While there’s not a clear, standard progression, we’ve observed a broad evolution in the way that IT operations is being conducted in organizations that are adopting cloud-native technologies. Fading from view are traditional, ITIL-based models; in their place is a transition through an awkward phase of tool sprawl and poorly performing apps to a model that’s still evolving and includes centralizing some monitoring functions. Given the key role that apps and services play in so many businesses, we anticipate more focus on ensuring that operations functions smoothly, so that apps and services can deliver the level of performance that users demand.
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Prior to joining 451 Research, Nancy was Editor in Chief of the enterprise IT publications at Fierce Markets. She launched the DevOps publication, setting the editorial direction for the new coverage area, and oversaw seven publications aimed at senior enterprise IT executives.

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2. Software Drives Business

An evolution of the function of monitoring has occurred concurrently with the adoption of new technologies, such as cloud and containers, as well as new development and team organizational approaches, such as agile and DevOps. Broadly speaking, this evolution is directly related to digital transformation, as software agility becomes a key driver of success for businesses of all sizes and sectors. Ninety-seven percent of IT decision-makers responding to our recent *Voice of the Enterprise: Digital Pulse, Workloads & Key Projects 2019* survey say that they are either underway or planning to see digital transformation progress in the next 24 months, meaning virtually all organizations that we surveyed are on the digital transformation road.

In turn, the performance of applications and services grows even more important – particularly as fickle end users have no qualms about switching to another provider or brand due to a poor user experience. In a recent 451 Research Voice of the Connected User Landscape survey, 79% of respondents are somewhat or very likely to switch brands or providers as a result of poor app or service performance, with only 21% saying they are somewhat or very unlikely to switch as a result of slow, buggy or unavailable apps or services.

To better serve the needs of customers by adding new capabilities and features quickly, businesses are reorganizing, evolving business models, adopting new methodologies and embracing new IT technologies. However, virtually all these new developments have a material impact on IT monitoring and performance. For instance, we’ve heard from many organizations that saw a dip in application performance correlated with adoption of DevOps. There are several possible reasons for this performance hit, including monitoring applied to new applications being essentially an afterthought, the use of existing monitoring tools that didn’t well-serve new technologies employed in the applications, the lack of expertise around monitoring new technologies and monitoring tool sprawl.
Some of the new technologies that businesses are embracing to build their apps – including containers, serverless environments and orchestration tools – abstract infrastructure and software that operators have traditionally had under their control. We think of these technologies as falling along a spectrum of abstraction (see Figure 3).

Many organizations struggle with either a perceived or a real lack of control over these environments, as well as poorer levels of visibility than they’re accustomed to, in part because abstract systems often control access to those systems in ways that may limit collection of IT ops data, and thus visibility. Organizations that fail to develop a monitoring and operations strategy alongside the adoption of these technologies will suffer through poor visibility and ultimately poor service performance.

We recognize a positive trend whereby IT stakeholders have recognized the gaps in their approach to operations and have begun implementing new approaches aimed at closing those gaps. For instance, modern organizations designate a team that centrally manages monitoring tools and offers them as a service to DevOps teams, thereby avoiding the problems associated with tool sprawl and enabling a centralized view of application performance. While the evolution of IT ops continues, with best practices not yet fully established, approaches like these are proving beneficial. In addition, vendors are recognizing the demand for visibility into abstracted systems and they are developing novel approaches to monitoring environments such as serverless systems and Kubernetes.
The 451 Research IT Ops Maturity Model is geared primarily toward enterprises and those that are adopting cloud-native technologies. Some sectors, like government agencies, or specific enterprises may choose not to adopt cloud-native technologies, but they may still embrace modern operations practices and technologies. Thus, such sectors may follow the progression we describe in terms of tools and organizational models, but do so based on different drivers than we describe in our model.
3. The Four Phases of IT Ops

Figure 4: The IT Ops Evolution
Source: 451 Research, 2019

- **Traditional**: Ops teams, development teams
- **Maturing**: DevOps teams, development teams, Ops teams
- **Modern**: SREs, observability engineers, DevOps
- **Future**: SREs, automation engineers, DevOps

<table>
<thead>
<tr>
<th>App performance</th>
<th>Number of tools</th>
<th>Level of Abstraction</th>
</tr>
</thead>
</table>

**Report Excerpt**

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### Figure 8: IT Ops Maturity Model
*Source: 451 Research, 2019*

