THE DATA-DRIVEN VIDEO PRODUCT ORGANIZATION

AND THE ROLE OF TEST AUTOMATION

MAKE YOUR VIDEO PRODUCT A POWERFUL COMPETITIVE ASSET

To deliver a compelling and contemporary user experience, it has become essential for anyone offering digital video product to shift from a hardware based platform with multi-year service cycles to an agile software-based platform, continuously evolving through rapid development.

TV operators must do this to keep up with digital natives – the likes of Google's YouTube, Netflix, Amazon and Facebook – companies who have never been held back by long hardware rollouts, but who are more frequently associated with advanced software skills and data centricity who are entering the digital video space.

Gone are the days when you needed a crystal ball and two years of business analysis to fully describe every requirement of a TV service. Instead what is now required is detailed understanding of viewer usage, system performance and an agile operating model to deliver the functionality and experience demanded of a modern video service.

As delivery organizations move away from waterfall to more agile development methods, you must adjust your organization to one where the operational team no longer tries to manage the expectations of the viewing customer. Instead it will be the product teams which has a window into the consumer habits, and with development, specify feature enhancements and apply changes on an almost daily basis.

Existing pay TV operators may initially feel disadvantaged at having to compete with digital natives, but TV operators can maintain a high service velocity, and have the advantage of owning intimate viewing data, which can in turn drive the evolution of service features.

The key requirements to make this achievable is transparent access to data from development, delivery and consumption. Test automation injected across the Software Development Life Cycle is ideally placed to provide accurate, timely feedback at scale. This provides a shared source of objective feedback, when instrumented to measure agreed KPIs.

Massive cost and time overruns happen if we don't know the answer to questions like "do we know how we are doing right now?"

IMPROVING RETURNS FROM YOUR PRODUCT INVESTMENTS

COST

AGILE

QUALITY

Video Service Providers return on invested capital is under close scrutiny. Pay TV traditionally have risked huge investments in proprietary equipment and appliances. Introducing new CPE or video platforms are vast undertakings. Just 6 or 7 years ago, it took 30 to 36 months to build a new platform and another 10 years to roll it out to millions of homes. Nowadays digital native rivals are moving at the speed of agile.

The scale of those undertakings heightened the risk involved and cost many promising careers. Relationships with a multiplicity of third parties had to be pre-negotiated to encompass new ranges of chips, new technology enablers, existing content partners and CDNs and ISPs.

A slow moving, heavily regulated industry can afford to move as deliberately as a tortoise. But as the market moves to software platforms, and new competitors enter, the limitations of the waterfall development process become obvious. Waterfall equates to waste. Wasted resources, wasted (development) time, wasted efforts moving up blind alleys. It hampers responsiveness making it hard to evolve products at speed.

The state of the art previously was the 'V' development process, with long delays emphasizing carefully defined requirements, and planned delivery to the 'nth' degree. Thing is, change happens. The waterfall model of software development - in which each phase must be completed before the next one begins – is an inadequate match for the needs of today's viewers affecting competitiveness and market agility. To increase service rollout velocity, you must bring new features to live systems and do so fast enough to keep up with unfettered digital rivals.

Fully and completely describing a project before coding begins – means you need a crystal ball.

You can all too easily end up building the "Wrong Thing" or building the "Things Wrong" using a batch and queue mentality, accumulating a technical rolling debt.

HOW TV OPERATORS CAN SHIFT TO RAPID SERVICE DELIVERY

The old waterfall world promoted waste and hampered responsiveness and certainly won't help one compete with digital natives who have long ago embraced agile methods in software development.

In the digital video industry, rapid new product development is the foundation for growth. Through new product development, leading entertainment and communications companies drive their businesses forward and deepen the engagement with customers.

A key enabler to building better products that all pay TV operators have is access to their own customer and operational data. You must understand what your viewers are doing with existing systems as well as how new software builds perform. Intelligently applying test automation enables product data to be harnessed, providing the transparency and scale needed to most effectively direct efforts across the entire Software Development Life Cycle.

