Challenges in Software Testing

Prepared and presented for JaSST by

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Contents

- software testing in the past
  - software testing in Europe
  - qualifications and ISTQB
- practical advice for the present
  - measuring the value of testing
  - intelligent mistakes in test automation
- challenges for the future
  - for testing, automation and testers

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70s and before

- mainframes, few turnarounds/day
- or real time – assembly language
- developers test their own code, no testing careers
- tools are “utilities” developed for purpose
- first books on testing (USA)
  - 1st mention, Jerry Weinberg - programming book, 1961
  - Bill Hetzel, Program Test Methods, 1973.
  - Glenford Myers, The Art of Software Testing, 1979
- Hot topics
  - optimising for hardware space
  - high level languages

DG See www.testingreferences.com for a testing timeline – and Keizo Tatsumi 3

80s

- IEEE829 and other test standards
- US testing conference USPDI Washington DC ‘83
- testers - seen as 2nd class, developers paid more
- commercial test tools
  - Linda Hayes’ Autotester, 1985
- UK SIGIST begins 1989
- Hot topics
  - structured programming
  - PCs, GUIs, client/server, OO, connectivity
  - new development methods to do away with expensive people (CASE tools) – and testing?

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Technology

- My new computer (1989)
  - Apple Macintosh SE/30 HD 2/40
    - Motorola 68030 processor - 16 Mhz
    - 2 MB memory, 40 MB internal disc
    - black & white screen
- Cost: £2223 (with 30% discount) (¥ 300,000)
  - equivalent to £5000 today (¥660,000)
  - Powerpoint and Word £110 each (¥15,000)
- No connection to outside world
  - no internet, no email, no mobile phones!

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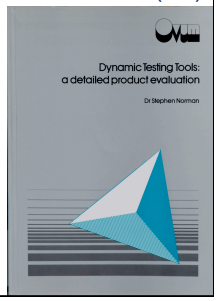
90s

- tool reports (CAST Report, Ovum)
- 1st EuroSTAR 1993, London
- email and the internet
- BS7925 published by BSI (98)
- qualifications, career testers
- more books, magazines
- Hot topics:
  - tools
  - tester/develop ratios
  - testing GUIs, RAD, OO
  - process, Quality Management, ISO9000

82 tools described (from '91)

17 evaluated ('93)



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European testing groups

- SAST (Swedish Association for Software Testing) founded 1995
- TestNet (Netherlands) founded 1997
  - Tmap book published 1995 (in Dutch)
- first SQC conference 1996 (Germany)
- FAST (Finnish Association of Software Testing) founded 2001
- Soft Test Ireland founded 2002
- SJSI – Polish IS Quality group founded 2003
- Norwegian computer society

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00s to now

- tool suites, open source tools
- developers re-discover testing (TDD)
- context-driven school, exploratory testing
- professionalism, specializations in testing
- many SIGs, publications, conferences
- Hot topics
  - outsourcing / off-shoring
  - certification / anti-certification
  - agile, exploratory testing
  - test automation
  - social networks, cloud, virtualisation

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ISTQB

- ISTQB = International Software Testing Qualifications Board
  - precursor: UK's ISEB Software Testing Board
    - first software testing foundation certificate issued 1998
  - ISTQB formed in 2002 (group meetings in 2001)
  - common syllabus, accreditation of trainers, shared exam questions, international governance
  - 46 member boards, covering 70 countries
  - 250,000 ST certificates world-wide

