

Software Engineering: Designing a Better Experience for Communications, Media and Technology Customers

Software makes the world go 'round, from hyperefficient business operations to users wowed by the newest app interface and digital products. For CMT companies, software development innovation is the key not only to enhancing business agility but to rapidly designing and offering extraordinary experiences and cutting-edge products that will continually satisfy and delight customers.

Executive Summary

With the ubiquitous presence of software in our digital lives, one might conclude that the world's operating system is in fact built on software code. But this is a case where the paths of perception and reality actually diverge.

Yes, software is now an enabler of operational efficiency and innovation, and the basis of a growing range of products and services used at work, in the car, at home or anywhere people connect. Indeed, it is safe to say that increasingly, software is the business. As a result, the ability to quickly develop and deploy software is now central to commercial success. This is especially true in the communications (i.e., cable and telco), media/entertainment and technology (CMT) industries, where companies have pioneered the digital revolution and led the way in putting software at the heart of the business.¹

Not surprisingly, 94% of CMT respondents in our recent global study, which included more than 1,000 CMT senior executives, said they believe that software engineering is critical to their company's future. And they see better software engineering as a means to achieve a range of business goals, including delivering a better customer experience, increasing business agility, accelerating time-to-market, reducing costs and enabling growth. (See **Methodology, page 22.**)

But here's where perception and reality begin to part ways. The truth is, many companies struggle to build the software-development capabilities they need to truly operate as software-driven enterprises. In our survey, only 25% of the CMT executives said that their company has rolled out a large-scale implementation of new software-development practices or is in the process of doing so. Even after decades of advancements in software helped rebuild established brands and launch app-only billion-dollar unicorns, the reality is that most companies remain in the planning or pilot-project stages with their software-development improvement initiatives. Across the broad range of CMT companies, some sectors are farther along on their software journey than others. The digital road is being paved with software, but it's still a work in progress.

To move forward, companies should take advantage of sophisticated techniques for building software that draw on modern engineering principles and focus on customer experiences and continuous experimentation. To do this, enterprises should use human-centered design – which incorporates customer/user input throughout the development process – and “outcome engineering” – which

brings design and engineering together to create innovative products and processes, to help keep development focused on people and the customer experience.

Even more important, CMT companies need to adopt new approaches to their people, teaming and culture that will enable them to get the most from today's advanced tools and technology. They should reshape the software-development organization by establishing a cocreation mindset and empowering teams to thrive and realize their full potential. Companies can start by creating a center of excellence, enabling inspiration among peers and building a sense of belonging and pride. They should also embrace a cross-functional team "pod" approach, which fosters speed, quality and innovation.

However, as the world operates with more remote workers, virtual pods will add a dimension of complexity. But whether it's a team under one roof or individuals digitally connected but geographically distanced, three things are true of successful software-centric organizations: Companies require a culture that values collaboration and partnering in a pod model, has a "fail and learn fast" mindset, and encourages the organization and its employees to work in a more unified way. (For more, see "[Understanding How to Fail: The Essential Ingredient of Radical Innovation.](#)")

As COVID-19 has made clear, business agility and resilience are of paramount importance and will determine which companies thrive. Thus, many CMT companies will want to harness innovative software engineering approaches to create new systems or modernize their legacy systems, making them more efficient and flexible.

Even though IT organizations are aware of the importance of mastering software development, that view is not necessarily shared across the business. In our survey, 34% of CMT respondents ranked poor perception of the business impact of software engineering as a top obstacle to implementation, and 80% said their efforts are hampered by a lack of budget. An enhanced ability to create software that delivers business results can encourage strong senior executive support and, ideally, foster a software-centric culture throughout the company.

Redesigning a company's approach to software engineering is a significant undertaking. But the world, and the competition, are not standing still. A failure to act quickly will mean falling ever further behind more proactive competitors and potentially put the organization's long-term survival at risk.

Software engineering: Great – yet still unmet – expectations

Across industries, senior executives are catching up to the fact that software is very much at the heart of the business. It is the key to efficiency and innovation, the primary touchpoint for reaching customers and engaging employees, and integral to many products and services.

CMT companies are among the first to recognize this new reality. They have long been early adopters of technology and pioneers in putting software at the center of the business. That's because they need to provide customers with a steady flow of new, engaging experiences and adapt quickly to sudden shifts in technologies, competition and business models – all of which make the ability to manage, create and deploy software quickly and on an ongoing basis a key capability.