TV operators can move from a single software release each year to a situation where they may introduce 1 or 2 releases each day, but where each change is data driven, not driven on the back of a developer's hunch or a misunderstanding on the specification.

Requirements analysis needs to begin and end inside the operational lines of business, working side by side with system architects and business analysts, throughout the service creation, operation and evolution.

Such a series of metrics provide a common language in which to discuss what exactly was it that we were trying to do and answer whether we achieved that or something else. It provides a common language to describe what you agreed to build, and to help you know when you've built it.

For example, when accepting a supplier's component build being able to review pre-agreed test results prior to receiving the release, speeds up the development cycle and avoids wasted downstream effort.

To do this requires fundamental changes to your organization – changes to QA, development, clear identification of the product owner, and it must involve everyone in every step of the way. Test automation supports that change, providing a basis for common understanding across functional and organizational boundaries.

As organizations adopt this type of continuous development process, well implemented test automation ultimately enables speed of feedback, which in turn constantly validates product direction and takes all the guessing, and cost overruns, out of development.

That in turn leads to quicker bug fixes, which drives up viewer engagement, reducing costs, help desk calls and field service callouts, all with an accelerated service velocity.

One non-negotiable item here is that you are all led from a shared source of objective feedback, and to produce that you need a test automation capability instrumented to measure agreed KPIs.

WE HAVE A DREAM - ACCURATE, TRANSPARENT AND PREDICTABLE PRODUCT DEVELOPMENT
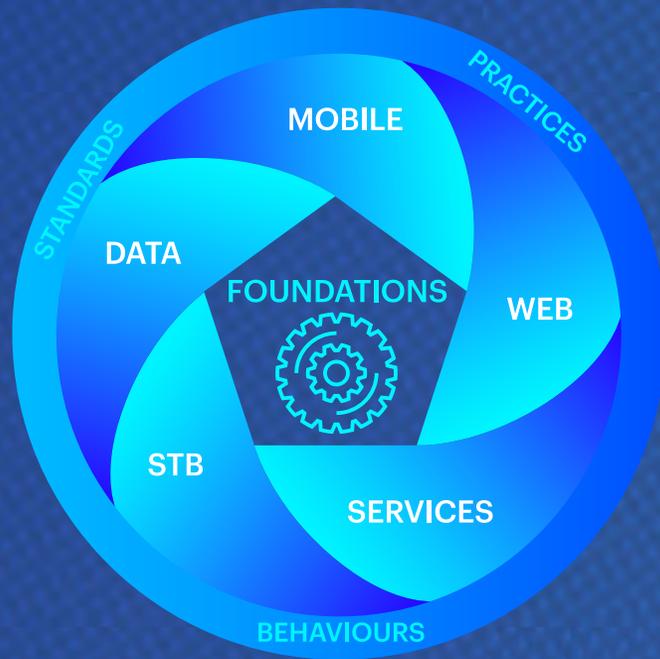
Digital Native companies have overturned many of the conventions of software development and consumer experience. They do this by embracing agile and cloud and this is now coming to the TV. Their video delivery platforms are built entirely as software.

They have never relied on specific chips or proprietary hardware and have no remnant of an analogue culture. They take the cloud for granted and are, if nothing else, great exponents of software development.

The critical difference is that they also understand the value of data. They are used to observing consumer behavior and changing their offerings accordingly. They value experimentation over procrastination. They can change UIs overnight, and can do it for their entire customer base, or for a targeted segment.

TV operators need to evolve the way they make decisions, using data to drive value and change in their delivery systems. To do this the operator has to move from an environment of multiple software releases a year which was sufficient to keep customers happy, to a world of continuous deployment. The only way to reliably increase release velocity and accuracy, is through data driven prioritization.