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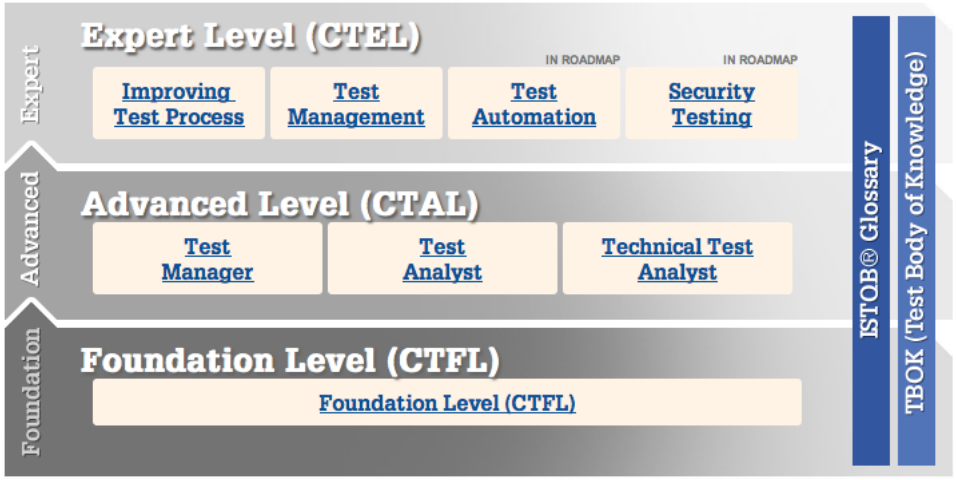
Source: ISTQB.org

Qualifications



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Source: ISTQB.org

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Before ISTQB

- some training, all different
- varied terms in testing
- testers not respected, not a real career
- pockets of interest / expertise
- “anyone can test”

After ISTQB

- common syllabus for training
- common vocabulary
- recognized as a profession, more respect
- coordinated sharing of expertise & knowledge
- something to be learned

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What has changed over the years?

- a growing profession
  - qualifications and respect
  - from one book to hundreds
  - from “tester” to specialisms within testing
- technical change
  - from mainframes to the cloud, SoLoMo
  - from homegrown utilities to commercial & free tools
  - from KB to GB to TB
  - from print (books, journals), to internet, blogs, twitter..
  - from “turnarounds” to continuous integration

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What hasn't changed?

- managers don't understand testing
- testing seldom taught at university (or to CEOs)
- tools are seen as a panacea/silver bullet syndrome
- people new to testing don't know much
- lots of people are new to testing
- no/little desire to learn from the past
- new technology, constant change
  - testing follows the technology
- testing is still testing; people are still people

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What value does testing provide?

- Potential value
  - finds defects
  - gives confidence
  - gives information, e.g. about risk
- How can you tell if value is provided?
  - how can you measure this value? (examples)
    - for finding defects – DDP
    - for assessing confidence
    - for showing risk

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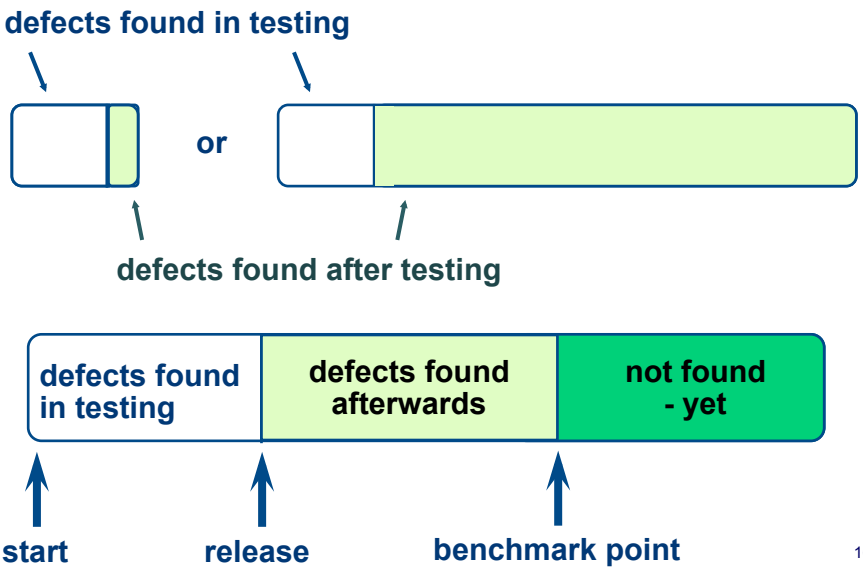
How effective are we at finding defects?



