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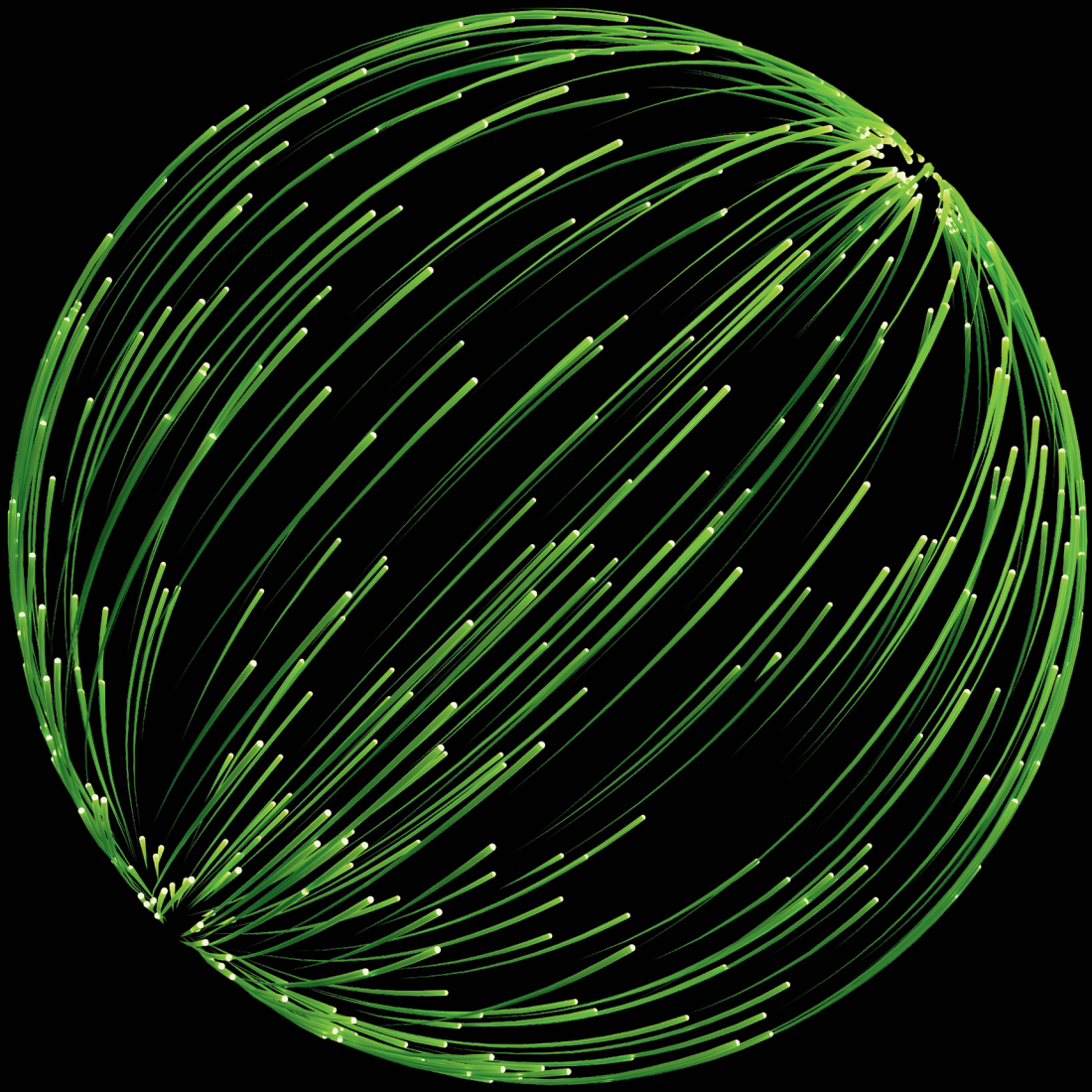


Engineering your digital business future

Engineering

Engineering your digital business future

Demand for digital solutions is reaching new heights, bringing businesses from all industries to an inflection point. However, merely adopting technology or focusing on talent may not be enough to meet the need of the digital business future. Success likely hinges on product-centricity and taking advantage of what the wider software engineering ecosystem has to offer. This research imagines models for software development and provides considerations for leaders on becoming an Engineering Leader.

Many companies today are digital businesses enabled by software engineering. Digital businesses create, market, and sell digital products and services. They can take many shapes, but ultimately, they deal in digital assets and services—software, data, and platforms. Moreover, they're often trying to reach a global market with a focus on innovation and agility. Digital businesses run on software.

Business and tech imperatives are creating a need to improve software development capabilities and to become more user-centric. For one, integrating advanced technologies into customer experiences may be considered table stakes. Enterprises cannot really opt out anymore. Even organizations with a long heritage of business models that are based on physical products need digital technologies to be customer-centric. The US Postal Service's evolution to augment physical mail with a digital option is just one of many examples.[1] If you want to interact with customers on not just a mass scale but also a micro scale with personalized and targeted experiences, you're going to need a sophisticated tech element.[2] People expect it, in part, because software is pervasive in our everyday lives. Indeed, the average US household has 21 smart devices,[3] and 90% of Fortune 500s are expected to become digital providers by 2025.[4]

An ever-higher stake also means an ever-higher bar to clear, with constantly rising expectations for what businesses should be able to achieve with software. Everyone wants to be a platform company with attractive margins and recurring revenue.[5] This has contributed to a surging demand for new and innovative digital solutions driven in part, most recently, by the enthusiasm around Generative AI. Organizations likely need strong application development capabilities, clean and classified data, DevOps, and more, to effectively deliver against these strategies.

However, for many companies, their software engineering muscle is weak, making it challenging to keep up with the potential of new technology in the ecosystem and to create competitive advantage.

Product leaders, chief information officers (CIOs), chief technology officers (CTOs), and engineers in a Deloitte survey agree their organizations are not equipped to manage the rising talent, technical debt, and cost challenges.[6] Moreover, 41% of business leaders surveyed are unprepared specifically for GenAI talent needs.[7]

Merely adopting technology or hiring talent will likely not be enough. Successful digital transformations—those seeing greater market returns—bring together a digital strategy, aligned tech investments, and a strong digital change capability to help drive market value.[8] Businesses that want to succeed should consider a competency in software engineering—reliable application development based on user requirements.[9] That includes enduring human capabilities such as imagination and creativity as a foundation for adapting to the rapidly changing tech landscape, with new technology bringing new opportunities to enable them.[10]

An organization's approach to engineering could be the difference between thriving in today's digital economy and languishing in a never-ending cycle of ineffective technology implementations.

We imagine four different approaches to software development that are grounded by scenario analysis and interviews with those knowledgeable in this space. They reflect different levels of engineering maturity based on fundamentals: product-centricity and the operating model. Each type has advantages and disadvantages, but if leaders can get more product-centric and more decentralized, they can become an Engineering Leader.

Four models of software development organizations

While there are many factors shaping an organization's digital business future, our analysis distills them down to two core dimensions linked to 10 driving forces inside and outside organizations (see *Methodology* for more on our analysis and detailed definitions).

