent of respondents agree that starter templates — industry-tailored, prepackaged business frameworks that act as a foundation for an application — are an essential part of an application development platform (Figure 11). One respondent, an ops/business VP from the US, states "Software development efforts [can be] reduced with properly designed starter templates with basic functionality." Starter templates are also appealing to technology leaders — an IT/tech director from the UK says they prioritize "accuracy and ease of implementation." When aligned with a low-code platform, starter templates can be galvanized to further boost operational efficiency.

It is clear from our research that democratized, low-code application development platforms can be leveraged to meet the internal and external challenges faced by industrial manufacturing decision-makers. When IT and operations domains are connected with an agile, accessible, and cost-efficient development platform, their unique strengths can be galvanized and used to streamline a manufacturing value chain that ultimately produces a better-quality product.

Figure 11

"How important is it to have a starter template available within an application development platform?"

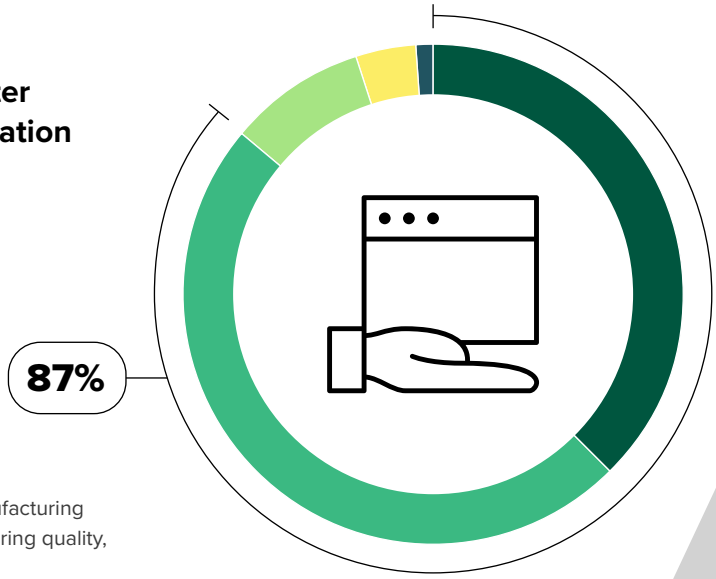
38% Very important

49% Somewhat important

9% Neutral

4% Not very important

1% Not at all important



Base: 405 decision-makers with knowledge into manufacturing technology in IT manufacturing software or manufacturing quality, supply chain, logistics, and engineering positions
Note: Percentages may not total 100 because of rounding.
Source: A commissioned study conducted by Forrester Consulting on behalf of Mendix, September 2022

Key Recommendations

To optimize your organization's application development with the benefits of low-code, you must first assess your cross-domain technology and operational landscape. Data from Forrester's in-depth survey of 405 IT and operations decision-makers about low-code yields several important recommendations:

Prime your organization for agile workflows.

The ability to foresee, address, and recover from an unexpected change is essential in manufacturing as you may be constantly mitigating challenges like waiting, overproduction, overprocessing, or risk of errors that require costly correction. These essential abilities are equally as important when adapting low-code to your organization. If you establish best practices that align with its benefits, low-code platforms naturally support agile development practices, allowing for rapid iteration and frequent deployment. Successfully onboarding a low-code platform requires you to first assess your development practices and how they contribute to processes along your manufacturing value chain. By evaluating your development teams' readiness for agile practices, you can facilitate their ability to rapidly make changes without the risk of increasing costs or timelines. In addition, agile practices help reduce the number of resources your organization needs to accomplish goals. Ultimately, to optimize low-code development in manufacturing, it is essential to move away from limited development practices (e.g., waterfall), and move towards agile operations, aligning development with day-to-day experiences that encourage experimentation and communication.

Target organizational domains that need more transparency and collaboration.

In manufacturing, leveraging the ability to integrate is critical for continued efficiency and scaling. You must prioritize increasing connectivity within your organization, therefore relieving your ecosystem of fractures and empowering development collaboration across IT and operations domains. A lack of collaboration inhibits agility and reduces operational efficiency, so zeroing in on exactly where your pain points are will help you formulate a

plan for people, processes, and technology to be implemented with efficacy. Assess all areas from the point of view of frontline operations, from the shop floor through management and the business, as those highly sought-after insights from the bottom up will be a valuable form of visibility for data-driven decisions. This is especially significant for manufacturing organizations with various locations.

Evaluate your technology infrastructure for flexibility and scalability.

The modern manufacturing ecosystem necessitates a modern technology interface. Adopters of new technology platforms are often challenged with the debate of build vs buy. Fortunately, low-code offers the flexibility to do both — build at speed or buy customizable solutions that scale. However, before you take advantage of low-code's ability to scale and integrate, it is critical to align and measure your own technological flexibility. Using siloed COTS suppresses the ability for technology infrastructure to grow with your organization's manufacturing value chains and threatens cross-domain collaboration and agility. Therefore, taking stock of your organization's legacy technology infrastructure and use of COTS systems is critical. The degree of modernization of your technology infrastructure will help or hinder your ability to integrate and scale with the foundation of a low-code platform.

Appendix A: Methodology

In this study, Forrester conducted an online survey of 405 IT and non-IT manufacturing decision-makers from manufacturing, technology, automotive, transportation, healthcare, and retail organizations with more than 1,000 employees in North America, Germany, UK, China, and Japan to assess and understand the benefits they can gain from using a low-code platform. Study participants included decision-makers with IT and strategic manufacturing responsibility and knowledge of manufacturing technology. Questions provided to the participants asked about their current application development approach, use of COTS technology, cloud strategy, and challenges and opportunities related to application development. Respondents were offered a small incentive as a thank you for time spent on the survey. The study began in August 2022 and was completed in September 2022.

Appendix B: Demographics

REGION	
North America	**38%**
EMEA	**37%**
APAC	**25%**

DEPARTMENT	
IT/technology	**51%**
Operations/business process	**49%**

DOMAIN	
Customer service/relations	**21%**
Quality and compliance management	**18%**
Manufacturing engineering	**17%**
Product engineering	**12%**
Product development	**9%**
Factory automation/plant maintenance	**5%**
Manufacturing operations	**7%**
Supply chain and logistics	**7%**

SIZE	
25,000 to 49,999	**1%**
15,000 to 24,999	**12%**
8,000 to 14,999	**11%**
5,000 to 7,999	**18%**
2,000 to 4,999	**23%**
1,000 to 1,999	**35%**

LEVEL	
C-Level executive	**11%**
Vice president	**12%**
Director	**23%**
Manager	**23%**
Project manager	**12%**
Full-time practitioner	**9%**

RESPONSIBILITY (OPERATIONS)	
Final decision-maker for organization's manufacturing strategy	**23%**
Part of team making decisions for organization's manufacturing strategy	**56%**
Influencer of decisions for organization's manufacturing strategy	**22%**

RESPONSIBILITY (IT)	
Final decision-maker for organization's IT manufacturing software strategy	**40%**
Part of team making decisions for organization's IT manufacturing software strategy	**43%**
Influencer of decisions for organization's IT manufacturing software strategy	**17%**

Note: Percentages may not total 100 due to rounding.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