The Rise of Application Visual Management: Visual AI Powered UI Management in the Era of Digital Transformation

SUPPORTING QUOTES:

*"What makes the difference [in customer experiences] is what customers see when they use the applications and the services based on those applications. It's largely and strongly influenced by what they see." – **Diego LoGiudice, Forrester Analyst***

*"Today, software is increasingly the face of the largest brands in the world, regardless of industry. Ensuring applications render properly across devices, platforms and web interfaces is a high priority as growing complexity and need for speed spur DevOps and Continuous Delivery practices." – **Gil Sever, CEO and Co-Founder Applitools***

*"Visual anomalies are difficult enough to detect for the human eye, but prove almost impossible in traditional test scripts that are not programmed to notice such anomalies. To ensure a visually perfect digital application, an automation framework dedicated to such detection is required." – **Angie Jones, Sr. Automation Engineer at Twitter***

*"Businesses today are expected to provide a visually perfect product experience across 100s of UIs to serve their brand. With rising pressure to innovate faster and release continuously, testing and monitoring UI regressions manually is not only a bottleneck, but also has a higher risk of releasing bugs that can impact customers. To address this challenge, an automated AI-based approach is necessary to detect issues at scale quickly, more accurately, and with better relevance to the end user." – **Aakrit Prasad, VP of Product & Strategy Applitools***

*"The cutting-edge apps of today and tomorrow have components that are increasingly challenging to manage in an automated fashion. From the inclusion of novel UI components to the need for flawless rendering across a variety of form factors and platforms. The requirements for automated application delivery are growing at the same rate as the difficulty of doing so. There is a great need in the industry for accurate and fast feedback on all application delivery elements, functional and visual, to support the increasingly high expectation for rapid and holistic CI/CD cycles." – **Jonathan Lipps, Founding Principal at Cloud Grey***

*"With increasing pressure on developers to build, test and release applications faster and with higher quality, it's clear they need accurate and scalable automation to ensure the visual integrity of their work." – **Adam Carmi, CTO and Co-Founder Applitools***

EXECUTIVE SUMMARY: IT'S OFFICIAL - WE'RE DIGITALLY TRANSFORMED

In today's highly dynamic and competitive business landscape, the focus on "digital" is a given for businesses of all types. eCommerce will double by 2021 to over $350 billion USD, according to *eMarketer*. People now spend up to 10 hours a day on screens, according to Nielsen, and mobile internet usage is surpassing desktops. Everything from refrigerators to industrial IoT assets are differentiated through a sophisticated digital experience. Not only are the next-generations of consumers making buying decisions and purchasing more frequently through an app and/or website, but "digital business" is now the path to create new value chains for growth and competitive advantage.

It's clear that organizations must be laser-focused on continuously providing the best User Interface (UI) experience for customers and audiences to outperform the competition and thrive. This is illustrated in the Forrester report: "Business Impact of Customer Experience." *In this report, Forrester estimated that moving from a below-average customer experience to above average would return $494 million in additional revenue for insurers (up 61 percent from 2013), $572 million for retailers (up 152 percent from 2013), $1.4 billion for airlines, and $1.6 billion for wireless carriers. Forrester once again concluded that there is a "high correlation between customer experience and consumers' loyalty to a company."*

How does the digital transformation drive business growth? Essentially, by getting new customers onboard through an initial positive digital user experience, all the while delighting the current customer base through the same digital experience they know and appreciate. Not surprisingly, when it comes to digital, the User Interface is the most crucial element of the brand experience. Providing better UI than your competition over a sustained period of time will result in a material competitive advantage, customer growth and retention, and revenue gain.