Our survey found that executives from CMT companies not only view software engineering as critical to future success, they expect it to help them meet a range of key goals, including:

-
- I Deliver hyper-personalized consumer and employee experiences.** CMT executives most often ranked “improve customer experience, engagement and retention” (42%) as one of the top three expected benefits of software engineering – as one might expect in industries where a digitally enabled experience is often the core of the business.
 - I Increase business agility.** For CMT companies, evolving business models and constant technology-driven disruption have been the norm for years, and 30% of CMT respondents ranked “make our business more agile and flexible” among the top three expected benefits.
 - I Boost efficiency to reduce costs.** “Enable operational efficiencies” was cited among the top three benefits by 30% of CMT executives. Software engineering can also yield additional tactical benefits related to efficiency, such as reduced cycle times for developing, testing and building applications.
 - I Enable growth.** For CMT companies, expected benefits such as an improved customer experience, increased agility and shorter time-to-market can create opportunities to reach customers and increase revenue. Overall, 30% of CMT executives said that they anticipate that software engineering would improve competitiveness.
 - I Accelerate time-to-market.** CMT customers expect a constant stream of innovations, and 25% of CMT executives cited “scale products more quickly from ideation to revenue realization” as a top benefit, while 20% cited “keep pace with market needs.” Interestingly, the ability to scale products quickly was less important to respondents at technology companies (21%), compared to those in communications (33%), media (28%) and entertainment (29%). (See “Making Small Business TV Advertising Easy & Cost-Effective,” next page.)

Quick Take

Making Small Business TV Advertising Easy & Cost-Effective

Challenge:

Comcast, one of the world's largest cable, media and technology companies, as well as a leading distributor of advertising across linear and digital platforms, had found that one advertiser segment proved particularly challenging to engage: small and mid-sized businesses (SMBs), whose needs and budgets differ from larger advertisers. Comcast's advertising sales division, Effectv, embarked on a journey to help SMBs evolve the way that they connect with target audiences and promote their businesses.

Solution:

To uncover and meet the unique demands of SMBs, Effectv partnered with us and ReD Associates, our partner that specializes in ethnographic research. Conducting deep field research with small businesses nationwide to learn how they make marketing decisions, ReD Associates uncovered that TV advertising in particular can help smaller businesses expand their reach and impact. We applied that insight to forge an industry-first solution: the Effectv TV Ad Planner, an innovative, advertiser-driven media-buying platform specifically designed for the unique needs of small businesses. This helped SMBs see TV as a more accessible, affordable and understandable medium in which to spend their ad dollars, and enabled them to reap the benefits by planning, buying and quickly launching their own TV ad campaigns.

Outcomes:

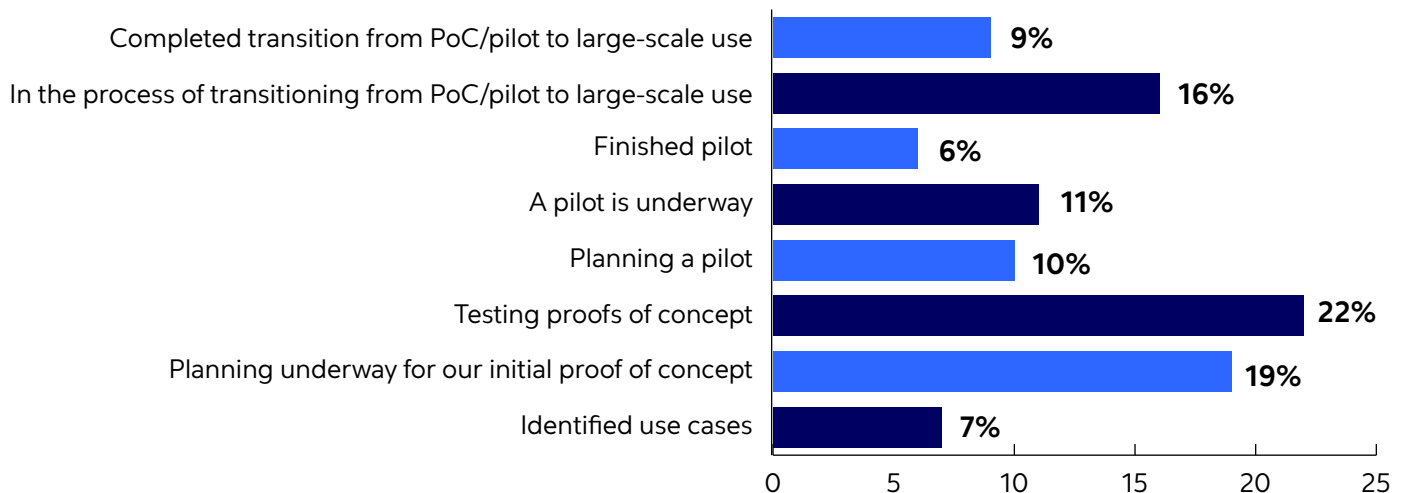
Effectv TV Ad Planner has become a solid source of qualified leads and served to increase the average campaign spend across the SMB segment. "We were able to research, plan, build and launch Ad Planner in just four months," said Travis Parrill, Effectv's Senior VP of Operations. By helping identify the needs of SMB owners, this breakthrough application for its industry yielded these results:

- I **Four months** from concept to market.
- I **10 minutes** on average for SMBs to create a campaign.
- I **48 hours** for SMB owners to run their ads.