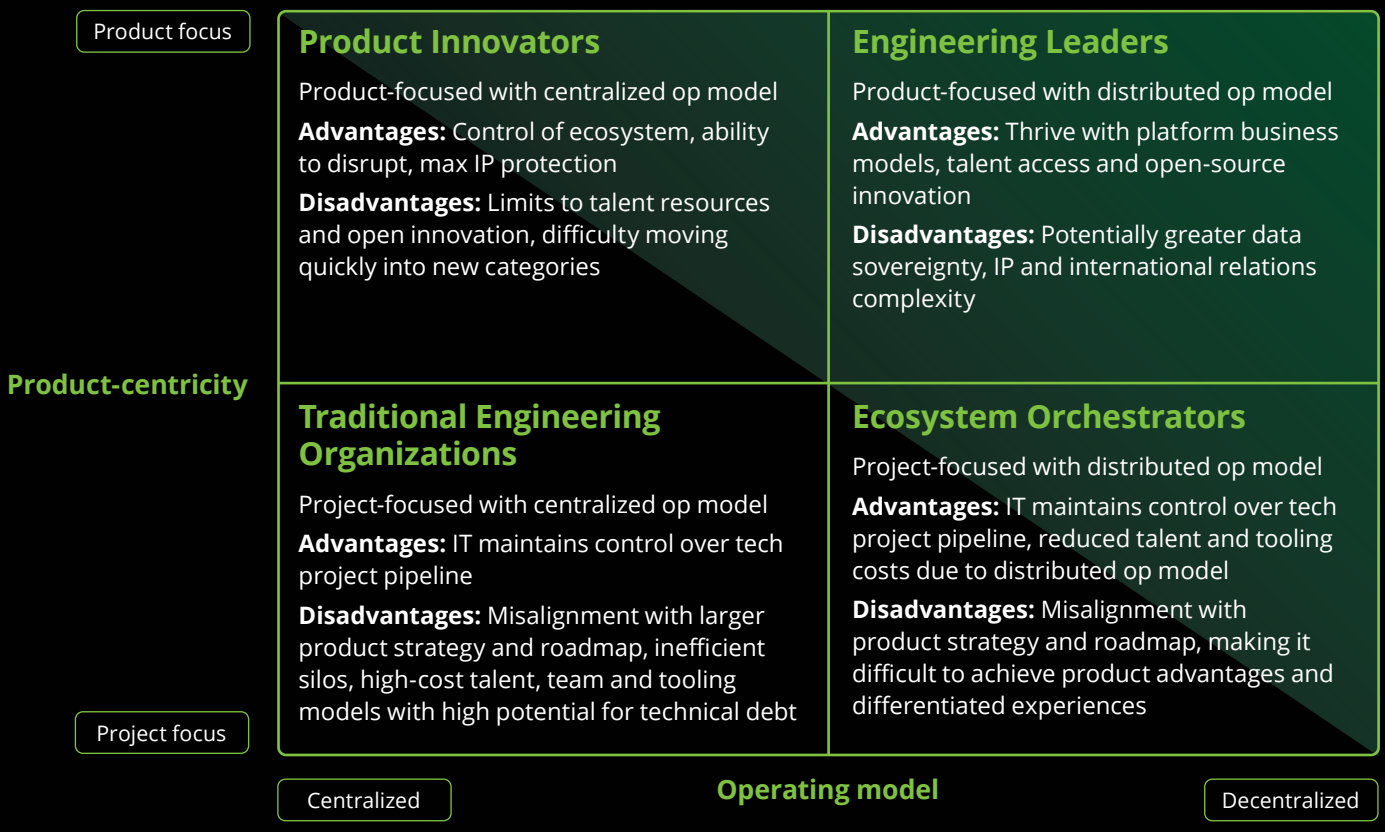
The first dimension is an organization's **level of product-centricity**. Ideally, an organization could be product-focused instead of project-focused with its software engineering function. This can affect *internal drivers* within an organization like their business model, product roadmap, talent experience, teaming/tooling, and data modernization security and innovation strategies.

The second dimension is an organization's **operating model** and how centralized or decentralized it is. Ideally, an organization could take a decentralized approach to software development to harness the full potential and power of the wider ecosystem. This can introduce both risks and opportunities related to the commercial model and intellectual property (IP), workforce ecosystem, developer environment, international relations, and social norms as important *external drivers*.

Based on these core dimensions, we imagine four organizational approaches to software development that could inform the type of software development organization a business could become in its digital future. Each type can help achieve greater engineering maturity and could include an organization from any industry (figure 1):

- **Traditional Engineering Organizations** focus on delivering IT projects with internal IT delivery teams. These organizations may lose sight of business and user needs, and broader market risks and opportunities.
- **Ecosystem Orchestrators** work to design and deliver software solutions project by project, with assistance from a decentralized delivery model. While they can benefit from tapping into the broader ecosystem, these organizations are often engineering out of delivery necessity rather than a differentiated product strategy.
- **Product Innovators** are highly user-centric in product design and delivery. They typically employ a centralized operating model. For some organizations, this centralized delivery approach may be a tactic to preserve competitive advantage at the expense of more open talent and innovations. For others, it's a missed opportunity to tap into the wider workforce ecosystem to address talent needs and accelerate delivery.
- **Engineering Leaders** are the most user-centric in their product design and delivery. They take the most decentralized approach to their commercial strategy and delivery. These organizations are most open to platform and ecosystem business models, distributed data approaches, and open talent and development models. Most organizations can gain additional advantage from this approach, regardless of industry.

Figure 1. Four models of software development organizations



Internal drivers influenced by level of product-centricity

1. Business model
2. Cost to value and product roadmap
3. Talent and developer experience
4. Interoperable teams and tooling
5. Data modernization, security, and innovation

External drivers based on operating model

1. Commercial model and IP
2. Workforce ecosystem
3. Development environment and open source
4. International relations and data sovereignty
5. Social norms and consumerism

Source: Deloitte Center for Integrated Research

Centralized operations and project-focused:
Traditional Engineering Organizations may be at risk

Imagine that

You're on an airline company's app, searching for tickets. The app glitches. You refresh it, re-key your destination, and realize the price increased. Frustrated, you switch to an aggregator app and find cheaper tickets with another carrier. The original airline company in that scenario has a problem. Its software isn't serving your users—it's giving aggregators and competitors an unintended advantage.

Overcoming the challenges of the status quo

While this example involves an airline company, you could imagine a similar scenario playing out in any industry. It's a challenge that could arise more frequently for companies that adhere to a more traditional engineering approach. In Traditional Engineering Organizations, IT function serves as a project delivery organization integrating the application with enterprise systems and addressing security. Here, projects can pile up, and eventually, there may be a backlog of software development requests.[11]

Product and engineering teams tend to operate in silos to protect the new application functionality as it's built out. These teams often are not using common platforms, tend to have difficulty achieving the right cost structure, and may have closed talent models, which can lead to poor developer experience and talent retention.[12] They often have "bolted-on" security practices—security added on top of networks after a network is designed rather than building it into the system—that pose many challenges on multiple fronts.[13] Moreover, these organizations may not be tapping into talent across the ecosystem, tech tooling, and new commercial opportunities that come with a more decentralized operating model.[14]

We can see from Deloitte's *2024 Tech Trends* that many organizations fall into this group.[15] Traditional Engineering Organizations may try to build everything in-house and find it challenging to keep pace with modern engineering innovation demands.

What if

While this approach to software development may have worked in the past, it likely won't in the future. Traditional Engineering Organizations should consider how a fundamental reassessment of their IT strategy can help them compete in today's digital economy.

See page 23 for a complete list of 10 actions Traditional Engineering Organizations can take to address these risks.

Distributed operations and project-focused:
Ecosystem Orchestrators may lose sight of the product strategy

Imagine that

A petroleum company is using AI software to create visibility across its value chain. Its IT department is taking a project-by-project approach to building the application. One team is focused on manufacturing functionality. Another on functionality for buyers, and a third on transportation. The organization knows this is a common use case in its industry and collaborates with a cloud services provider to tap into off-the-shelf components.

Ecosystem Orchestrators may have an advantage over the Traditional Engineering Organizations. Regardless of their industry sector, Ecosystem Orchestrators are characterized by a project (not product) focus. However, their delivery operating model often looks outward to the wider ecosystem (figure 2).

Overcoming the challenges of the status quo

Given Ecosystem Orchestrators look outward on product delivery, a core strength of these organizations is that their decentralized operating model helps them to balance speed to market with compliance needs and security-by-design principles.[16] However, given their project focus, they may lose sight of the bigger strategic picture. Development teams run the risk of becoming too functionally focused versus strategic. They may not be able to anticipate the skills needed to create talent fungibility inside the organization, making them even more dependent on outside talent to operate their solutions. It may also be difficult for them to protect IP and create differentiated experiences in this ecosystem development model.

What if

Some companies may be forced to start in this environment, but they should not remain here for long. Ecosystem Orchestrators may find it difficult to achieve long-term product advantages. Yes, they may gain short-term delivery agility and a starting point to build out capabilities. However, without user-centric product design to guide their business, talent, and innovation models, they may run the risk of hyper-focusing on a losing strategy or functionality. While on the one hand, these organizations can fail fast, if they don't readjust from a project-centric to a product-centric focus, they could be at risk of product failure.