A positive UI is a reflection of the software a company builds and delivers. The UI of an app has to respond and perform well, it must be secure and reliable, and it must look visually perfect. But, *Diego Lo Giudice, principal analyst at Forrester Research also says, "What makes the difference [in customer experiences] is what customers see when they use the applications and the services based on those applications. It's largely and strongly influenced by what they see."*

WHO IS IMPACTED? EVERYONE WHO CARES ABOUT THE UI

DevOps teams, front-end developers, testing and QA teams, designers and business leaders all know how increasingly difficult it is to monitor and manage an application's visual characteristics in user interfaces that span across many servers, browsers, devices, digital assets and web pages. As a result, there is a greater reliance upon new modes of software delivery that help ensure positive user experiences, including application delivery management and performance monitoring. This technical complexity now represents the fundamental building blocks of today's digital business. Thankfully, these strategies are quickly moving away from slow, inaccurate manual processes.

In addition, there is increasing pressure from business executives to protect the brand experience as digital transformation initiatives continue unabated. This same pressure to ensure that digital experiences deliver as promised led to the rise of the adjacent market category, Application Performance Monitoring (APM). Focused on monitoring and management of performance and availability of software applications, this market exploded in 2013 and is now expected to become a $5.5 billion market by 2020. Now, businesses are looking to extend continuous monitoring to the increasingly important visual aspects of their digital brand. This encompasses both pre-and post-production, as part of test automation, DevOps and front-end development.

What's needed – and is happening – is an industry focus toward the visual aspects of the digital user experience.

DIGITAL TRANSFORMATION QUANTIFIED

Hundreds of digital brand UI variations exist everyday in market.

Microservices | **OS Versions** | **Browser Versions** | **Devices and Screens**
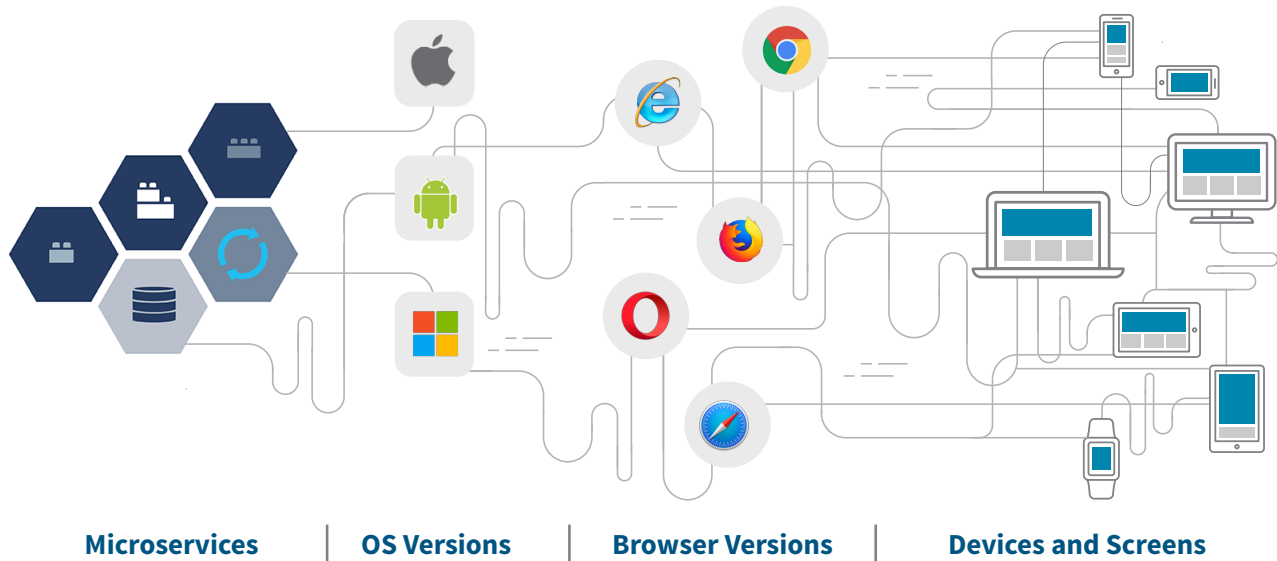
TECHNOLOGY BREAKTHROUGH - VISUAL AI IS HERE

As referenced above, we see a rising tide of emerging strategies that extend beyond Application Delivery Management (ADM) and Application Performance Monitoring (APM), to create a more complete and visually perfect application delivery and management process, along with CI-CD and Digital Transformation. Digital Transformation, in particular, is continuing unabated with a proliferation of mobile devices and browsers, a growing dependency on microservices, content which is more dynamic and more individually personalized than ever, and the spread of Bring Your Own Device (BYOD) behavior. And this is just the beginning – with video, artifical reality, IoT and who knows what else, following in the next couple years at an even faster pace.