Executives from CMT companies clearly see significant potential in effective software development – but there is a gap between their expectations and the actions their organizations are taking. Indeed, many reported only limited progress in their efforts to improve software engineering (see Figure 1). Only 9% of CMT respondents said their company has rolled out a large-scale implementation of new software-development practices, while 16% said they were in the process of doing so. Most companies remain in the planning stages or are working on pilot projects. Further, only 52% of CMT executives said their companies have a software engineering strategy in place. So, while executives have high hopes for better development capabilities, they appear to be unsure about how to get there.

To accelerate their software engineering push, CMT companies will have to adopt a variety of new approaches, including today’s new and sophisticated development tools and processes, such as outcome engineering and DevOps. Organizations will also need to retain top talent by ensuring skills are in step with the latest trends and that their employees feel they are contributing to business outcomes. But perhaps most important, they will need to transform the development organization itself to take full advantage of those tools – by empowering people and teams and building a software-centric culture that values collaboration, partnering and risk-taking.


CMT software engineering shows much room for progress



Response base = 798 CMT executives

Source: Cognizant

Figure 1



Executives from CMT companies clearly see significant potential in effective software development – but there is a gap between their expectations and the actions their companies are taking. Indeed, many reported only limited progress in their efforts to improve software engineering.

Making the human connection

Today, companies can draw on a variety of sophisticated software-building methods that use modern software engineering principles, focus on experiences and continuous experimentation, and effectively gather user feedback along the way. These approaches tightly align business needs with the software under construction – a key benefit, since it's generally accepted that 20% of defects stem from problems capturing business requirements.²

With the increasingly personalized and pervasive nature of their digital products, CMT companies are typically focused on delivering more human-centric products and services. With that in mind, the principles of human-centered design should permeate the development process, with user input to understand people's requirements, goals and behaviors.

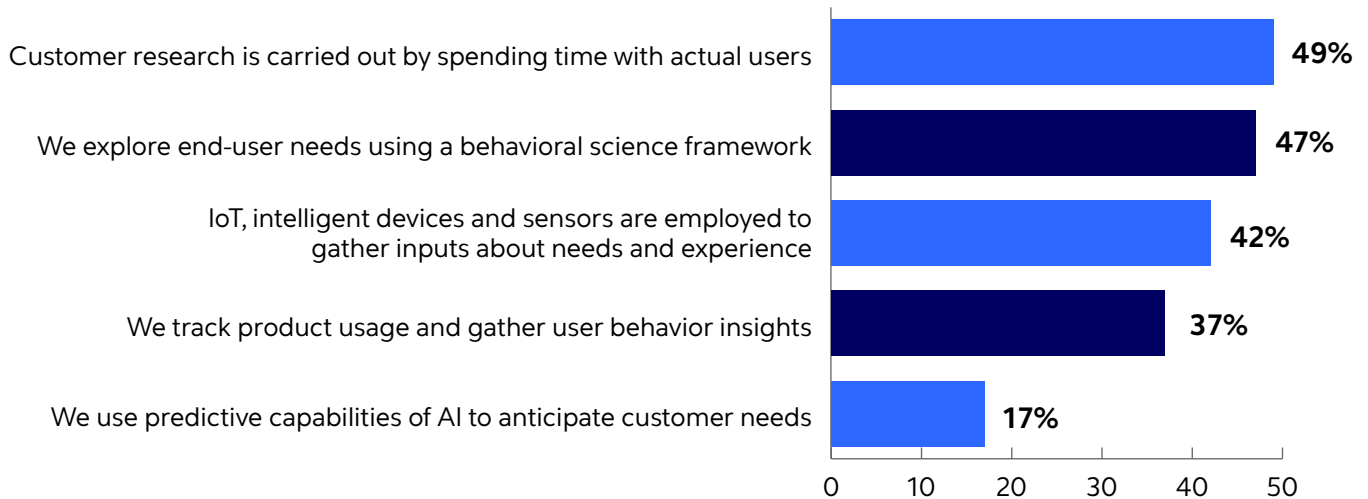
Companies can also apply a behavioral science framework to explore end-user needs, track product usage to identify customer behaviors, and deploy the predictive capabilities of AI to anticipate what customers want. Additionally, they can employ outcome engineering to keep development focused on meeting customer needs.

With the increasingly personalized and pervasive nature of their digital products, CMT companies are typically focused on delivering more human-centric products and services. With that in mind, the principles of human-centered design should permeate the development process, with user input being deployed to understand people's requirements, goals and behaviors.