Figure 2. How Ecosystem Orchestrators navigate the 10 underlying drivers

Internal drivers influenced by level of product-centricity

1. **Business model:** Enables platform and ecosystem business models; however, competitive advantage could be impaired without high levels of product-centricity.
2. **Cost to value and product roadmap:** Helps with management of cost challenges and speed to delivery; however, product strategy can suffer without high levels of product-centricity.
3. **Talent and developer experience:** Potentially disjointed talent and developer experience.
4. **Interoperable teams and tooling:** Business objectives and technology functions tightly integrated across individuals and teams in IT; however, may not have business/product leadership that is needed.
5. **Data modernization, security, and innovation:** A sustainable and secure data model is in place to drive modern data and monetization strategies.

External drivers based on operating model

1. **Commercial model and IP:** Introduces challenges to IP management and need for more controls.
2. **Workforce ecosystem:** Resources access to automated coding and talent to address capacity constraints.
3. **Development environment and open source:** Speed to market benefits from access to open source and open innovation.
4. **International relations and data sovereignty:** Increased data and cyber risk requiring zero trust approaches and shared responsibility models.
5. **Social norms and consumerism:** Need to adapt to customer and market needs.

Source: Deloitte Center for Integrated Research

Product-centric and centralized operations:
Product Innovators can still gain greater advantage

Imagine that

Think about your company's industry. The business has an innovative new product it wants to deliver this year. The business and technology are aligned on the product strategy, the application design, the technology investments that are needed, and the pod team structure. You're working in sprints to deliver the beta version for user acceptance testing. You've decided to build everything in-house and are feeling the pressure on your budget, your development team, and your resources. You may be a Product Innovator, but you can still gain greater advantage.

Overcoming the challenges of the status quo

Product Innovators have strong, differentiated product strategies and a tight alignment between business, product, engineering, and IT functions. Product-centric centralized teams can be especially impactful in smaller organizations where the number of engineers does not exceed one thousand. This is because teams are small enough to work in coordinated pods effectively, when agile adoption is strong.[17] However, as teams grow and scale, their more centralized operating model could make it more difficult to tap into talent and open innovation. Tech investments may need to be higher to make the same impact. While closed development models can give them more control over their ecosystem and IP, they are often much less agile and could lose out on open-innovation opportunities (figure 3).

What if

Product Innovators can be highly effective with their business strategy, talent, and innovation models. Where they may fall is tapping into the full power and potential of their broader ecosystem. If you are a market leader with your digital product, that may not be an issue for you. But if you are not, your ability to compete might be hindered—given you are likely underutilizing the broader talent and innovation ecosystem available to you.

Product Innovators should be able to maintain a premium cost structure; therefore, being able to be successful in this category is limited to only a select few leaders in their industry. If you're the leader in your sector, you may be able to differentiate yourself in this group with high product-centricity and an internal operating model. More likely, though, as you mature and secure your place, the market may shift, and you may move to become an Engineering Leader. Even industry leaders exploring platform models and ecosystem co-innovation models can benefit from becoming Engineering Leaders.

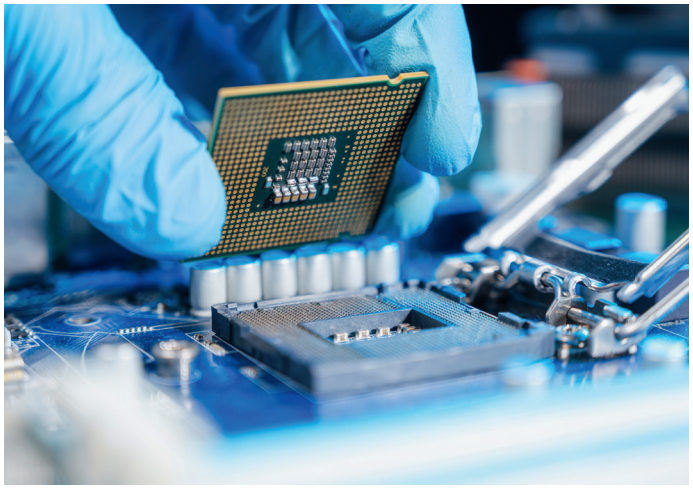
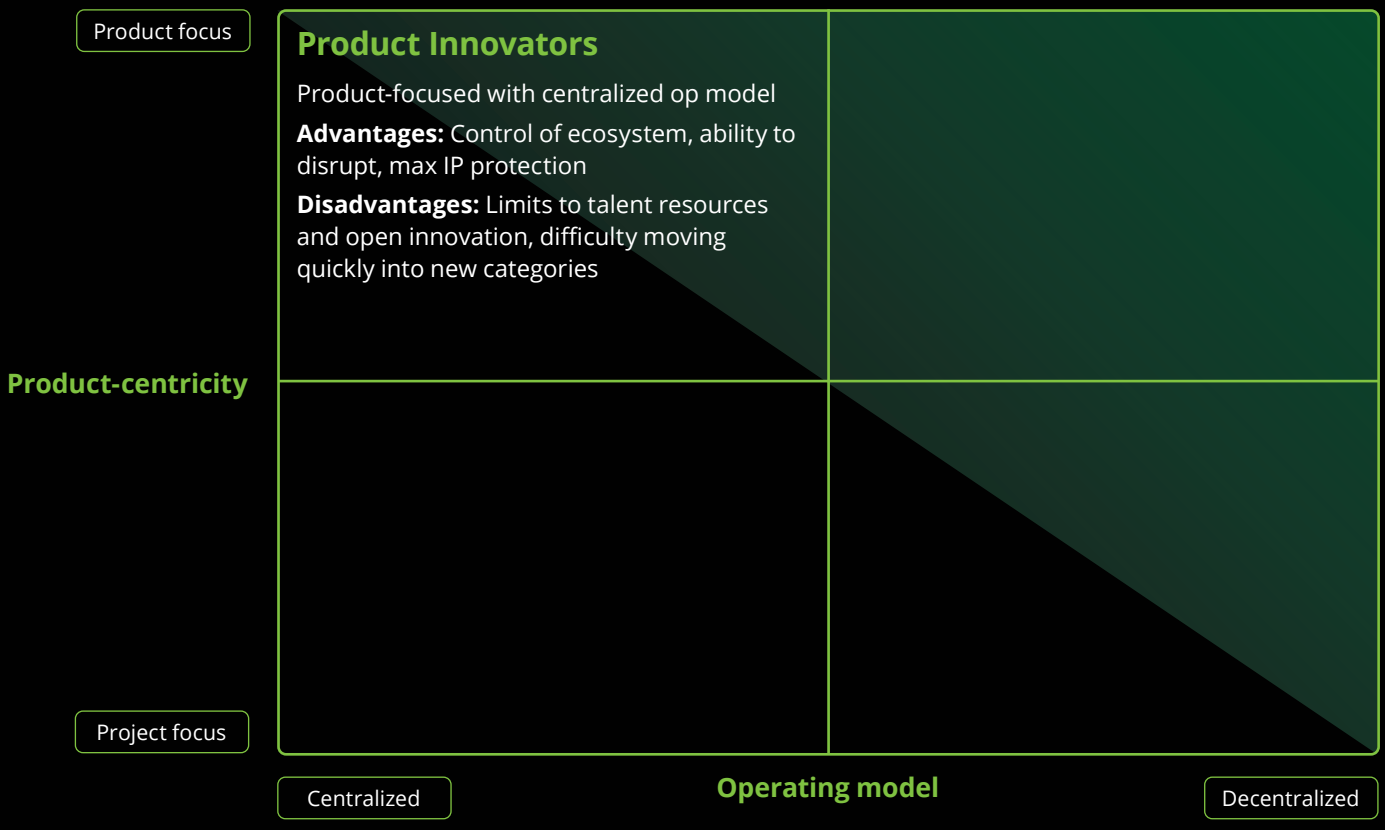


Figure 3. How Product Innovators navigate the 10 underlying drivers



Internal drivers influenced by level of product-centricity

1. **Business model:** The business model is centralized and focused on competitive differentiation over collaboration across the data, innovation, or supplier ecosystem.
2. **Cost to value and product roadmap:** The organization has greater control over the full product development life cycle, but the product roadmap may be constrained by cost, technical debt, and limits to IT resources.
3. **Talent and developer experience:** Talent resources and open-innovation opportunities are limited, making talent attraction and retention more challenging.
4. **Interoperable teams and tooling:** Proprietary tools and centralized teams are not always interoperable across the wider ecosystem. These organizations are not open-source/open-innovation beneficiaries.
5. **Data modernization, security, and innovation:** Data controls and security may be more easily managed; however, data monetization strategies may be more limited.

