

# Infrastructure Automation Maturity Model



# TABLE OF CONTENTS

Intro	3
Infrastructure Automation Maturity Model	4
Infrastructure Level 1 - Ad-hoc	5
Infrastructure Level 2 - Automated	6
Infrastructure Level 3 - Frictionless	7
Infrastructure Level 4 - Lifecycle	8
Infrastructure Level 5 - Self-Defining	9
Using the Maturity model and next steps	10
About the Author/About Quali	10
Automation Maturity Model Quick Guide	11

# DevOps tools play a critical role in the delivery of software application services to businesses.

Effective use of DevOps tools throughout the software delivery lifecycle enables organizations to respond to business requirements and deliver change faster with greater agility.

While DevOps objectives and value are understood, the way they are delivered differs from company to company, organization to organization, and team to team. The ideal DevOps state is acknowledged, but the reality for enterprise organizations is that one size does not fit all.

Application architectures and business use cases always determine the IT stack required to support them and how they are managed. The result is a highly diverse set of IT infrastructure that is used to support applications and the tools to deliver and manage them.

This situation is exacerbated by freedom of choice. Infrastructure and tools differ between DevOps teams and throughout the software delivery lifecycle. Teams gain significant execution efficiencies when they are able to choose their own tools. However, for enterprises seeking to mature their DevOps practices, this choice also creates significant scale issues especially concerning costs, skills, and IT complexity.

To address this, long established enterprise thinking of standardizing infrastructure and tools is regarded as a logical answer. This approach is difficult as it requires agreement on common objectives which takes significant time, effort, cost, control, and most importantly, a change in culture. For many enterprises with highly distributed business structures,

standardization can only be achieved in logical areas or locations.

Solutions to scaling DevOps that introduce process bottlenecks, impede change, inhibit innovation, slow business growth, and prevent competitive differentiation are not going to work. The answer is enabling DevOps to mature naturally, allowing teams to focus on increasing business value. This is enabled through the adoption of modern management platforms that allow infrastructure and tools choices to be made while ensuring DevOps scale is managed and controlled without limitations.

To guide this approach, Quali has developed the Infrastructure Automation Maturity Model™. Each level in the model describes infrastructure automation value and the drivers, changes, and requirements to move to the higher maturity levels.

IT leaders and DevOps practitioners should use the Infrastructure Automation Maturity Model™ to assess their positioning and plot a strategy for sequential improvement by investing in the platforms and tools.

The Infrastructure Automation Maturity Model™ provides enterprises a DevOps path that answers the following questions:

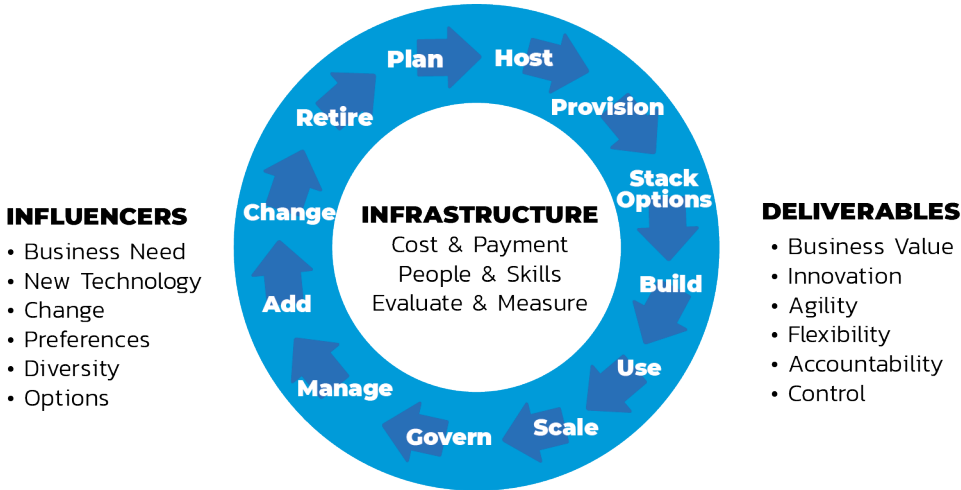
- How do enterprise organizations scale and evolve their DevOps practices, and how will they be exploited to achieve software development excellence?
- How will enterprise organizations define their software delivery processes and measure them against business value?

# INFRASTRUCTURE AUTOMATION MATURITY MODEL™

The Infrastructure Automation Maturity Model™ is built around real-world factors to ensure each level can be accurately assessed and measured. This includes the following assumptions:

1. Applications determine the infrastructure and tools requirements
2. Teams use whatever they want to deliver the product objectives
3. Change is constant throughout the DevOps lifecycle
4. Skills will differ between teams and throughout each DevOps process
5. Infrastructure complexity will continue to increase
6. Lifecycle means continuous delivery and planning to end-of-life

Infrastructure management includes every activity required to deliver and manage infrastructure throughout the entire lifecycle. The lifecycle is influenced by a number of factors and is measured against required deliverables.