<table>
<thead>
<tr>
<th>DRIVERS</th>
<th>TRADITIONAL</th>
<th>MATURING</th>
<th>MODERN</th>
<th>FUTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infrastructure</strong></td>
<td>Datacenters</td>
<td>Public cloud adoption for greenfield apps</td>
<td>Hybrid, some multi-cloud</td>
<td>Hybrid, multi-cloud</td>
</tr>
<tr>
<td><strong>App Architecture</strong></td>
<td>Monolithic</td>
<td>Microservices</td>
<td>Microservices</td>
<td>Microservices</td>
</tr>
<tr>
<td><strong>Level of Abstraction</strong></td>
<td>VMs</td>
<td>Containers</td>
<td>Kubernetes and serverless adoption begins</td>
<td>Kubernetes, service mesh and serverless are widespread</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEAMS/TITLES/STAKEHOLDERS</th>
<th>IT ops team: comprises first responders as well as specialists, including network admins, DBAs and server admins.</th>
<th>IT ops team: largely the same as Traditional.</th>
<th>Observability team: composed of SREs, observability engineers.</th>
<th>Observability team: composed of SREs, automation engineers, observability engineers.</th>
<th><strong>DevOps team</strong>: emerging; DevOps engineers, release managers, generalists.</th>
<th><strong>DevOps teams</strong>: established.</th>
<th><strong>DevOps teams</strong>: 100% of development occurs in DevOps teams.</th>
<th><strong>Product teams and chief executives</strong>: emerge as beneficiaries.</th>
<th><strong>Product teams and chief executives</strong>: established beneficiaries.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Development team</strong></td>
<td>composed of engineers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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*REPORT EXCERPT*
## The IT Ops Evolution

<table>
<thead>
<tr>
<th>PROCESS/FUNCTION</th>
<th>TRADITIONAL</th>
<th>MATURING</th>
<th>MODERN</th>
<th>FUTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IT ops team:</strong> members carry pagers and respond to all incidents.</td>
<td><strong>IT ops teams:</strong> relegated to managing legacy systems.</td>
<td><strong>Observability team:</strong> centrally manage (fewer in number) monitoring tools, offering them as a service to DevOps teams; SREs programmatically approach performance problems; run postmortems; begin to develop cloud cost optimization practices.</td>
<td><strong>Observability teams:</strong> primary responsibilities lie in managing orchestration and automation functions; conduct regular reviews of automations that are performed in order to inform app/service development; responsible for cloud cost optimization.</td>
<td></td>
</tr>
<tr>
<td><strong>Development team:</strong> organized around writing code for single application; waterfall methodology.</td>
<td><strong>DevOps teams:</strong> responsible for the development as well as operations of the code they write; agile methodology.</td>
<td><strong>DevOps teams:</strong> continue to write and operate applications; begin to track SLOs; run postmortems; embrace agile methodology.</td>
<td><strong>DevOps teams:</strong> development priorities guided by app performance; agile methodologies.</td>
<td></td>
</tr>
<tr>
<td><strong>IT ops teams:</strong> relegated to managing legacy systems.</td>
<td><strong>Development teams:</strong> develop legacy apps; adopt some agile methodology.</td>
<td><strong>DevOps teams:</strong> development priorities guided by app performance; agile methodologies.</td>
<td><strong>Product teams and chief executives:</strong> require dashboards indicating impact of service performance on revenue, KPIs of their choosing.</td>
<td></td>
</tr>
<tr>
<td><strong>Development teams:</strong></td>
<td><strong>Observability teams:</strong></td>
<td><strong>DevOps teams:</strong></td>
<td><strong>Observability teams:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Development teams:</strong></td>
<td><strong>DevOps teams:</strong></td>
<td><strong>DevOps teams:</strong></td>
<td><strong>DevOps teams:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Tools:</strong> number of tools of all kinds – including monitoring, ticketing, event analytics, alerting, and others – proliferate as individual DevOps teams have the autonomy to choose their own.</td>
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<td></td>
</tr>
<tr>
<td><strong>Monitoring tools:</strong> point tools – including APM, infrastructure monitoring, database monitoring and network monitoring – that display predefined dashboards graphing the performance of a common set of metrics.</td>
<td><strong>Monitoring tools:</strong> Capabilities expand horizontally, with individual vendors offering utility across APM, infrastructure monitoring and other functions; distributed tracing becomes a requirement.</td>
<td><strong>Monitoring tools:</strong> Monitoring tools are accessed by humans only 10%-20% of current levels; instead, their primary role is feeding orchestration and automation tools that solve the vast majority of problems before they impact users.</td>
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<td></td>
</tr>
<tr>
<td><strong>Log analytics:</strong> used for troubleshooting.</td>
<td><strong>Tools across monitoring and incident management employ AI/ML.</strong></td>
<td><strong>Tools are fully customizable, must allow flexible querying, and employ AI/ML.</strong></td>
<td><strong>Tools are fully customizable, must allow flexible querying, and employ AI/ML.</strong></td>
<td></td>
</tr>
<tr>
<td>Ticketing systems, event management tools, alerting and on call management tools are commonly used.</td>
<td><strong>Query centric tools emerge.</strong></td>
<td><strong>Open source usage grows.</strong></td>
<td><strong>Open source usage grows.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Security and DevOps teams share some tools.</strong></td>
<td><strong>Security and DevOps teams share some tools.</strong></td>
<td><strong>Security and DevOps teams share some tools.</strong></td>
<td><strong>Security and DevOps teams share some tools.</strong></td>
<td></td>
</tr>
</tbody>
</table>