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Defect Detection Percentage (DDP)

$$\frac{\text{defects found by this testing}}{\text{total defects including those found afterwards}}$$

- "this" testing could be
  - testing of a sprint, increment or story
  - a test stage, e.g. component, integration, acceptance, regression, etc.
  - testing for a function, subsystem or defect type
  - all testing for a system

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DDP example

testing	live running	DDP after live
150	50	75%

$$DDP = \frac{150}{150 + 50} = \frac{150}{200} = 75\%$$

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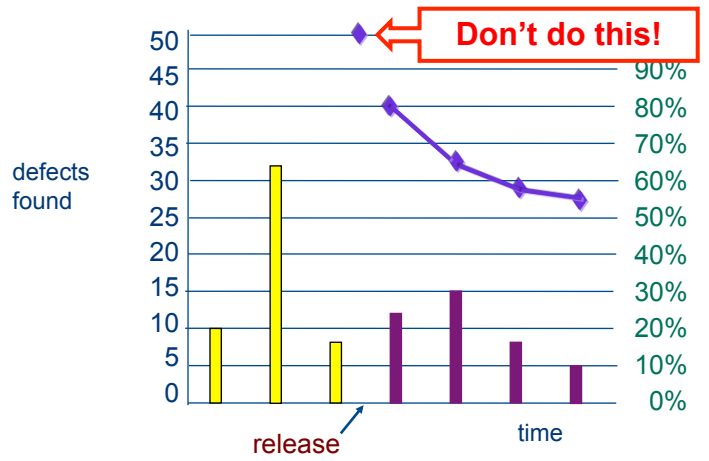
Effectiveness at finding defects



defects found in testing: 50 | defects found after testing: 40 | total defects found: 90

$$DDP = \frac{50}{90} = 55\ \%$$

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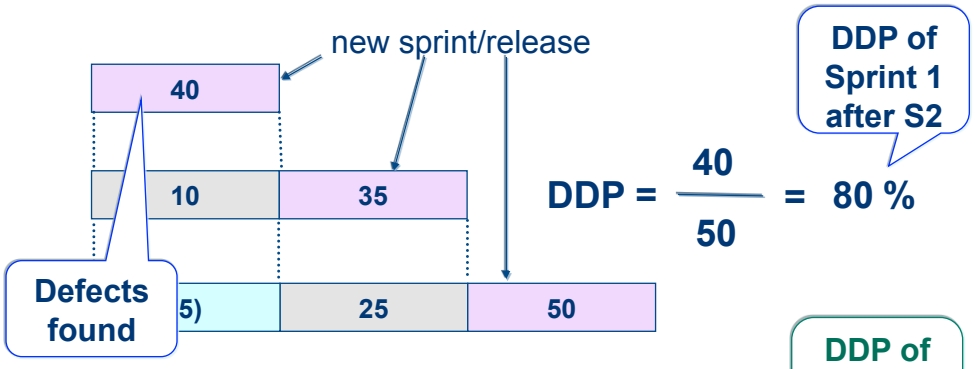
DDP in agile/iterative development



DDP of Sprint 1 after S2

$$DDP = \frac{40}{50} = 80\ \%$$

DDP of Sprint 2 after S3

$$DDP = \frac{35}{60} = 58\ \%$$

Options: by sprint, all previous sprints, all defects for each sprint, etc!

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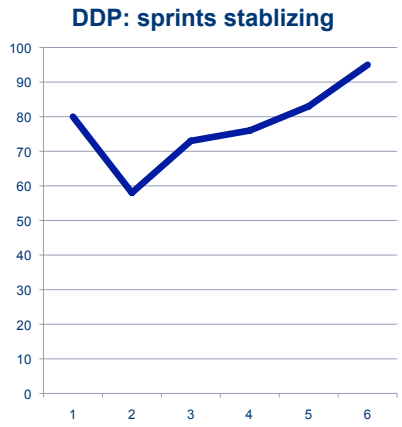
DDP examples over Sprints



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What is your DDP?