External drivers based on operating model

1. **Commercial model and IP:** Tight control and protection of their IP, but more vulnerable to IP business model disruption.
2. **Workforce ecosystem:** Automated coding, vendor ecosystem, and open talent models not fully optimized.
3. **Development environment and open source:** Open-source and open-innovation communities are not fully leveraged.
4. **International relations and data sovereignty:** A more closed operating model could limit broad exposure while centralizing risk.
5. **Social norms and consumerism:** These organizations may have difficulty responding to customer needs that require moving quickly into new categories.

Source: Deloitte Center for Integrated Research

Product-centric and decentralized operations: *Engineering Leaders*

Imagine that

A modern bank runs on software to place, clear, and settle trades; manage home loan applications; and engage with banking customers. JPMorgan Chase, for example, has 60 million clients accessing products and services through digital channels, and more than 75% of its mortgages are delivered online.[18] Its chief product officer (CPO) and CIO work together on a product strategy centered on delivering omnichannel experiences. The bank talks openly about the importance of a product-led strategy and relies on open source as a cornerstone of its innovation strategy.[19] Organizations like this are Engineering Leaders.

In 2024, Mastercard announced a new Generative AI solution. It was built based on $7 billion in cybersecurity and AI technologies that resulted in a proprietary AI model solution to detect fraud across its ecosystem of approximately 600 million cardholders with 125 trillion transactions a year.[20] This was a massive engineering undertaking. It involved digital platform strategy, substantial capital investment, and sophisticated cryptography and GenAI techniques across the developer ecosystem. This type of product-led, distributed strategy characterizes an Engineering Leader.

Look at DoorDash. When the company expanded into Japan, its engineers took a product-led, user-centric approach to localize the application design for users as part of its international expansion product strategy. Product teams worked to address challenges related to currency calculations, address translations, honorifics (to reflect proper etiquette with naming customs), and local standards in how dates are presented.[21] The "open by design" operating model allowed businesses access to the platform in one of the "most restaurant-dense countries in the world."[22] That is an Engineering Leader.

This model can be used by product leaders, CIOs, CTOs, and engineers in any industry, if an organization can navigate the 10 underlying drivers (figure 4).

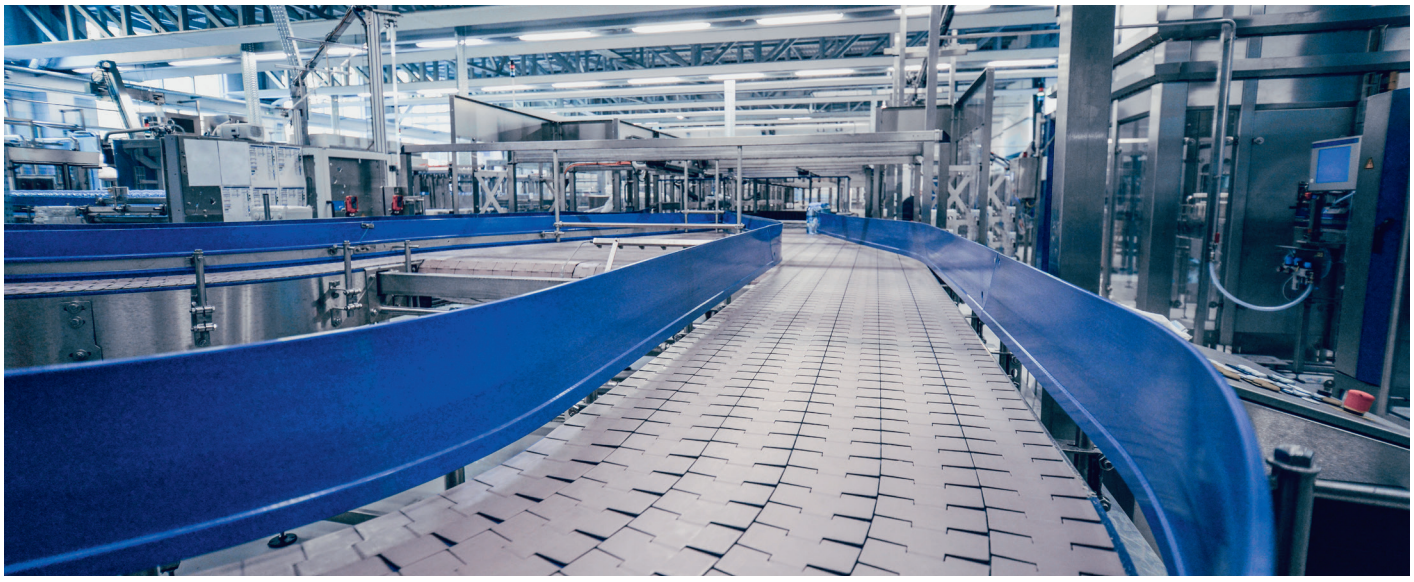
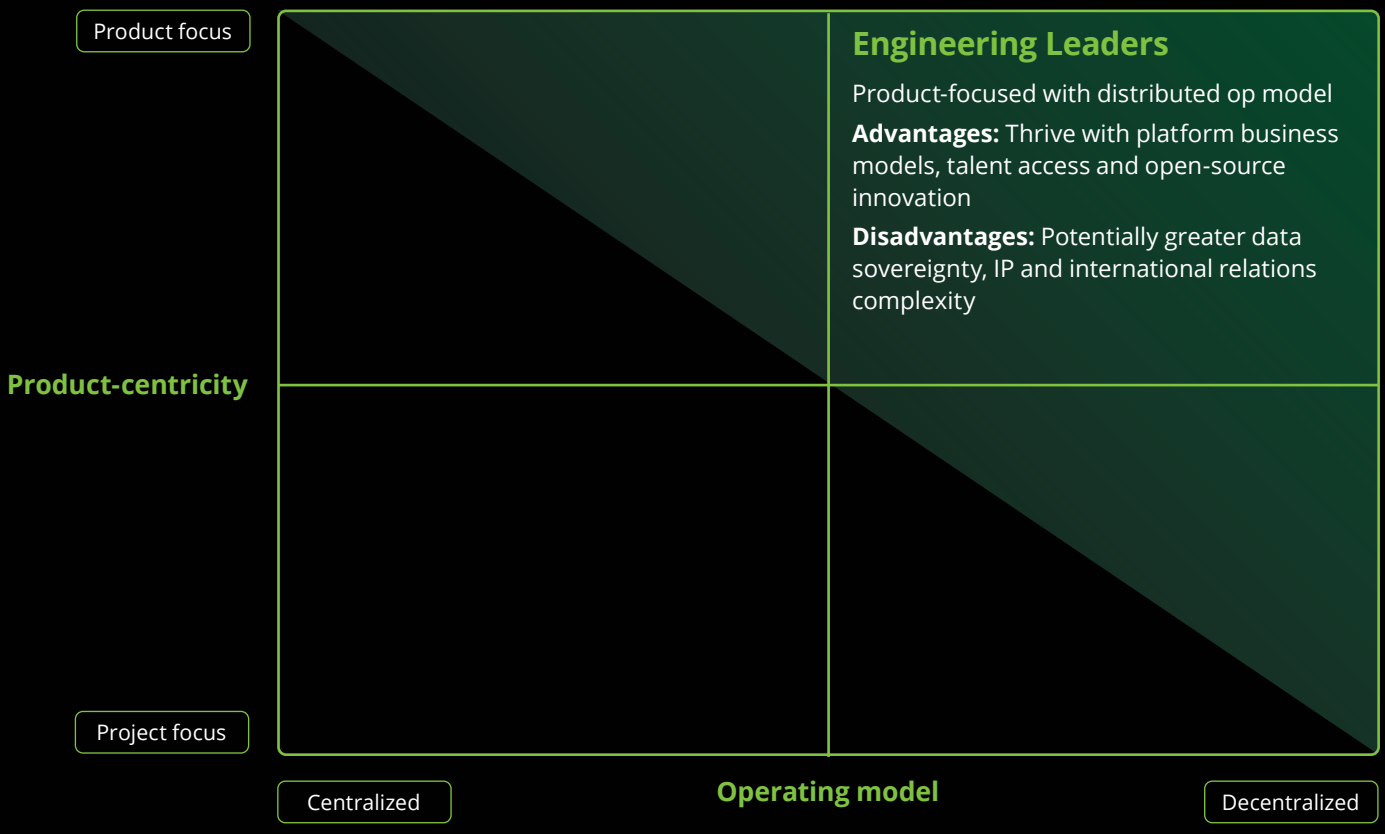


