The State of Software Quality Assurance (and Testing)
The Year That Software Bugs Ate The World

In 2017, bugs banned people from Twitter, secretly recorded them in their homes, and even caused a train crash. Is there anything they can’t do?

BY HARRY MCCracken
In 2017, it was fashionable to stress over the prospect of machines getting so smart that they render humans obsolete or maybe even decide to kill us all.

Look on the bright side, though: This also turned out to be a year that provided an inordinate number of reminders that what computers do is follow instructions given to them by people. And people have a tendency to write buggy software. When it fails, it can be startling, alarming, irritating, or darkly funny—or, sometimes, all of the above.

https://www.fastcompany.com/40505226/the-year-that-software-bugs-ate-the-world
Before we look at the 2017 recap, let’s look at a local one from 2018…

LOUISVILLE, Ky. (WDRB) -- Churchill Downs' online betting system was inoperable for at least 16 minutes in the final hour leading up to the Kentucky Derby, frustrating horse racing fans looking to wager on the race.

TwinSpires.com tweeted about the “technical difficulties” at 6:18 pm. The account then said the problem had been resolved at 6:34 pm.

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THE BUG THAT MADE GMAIL DISRESPECT PERSONAL BOUNDARIES

A defect in Google's Play Services software for Android caused Gmail to demand access to "body sensors" before it would let users send email. Of course, Gmail obviously doesn't need that information.

Google Play Services is a core Android app that provides functionality like authentication and synchronized contacts across Google apps. It can also enhance apps by speeding up offline searches and providing more immersive maps.

Google Play Services uses the Body Sensors permission for apps like Google Fit, which tracks steps and other fitness activity. But Gmail doesn't actually use the Body Sensors permission, a Gmail community specialist said on the product forum thread.

The message was actually a bug that has lingered around for a while now, with the earliest user complaints dating back to 2015. Pressing "Cancel" on the pop-up does not seem to fix the issue and causes the pop-up to show up later.

Danny van Kooten @dvkoot - 13 Feb 2017
Replying to @BrusselsGeek @gmail @googledevs
Gmail App is the worst. I disabled a bunch of app permissions and it keeps asking to re-enable, but works.

Wojtek Wiewiorowski @W_Wiewiorowski - 13 Feb 2017
Replying to @BrusselsGeek @gmail @googledevs
Tell me, it is fake news, please.

Jennifer Baker @BrusselsGeek - 13 Feb 2017
Nope. :

Technology Wales @TechologyWales - 13 Feb 2017
Replying to @BrusselsGeek @gmail @googledevs
They want to measure our stress levels so they can monitor how well they are screwing us over on privacy.

James Kast @jameskast - 13 Feb 2017
Replying to @BrusselsGeek @gmail @googledevs
Don't use Gmail if you want privacy.

Sylvie Fodor #FreeShahidulAlam @cepic_sf - 13 Feb 2017
Replying to @BrusselsGeek @gmail @googledevs
You need to change email client and use other services!
THE BUG THAT EQUIFAX PROBABLY WISHES IT HAD PATCHED

In September, credit-monitoring kingpin Equifax’s website is breached by someone who makes off with sensitive information on up to 143 million Americans.

EQUIFAX OFFICIALLY HAS NO EXCUSE

“As the security community processes the news and scrutinizes Equifax’s cybersecurity posture, numerous doubts have surfaced about the organization’s competence as a data steward. The company took six weeks to notify the public after finding out about the breach. Even then, the site that Equifax set up in response to address questions and offer free credit monitoring was itself riddled with vulnerabilities.”
THE BUG THAT CONFIRMED EVERYONE’S FEARS ABOUT SMART SPEAKERS

Members of the media who got an early unit of Google’s Home Mini smart speaker discovered that their Mini is recording audio 24/7 and storing it on Google’s servers.

It turns out that a software glitch with the speaker’s touch panel was to blame; Google reacts by simply disabling the option to talk to the Mini by pressing the touch panel.
Twitter users notice that searching for terms such as #gay and #bisexual didn't find any results. The company apologizes, explaining that a bug relating to the algorithm it uses to flag adult content had mistakenly hidden all tweets relating to some terms regardless of the nature of their usage.