## Infrastructure Automation LIFECYCLE

The Infrastructure Automation Maturity Model™ describes the attributes of four areas: culture, people, process, and technology. Each area is grouped with maturity progress against five levels of maturity: ad-hoc, automated, frictionless, lifecycle, and self-defining. Lastly, the end-to-end view of the 5-level model covers three maturity time zones. The time zones reflect the current, emerging, and horizon states.

# INFRASTRUCTURE LEVEL 1 - AD-HOC

At Level 1, the enterprise infrastructure is a mix of old and new technology. The IT organization is large, fragmented, and managing different parts of the infrastructure stack and flavors of infrastructure within each stack layer (e.g., servers, physical & virtual, on premise and cloud). IT teams are highly siloed with skills focused on domain areas including planning, development, testing, release, operations, and support. The provisioning of the infrastructure is accomplished using multiple methods and tools requiring highly-skilled personnel. Infrastructure change can take time, create risk, and impact business services with increased change velocity—creating significant challenges.

## LEVEL 1. Infrastructure challenges that need addressing:

1. The rapid build of infrastructure (on premise/cloud)
2. Teams use their tools with shareable content, reporting, and control
3. Rapid change management promoting collaboration and mitigating creation/change risk
4. Out-of-the-box support for the entire compute, network, storage, and software infrastructure stack
5. Existing methods and point tools evaluated with weaknesses identified and replaced to reduce complexity, optimize cost, and reduce risk

## Infrastructure challenges driving maturity from Level 1:

1. Execution speed
2. Establishing product teams
3. Agile adoption
4. Infrastructure diversity
5. Automating & integrating tools

Infrastructure Level 1 AD-HOC	
<b>CULTURE</b>	<ul style="list-style-type: none"><li>• Uncommunicated objectives</li><li>• Infrastructure assumed</li><li>• Blind to complexity and cost</li></ul>
<b>PROCESS</b>	<ul style="list-style-type: none"><li>• Skilled practitioners</li><li>• Domain/function focus</li><li>• Measured against activity</li></ul>
<b>PEOPLE</b>	<ul style="list-style-type: none"><li>• Project to product</li><li>• Manual activities</li><li>• Manual create &amp; configure</li></ul>
<b>TECHNOLOGY</b>	<ul style="list-style-type: none"><li>• Script-based tooling</li><li>• Manual activities</li><li>• Non-integrated</li></ul>

# INFRASTRUCTURE LEVEL 2 - AUTOMATED

At Level 2, the enterprise infrastructure remains a mix of new and old infrastructure stacks, however, cloud is rapidly adopted across the organization with agility and speed driving DevOps practices to deliver change and new IT digital services to the business as efficiently as possible. The IT organization remains large and fragmented due to the need to support legacy and new application architectures and business services. At this level, DevOps is emerging in different parts of the enterprise and teams are exercising their freedom of choice for infrastructure and tooling. This creates massive IT infrastructure diversity and an increasing demand for highly-skilled personnel.

### Level 2. Infrastructure challenges that need addressing:

1. Intuitive interfaces, simple infrastructure visuals, guided execution and integration with command-level tools ensure all personnel at all skill levels can rapidly create and manage the infrastructure
2. Cloud infrastructure costs captured and reported in real time ensures budgets are met and expenditures managed
3. Infrastructure platform needs to provide out-of-the-box integration with all infrastructure layers, in all locations, and with infrastructure task execution automated to ensure additional workloads are scaled easily with full control
4. Infrastructures created as code, managed by all DevOps team members at the level they need, in line with their skill level and infrastructure requirements
5. Guardrails, intuitive interfaces, access controls, permissions, secure full-stack integration, and automated lifecycle governance from creation to retirement ensure risk is mitigated and managed

### Infrastructure challenges driving maturity from Level 2:

1. Scale (skills, complexity)
2. Unplanned costs (cloud)
3. Increased workloads
4. Increasing skills & complexity
5. Execution risk

Infrastructure Level 2 <b>AUTOMATED</b>	
<b>CULTURE</b>	<ul style="list-style-type: none"> <li>• Reduce complexity</li> <li>• Reduce execution time</li> <li>• Remove manual activity</li> </ul>
<b>PROCESS</b>	<ul style="list-style-type: none"> <li>• Highly-skilled practitioners</li> <li>• Teams with broader functions</li> <li>• Measured against throughput</li> </ul>
<b>PEOPLE</b>	<ul style="list-style-type: none"> <li>• DevOps/shift-left established</li> <li>• Mixed/Hybrid Clouds</li> <li>• Silo process activity delivery</li> </ul>
<b>TECHNOLOGY</b>	<ul style="list-style-type: none"> <li>• Sophisticated/custom</li> <li>• Team automation &amp; integration</li> <li>• Tools choice freedom</li> </ul>