Requirements analysis used to be a process of opinions. Today we are shifting to it being a data led source of objective feedback.

Requirements analysis must be led by the lines of business, looking for real impact among consumers they understand

TEST IN MODERN DELIVERY: THE DRIVER OF INTEGRATION AND CONTROL

We said test automation is a key capability. The reason it is important is because it can rapidly and automatically generate objective feedback loops throughout the entire development process.

Test can be thought of as providing a common currency or language which is shared across functional and vendor borders. It is this shared data driven understanding which drives common goals and service velocity.

In the past, testing was mostly done after development and prior to the production. But if test is to play a more proactive role in reducing waste, having clarity earlier in the development life cycle around product acceptance criteria moves the role of test from simply catching bugs to one that stops the wrong thing from being built.

So, when we use the word test, we are not talking purely about a traditional software test to see if a build works properly.

Preparing for testing, and testing earlier in the development life cycle, *shifting left,* applies approaches such as Test Driven Development or Behavioral Driven Development to align the team on the definition of what they should build. This requires a fundamental change in the Operating Model, from one where defects are weeded out, to one where quality is built-in. This requires all stakeholders: QA, Development, Product Owner, Marketing to collaborate, define and agree on their deliverables.

A practical example of this, is the use of sanity testing for each contribution – as a key driver of reducing *Mean Time to Detect* errors - before a release proceeds to the next, resource intensive, stage in the cycle. At no stage is the operator expected to try out the rest of his system, partnered with code which is obviously broken. It may not be stress tested, but at least it has been sanity checked – it does the right thing. Now let's find out how fast, and what happens when it scales to higher volumes.

As organizations adopt Continuous Integration processes, well implemented test automation ultimately enables speed of feedback and reduces waste. The speed of feedback dramatically changes things for developers, because it validates the product direction. It takes all the guessing out of the process.

This type of transparency has an immediate impact on operational spend. Every process has a light shone directly on it, and no process can eat up excess resources, before the waste has been discovered. The less broken code is proliferated the less people's time is spent working with it. And time is market share.

Testing, more than ever, acts as an Early Warning System. If you are looking at the right KPIs, you can immediately tell if your organization is on track, or failing.

We are speaking here about testing in the scientific sense, where we validate measurable progress against carefully defined goals.

TESTING DURING RELEASE DEPLOYMENT: FOCUSING ON QoE

Testing in a lab can only take you so far. Putting a release on the screens of real users adds another, richer dimension, from a data perspective. The reality is that users may interact with the product in an unexpected way. There are environmental factors that cannot be replicated in a lab, and feedback on a release can become mired and confused as it makes its way back to development.

As operators look to accelerate release deployments and move to agile - Continuous Deployment models, waterfall approaches to deployment are found wanting. 'Soft launches' do not rigorously provide enough test coverage of the system. And relying on tickets from Customer Services creates fire drills and excessive costs. What is required is for Engineering to get its hands on actionable data they can use to find and resolve design flaws.

Importantly, reducing the *Mean Time to Detect* errors in the field, has a significant impact on customer service costs, and provides a window on viewer frustration. Actively testing the user experience provides additional insight into the end to end system. It enables development to be proactive in applying fixes, should it fail to meet performance or scalability expectations.

This creates a continuous feedback loop, between development, engineering support and operations teams, delivering actionable KPI metrics on the availability, stability, and Quality of Experience (QoE) of services and new deployments.

If service issues are recorded with logs including video snapshots – this makes it far easier to "see" the error. Line managers and executives can see it too instead of having to imagine what it must have looked like and they can assess product performance. Separately engineering has actionable data it can use to resolve the errors.