In essence, their algorithm identified “gay” and “bisexual” as pornographic content, in violation of the standards policies!

We’ve identified an error with search results for certain terms. We apologize for this. We’re working quickly to resolve & will update soon.

Late last week, we discovered a technical issue that affected search results: searches for certain words related to sexuality did not populate complete results. We apologize for anyone negatively impacted by this bug. It is not consistent with our values as a company.

As outlined in our media policy, media that may be considered sensitive is collapsed in places such as search results, meaning that images and videos would be presented as a link, not automatically populated.

One of the signals we use to identify sensitive media is a list of terms that frequently appear alongside adult content. Many of these words on the list are not inherently explicit, which is why they must be used alongside other signals to determine if content is sensitive.

Our implementation of this list in search allowed Tweets to be categorized based solely on text, w/out taking other signals into account. Also, the list was out of date, had not been maintained and incorrectly included terms that are primarily used in non-sensitive contexts.

We have audited the list and removed terms that should not have been included. We are making changes during the next 24 hours to correct this mistake. Once we are confident it is completely resolved, we’ll share an update here.

We have shipped changes to the English version of this list so that the terms related to sexuality will no longer return an error message in search results. In the coming days, we will be working to ensure these changes are reflected in all languages on the service.
THE BUG THAT ELIMINATED THE NEED FOR THOSE PESKY PASSWORDS

A bug in Apple’s High Sierra OS provided access to Macs simply by entering the user name “root” and no password, permitting anyone who gets their hands on your computer to get at your files.

Within a day of the problem gaining widespread notoriety, Apple rushes out an auto-installing patch and apologizes.
THE BUG THAT UNDID THE FIX FOR THE PESKY BUG THAT ELIMINATED THE NEED FOR PESKY PASSWORDS

The issue appeared to be fixed, but another update re-introduced the problem.

If MacOS update 10.13.1 was installed, the issue returned – and anyone could get into your computer, again. The patch could be reinstalled, and the computer rebooted to address (re-address) the issue.
THE BUG THAT SHOWED YOUR FRIENDS YOU WERE RUNNING IOS 11

A problem with the autocorrect feature in Apple’s newest mobile operating system caused iPhones to substitute an A and a strange character whenever users type “I,” resulting in widespread typos on Facebook and Twitter.

If you type the letter “i” and it autocompletes to an “A” with a symbol

If you updated your iPhone, iPad, or iPod touch to iOS 11.1 and find that when you type the letter “i” it autocompletes to the letter “A” with a symbol, learn what to do:

1. Head to “Settings”
2. Click “General”
3. Navigate to keyboard
4. Select text replacement
5. Click the little “+” button to add a new text replacement
6. Type an upper-case "I" in the Phrase box
7. Type and a lower-case "i" in the Shortcut box.

Apple issues an “easy”, 7 step, work around while they worked to create a patch:
THE BUG THAT COULD LET A STRANGER RANSACK YOUR HOME

In October, Amazon announced Amazon Key, a smart lock that lets its delivery people—or employees of Amazon partners such as housecleaning and dog-walking services—enter your home.

To make that idea less scary, their entry is recorded by the new Amazon Cloud Cam.

But security researchers soon show how a bad guy with Amazon Key access could use a Wi-Fi vulnerability to freeze the Cloud Cam’s video feed, making it appear as if the door is closed when someone’s opening it.

Amazon emphasizes that it’s an unlikely scenario, but releases a patch to alert users when their camera has been shut off.
About the Amazon Home Services Happiness Guarantee

We want you to buy with confidence anytime you purchase a service on the Amazon.com website; that's why we guarantee service quality when you purchase services from an Amazon Home Services pro on Amazon.com. If the service was not completed according to the final scope agreed through Amazon’s systems, or if your product or property was damaged as a direct result of the service, we'll work with you and the pro to correct the problem or we'll give you your money back.

If your Amazon Home Services purchase was of poor quality, please contact us to begin the process of filing a Happiness Guarantee claim. After collecting basic contact information and the required documentation of the problem, our support team will work quickly to resolve your case.