# INFRASTRUCTURE LEVEL 3 - FRICTIONLESS

At Level 3, enterprises are driven by the need to deliver rapid changes while ensuring risk is managed. Optimization becomes a key initiative. The need to standardize, reduce complexity, and gain visibility into costs must be addressed to understand how to measure DevOps activities and value to the business. Without a control over infrastructure complexity, there are significant impacts to an enterprise's ability to scale. Too many tools, too much time wasted, risks associated with change, and the ongoing need to hire scarce and high-cost skilled personnel take a toll and require a solution that makes the infrastructure invisible—easily and safely created, delivered and used without it being intrusive and detrimental to execution.

## LEVEL 3. Infrastructure challenges that need addressing:

1. Each infrastructure instance created on-demand by a team or team member ensuring it's associated with an owner, delivered and governed without human interaction—delivering a safe “create and forget” capability
2. Change accomplished with minimum effort and risk ensuring DevOps teams can focus on their role priorities and not on the complexities associated with managing the infrastructure
3. Infrastructure modeling ensures the infrastructure lifecycle is automatically managed whether for one stage of a DevOps process or shared across the entire DevOps lifecycle
4. Infrastructure usage and state are managed, ensuring they are optimized and automatically removed when no longer needed, saving effort and cost
5. Critical business infrastructures understood and managed with the same simplicity as smaller lab, test, or development environments

## Infrastructure challenges driving maturity from Level 3:

1. Accountability & governance
2. Infrastructure & DevOps infrastructure change
3. Infrastructure lifecycle management
4. Resource optimization
5. Infrastructure change priorities

Infrastructure Level 3 FRICTIONLESS	
CULTURE	<ul style="list-style-type: none"><li>• Self-service without risk</li><li>• Increasing workloads</li><li>• Change instances managed</li></ul>
PROCESS	<ul style="list-style-type: none"><li>• Skills focused where needed</li><li>• Skills optimized and leveraged</li><li>• Measured against productivity</li></ul>
PEOPLE	<ul style="list-style-type: none"><li>• DevOps scaled and optimized</li><li>• Full stack process managed</li><li>• End-to-end process visibility</li></ul>
TECHNOLOGY	<ul style="list-style-type: none"><li>• Low/no touch requirement</li><li>• Infrastructure agnostic at scale</li><li>• Intuitive simple UX</li></ul>

# INFRASTRUCTURE LEVEL 4 - LIFECYCLE

Modern software development practices must be used with full governance, security, and change control. Innovation remains a primary objective but not at the expense of cost and negative impacts to the business and company reputation. Infrastructures must be optimized, hardened (reliable/proven), controlled, and accountable to the value delivered. Infrastructures are managed holistically end-to-end, from plan to production and not a fragmented practice split across each DevOps team function. Efficient infrastructure management becomes a business differentiator.

## LEVEL 4. Infrastructure challenges that need addressing:

1. Infrastructure lifecycle costs are understood, controlled, and managed in line with budget and expected ROI
2. Business value created by ensuring the end-to-end DevOps lifecycle infrastructure management delivers to the business what was planned at the beginning of the process
3. An established single source of truth for infrastructure control allows each DevOps team or team member to leverage the infrastructure throughout the process
4. DevOps teams understand and leverage other DevOps teams infrastructure models delivered at scale saving time, effort, and cost
  - Infrastructures in the Dev side automatically *moved* safely to the Ops side, significantly reducing the gap and time between 'commit' and production
6. The library of proven/active infrastructure models (blueprints) combined with the data on usage and results allows infrastructures delivered to be trusted, known and proven

## Infrastructure challenges driving maturity from Level 4:

1. Cost transparent & managed
2. Infrastructure value to business
3. Organizational priorities
4. Infrastructure real-time observability
5. Infrastructure change prediction

### Infrastructure Level 4 LIFECYCLE

<b>CULTURE</b>	<ul style="list-style-type: none"> <li>• Governance required</li> <li>• Accountability measured</li> <li>• End-to-end change managed</li> </ul>
<b>PROCESS</b>	<ul style="list-style-type: none"> <li>• Cross-team prioritization</li> <li>• Cross-team optimization</li> <li>• Measured against outputs</li> </ul>
<b>PEOPLE</b>	<ul style="list-style-type: none"> <li>• DevSec Ops &amp; Dev Value Streams</li> <li>• End-to-end execution &amp; visibility</li> <li>• Infra. &amp; DevOps infra. lifecycle mgt.</li> </ul>
<b>TECHNOLOGY</b>	<ul style="list-style-type: none"> <li>• End-to-end management platform</li> <li>• Integrated/automated change</li> <li>• End-to-end change &amp; risk mgd.</li> </ul>



# INFRASTRUCTURE LEVEL 5 - SELF-DEFINING

Modern Infrastructure as Code architectures are intelligent, providing support to the business through constant evaluation, automatic enhancements, and cost-effective use with continual feedback showing business value. The management of the infrastructure no longer requires highly-skilled resources and is treated as a high-scale, end-to-end subliminal activity supporting and enhancing the software delivery value streams.