Figure 4. How Engineering Leaders navigate the 10 underlying drivers



Internal drivers influenced by level of product-centricity

1. **Business model:** The business/product/services model is platform/ecosystem-focused.
2. **Cost to value and product roadmap:** There is a product roadmap that balances value expectations with architecture costs/technical debt and budget constraints.
3. **Talent and developer experience:** The right resources in place to create a frictionless developer experience with talent mobility in place, including rotational roles, upskilling, and talent marketplace(s).
4. **Interoperable teams and tooling:** Business objectives and technology functions are tightly integrated across individuals and teams—with effective agile execution across pods with standardized tooling.
5. **Data modernization, security, and innovation:** A sustainable and secure data model is in place to drive modern data and monetization strategies.

External drivers based on operating model

1. **Commercial model and IP:** The organization has an open-innovation and data commercial model and has considered de-risking related to potential future changes to IP licensing.
2. **Workforce ecosystem:** The organization can tap into the broader workforce ecosystem including gig workers, crowdsourcing, and automation to address talent needs across front- and back-end developer, data management, and product roles.
3. **Development environment and open source:** There is an open development model that allows for open source, automated coding, and unbiased/integrated human and AI teams.
4. **International relations and data sovereignty:** There are resilience plans in place to address global and internal instability and potential impacts on hardware, software production models, and supply chains.
5. **Social norms and consumerism:** The organization has factored shifting consumer expectations, demographic trends, reception to innovation, and different privacy norms generationally.

Source: Deloitte Center for Integrated Research

Harnessing the five internal drivers

The high level of product and user-centricity at Engineering Leader organizations likely makes them more open to embracing new and innovative business models that tap into the platform and ecosystem strategies. They tend to invest competitively in technology to make big bold bets on digital change with a propensity toward cloud-native development that could have lower technical debt. Their focus on innovation helps them to attract talent, embrace open source to speed up development, and experiment with automated coding and smaller, skills-based pod team structures. These interoperable teams use the latest tooling and standards to help create consistency and agility across the organization. Trust is by design; security is by design. This can allow data to flow not just within the organization but across the ecosystem, with IP rights and controls properly managed. More mature organizations gaining greater value from their digital investments are putting larger budgets toward data monetization and exploring a range of strategies based on industry and sector priorities.[23]

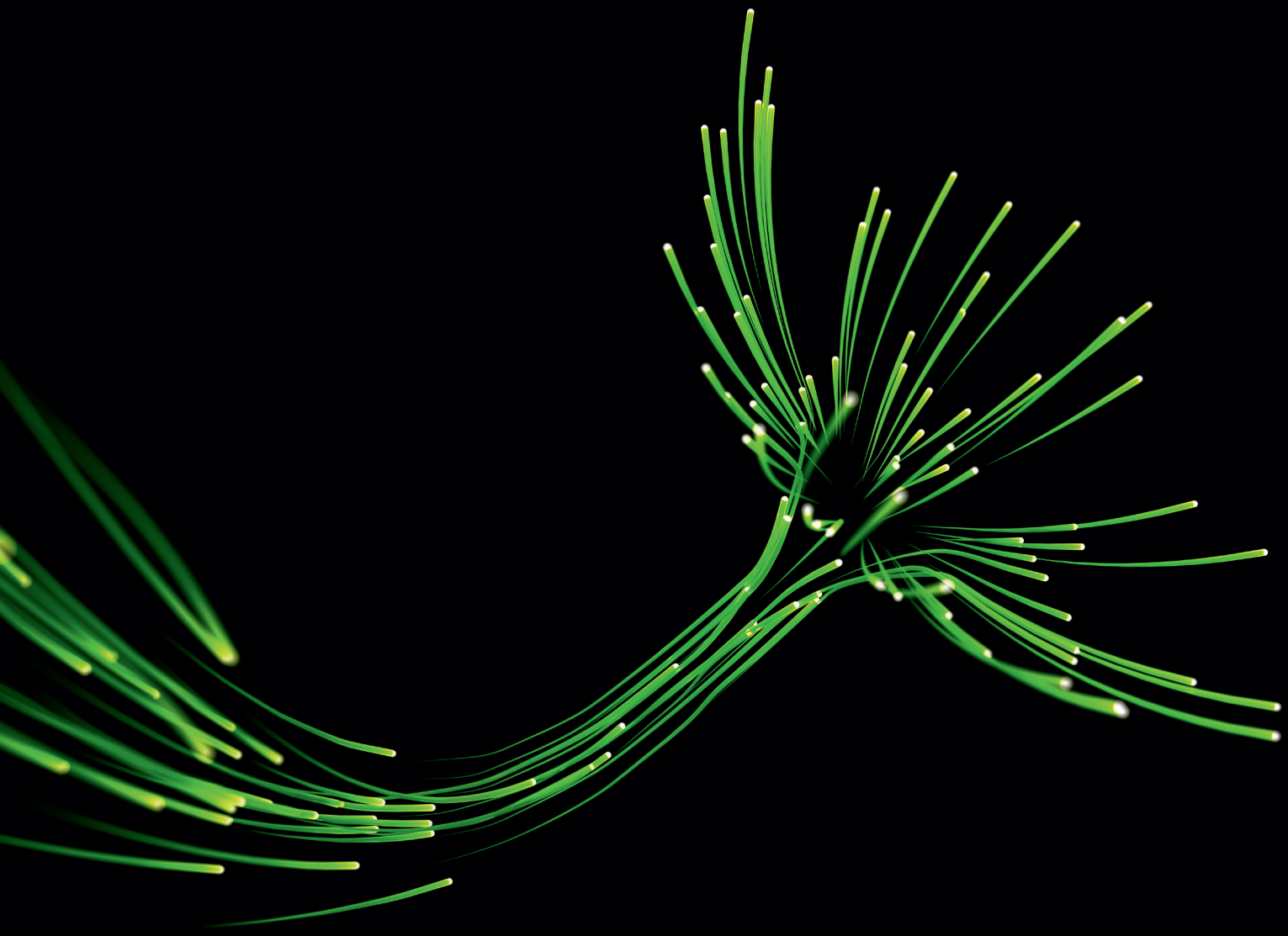
Harnessing the five external drivers

The willingness to embrace ecosystem dynamics often gives Engineering Leaders an advantage to tap hard-to-find skills—such as advanced data science skills or skills used by creatives—that are more readily accessible in open talent models. This can make for a highly innovative, collaborative, and dynamic development environment—and while it may introduce a higher level of risk, it can also provide more flexibility to move to multiregional talent models as the situation calls for. Their user-centricity and distributed operating model helps enable these organizations to innovate with customers' highest expectations in mind.

What if

This is the future of engineering that many organizations are trying to achieve to keep up with the massive demands for engineering talent while managing budget, talent, technical debt, and other constraints that may be facing them.