For brands to succeed in the era of Digital Transformation, and get the most out of new technolgies that have the potential to dramaticaly enhance customer experience, application management needs to evolve and maintain pace. While vital and important, both ADM and APM fall short in supporting these UI innovations, because they lack the automated capability to inspect, analyze and manage the visual aspects of these applications in a scaled and accurate manner.

Fortunately, as enterprises of all industries and sizes navigate these challenges and opportunities, Artificial Intelligence (AI) is coming of age. One vital and practical application of AI is Visual AI. Visual AI's first major commercial application launched in 2015 in the area of Automated Visual Testing. Today, most R&D leaders view testing as the biggest bottleneck to software production. AI-powered Visual Testing and Monitoring was the first real world application of Visual AI to be built and deployed successfully, with adoption by tens of thousands of users and many global brands, including Fortune 50 global enterprises.

However, in addition to application testing and monitoring, there are many more visual aspects of the application that can be managed by a Visual AI Engine. Those aspects include accessibility for visually impaired people; regulatory compliance for financial institutions, healthcare companies and insurance companies. Others include security, collaboration, unification of the UI for different modules and, different applications of the same brand. At the software delivery level, uses include visual version control; visual performance testing; and, Visual A/B Testing performance analysis.

Visual AI is a fundamental engine that can support each and every step in the application lifecycle, with various tools based on this technology emerging to become an inseparable part of the development and DevOps toolchains. Furthermore, *Visual AI is poised to leverage the ubiquity of application visualization, making it the common denominator in team collaboration that can bridge the "language" gaps between designers, developers, product management leaders, project managers, marketers, test automation engineers, manual QA teams, monitoring teams and DevOps at all levels.* While Visual AI started its journey at the acute pain-point of test automation and continuous testing and monitoring, there is a clear and obvious path to expand its scope and reach to improve every aspect of Digital Transformation.

Today and increasingly in the near future, what customers see in the application of a digital online business is the face of that business, and the way customers perceive the quality, value and overall equity of the brand will be impacted by that UI experience for better or worse.

