



**BUILDING A  
SOLID FOUNDATION  
FOR YOUR  
DEVOPS TRANSFORMATION**

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**W**ith technology transformations driving innovation in every industry, and DevOps lighting up conversations from engineers to the executive suite, the days of thinking IT doesn't matter are decidedly gone. [1] This new wave of doing business is shaking up the world because it touches every industry vertical—retail, banking, finance, government, and, of course, technology. Almost every company today is a software company, and every software company is in a race to keep up with the demand for innovation.

## The Emergence of DevOps

Today's marketplace demands a crushing pace for those who want to not merely survive but to win. Never before has there been such pressure to deliver quality software solutions so quickly. Customers expect innovation and excellence, and if they don't find it from you, they will move on. Competition is fierce with new businesses entering the market regularly and existing competitors continually improving their own products to keep pace.

Software is at risk in ways that manufacturing and retail never were. Security threats and vulnerabilities from faraway actors require fast responses and updates. Legal and regulatory policies may require updates to software and IT infrastructure. The ability to deliver quality software with speed requires a huge shift in the way technology is managed throughout any organization. DevOps is making this transformation possible.

DevOps is a revolutionary change in the way technology is developed and software is delivered. In contrast to the model where technology has been a separate component that was purchased or outsourced and then plugged into an organization, DevOps is a full value-chain activity that involves a number of roles, including a business champion, engineers, testers, and IT operations. These cross-functional teams allow rapid development that delivers business value, but DevOps also requires drastic changes to the way work is done. This shift is similar to the changes seen in lean and Toyota manufacturing methods, emphasizing not only technology and tooling but also process and culture.

## Technology, Process, and Culture

Too often, I see organizations implement their own tech transformation in the prescribed order of technology, process, and then culture. They focus on technology first because it's the shiny new toy to play with or because it's the easy problem to fix (just write a check). Update the tech stack (LAMP or ELK), use the hot new thing (containers), and we're bound to be successful, right?

Organizations usually set their sights on improving the process. They organize key players to implement new processes: Do A, then B, then C. They roll out agile and have stand-up meetings instead of the traditional, long-winded sit-down meetings. If they're lucky, they get around to culture.

But this ignores the truism that DevOps experts and practitioners have been preaching for years: You must also have the right culture. Without a supportive culture, the technology starts to fail, and the process will collapse. Just as the classic

Roman arch crumbles without the keystone at the top, technological changes—especially those as ambitious and transformative as DevOps—falter and fail without a solid, supportive culture with which to anchor the work.

Many cite Etsy as a prime example of what DevOps culture should look like. According to Etsy's engineering management, getting the culture right was key to the company's IT transformation from good to great. [2] Amazon is another company known for DevOps excellence. Greg Linden, the developer who designed the shopping cart recommender, said, "I think building this culture is the key to innovation. Creativity must flow from everywhere.

Whether you are a summer intern or the CTO, any good idea must be able to seek an objective test, preferably a test that exposes the idea to real customers. Everyone must be able to experiment, learn, and iterate." [3]

## Is Culture Really Transformative?

Stories are powerful, and anecdotes about the importance of culture abound. We can see in the data the critical role that culture plays in DevOps transformations. I have studied the effects of cultural and environmental factors on technology for almost a decade, and for the past three years, I have been the lead investigator on the Puppet Labs annual State of DevOps Report. [4, 5, 6]

These are the largest studies of DevOps practices and impacts to date, collecting more than twenty-five thousand survey responses from DevOps professionals representing more than a thousand organizations in hundreds of countries and dozens of industry verticals. The data show that culture has an impact not only on IT performance but also on overall organizational performance. So, what do we mean by *culture*? Basically, culture is what it feels like to work in your company and on your teams. It includes your thoughts and emotions, and it influences the actions you take. It lets you know what you can expect from your colleagues.

In the State of DevOps studies, we developed an assessment of culture based on research done by Ron Westrum, who found that cultures high in trust and information flow are predictive of performance outcomes, particularly in complex, high-risk work environments like health care and aviation. Westrum's work is especially interesting because it tells us what happens when things go wrong. [7] As technology professionals, we know that can happen quite often.

Although Westrum's cultural framework hadn't been tested in DevOps or technology environments, we knew software development was complex and high-risk, prone to errors and failures. True to our hypotheses, we found similar patterns that cultures fostering information flow and trust drive performance. Westrum classifies organizational culture into generative, bureaucratic, and pathological groups. In our own study, 33 percent of survey respondents reported working in a generative (high-trust) culture. This group had the highest IT performance outcomes.

Only 15 percent of survey respondents reported working in a pathological (command-and-control) culture, and they saw the lowest IT performance outcomes. By far the largest number,

52 percent, of respondents reported working in the middle environment, the bureaucratic (rule-oriented) culture, which saw moderate IT performance outcomes.

Table 1 shows the importance of cooperation, sharing risks, failure leading to learning, and embracing novelty among the different culture groups. The results from our State of DevOps studies lined up with Westrum’s framework of how culture influences performance outcomes. Where do your team and organization fall?

## How Culture Impacts Team Effectiveness

An analysis from Google’s People Operations team (the mega company’s version of HR) highlights the importance of culture in team effectiveness. [8] When the research team initially started interviewing employees, they expected to find some magical mix of individual traits and skills necessary for assembling a dream team.