We can even track the ultimate value and the improvement in value that the system changes are delivering to us. You must measure "How many defects have been found?" "How much time has been shaved off fixing bugs?" "How many extra features were added in this release, because of the reduced effort of fixing bugs?"
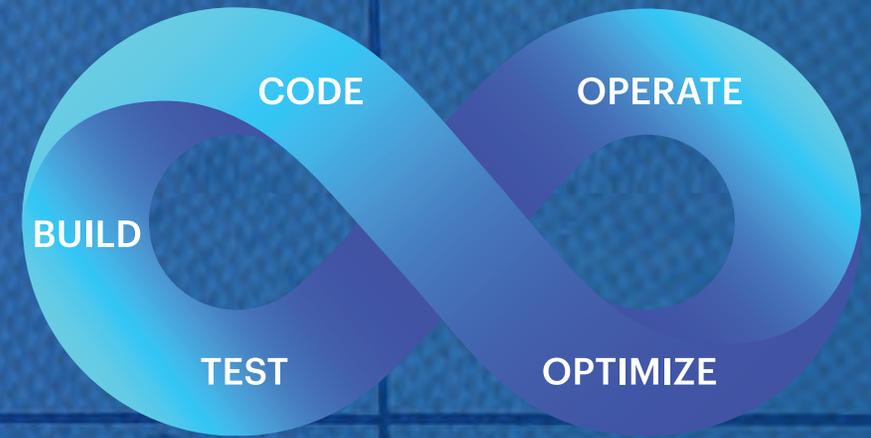
Customer activity is a rich source of insight for digital media businesses. Device monitoring of the live network provides early, data-driven feedback on releases.

CODE

OPERATE

BUILD

TEST

OPTIMIZE

TESTING DURING OPERATION: RELIABILITY AND SCALABILITY

Progressive operators are moving toward a model of continuous service testing on devices in live network environments to ensure that performance in the field matches the expected results of their lab tests.

Monitoring live viewer behavior gives insight into usability and puts a value on each feature. By actively monitoring system performance and stability you immediately see differences in usage data and whether the system is working as it was envisaged. Usage may suggest something is not quite right with the finished system – wrong behaviors may be due to release problems or due to a bad UX. You must decide to take appropriate action.

To gain insight into the total digital business you must define key performance indicators to follow. The aim is to work out which future change would result in the largest improvement in consumer experience. KPIs can include audio availability, video availability, image quality, application access times, channel change times, video start times, and buffering ratios.

We can expect feedback from systems prior to them going live, through Canary tests, and we may have simulations which tell us in advance what is at least likely with a new UI layout or when a system is under a heavier load. Today, it is possible to test features in the live network, selecting a segment of the audience to discover viewer preferences.

It is particularly important to watch if KPI results are varying from release to release and any instance of them going backwards – if for instance one activity was common on one release, and then disappears in the next – that implies something is not working, as it should. It may be that a new UI is too complex, or another unexpected action has taken place instead.

Ultimately, each adjustment or feature, should stimulate increased usage, and eliminate any choke points in the way or reaching a certain point in the video experience.

As we increase velocity of delivery, using agile and DevOps, having an accurate status of the health and direction of release trajectory is essential.

THE HOME ENVIRONMENT

The bulk of a Video Service Operator's spend is going on supporting customer service costs. In-home technologies become more advanced and make accurate diagnosis of faults more difficult.

The more complicated the service, the more difficult it is to know precisely what is happening with the user experience (UX). More than ever, the operator needs to be able to control the UX and ensure it is relevant and up to date. It is by controlling the UX that operators retain control of the customer account, instead of conceding that control for instance to a voice assistant such as Amazon's Alexa or Apple's Siri.

Field engineers need to be able to rapidly resolve problems that are occurring on a device that affect the UX. They should be capable of executing tests on devices in the home to isolate and resolve hardware faults, and configuration problems, at source.

The aggregated data available from these tests can then be used by Product teams to diagnose the most frequent failures, and be used to guide changes to the underlying device and its firmware to eliminate UX issues.

With modern delivery systems being software-based, operators are increasingly able to harvest more data to form a richer picture of the viewer's actual UX. Reboots, crashes, CPU utilization, system memory events are now available not just on one device, but across the population of installed devices.