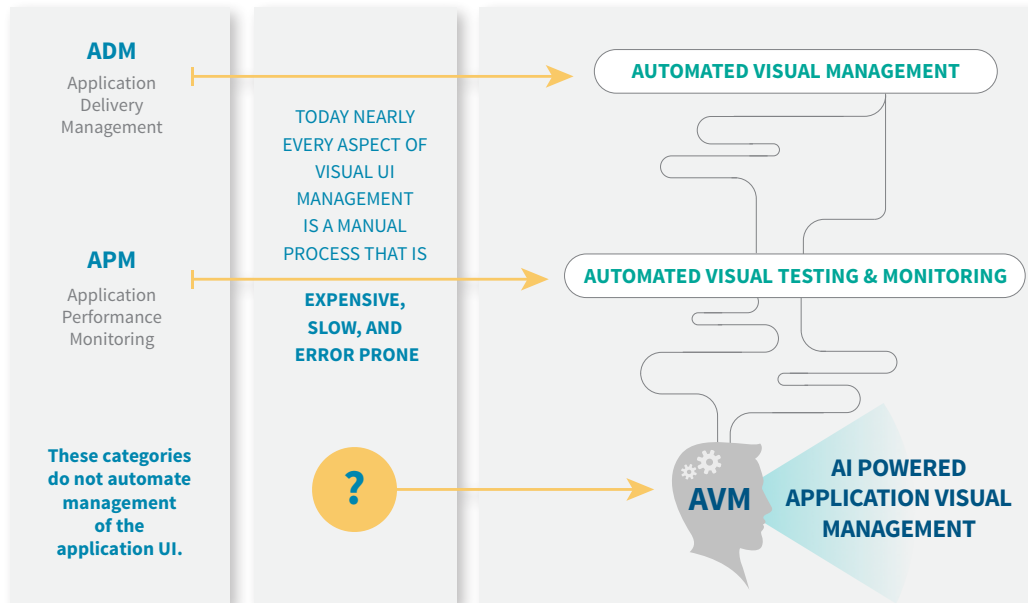## INTRODUCING APPLICATION VISUAL MANAGEMENT

We see an emerging category, Application Visual Management (AVM), combining new Visual-AI testing approaches and technical solutions that focus on verifying the integrity of the UI. *The goal of AVM is to ensure applications render correctly whenever changes are made – across all devices, platforms and browsers.* We feel this customer-centric, visual approach to application management and performance monitoring is vital in this digital transformed world we now live in, including e-commerce, financial services, healthcare, education, communications, government and business technology.

This paper provides a guiding framework for understanding and applying Application Visual Management to the entire application development lifecycle. It provides an entirely new automated visual management layer to bring Digital Transformation to new heights of quality, performance, time to market, agility, customer support and much more.

APPLICATION VISUAL MANAGEMENT

Visual AI allows us to keep pace with the digital transformation impacting the UI daily.

WHY APPLICATION VISUAL MANAGEMENT?

DEVELOPERS:
• **Challenge:** Pressure to release applications features faster, across increasingly complex release environments – web, mobile, cloud, containers/microservices.
• **Need:** Immediate visual feedback for all code changes – awareness if changes adversely impact the overall application appearance.

TESTING AND QA:
• **Challenge:** Extending the reach of test to visual elements and the UI.
• **Need:** Automated technology to continuously monitor, detect and resolve issues before the customer sees it

DEVOPS TEAMS:
• **Challenge:** Lack of confidence that frequently released software renders properly, meets the standards of the business and that cross-functional teams have consistent and uniform feedback.
• **Need:** Continuous, enterprise-wide visual monitoring, reporting and remediation for swift and safe deployment of applications.

BUSINESS EXECUTIVES:
• **Challenge:** Digital transformations deliver business value as promised, increase brand value and do not hinder customer engagement.
• **Need:** Assurance that digital business ideas are released with confidence, new services are introduced in a seamless, quality manner, and end-users have a visually perfect digital experience that is consistent and supports the brand values of the company.

VISUAL AI IN A DIGITALLY TRANSFORMED LANDSCAPE

Shifting technology dynamics are continuously impacting organizations of all types and are important within the context of Application Visual Management. Relevant industry changes include:

1. **Digital Transformation:** every organization is digitized and offering services 24x7, from e-commerce and internal processes to end-user engagement. This makes the applications that make up the digital experience the most visible and primary path to success or failure.

2. **Software is Brand:** today's consumers now interact with brands primarily through digital experiences – and are quick to share bad experiences via social media that can lead to lost revenue and negative word-of-mouth reputation.

3. **Device Proliferation:** every app and content type must now be compatible with a growing number of devices, platforms, browsers and environments.

4. **Shrinking Release Cycles:** digital business mandates shorter software release cycles, leading to an increase in DevOps, and Continuous Integration - Continuous Delivery initiatives that stress testing and quality practices, while the likelihood of software "breaking" also rises.

5. **Microservices Architectures:** decoupled architectures and microservices have led to more releases of individual components, rendering pre-production testing less effective and new applications often disconnected from the user experience.

6. **Call to Shift Left:** developers are now responsible for much more than writing good code, as test, QA and deployment increasingly become part of daily tasks to ensure higher quality from the start.

7. **The Rise of Automation and Artificial Intelligence:** to release quality software at scale and speed, enterprise IT organizations are turning to smarter automation platforms that continuously monitor, learn and report actionable information.

OUR INDUSTRY PERSPECTIVE

Based on our collective experience working with customers across a wide range of industries and data needs, we see the following dynamics unfolding within the software delivery industry:

1. **Today's Automated Testing is Limited:** automated testing confirms that applications function properly after changes are made – creating a new opportunity to extend testing to how apps appear and increasing coverage, accuracy, frequency of UI testing.