What the tech giant found instead was that high-performing teams are driven less by who is on the team and more by a team culture that fosters communication, structure, and meaningfulness in the work. And the most important aspect of this team culture? Psychological safety. This essential ingredient refers to the trust between members to take risks in their work and be vulnerable around each other. Google’s thoughts on culture are similar to the generative culture in table 1.

Although many in tech may be surprised that culture is that important and teams matter more than individuals, Toyota knew it years ago, based on its manufacturing process that focuses on continuous improvement and efficiency. Toyota’s success was enabled by fostering a culture of trust, teamwork, and improvement through all levels of the organization. Perhaps the clearest example of the effect of culture on performance

from Toyota lies in the story of the NUMMI automotive plant.

In 1984, GM and Toyota opened a joint venture called New United Motor Manufacturing Inc. (NUMMI) on the site of the former General Motors Fremont assembly plant. Historically, this manufacturing plant was infamous for poor quality and assembly line workers who exhibited bad behavior while on shift. As a part of this new joint venture, Toyota was convinced to hire most of the prior GM workforce—the same workforce that did such abysmal work.

Several of these workers were sent to Toyota City in Japan to learn the Toyota Production System, and they returned to NUMMI armed with a new way of working and immersed in the Toyota work culture. On site, they passed on their new knowledge—of both the production system and the culture—to their colleagues. Within months, the first car rolled off the production line, and the NUMMI plant was producing cars with the same quality and low defect rates as those seen in Japan.

It was the same workers, just operating within a different culture. What caused such a change in the NUMMI workers? Toyota’s manufacturing process made it safe to ask for help when things went wrong. If any work could not be completed in an allotted amount of time, the worker rang a bell, which resulted in a manager coming to help solve the problem. If another specified amount of time passed and the problem was still not resolved, the andon cord was pulled, stopping the entire production line.

During this time, key players swarmed around the problem to troubleshoot. What could improve the work? Could a tool’s design be modified? Could a process somewhere else along the line be changed? The shared vision and collaboration at Toyota were so complete that even upstream suppliers were willing to modify the design of their parts to improve the process.

<b>Pathological</b> <i>Power-oriented</i>	<b>Bureaucratic</b> <i>Rule-oriented</i>	<b>Generative</b> <i>Performance-oriented</i>
Low cooperation	Modest cooperation	High cooperation
Messengers shot	Messengers neglected	Messengers trained
Responsibilities shirked	Narrow responsibilities	Risks are shared
Bridging discouraged	Bridging tolerated	Bridging encouraged
Failure leads to scapegoating	Failure leads to justice	Failure leads to inquiry
Novelty crushed	Novelty leads to problems	Novelty implemented

Table 1: The three groups of organizational culture (according to Westrum)

## The Right Culture Benefits Performance

The Toyota example shows us a culture of trust, teamwork, and improvement. Trust—that asking for help will be met with assistance, not with blame or punishment for failure to complete a task on time. Teamwork—centered around solving problems together with key players within the company. Improvement—of the parts and process whenever the work deviates from the plan. And beyond this, a culture of continued improvement, because all team members knew the end goal was producing a quality car. In fact, Toyota welcomed visitors to its production plants and had no concerns when they took copious notes about Toyota's processes. Because it wasn't the process that brought a competitive advantage; it was the culture. This is the power of culture with performance.

Of course, technology is important as well. Effecting rapid change is easier on a greenfield project, starting out with new technology and without the constraints of prior work, than on legacy systems. But don't let an old technology hold you back if that is where you find yourself. A trusting culture with good information flow that prioritizes safety in teams can make even legacy or hard technology an innovative and exciting place to be.

A great example is the work of Gary Gruver and his colleagues who worked at Hewlett-Packard on the HP LaserJet. [9]

The team was able to implement DevOps in firmware and see marked increases in efficiency, freeing up time and giving the team eight times the capacity for innovation. This transformation relied on a culture change that prioritized quality collaboration. Similar to the Toyota way, the team stopped all work when something broke a build. This approach enabled collaboration and information flow to solve problems early.

## Make a Cultural Move in Your Organization

What can you do? Let's reference the Westrum framework for some clues. As an IT leader, you can create and support cross-functional teams to support high cooperation. As a team member, you can do your part to reach out to your peers, both inside your own team and across teams.

Conducting blameless postmortems following an outage or failure is also a highly cited best practice in the DevOps community, and for good reason. This positive style of handling postmortems supports two important areas of the Westrum framework: training the messenger and failure leading to inquiry.

Technology transformations are undertaken because of the exciting rewards they can offer, but all change introduces risk. As organizations and teams transform, these risks and responsibilities should be shared. This implies that all of us should take ownership of things like quality, availability, reliability, and security. Start conversations about aspects of technical work that are overarching and that everyone can contribute to. When Westrum encourages bridging, this is the essence of DevOps. In other words, look for any excuse to break down silos in your work.

Finally, implement novelty by encouraging experimentation and making it safe to fail on new ideas that could bring value

to the work.

Armed with these tools and techniques, you can improve and support your own culture. With an open, collaborative culture providing a solid foundation for your tech transformation, you can drive innovation and provide real value to your business and your customers. {end}

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Notes

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■ References