CMT companies are making use of some of these approaches. (See “Creating a Human-Centered Portal,” next page.) About two-thirds of the CMT respondents said their companies’ adoption of human-centric design, design thinking and experience was significant. But overall, the industry is not taking full advantage of these processes to gather customers’ insights. For example, just 52% of CMT respondents reported a significant level of design-thinking-led change in customer engagement on all channels. Only 47% said they are using behavioral science frameworks, 37% are tracking product usage/behavior insight and just 17% are using predictive AI for customer insight (see Figure 2).

However, there were differences across the CMT industries in the use of these techniques. For example, communications companies were the most likely to report tracking products/behavior (50%), followed by technology (40%), entertainment (33%) and media (30%) companies. And about one in five communications and technology companies reported using predictive AI to understand customers, compared to about one in 10 among both media and entertainment companies.

Adoption of human-centrism in CMT industries is substantial but still needs expansion



Note: Multiple responses permitted.
Response base = 1,026 CMT executives
Source: Cognizant
Figure 2

Quick Take

Creating a Human-Centered Portal

Challenge:

At a global software-as-a-service company, people were struggling to use the employee service portal due to an inconsistent user interface, fragmented information architecture and poor navigation features. The company asked us to help reimagine the portal and roll it out globally.

Solution:

We began by auditing the company's applications and hosting design-thinking workshops. Using an employee-centric approach, we then designed new service applications, centralized the platform's information, implemented better search capabilities and introduced AI-driven virtual assistants.

Outcomes:

After it was launched, the new portal quickly became a one-stop service destination for the company's more than 7,000 employees. With a better user experience and easy access to information, this new portal helped:

- I Improve employee productivity.
- I Increase employee use of self-service functions.
- I Increase employee portal usage by 81%.

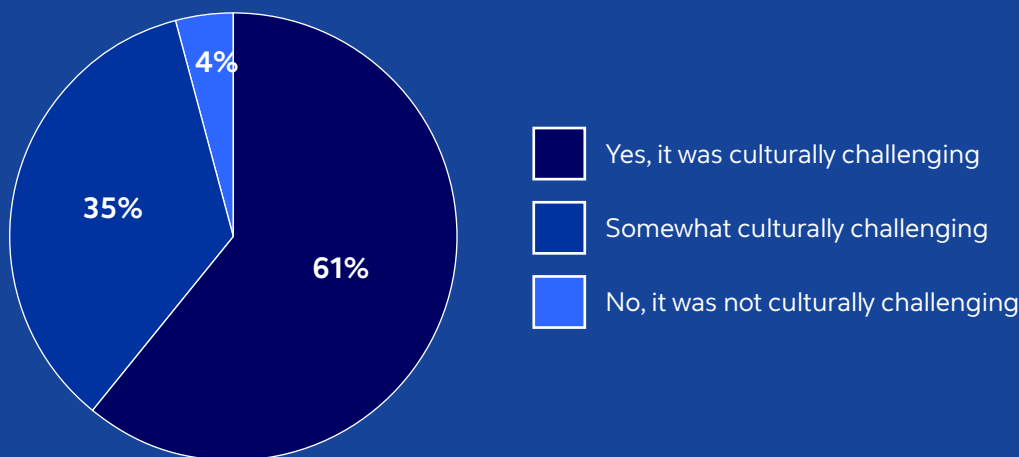
Software of the people, by the people and for the people

In effective software engineering, tools and techniques are just part of the equation. Companies also need to look at the software-development organization itself, and change it while sustaining progress – that is, do what we call “transforming while performing.”³

To build on the advantages of DevOps, Agile and outcome engineering, modern businesses will have to address critical human factors – i.e., the needs of people – to achieve the desired impact on the business. In order to create a true software-centric culture, companies need a clear vision, and an ability to influence outcomes by taking a design-thinking approach.

Culture is the root of consistently creating stand-out software products and services on a sustainable, ongoing basis. Not surprisingly, our respondents underscored its importance, yet noted difficulties in adopting new approaches that conflict with existing conventions. In fact, 96% of CMT respondents said software engineering disciplines presented challenges for their company’s culture (see Figure 3). To help overcome those challenges, we suggest that organizations focus on three vital culture-related areas: how software development teams collaborate, the approach to talent and enablers that embed the right mindset in the organization.