- How many bugs found in testing for the system or area that is now live/released?
- How many bugs found since it was released?
- Your DDP will be:
  - guaranteed to be
    - between 0% and 100%
  - your actual number doesn't matter a lot
    - it's how it changes over time

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Case studies from clients

	1 mo	10 mo
year 1	70%	50% est
year 2	92%	

Finance (insurance)

Operating system

System Test Group DDP = 38%
(before performance testing)

Priority 1 & 2 only: DDP = 31%

23% to 87% by application

Defects: 1 / 4 160 / 200

Scientific software
(chemical analysis)

Not useful for low numbers of defects

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DDP Summary for AP Europe

Project or App.	Months	DDP	DDP Status	Comments
Before New Testing Process				
S4		50%	ESTIMATED	
After New Testing Process				
R1	3	81%	FINAL	*Major re-engineering*
LBS	4	91%	FINAL	
CP	7	100%	FINAL	*Reporting System*
DS	3	95%	FINAL	
APC	4	93%	FINAL	
ELCS	4	95%	FINAL	*Eur impl. of US system*
SMS	3	96%	FINAL	*Enhancement Release*
C	4	96%	FINAL	
E7 (US)	5	83%	FINAL	*Global Enhancements*
E7 (Eur)	1	97%		*Global Enhancements*

Source: Stuart Compton, Air Products plc

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What does it mean?

- DDP is very high (> 95%)
  - testing is very good?
  - system not been used much yet?
  - next stage of testing was very poor?
    - e.g. ST looks good but UAT was poor, ST after UAT is high – but live running will find many defects!
- DDP is low (< 60%)
  - testing is poor?
  - poor quality software (too many to find in the time)?
  - deadline pressure – testing was squeezed?

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DDP benefits

- DDP can highlight
  - testing improvements
  - the effect of severe deadline pressure
- can raise the profile of testing
- is applicable over different projects
  - reflects testing process in general
- can give on-going monitoring of testing

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Options for measuring DDP

- what to measure
  - simplest: all test defects / all defects so far
  - by severity level
- how "deep" to go?
  - deeper levels give more detailed information
  - deeper levels more complex to measure
- advice: start simple
  - simple information is much better than none
  - trend is important, detail & accuracy are not
  - build DDP calculation into your bug system

e.g. many sprints, eliminate duplicate defects

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Confident about what?

- objective measures
  - the system does the right things, usable, reliable
    - if tests pass [and a good set of tests]
  - is the testing good [enough]
    - coverage (of code, functions, menus etc)
    - review against standards
- subjective measures – confidence is a feeling
  - ask “how confident are you” (on a scale of 0 to 5)
  - assess against targets
    - e.g. target = 4.5 (out of 5.0)
    - average confidence = 3.5 ➔ not there yet

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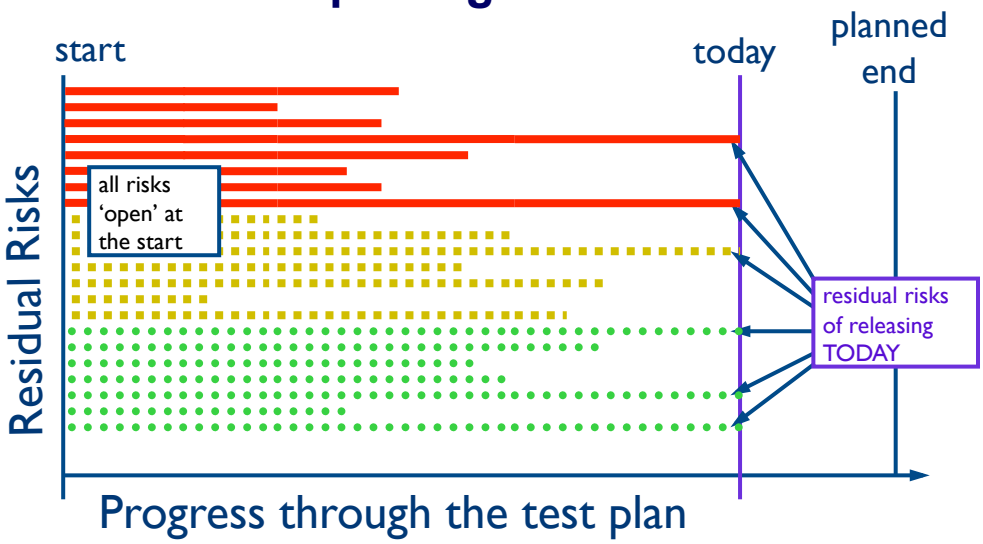
Risk-based reporting