This makes it possible to correlate device errors with trouble tickets and prioritize bug fixes to eliminate thousands of tickets. It can also be used to drive down trouble tickets by pre-emptively applying fixes before they ever become an issue in the field and use them to create a comparative analysis of service performance by device and manufacturer, based on the number of errors that have occurred.

As an operator achieves better UX visibility, they must also accelerate their response to problems within it. The velocity of bug fixes need to fall from weeks or months to hours and days. Using the results of testing in the field, Development teams can access performance and device status data to assemble an accurate picture of the UX.
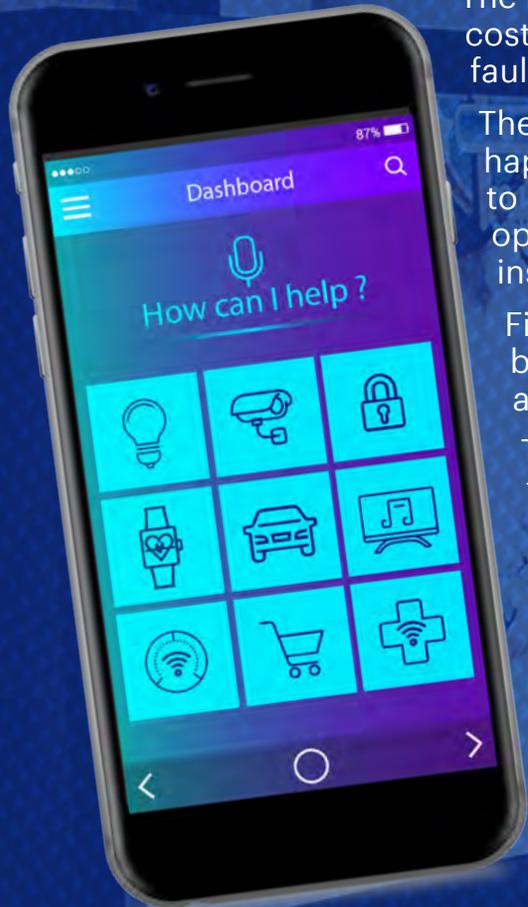
SUMMARY: A BUILD, MEASURE, LEARN, ITERATE MODEL IS CRUCIAL

In today's market, consumers are unforgiving. If they try out a new video service and find it a great experience they transfer to it. If they find one which is a poor experience, they will not only leave it, but also advocate against it actively on social media. It's a double whammy.

Delivering better experiences requires richer, more actionable data, and a culture change. With the right culture, tools and process you can measure the velocity of value as you create it.

This is important today, but as Operators open up their platforms into Home Automation, IoT, VR and start using AI they will witness further complexity and this culture change becomes more urgent.

Test automation has emerged as a key capability. It is important because it can rapidly and automatically generate objective feedback loops throughout the entire development process, at scale.

It is essential to test at every level in development and delivery, testing units, components, UI, service layer, business rules and consumer behavior. Once you have done this collect all the data this throws up and organize it so you can clearly see which are the appropriate actionable insights.

This in turns shows you how efficient the development process is and it also drives vendor accountability.

And all of this will provide transparency on development and operational spend and eliminate waste in the delivery cycle, and get value adding features to market faster. All of which helps deliver a better customer experience, and provides a springboard for operators to create new revenue streams.

Operators must move to a culture of test and learn, where data driven decisions are made at every level throughout the organization.

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ACRONYMS

AI = Artificial Intelligence

CDN = Content Delivery Networks

CPE = Customer Premises Equipment

CPU = Central Processing Unit

EPG = Electronic Programming Guide

IoT = Internet of Things

ISP = Internet Service Provider

KPI = Key Performance Indicators

QA = Quality Assurance

QoE = Quality of Experience

UI = User Interface

UX = User Experience

VoD = Video on Demand

VR = Virtual Reality