Driving change



The type of engineering organization your company becomes is in your hands. Leaders can keep the following principles in mind to help improve their maturity overall. Each one lines up with the 10 driving forces discussed earlier. On the one hand, greater product-centricity can enable an organization to move up to one of the two more favorable scenarios. From there, leaders can consider the trade-offs between being a Product Innovator and an Engineering Leader. The below actions can help organizations to become Engineering Leaders.

Productize and commercialize your business model with a focus on outcomes

The more organizations are tethered to traditional business models versus embracing software-driven, innovation-oriented, and/or digital product/platform-enabled business models, the more challenging it could be for them. Platform business models may automatically open an organization to a wider ecosystem to manage.

Consider defining your digital product strategy in the context of digital-native contemporaries—peers and competitors—to work toward an engineering-led organization. This could entail embracing product-led development, a platform approach, and in some cases, might even mean a shift from hardware to software development or bold strategies. It also asks organizations to understand their users. Not every organization will want to be completely user-centric—as sometimes innovation requires innovating in ways potential users haven't anticipated that they want or need—but those choices should be intentional and strategic.

Many companies are taking a core competency and using it to push into other industries, as strong engineering capabilities can enable them to use their size and scale to move into new sectors. Consumer products companies have gone directly to customers to become retailers. This market can be hard to predict, so multidimensional innovation—that is, innovation across tech, engineering, and business—is how some organizations are dealing with uncertainty in a changing world.

Evolve. Do not just transform. This could mean preparing an organization for continuous change and repositioning from a culture of *operation*—aided by IT services—to a culture of *innovation*. The organization should have both improvisational tech and a method for deciding when to modernize and when to sunset.

Organizations that view tech as an enabler to adequately prioritize budget remove tech debt and compensate talent at the levels necessary to achieve engineering goals. Organizations should be willing to invest, and sometimes even to take bold action to address technical debt. For example, one restaurant chain has rebuilt its mobile app every three years to keep it clean of technical debt. This helps it to remain at the forefront, taking a strategic rather than scaled approach to engineering.[24]

Consider the value stream, plan for unplanned expenses, and extend your return on investment (ROI) thinking to align with longer-term ambitions. Many mature companies measure and manage the ROI from their technology investments across financial, customer, process workforce, and purpose measures.

Expand the development environment upstream and to include users

Allow the engineering organization to grow upstream to not only control the outcomes but also have a say in the definition of the problem and product strategy. This can help the growth and influence of engineering across an organization—helping to build an engineering mindset and culture across the organization and not just within IT.

Delineate clear ownership of engineering outcomes and functions and check bias at the door so you're willing and able to embrace the open standards as well as the cutting-edge techniques that are needed to become a more mature organization. For example, chaos engineering may sound intimidating to a product or business leader, but being able to test and learn in a "safe" production environment is often invaluable to customers and an engineer's dream.

Products often gain adoption and are successful if they are engineered based on user needs and expectations related to the data. Businesses and consumers with purchasing power tend to expect solutions to be in the cloud. Factor in your own potential bias, user-centric design principles and user group feedback, perspectives from marginalized users, product adoption trends, and the missing market—lost by the digital divide—for engineering equity.

Hyper-focus on the developer experience

Talent and developer experience is an enabler of culture and capacity, affecting an organization's ability to attract and retain talent based on supply and demand. Therefore, leaders can rethink their talent models accordingly to help enable more effective delivery across teams and more enticing career opportunities. Individuals can become not just software developers but software architects—assisted by automated coding and product-centric teams.

Identify and recognize superstar individuals and teams as an anchor for the future, but also focus on talent you can get and train.[25] You should have both. Consider a strong onboarding and usage plan to nurture this group to become hyper-productive developers through talent fluency, career path development, continuous performance reviews, and competitive compensation and incentives, of course. For many engineers who are builders and creators at heart, having a larger sense of purpose can be an incentive.

Make pods smaller but mightier teams. In many cases, pods today are 8–12 people comprising a product manager, scrum master, tester and engineers.[26] These teams will likely evolve and may get smaller in nature. In many cases, smaller is better, but not always. As a guiding principle, organizations can avoid teams becoming bigger than 15 and align the size of the pod with workload and based on the automation level—staying away from role-based delivery. Conduct a technical skills assessment to identify gaps and skills

of the future—and do it not just once but continuously so that you can keep adjusting based on necessary skills and better manage uncertainty across delivery capacity. As projects move into distinct phases, there may be different life cycles of pods—a build pod, an operate pod—or based on certain skills like a GenAI pod.

Pursue multidimensional open talent models. Individuals have moved from single-skill specialists to multifaceted individuals (full stack) with a need to bring many skills. This can affect pods that were once teams of individuals with a single skill, moving them toward becoming pods of multifaceted individuals. This move toward multifaceted innovation teams may be exponential. Consider leveraging the people who work on projects and products, who are doing research in the open-source community and through ecosystem services like industry clouds, to further harness the power and potential of the wider ecosystem. In doing so, look to evaluate licensing agreements to manage resourcing gains and IP licensing requirements associated with those opportunities.

Architect open and interoperable solutions

Think about the ecosystem as modular. Use service-oriented architectures to make tech more composable—application programming interfaces (APIs) and enabled cloud services. Businesses should have a tech capabilities framework to avoid tech decisions that are really about building someone's personal résumé rather than the organization's capabilities. At the same time, find ways to balance developers' desire to work with cool and innovative technologies while also selecting the right tech capabilities for the task at hand.

Balance data readiness, data sovereignty, and AI

Data readiness could take an organization a long way because many things are layers on top of data. Mature engineering organizations cultivate ecosystems for shared responsibility of data and put guardrails in place. For example, you may have bifurcated privacy approaches that address different user expectations based on generational differences in privacy expectations.

Address potential biases in data and data models head-on. Data provenance and the source of training data used for automated coding can have different implications on proprietary software versus open-source environments—an important area to consider as it evolves.

If US businesses are to maintain their high level of innovation, merely adopting tech may not be enough to move the needle in today's digital economy. Success hinges on elevating engineering as a core discipline with a high level of product-centricity and an operating model that taps into the power of the broader ecosystem. The time to engineer your digital future is here.

Also, look to build trust by design with an attention to developing ethical and responsible solutions with the proper guardrails, internal audit and control functions, privacy, regulatory limits, geopolitical risk considerations, and sustainability measures from the ground up.

Advanced engineering organizations might use artificial general intelligence (AGI) for automated coding with automated feedback loops. Increasingly automated and immutable systems with fewer humans could pose less risk to data identity access and management (IAM). This can leave humans to focus on solving for challenges like innovation management, sustainability, and ethical considerations.

Methodology

- We did a macro analysis of driving forces shaping the future of engineering using the Social, Technological, Economical, Environmental, and Political (STEEP) method. The analysis drew on:
  - Secondary research.
  - Data and insights from a Deloitte business survey of 100 engineering decision-makers across CIO, CTO, engineering, and product officer roles.
  - Nine interviews with Deloitte leaders knowledgeable about the future of engineering.
- We then used a 2x2 scenario planning matrix approach to:
  - Identify key drivers inside and outside of the organization (figure A).
  - Reduce them down to the 10 most critical drivers based on both level of importance and uncertainty (figure B).
  - Identify the two driving forces most affecting the engineering organization.
- Insights related to actions and recommendations are based on the nine interviews. We used open coding to identify themes and define 10 driving forces shaping the future.
- These 10 driving forces inside and outside the organization have been considered against each of the four scenarios.