2. **Manual Processes, or No Process at All, is Used to Monitor Digital Experiences:** many organizations have hundreds of people monitoring thousands of digital screens to ensure quality – this is highly error-prone, and not effective, scalable or sustainable. As a result, in many cases, there is no testing at all.

3. **Customers Are Now UI Bug Hunters:** many companies don't prioritize visual testing (even manual), or don't see the value, resulting in a quick acceptance test and push to customers who eventually find bugs.

4. **Customers Are Vocal, Especially Unhappy Ones:** as DevOps extends modern software delivery practices across the enterprise, end-users are increasingly the first to know when applications have issues – and they are vocal.

5. **Continuous Digital Content and Apps:** the pace of change and the growing volume of dynamic content is relentless within the digital enterprise. Continuous Integration and Continuous Delivery bring faster waves of inter-connected complexity to software deployments that impact the UI and what end-users see and interact with when using the application.

OFFERING A SHARED
INDUSTRY VISION

As we collectively work to deliver value to the organization, it is vital to gain a common, shared vision for our industry and community. We offer the following as we move forward:

1. **Must Factor Visual User Experience into the Application Test, Monitoring and Management Paradigm:** end-users are the first to "see" digital transformation initiatives, and visual dynamics must be addressed as part of the testing, monitoring and quality lifecycle.

2. **Empower the Developer/Tester:** developers are increasingly responsible for testing, and they must have automation tools that provide immediate, visual feedback.

3. **Must Validate Application Appearance with Confidence:** with dynamic content and the pace of software delivery increasing; and decoupled, component architectures and multiple deployments per day, the digital enterprise needs automation to continuously monitor, detect and help resolve UI issues that arise with app changes.

4. **Must Incorporate AI into Software Delivery Pipeline:** new artificial intelligence and machine learning technologies must be incorporated into the increasingly automated software delivery pipeline, to mimic "virtual customers," and how they see and interact with digital content to ensure a consistent, quality experience.

5. **Business owner must be enfranchised:** the idea here is that business owners have too much at stake and must be a part of the workflow and team dealing with UX.

APPLICATION
VISUAL MANAGEMENT

Application Visual Management (AVM) is a means of integrating automated visual testing into your development workflow to increase test coverage, accuracy and frequency of UI monitoring. It also provides a path for manual testers to manage Visual AI processes and to fill new roles as visual test automation engineers. AVM helps organizations extend the monitoring and management of visual testing across development workflows to quickly detect, notify and remediate digital UI issues in near real-time.

Fundamentally, the core characteristics of Application Visual Management are as follows:

1. Represents an emerging form of software focused on visual UI management including all pre-production, testing, and monitoring elements.

2. Uses Visual Artificial Intelligence to automate the way organizations test, monitor and manage all UI aspects of applications by automatically detecting and logging errors, continually updating baselines as changes are accepted, and maintaining a history of the application UX changes over time.

3. Is driven by initiatives like Continuous Deployment and DevOps, along with the de-coupling of applications into independent components that can adversely impact what customers "see."

4. Aims to dramatically increase the effectiveness of manual testing to extend test coverage and accuracy, while simultaneously eliminating the need for customers to detect and report visual UI problems.

AVM promotes faster detection and resolution of visual issues in the face of continuous change, rapid technological advancements and new, disruptive business threats. AVM aims to organize and automate visual testing to help organizations deliver an exceptional digital experience for all customers with the utmost confidence.