A move to modern software engineering poses a major cultural challenge



Response base = 798 CMT executives
Source: Cognizant
Figure 3

Mix it up: Build boundary-crossing teams

Teams are important, but “team” should be a loosely defined term, with no set number of participants – and typically, a team only grows stronger with synergistic contributions from cross-functional perspectives. Based on our experience, software development teams should include communities and pods – two groups that together foster speed, quality and innovation. At our company, for example, communities of talent come together as pods. With a goal of creating better user experiences, members collaborate to infuse technology, design and product-led thinking at every step. Using that type of model helps foster cross-functional teams that are plugged into the company’s innovation vision. (See “Intrado Expects to Free Up \$13 Million Annually Through Cloud Adoption Deployed by Pods,” next page.)

Communities transcend traditional departmental boundaries. Each community focuses on a specific area of expertise, such as robotics or machine learning. It provides a forum for skilled experts to share, grow and hone their knowledge. Pods are small, cross-functional, agile teams that perform all the tasks needed to successfully complete a given project and deliver a specific product or solution. A pod will draw on various communities to assemble the ideal combination of knowledge and expertise.

This community-and-pod model unites product design, engineering and quality assurance to foster greater collaboration and help ensure that the right expertise is available for each project.

Quick Take

Intrado Expects to Free Up \$13 Million Annually Through Cloud Adoption Deployed by Pods

Challenge:

Intrado (formerly West Corp.) builds the software that powers services sold by communications services providers, such as 911 calling, videoconferencing, call center operations and messaging. More than 200 legacy applications used different platforms, languages and middleware. Most applications depended on multiple other applications, so deploying new code took up to 12 months.

Solution:

We migrated the entire application portfolio to Pivotal Cloud Foundry – a platform-as-a-service (PaaS) solution that can be deployed on multiple public clouds. More than 60 Pivotal specialists worked in pods, first identifying application interdependencies and then transforming applications into reusable microservices.

Outcomes:

- | \$13 million of annual savings – money that can be reallocated to innovation.
- | On-demand deployment of new code, down from eight hours previously.
- | Faster time-to-market: new releases take one person-day, down from five person-years.

Read more [here](#).

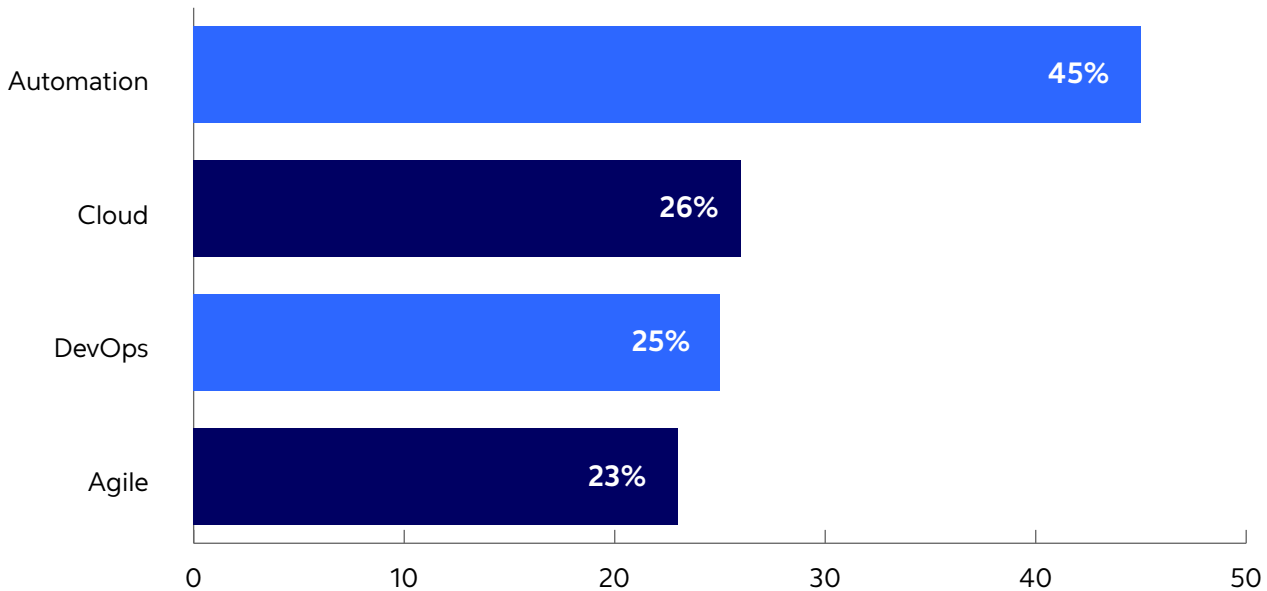
The physical space used for software development should reflect and support these new models. Companies can set up studios – facilities that bring together a variety of technology, design and business talent to work side-by-side. This environment encourages multidisciplinary collaboration, openness, creativity and idea-sharing – qualities that enable innovation and the rapid delivery of customer-focused outcomes and experiences. The studio concept can also be applied to virtual teams, which have become more important with the COVID-19 crisis, by using video meetings and collaborative tools to allow remote professionals representing various perspectives and disciplines to work together closely. To learn more, read [“Software Engineering Takes on New Meaning in the COVID-19 Pandemic.”](#)

Retool the approach to talent


Access to top talent has long been a significant hurdle for software development, and 36% of CMT executives said that a lack of adequate talent is an obstacle to effective software engineering at their companies. Talent is typically scarcest in the very areas most critical to the software-centric business, such as DevOps, cloud technology and Agile methodologies (see Figure 4).