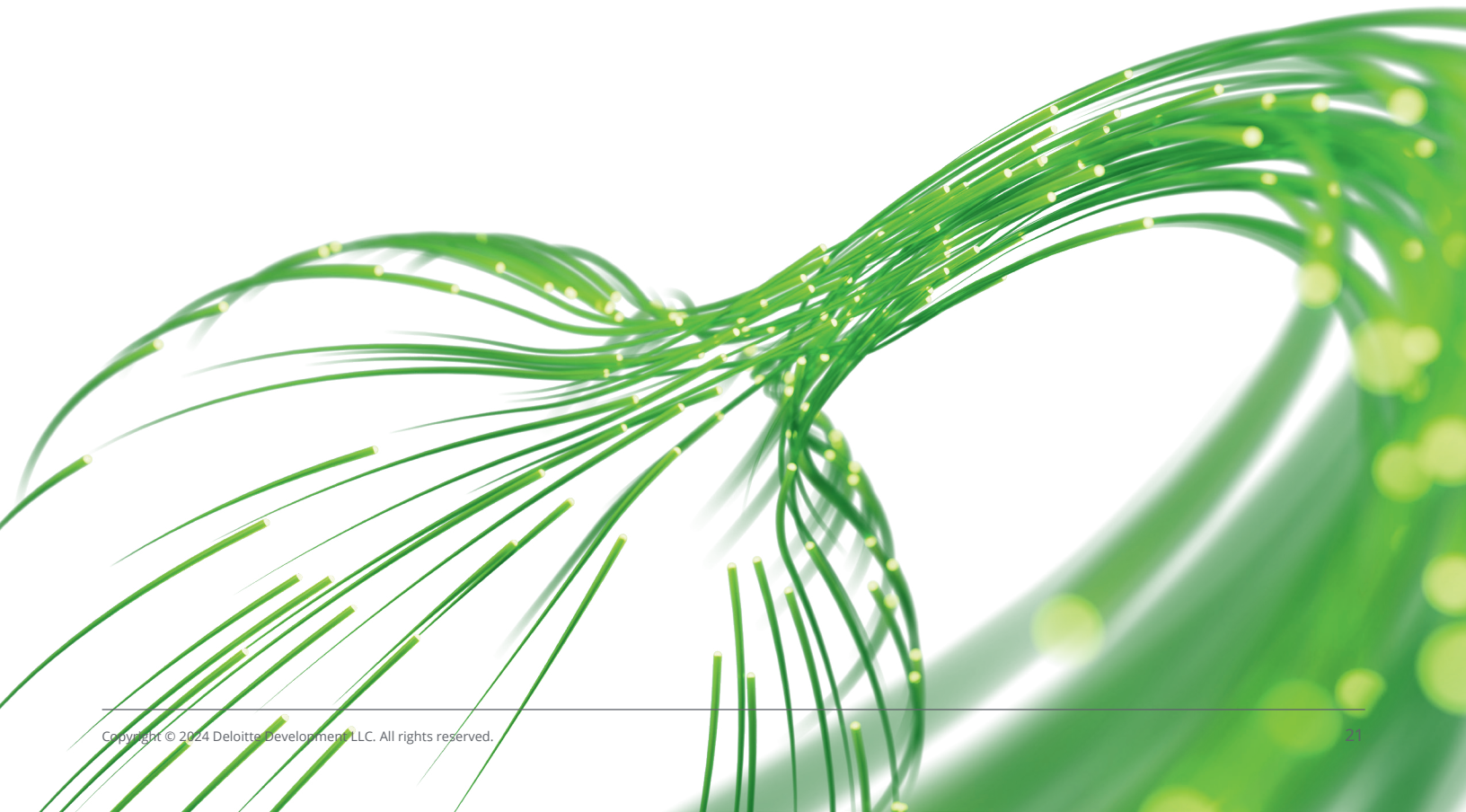
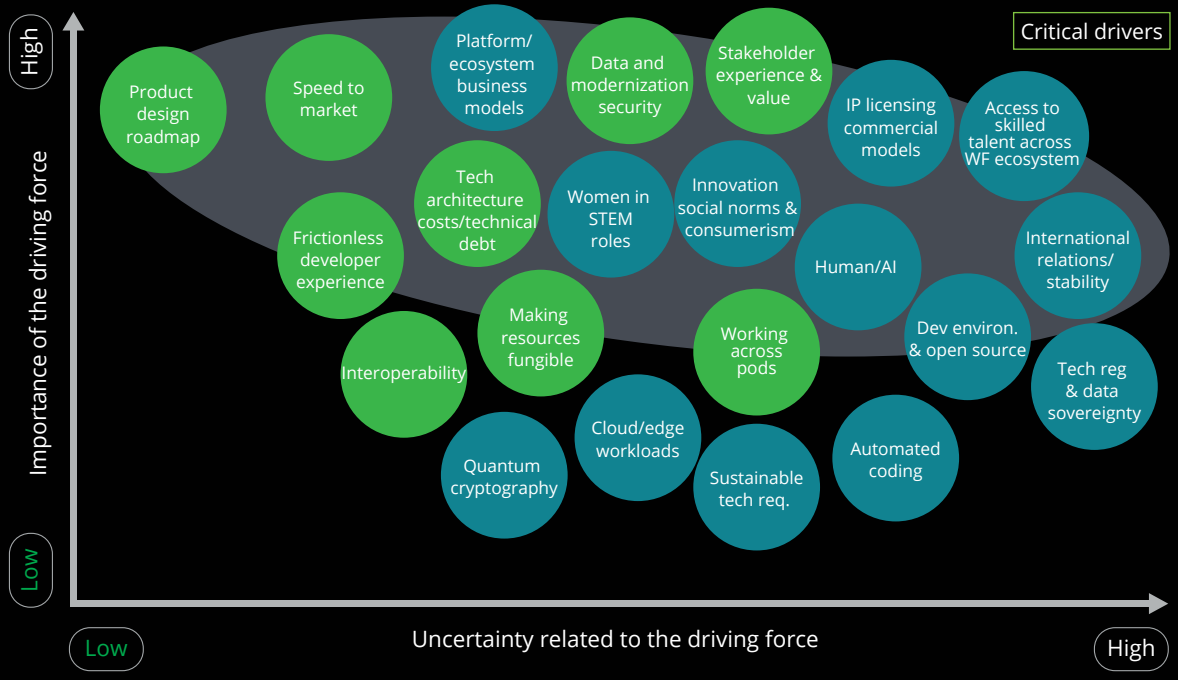


Figure A. Critical drivers shaping the future of software engineering based on importance and uncertainty