If your purchase is covered by the Happiness Guarantee, Amazon Home Services will make it right in one of these three ways:

1) Work with you and the pro to correct the service.
2) Refund your money for the purchase, and cover related property damages up to $2,500.
3) Help you to file a claim against the provider’s insurance.
THE BUG THAT SCARES THE BEJESUS OUT OF YOU

Alexa Creepy Laugh Compilation: 3,827,450 views

THE BUG THAT SCARES THE BEJESUS OUT OF YOU

The robot wars are coming, and Alexa will have the last laugh.

Amazon acknowledged that some of its Alexa-enabled devices have developed a new skill: creeping out their owners with unexpected and unwarranted bursts of robotic laughter.

“We’re aware of this and working to fix it,” the company told the Verge.

People began reporting the problem with their “smart” speakers on social media in recent weeks. “So my mom & I are just sitting in the living room, neither of us said a word & our Alexa lit up and laughed for no reason,” tweeted one woman, Taylor Wade, on 5 March. “She didn’t even say anything, just laughed.”

[Diary of a Mad Nursing Student]

Was really considering an @amazonecho device but then the laughing horror story just changed my mind. I forgot people can hack those things. #nevermind

[Mac Mecoy]

The time has come to put Alexa, Siri, my phone, and all of their tech in another room. It’s going out the window.

[Aaron Levy]

Amazon Alexa is apparently laughing for no reason.

Which is basically the last thing we need in a news cycle right now.

6:30 PM - Mar 7, 2018

1,276 335 people are talking about this
In 2017 the social network’s AI research team turned translation services over to AI, completely.

A Palestinian man was wrongly arrested by Israeli officials after Facebook mistranslated his post.

The construction worker posted a photo of himself by a bulldozer, with the caption “Good morning” written in Arabic.

Facebook translated the message to “Attack them” in Hebrew, and “Hurt them” in English.

Facebook’s translations are entirely powered by AI, and around 4.5 billion translations are made each day across the social network.
SOFTWARE FAIL WATCH
5TH EDITION
Brand Erosion Index
LO$$E$$ FROM SOFTWARE FAILURES (USD)

1,715,430,778,504

ONETRILLIONSEVENHUNDREDFIFTEENBILLIONFOURHUNDREDTHIRTYMILLIONSEVENHUNDREDEVENTYEIGHTTHOUSANDFIVEHUNDREDFOUR
ACCUMULATED TIME

46 MINUTES
8 HOURS
3 DAYS
2 WEEKS
8 MONTHS
268 YEARS
Statistically, there is a very good chance that you have been personally impacted by a software failure over the past year – perhaps even in the last quarter, or week.
**SOFTWARE TYPE**

- **113** Embedded
- **193** Mobile / Cloud
- **300** Enterprise Apps

*“Embedded” includes all software that is built into a device or piece of hardware. If a casino’s slot machine experienced a software glitch, or a car’s airbag sensor malfunctioned, it was placed into this category. Transportation makes up the majority of this category, with 41 of 113 stories. This is unsurprising given that most Transportation software fails stem from a problem programmed in the vehicle itself, be it car, plane, or train.*

*“Mobile/Cloud” encompasses all web or app-based software. If a website crashed due to a software fail, it went into this category. While each industry was well represented (showing how even industries that traditionally run legacy software have jumped on the mobile boat), Retail and Consumer Tech predictably took the lead with 125 stories. Of those 125 stories, 72 featured hardware and smartphone manufacturers such as Apple, Alphabet, or Samsung.*

*“Enterprise Apps” encompasses all software that requires installation in a specific location. If an organization’s internal system, such as an ERP (Enterprise Resource Planning) or accounting software crashed, it went into this category. Enterprise Apps software exists within every industry. However, Public Services and Healthcare overwhelmingly dominates this list, making up 42% of the stories in this category.*
While vehicle recalls are the most ubiquitous of the Transportation industry-related software fails, the bugs that create the biggest uproar are certainly airline outages. While only 14 of the reported transportation stories pertained to air travel, the rage that these types of bugs elicit ensures broad media coverage and palpable brand damage. British Airways took one of the biggest hits, with 6 outages within 2017 – 3 of which took place in the span of 1 month. An outage in May 2017 spawned global chaos over the course of 2 weeks, causing a total loss of $200 Million and as much as a 4% percent drop in stock price that erased hundreds of millions from the company’s value.