Talent shortfalls in critical areas of software engineering

Respondents citing they had the required talent.



Response base = 773 CMT executives
Source: Cognizant
Figure 4



In a highly competitive talent market – where the demand for trained software professionals far outstrips supply – external sources of talent are not likely to be sufficient or easy to align with a company’s requirements. Companies need to strengthen their internal talent pipelines through more robust employee training and continuing education.

Going forward, CMT companies must make it a priority to find new ways to tap into and deploy software-related talent, such as creating (and promoting to their recruits) communities and learning opportunities. But in a highly competitive talent market – where the demand for trained software professionals far outstrips supply – external sources of talent are not likely to be sufficient or easy to align with a company’s requirements. Companies need to strengthen their internal talent pipelines through more robust employee training and continuing education. Overall, we recommend companies do the following:⁴

- Search for digital talent where it actually hangs out (e.g., hackathons).
- Offer robust continuous-learning opportunities to current employees.
- Celebrate agility, design thinking and creativity.
- Ensure corporate responsibility to entice young talent who expect this and crave commitment.
- Establish and cultivate community on all levels.

In the quest for digital talent, partnerships with professional services firms can offer distinct advantages. Partners can provide access to scarce skills that are hard to hire or build internally – and partner talent can support the community/pod structure.

In spite of the importance of software-related talent, many survey respondents said their organizations are not cultivating or empowering internal talent or engaging in strategic partnerships to access talent. In fact, 68% of CMT respondents said that their companies’ operations rely on external partners and contractors to support their software engineering talent pipeline.

Culture: The key to long-term success

Culture can make or break software development. Introducing the community-and-pod approach, as well as retooling the approach to talent, helps ensure a more productive workplace. But what is the nature of the right culture? While the details will be unique to each company, culture must value collaboration and partnering, as well as risk-taking that infuses a “fail fast and learn fast” mindset that encourages experimentation.

To foster the right culture, companies should establish incentives that encourage individuals and teams to experiment and innovate. Create programs that recognize and celebrate individuals and teams that contribute to product and process improvements. And provide opportunities for individuals to develop and improve themselves, fostering a personal-growth mindset.

Moreover, we suggest managing team performance across four dimensions:

- **Business impact:** Maturity measurement models can track pod delivery with tangible KPIs.
- **Rewards and incentives:** Drive retention, performance and continuous improvement.
- **Faster time-to-market:** The speed with which the team completes projects.
- **Autonomy:** Track the degree to which the team operates without unnecessary or excessive management overhead.

This comprehensive view of performance not only shapes work behavior, it also drives deeper cultural change as well.

Creating a software-centric culture can have the corollary effect of heightening company-wide awareness of the value of development. Why is that important? In our survey, an almost equal percent (~34%) of respondents from across CMT sub-verticals ranked poor perception of the business impact of software engineering as a top obstacle to implementation, and 80% said their efforts are hampered by a lack of budget. Embracing a software-centric culture that drives real business value can improve perceptions and help ensure that senior management sees software as central to business strategy. Just as important, it can provide a starting point for extending the software-centric culture beyond IT, and embedding it across the company – which can help make software a higher business priority.