APPLICATION VISUAL MANAGEMENT CONCEPTUAL FRAMEWORK

This framework highlights key tenets of AVM that will be explained in depth in 2018.
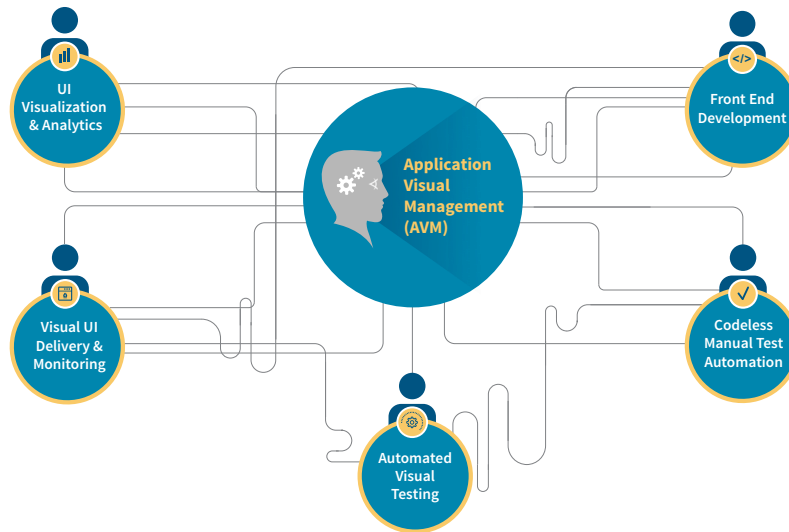
THE INDUSTRY IMPACT OF APPLICATION VISUAL MANAGEMENT

Creating a more unified and standardized approach to automation and testing is profound. Specifically, the benefits and rewards that AVM delivers include:

BUSINESS EXECUTIVES

1. Ensures the face of the organization – the Visual Digital Interface – is continuously tested, monitored and managed through automation and AI.
2. Release applications faster, and with more confidence.
3. Supports critical digital transformation initiatives – improves success and profits.

DEV, TEST AND QA

1. Extends automated testing to the customer UI.
2. Provides immediate visual feedback for all code changes.
3. Reduces the risk of both teams and apps "looking bad."
4. Automates and solves a huge problem – continuously.

INDUSTRY

1. Pulls Visual AI and the visual dynamics of digital experiences into the application delivery lifecycle, test, CI/CD and DevOps.
2. Improves the efficiency of testers, developers and DevOps professionals both as individuals, but also collectively as a team to drive faster application release cycles.
3. Supports the growing trend of de-coupled architectures, microservices and containers.

APPLICATION VISUAL MANAGEMENT ROI CALCULATOR

ROI is driven by time savings for every user, faster release cycles for every team, and a visually perfect UI for every brand.

TIME SAVINGS

Visual testing that used to take days/weeks now takes minutes!

PERSONA MOST IMPACTED:
Test Automation Engineers

TREND ADDRESSED:
Test Automation
Digital Transformation

ROI CALCULATION:
Time savings per dev in hours
Number of devs involved
$$ per hour per dev

COVERAGE INCREASES

Automated test coverage increases dramatically, allowing the entire team to release faster.

PERSONA MOST IMPACTED:
Manual Testers
DevOps Leads

TREND ADDRESSED:
Agile, CI-CD, Microservices
Digital Transformation

ROI CALCULATION:
Days/hours improvement in release cycles
$$ value of release in market?

UI BUGS KILLED PRE-PROD

Very few UX bugs enter market, those that do are killed quickly.

PERSONA MOST IMPACTED:
Front End Devs
Business Leaders

TREND ADDRESSED:
Shift Left
Digital Transformation

ROI CALCULATION:
Avg Cost of UX bugs in market
# of Bugs Caught Pre-Prod
$$ per hour per dev

CONCLUSION

At Applitools, we believe that as the pace of software increases, and end-user expectations rise, the need to ensure an exceptional visual experience is vital for business, government and education. Through Application Visual Management, we are pleased to define an emerging industry approach to help teams, organizations and our industry move forward, as we adapt to disruptive dynamics – some that are apparent today, and some that are unforeseen. As a new category within the automated testing market that is expected to top $50 billion by 2022, AVM represents innovation based on AI and machine learning that will help software developers release applications with greater confidence, while enterprises know the face of the "digital brand" is being monitored and managed. We hope it shifts how you think about and manage the visual aspects of your applications, so the promise of digital transformation delivers the highest level of value.