2017 also saw a surprising increase in train-related software bugs, 4 of which, oddly enough, took place in Denver, Colorado. The biggest train bug of the year took place in Singapore. A software safety mechanism failed, causing two metro trains at the station to crash into each other. 38 people were injured, and the scheduled maintenance to fix the bug will impair train operations for over 6 months.

These types of bugs often occur as a result of routine software updates, a fact which underscores the necessity of end-to-end testing. This is particularly true within highly-complex system landscapes like transportation logistics, when the lives of customers—not just financials—are at stake.
THE ANATOMY OF A SOFTWARE FAIL
BRITISH AIRWAYS, MAY 27, 2017

- Over 1000 flights canceled over 3 days
- Over 75,000 people affected
- British Airways has estimated compensation bill of over $200 million
- British Airways share price dropped by over $220 million

Power Surge causes system failure
Back-up System fails to engage
All “communications hardware and messaging systems” are down at two airports
Booking system: British Airways forced to rebook 50,000 people on 30 other airlines; RyanAir sees surge in last minute bookings
Arriving Airplanes: Thousands of people forced to wait for hours on tarmac to disembark
Check in desks: No computerized check-in possible Airport staff has to use whiteboards to display flight information
Baggage handling: “Tens of thousands” of passenger bags left sitting in warehouses
Mobile phone apps: No mobile check-in possible British Airways has to reimburse premium phone charges
Calling Your Own Baby Ugly is Hard
Cost reduction through effective QA

Based upon analysis of over 4500 projects:

- There is too large a disconnect between defect creation and defect discovery

- Roughly 80% of defects are created in the analysis and design phase but 70% of defects are found between implementation and deployment

- Fixing defects early in the lifecycle avoids a significant amount of costly re-work, re-test, regression testing, and re-deployment

- Defects found in production can have a major, and sometimes catastrophic impact on business operation – QA throughout the SDLC process reduces the risk of revenue loss/brand damage
Software Development Lifecycle (SDLC)

- An SDLC is framework that describes the activities performed at each stage during a software development project.
- The exact lifecycle/process varies from one model to another, and there are various kinds of software development models.
What is SQA

Software Quality Assurance (SQA) consists of the means of monitoring the software engineering processes and methods used to ensure quality.

SQA encompasses the entire software development process, which includes processes such as requirements definition, software design, coding, source code control, code reviews, software configuration management, testing, release management, and product integration.
Quality methods can be segmented into two categories:

1) Preventive (QA) – proactive (shift left)
2) Detective (QC) - reactive

The key difference to remember is that Quality Assurance is interested in the process whereas Quality Control (testing) is interested in the product. Both are needed, one is not enough.
Chasing the new, shiny, thing...
TMMI
Test Maturity Model Index

LEVEL 1: INITIAL
- Chaotic process
- Dependent on heroes
- No understanding of the cost of quality

LEVEL 2: MANAGED
- Test policy and strategy
- Test planning
- Test monitoring and control
- Test design and execution
- Test environment

LEVEL 3: DEFINED
- Test organization
- Test training program
- Test life cycle and integration
- Non-functional testing
- Peer reviews

LEVEL 4: MANAGEMENT & MEASUREMENT
- Test measurement
- Software quality evaluation
- Advanced peer reviews

LEVEL 5: OPTIMIZATION
- Defect prevention
- Test process optimization
- Quality Control
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In this example, the overall testing maturity level at the client is currently quite low. Several common themes were discovered as contributing factors to the current state. QA can take advantage of several opportunities to change current perception. By choosing specific, initial projects, QA can demonstrate value and stand as an independent reliable quality practice, providing standardized processes and specific skills across all projects.
Understand the current QA organizational structure, staffing levels, staff skill sets, and overall roles/responsibilities in a typical project/program. Overall focus would entail the following:

- Current QA/IT organization and staffing
- Roles of the key players on a typical project/program
- Current skill sets of the QA staff
- Interactions and handoffs between QA and all preceding/proceeding groups
- Training needs
Focus Area – People  
Dimension – Right sized Staffing

## Top Findings

- Currently only 2 FTEs reside in the “testing” organization along with a few contractors. This number is too small to support an IT organization of this size.
- Contractors are brought in as needed to support projects, typically late in the development process. This makes them little more than rented testers asked to follow whatever process or activities used by that project.