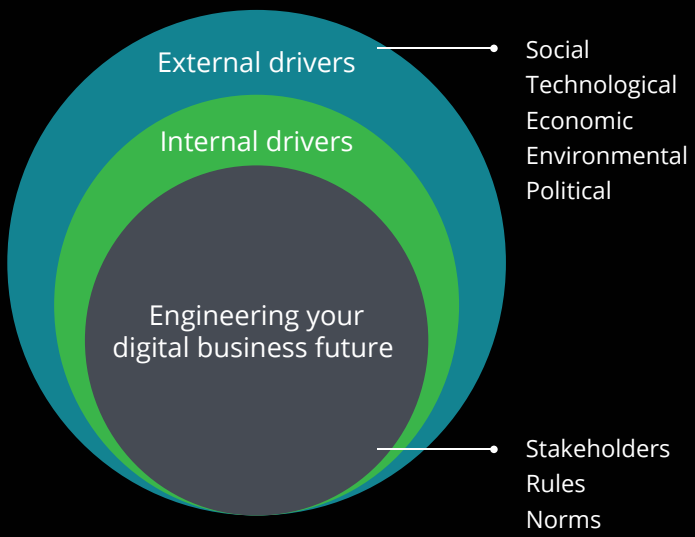
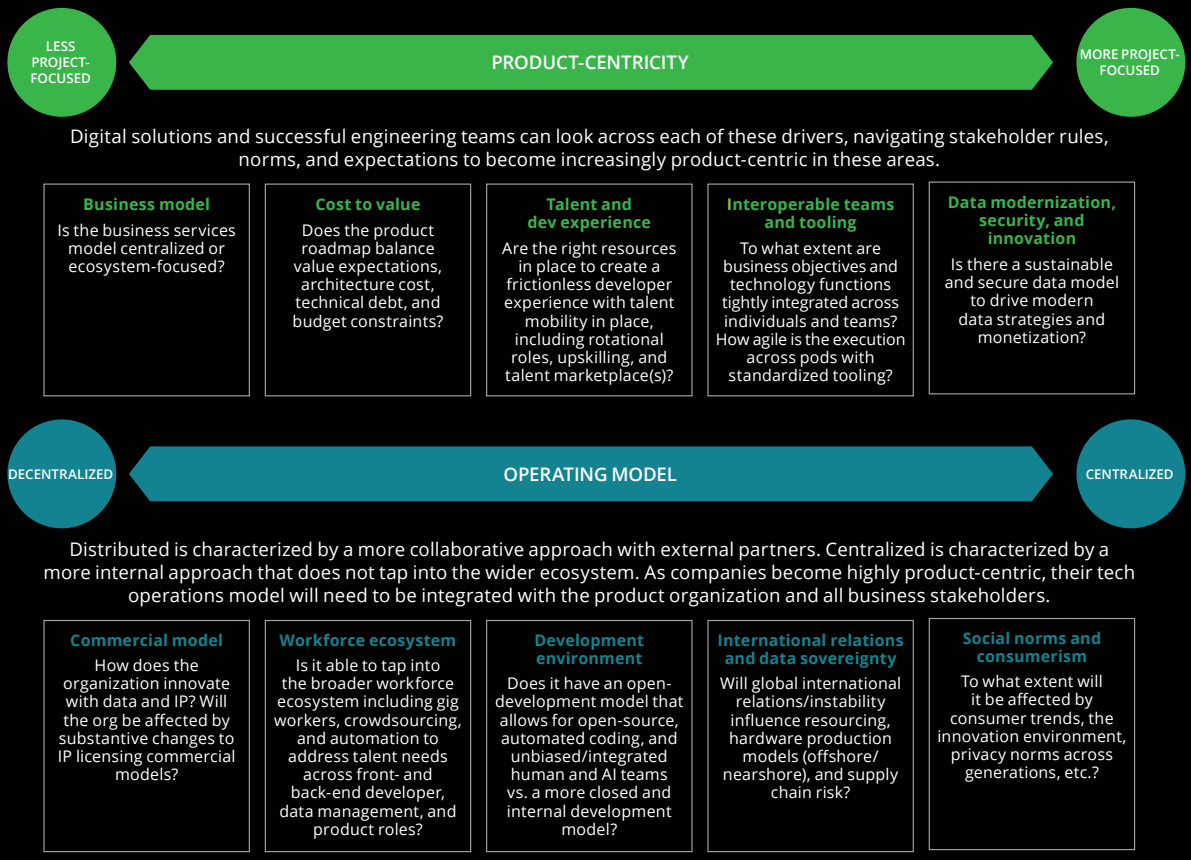


Figure B. Ten core dimensions shaping the future of software engineering



Internal drivers influenced by level of product-centricity

- **Business model** – The extent organizations are tethered to traditional business models or embracing software-driven, innovation-oriented, and/or digital product/platform-enabled business models.
- **Cost to value** – The extent organizations are able to effectively measure and manage the ROI from their technology investments across financial, customer, process, workforce, and purpose measures.
- **Talent and developer experience** – An enabler of culture and capacity affecting organizations' ability to attract and retain talent.
- **Interoperable teams and tooling** – The extent organizations are successful at integrating software into various aspects of the business, adopting modern engineering practices and microservices, and openly embracing cloud capabilities.
- **Data modernization, security, and innovation** – The engine behind product-centric digital strategies is data, making a core objective to bring data seamlessly across the organization in a way that drives innovation and enables personalized experiences.

External drivers based on operating model

- **Commercial model** – The organization's business model can dictate how it functions in the wider ecosystem—how it makes money and competes. This is where economic and market forces as well as larger trends related to engineering innovation and intellectual property can be shaped by these modalities.
- **Workforce ecosystem** – How open an organization's operating model is could dictate the extent to which the organization can tap into talent contractors, gig workers, technology, organizations, and other complementors outside the organization versus how dependent they are on bringing talent into a decentralized model or technology within the firewall.
- **Development environment** – As open-source communities continue to be a major driver of that change along with automated coding, organizations can be affected by the rate it's introduced into development teams as a norm.
- **International relations and data sovereignty** – Global relationships and levels of stability can have positive and negative impacts on an organization's engineering future. This can directly affect the extent to which an organization is able to access talent and from where, data sovereignty risks and infrastructure decisions, and supply chain risk.
- **Social norms and consumerism** – An organization's ability to address consumer expectations while closing the digital divide has a bearing on market potential.

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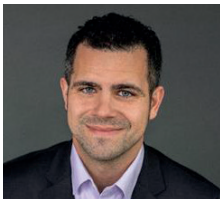

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Acknowledgments

The authors would like to thank those who gave the time and expertise to the development of this research.

This includes Ahmed Alibage, PhD; Alexander Heldring; Justin Joyner; Lisa Beauchamp; Iram Parveen; Nicole Bostock; Brad Kreit; Monika Mahto; Kelly Nelson; Brenna Sniderman; Rajeev Vasudeva; Siva Muthu; and Negina Rood.

Endnotes

1. Christopher Augsburg, "A guide to offering digital solutions for postal industry," *Parcel and Postal Technology International*, November 30, 2022.
2. Kasey Lobaugh et al., "Mass to micro: Meeting unprecedented consumer market shifts," Deloitte, accessed March 13, 2024.
3. Jana Arbanas et al., "Consumers embrace connected devices and virtual experiences for the long term," Deloitte, accessed March 13, 2024.
4. Equinix, *Global Interconnection Index*, 2024.
5. Thomas H. Davenport, "How legacy companies can pivot to a platform model," *Harvard Business Review*, March 9, 2022.
6. Deloitte US Consulting's Engineering Buyer Study of 100 C-suite engineering leaders across product leader, CIO, CTO, and engineering functions conducted in 2023.
7. Deborshi Dutt et al., *Deloitte's State of Generative AI in the Enterprise: Q1 report*, Deloitte, January 2024.
8. Gregory Dost and Diana Kearns-Manolatos, "Unleashing value from digital transformation: Paths and pitfalls, Deloitte, February 14, 2023.
9. *Britannica*, "Software engineering," accessed March 13, 2024.
10. David Mallon et al., "What do organizations need most in a disrupted, boundaryless age? More imagination," Deloitte Insights, accessed March 13, 2024.
11. Mark de la Grange et al., "Accelerating value realization: Why organizations are embarking on product transformation journeys," Deloitte, 2023.
12. Khalid Kark et al., "Reimagining the technology operating model," Deloitte Insights, May 7, 2020.
13. Deloitte US Center for Integrated Research interview with Deloitte Engineering Consulting leaders conducted in December 2023.
14. Elizabeth J. Altman et al., "Workforce systems: A new strategic approach to the future of work," Deloitte Insights, April 13, 2021.
15. Michael Bechtel and Bill Briggs, "From DevOps to DevEx: Empowering the engineering experience," Deloitte Insights, accessed March 13, 2024.
16. Deborah Golden et al., "Integrated cyber for cloud migration," Deloitte, March 2, 2021.
17. Lars Cromley, Jonathan Holdowsky, and Diana Kearns-Manolatos, "When scaling Agile, engaged self-aware leadership matters. A lot," Deloitte Insights, September 30, 2022.
18. Fortune Brand Studio, "How financial institutions are delivering richer digital banking experiences," accessed April 5, 2024.
19. Rao Lakkakula and Benjamin Flatgard, "Doing Our Part to Secure the Open Source Ecosystem," JPMorgan Chase, accessed April 5, 2024.
20. Ryan Browne, "Mastercard jumps into generative AI race with model it says can boost fraud detection by up to 300%," CNBC, February 1, 2024.
21. Noah Zempsky et al, "Overcoming localization challenges for international expansions," DoorDash, June 9, 2021.
22. DoorDash, "DoorDash expands to Japan," press release, June 9, 2021.
23. Tim Smith et al., *Digital value and the industry context*, Deloitte, 2023.
24. Deloitte US Center for Integrated Research interview of Deloitte Engineering Consulting leaders conducted in December 2023.
25. Mike Bechtel and Bill Briggs (eds.), *Tech Trends 2024*, Deloitte Insights, 2024.
26. Deloitte US Center for Integrated Research interview of Deloitte Engineering Consulting leaders conducted in December 2023.

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