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### Tools/Technologies

- **Monitoring tools:** point tools – including APM, infrastructure monitoring, database monitoring and network monitoring – that display predefined dashboards graphing the performance of a common set of metrics.
- **Log analytics:** used for troubleshooting.
- **Ticketing systems:**
- **Event management tools:**
- **Alerting and on call management tools:** are commonly used.

### Reporting

- **Observability tools:**
- **DevOps tools:**
- **Product teams and chief executives:** require dashboards indicating impact of service performance on revenue, KPIs of their choosing.
7. Conclusions and Recommendations

We view it as a positive that we’re hearing more discussion about approaches to operations in cloud-native environments. It’s clear that simply buying new tools and turning them on won’t solve the challenges that organizations face as they evolve their operations activities in response to new technology adoption. We see enterprises look to early adopters – such as the most advanced web businesses – for cues about best approaches to operations, but then customize those approaches to meet their enterprise requirements.

Businesses that identify with each of the first three phases of the IT Ops Maturity Model should take steps to avoid the pitfalls associated with the evolution along the spectrum and ultimately to set the stage for achieving the Future vision.

Traditional: Enterprises that currently fit the Traditional phase of the model can avoid the application performance drop that many Maturing organizations experience by:

- Building monitoring into digital and cloud transformation processes.
- Laying the groundwork for executing the recommendations below for Maturing organizations.
- Adopting modern monitoring tools before shifting existing applications to the cloud in order to benefit from measuring the performance in a traditional model compared to running in a cloud-native environment.

Maturing: Early in the Maturing phase, organizations should plan processes as well as the division of labor between a central IT ops team and DevOps teams:

- Set policies for application instrumentation, and build processes for enforcing those policies.
- Determine which types of tools DevOps teams have the autonomy to choose for themselves.
- Develop a system for centralizing specific types of operations data in order to achieve broad views of systems and performance.
- Designate who or what team is responsible for tracking the performance of the user-facing experience.
Identify monitoring skills gaps and invest in filling those gaps.

Establish a regular post incident review process.

Invest in retraining traditional developers to transition to DevOps or SRE roles.

**Modern**: To prepare for the evolution to the Future phase, organizations that currently identify with the Modern phase should take several steps:

- Investigate and invest in automation tooling.
- Invest in automation expertise.
- Build bridges with internal business customers, introducing them to the value of IT ops data.
- Use learnings from post incident reviews to feed development priorities.
- Continue to invest in retraining developers as DevOps team members, SREs or automation engineers.

Vendors serving the operations use case face a crowded – and growing – sector of competitors. There are a few demands that vendors must serve in order to be successful in this evolving space:

- Enterprises will be designating a monitoring tool that they position as the one that collects and analyzes IT ops data across systems. Vendors across sectors are vying for this position – those that win this centralized use case will be sticky and able to drive more revenue than those that don’t.

- Programmability will become increasingly important, as enterprises realize that essentially every IT environment is unique, requiring extensive customization of tools in order to collect the data they need and then make the most of the IT ops data they collect.

- Enterprises are looking for guidance about effective operations practices in cloud-native environments; vendors with tools that can support users that are learning about this new world will be in demand.

- Enterprises will wrestle with tool sprawl issues for years to come; vendors that directly solve related problems like alert fatigue and slow mean time to repair, will attract and retain customers.

We anticipate continued discussions around the topic of operations and in the coming years, more consensus around best practices. Such consensus should help the common goal that most enterprises are striving toward: perfectly performing applications.
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451 Research is a leading information technology research and advisory company focusing on technology innovation and market disruption. More than 100 analysts and consultants provide essential insight to more than 1,000 client organizations globally through a combination of syndicated research and data, advisory and go-to-market services, and live events. Founded in 2000 and headquartered in New York, 451 Research is a division of The 451 Group.

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