## Recommendations

- FTEs should be established as Test Leads on one or more simultaneous projects to be involved from project initiation. These leads can then work with additional team members as needed to transfer project knowledge and mentor/manage staff on department processes and standards.
Suggested Approach - Process Review

SDLC review, along with QA work input drivers and schedules, review of current quality definitions, measurements, metrics, and current business analysis and non-functional requirements processes.

- Determining what to test/test objectives
- Test methodology
- Test planning
- Development/Testing/Production phase gates
- Types of tests executed (unit, system, parallel, integration, UAT, etc.)
- Load and performance test planning/design
- Test Automation planning/design
- Reporting & metrics
- Requirements process and decomposition
  - Review of existing processes, practices, standards, structure, and capabilities relating to business analysis, requirements elicitation, and requirements management
  - Reviews of requirements deliverables (BRDs, use case models, business process diagrams, etc.)
- Go/no go decision making
Focus Area – Process  
Dimension – Well Defined

Top Findings

- No QA process exists in the QA dept. at this time.
- Some degree of process is defined by project teams at the BA or PM level. The level of definition and degree of rigor depends solely on the person in the role considered responsible for testing.

Recommendations

- A formal testing process is required. The process must be comprehensive, and include no ambiguity as to how QA activities will be conducted (i.e. what inputs are needed, what deliverables will be created, etc.).
- The process must be documented, circulated, and approved. All documents should provide standardization for all phases of testing allowing customers to understand what services will be provided by the QA team when engaged.
- When planning for testing activities, use ISO 25010 as a guideline for quality attributes.
Full spectrum testing using ISO standards

ISO 25010 can be used to ensure all quality attributes are considered.

ISO 25010 can also be used to support quality requirements specifications.
### Suggested Approach - Tools/Tech Review

Review of technical tools and network environments including development process, infrastructure & test environments, supporting technology, and applications that would fall within the scope of a typical QA engagement. Overall focus would entail the following:

- **Test Management Tools**
- **Test Automation Tools**
- **Load & Performance Test Tools**
- **Defect Tracking & Reporting Tools**
- **Test Data**
  - Test Data population and data management
  - Test Data refreshing
- **Requirements Management Tools**
  - Requirements management and versioning
  - Requirements traceability
- **Test Environments**
  - Primary/Secondary use of the environment and access/control
  - Back up plans/schedule
  - Data population for the environment?
- **Technology base for the applications most commonly tested**
Focus Area – Tools
Dimension – Customized for Enterprise Use

Top Findings

- Tools are configured very “vanilla”.
- Tools are not currently integrated and do not share data via synchronization.

Recommendations

- The QA team has demonstrated that fairly basic enhancements (custom fields, added list values, etc.) to the tool set would streamline many basic testing activities.
- If tool evaluation and streamlining dictates that Tool 1 and Tool 2 must coexist, data should be synchronized between systems. This will allow development and QA to leverage tools designed to allow each group to utilize best practices. If only one tool is kept, extensive customization may need to be performed to support all teams.
Tools and Tech Diagrams

High Priority App view

- Web Apps, End Mobile Apps, User Computing and Mobility
Tools and Tech Diagrams

Application stack View
- Visibility into impact of changes by level of control by internal teams
DevOps View

- DevOps enabling tools distributed across the enterprise but not “tool chained”
Improvement Areas and Recommendations: “Quick Hits”

1. Create standard form for the QA audit and toolset.
2. Implement internal training.
3. Develop a consistent process for all of the teams.
4. Create engagement.
5. Establish a clear and defined plan with specific measurable

QA Program Assessment feeds into a test strategy document and roadmap.