Strengthening the technology foundation

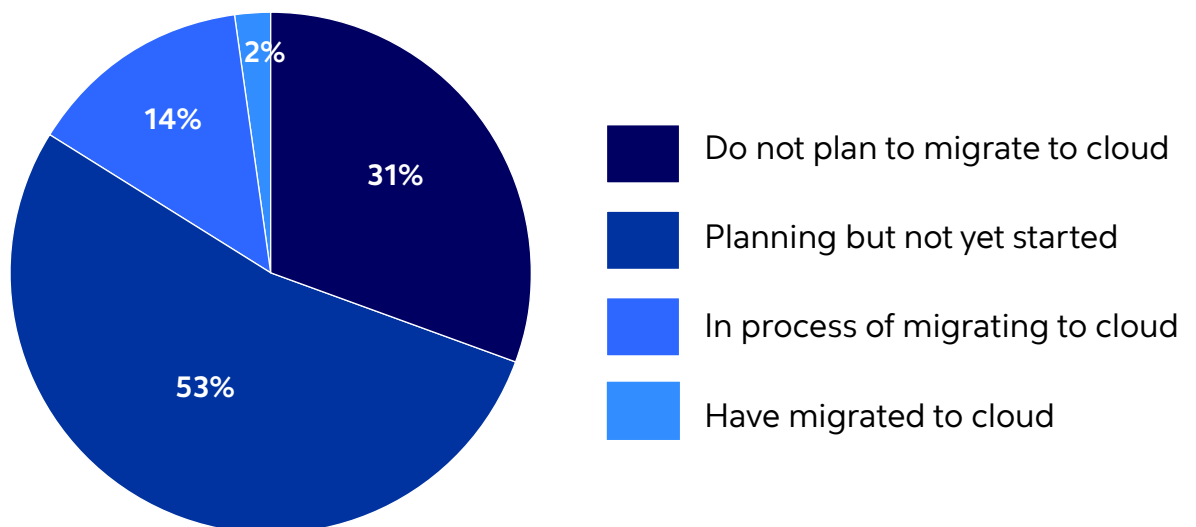
As CMT companies rethink their approach to developing customer-facing software, they will benefit by also assessing their technology foundations and modernizing their inefficient legacy applications. This will vary by company and sector. For example, “rationalize application portfolios and free-up resources” was more likely to be cited as a top benefit by communications (35%), entertainment (39%) and media (41%) companies, compared to technology companies (26%). But even technology companies – widely regarded as digital leaders – may have back-office systems, enterprise applications or monolithic systems that have been in place for two decades or more that need to be evaluated.

Legacy systems can be obstacles to further improvements in software engineering. Revamping them can enable the end-to-end linkage of customer-facing applications and the middle and back offices, which is key to the seamless delivery of superior customer experiences. It can also provide increased flexibility and help accelerate the modification and updating of existing applications, often reducing the time needed to create new functions and features from weeks to days – or less.

Legacy systems consume a large share of IT money and time. However, modernization can help reduce the total cost of ownership for those technologies. Such savings are a priority for CMT companies, and 33% of CMT respondents ranked “rationalize application portfolios and free-up resources” among the top three expected benefits of effective software engineering.

In general, CMT companies still have work to do with their technology foundations. For example, migrating systems to the cloud is a key element in the modernization of systems – and yet, only 31% of CMT respondents said their companies have migrated legacy apps to the cloud, while 54% are in the process (see Figure 5). Media companies were least likely to have completed such migration (22%), compared to 33% of entertainment and technology companies and 36% for communications.

Cloud migration at CMT enterprises is still a work-in-progress



Response base = 1,029 CMT executives
Source: Cognizant
Figure 5

Quick Take

Transforming Content Management

Challenge:

After an acquisition, a global telecommunications company needed to integrate the channel content management of two TV service providers onto one existing platform.

Solution:

We helped the company re-architect its platform into a microservices-based architecture, increasing its flexibility and scalability. The two companies used domain-driven design techniques to “decompose” the existing monolithic system into microservices, virtualized the services into containers and automated the delivery pipeline using workflow tools.

Outcomes:

The automation of deployment and testing activities saved hundreds of hours of development time, and the re-architected platform was completed in just four months. Now, with the transformed platform, the time needed to package and deploy code has been reduced by 75%.

CMT companies can begin by understanding what applications they have and using various techniques to determine whether to migrate, refactor, re-platform or reengineer systems. Often, modernization can be executed in an iterative fashion to minimize business disruption. In addition, code and apps can be generated in small, modular “chunks.” This not only speeds development, but also makes it easier to evolve and change applications over time, without having to entirely modify a large monolithic application. Essentially, this gives the company a continuous application modernization capability. (See “Transforming Content Management,” previous page.)

Modernization can also draw on accelerators such as a microservices development accelerator; and DevOps tools that can generate a 40% savings in effort in some cases, as we’ve experienced with our solution. Application portfolio mapping tools can automatically interrogate each company application – from mainframe apps to end points – and assess performance, usage and business impact. And an intelligent acceleration platform for application cloud transformation can be used to perform an automated cloud readiness assessment, share remediation templates and transformation recipes, etc. With these various insights, from both top-down and bottom-up perspectives, companies can more easily construct a roadmap directing which functionalities to switch off and which to leave in place.

The time is now

As CMT companies move forward, they will need to think in terms of transforming while performing – that is, keeping the business running while simultaneously reshaping software engineering. To do so, they can focus on individual projects and initiatives, and then gradually expand new thinking and approaches across the organization. And they should view this transformation not as a one-time event, but rather as an ongoing effort in an era of constant change.

Across both greenfield development initiatives and application/product modernization, we are seeing CMT companies focus on the following five key areas, listed in descending order of priority:

1. Application/product re-platforming/refactoring.
2. Data monetization programs.
3. Products and platform development.
4. Human insights and experience-driven systems.
5. End-to-end business transformation.