## LEVEL 5. Infrastructure challenges that need addressing:

1. Infrastructure provisioned and managed as defined by the application (infrastructure added, changed, tracked, and removed dynamically and upon instruction)
2. Infrastructure adapts in line with application use (performance, capacity, location, cost)
3. Infrastructure as Code mesh supporting many highly distributed, business application architectures, changing the infrastructure as usage dictates
4. Using data collected and analyzed by the infrastructure automation platform, dynamic changes are recommended or automatically made in support of infrastructure optimization, performance, cost, and efficiency
5. Infrastructure usage data collected and analyzed with changes automatically made to the library of infrastructure models (blueprints) ensuring continuous infrastructure improvements are made to deliver immediate benefits to the business

## Infrastructure challenges driving maturity from Level 5:

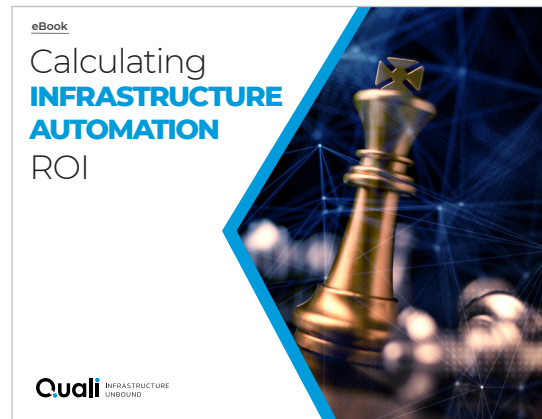
1. Application change-driven infrastructure
2. Usage dynamically adapted
3. Dynamic enterprise optimization
4. Environment delivered not developed
5. Continuous feedback/improvement

Infrastructure Level 5 <b>SELF-DEFINING</b>	
<b>CULTURE</b>	<ul style="list-style-type: none"><li>• Costs managed</li><li>• Business outcome measured</li><li>• Complete observability</li></ul>
<b>PROCESS</b>	<ul style="list-style-type: none"><li>• Business-driven contribution</li><li>• Cross-team business priorities</li><li>• Measured against outcomes</li></ul>
<b>PEOPLE</b>	<ul style="list-style-type: none"><li>• Business Value Streams</li><li>• End-to-end value context</li><li>• Seamless DevOps/infra process</li></ul>
<b>TECHNOLOGY</b>	<ul style="list-style-type: none"><li>• Dynamic lifecycle</li><li>• Intelligent predictive change</li><li>• Single source of truth</li></ul>

# USING THE MATURITY MODEL AND NEXT STEPS -

## Infrastructure challenges that need addressing:

1. **Create** an infrastructure management strategy
2. **Understand** current IT infrastructure practices and how they enable, challenge or inhibit current and future IT and business objectives
3. **Assess** how infrastructure is managed and map it against an established desired state
4. **Establish** a maturity path that meets the needs of applications today and into the future
5. **Measure** progress and make decisions against the strategic infrastructure management objectives



## ABOUT THE AUTHOR:

### David Williams | VP Product Strategy, Quali



David Williams leads Quali's Product Strategy and brings with him extensive experience successfully establishing, focusing and growing start-ups. David possesses exceptional managerial abilities, be it in handling small, dedicated teams or large distributed teams. Apart from growing revenues for established IT companies, David has had diverse experience in Product Management and Marketing. With over two hundred research papers and published articles, David has delivered numerous keynotes and presentations at leading industry events worldwide, on a wide range of IT management subjects.



Quali provides the leading platform for Infrastructure Automation at Scale. Global 2000 enterprises and innovators everywhere rely on Quali's award-winning CloudShell and Torque platforms to create self-service, on-demand automation solutions that increase engineering productivity, cut cloud costs, and optimize infrastructure utilization.

Learn more at [QUALI.com](https://QUALI.com)

## INFRASTRUCTURE LEVELS QUICK GUIDE

### Infrastructure Level 2 AUTOMATED

<b>CULTURE</b>	<ul style="list-style-type: none"> <li>Reduce complexity</li> <li>Reduce execution time</li> <li>Remove manual activity</li> </ul>
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