The right culture, instilled across the company, will help ensure that effective software development is a deeply embedded capability that enables continuous and sustainable innovation applied with agility and speed, in lockstep with evolving technologies and customer expectations.

New tools and technologies will be important, but the key to success will be the creation of a business, customer and software-focused culture. The right culture, instilled across the company, will help ensure that effective software development is a deeply embedded capability that enables continuous and sustainable innovation applied with agility and speed, in lockstep with evolving technologies and customer expectations.

Transforming the organization to support the software-centric business is no small challenge. Getting started now is essential to remaining relevant in the dynamic digital economy. Those companies that resist implementing the required changes to their mindset, organizational structures and technologies across the software engineering landscape will risk falling ever further behind their more innovative challengers.

Methodology

We surveyed 1,026 business and technology leaders across North America, Europe and Asia-Pacific in mid-2019 to understand their thinking around software engineering, both building cloud-native applications and transforming legacy environments, to operate in the modern digital world. We then applied our views of software engineering in a post-COVID-19 world drawn from our “[Becoming a Software-Centric Business](#)” white paper that was published in May 2020.

Survey respondents included primarily C-suite executives and vice presidents (55%), and directors and senior managers (45%) across the media, entertainment, communications and technology industries.

Endnotes

- ¹ We recognize there are significant differences between communications, media and entertainment, and technology companies, and even among their sub-industries. However, for simplicity, this report will refer to companies within this combined set of industries as CMT.
- ² Capers Jones, “The Mess of Software Metrics,” Vol. 9.0, March 8, 2017, https://www.ppi-int.com/wp-content/uploads/2018/02/The-Mess-of-Software-Metrics_Jones-C_2017.pdf.
- ³ Andres Angelani, *Transforming While Performing: How to Create a Culture of Innovation with Partners*, Roundtree Press, 2019.
- ⁴ From “Four Ways to Fill the Digital Talent Void” blog by Allen Shaheen, <https://digitally.cognizant.com/four-ways-to-fill-the-digital-talent-void-codex5268/>.

About the author



Badhrinath Krishnamoorthy

Markets Leader, Cognizant Digital Business

Badhrinath Krishnamoorthy (Badhri) is a Markets Leader in Cognizant Digital Business and is responsible for communications, media, education and technology (high-tech, software and online) industries. In this role, his charter includes driving successful business model changes that clients need to create and sustain their digital transformation imperatives. Badhri partners with strategic business and technology leaders in driving business value by embracing digital technologies and solutions. He manages

Cognizant's AI & Analytics, Interactive and Digital Engineering business units and brings in a human-centered, AI-first view to the business problems clients face in growing their markets with differentiated experiences and solutions. Badhri can be reached at Badhrinath.Krishnamoorthy@cognizant.com | www.linkedin.com/in/badhrinathkrishnamoorthy/.

Cognizant Digital Business

We help clients build digital businesses and innovate products that create new value — by using sensing, insights, software and experience to deliver on what customers demand in the digital age. Through IoT we connect the digital and physical worlds to make smart, efficient and safe products, operations and enterprises. Leveraging data, analytics and AI we drive intelligent decisions and anticipate where markets and customers are going next. Then we use those insights, combining design and software to deliver the experiences that consumers expect of their brands. Learn more about how we're engineering the modern enterprise at cognizant.com/digitalbusiness.

About Cognizant

Cognizant (Nasdaq-100: CTSH) is one of the world's leading professional services companies, transforming clients' business, operating and technology models for the digital era. Our unique industry-based, consultative approach helps clients envision, build and run more innovative and efficient businesses. Headquartered in the U.S., Cognizant is ranked 194 on the Fortune 500 and is consistently listed among the most admired companies in the world. Learn how Cognizant helps clients lead with digital at www.cognizant.com or follow us [@Cognizant](https://twitter.com/Cognizant).



World Headquarters

500 Frank W. Burr Blvd.
Teaneck, NJ 07666 USA
Phone: +1 201 801 0233
Fax: +1 201 801 0243
Toll Free: +1 888 937 3277

European Headquarters

1 Kingdom Street
Paddington Central
London W2 6BD England
Phone: +44 (0) 20 7297 7600
Fax: +44 (0) 20 7121 0102

India Operations Headquarters

#5/535 Old Mahabalipuram Road
Okkiyam Pettai, Thoraipakkam
Chennai, 600 096 India
Phone: +91 (0) 44 4209 6000
Fax: +91 (0) 44 4209 6060

APAC Headquarters

1 Changi Business Park Crescent,
Plaza 8@CBP # 07-04/05/06,
Tower A, Singapore 486025
Phone: + 65 6812 4051
Fax: + 65 6324 4051