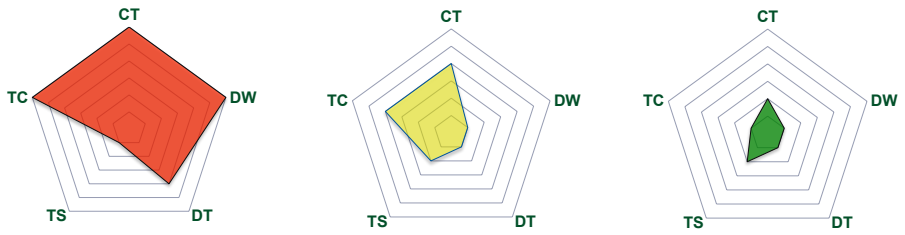


DG Source: Paul Gerrard & Neil Thompson, Risk-based e-business testing, Artech House, 2002

"Risk spider"

Weekly or daily updates on the top risk factors, e.g.

- **CT:** **Code Turmoil**
- **DW:** **Defects found this Week**
- **DT:** **Defects open in Total**
- **TS:** **Test Success Rate (% that passed)**
- **TC:** **Test Completion Rate (% of planned tests run)**



DG Source: Mike Ennis, Managing the End Game of a Software Project, EuroStar 09 30

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Intelligent mistakes in automation

- automated regression tests should find [lots of] bugs
- tools can and will replace testers
- the tool will provide the architecture for the tests
- automation is just test execution
- automate all manual tests
- ROI is essential

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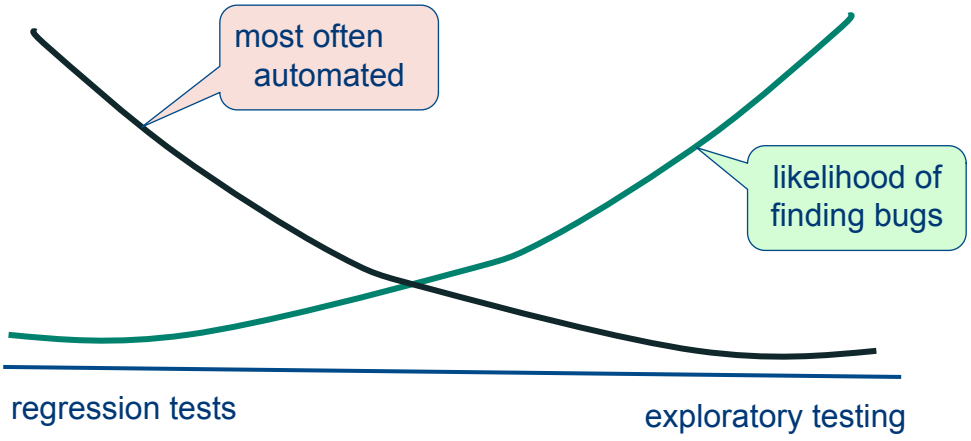
Bug-finding and automation



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Automation should find bugs?

- automation doesn't find bugs: tests find bugs
- the bug-finding ability of a test is not affected by the manner in which it is executed
- automation is a mechanism for running tests
  - a test-running activity, not a bug-finding activity
- mistake: confuse objectives for testing with objectives for automation

Automated tests	Manual Scripted	Exploratory	Fix Verification
9.3%	**24.0%**	**58.2%**	**8.4%**

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Experiences of Test Automation, Ch 27, p 503, Ed Allen & Brian Newman

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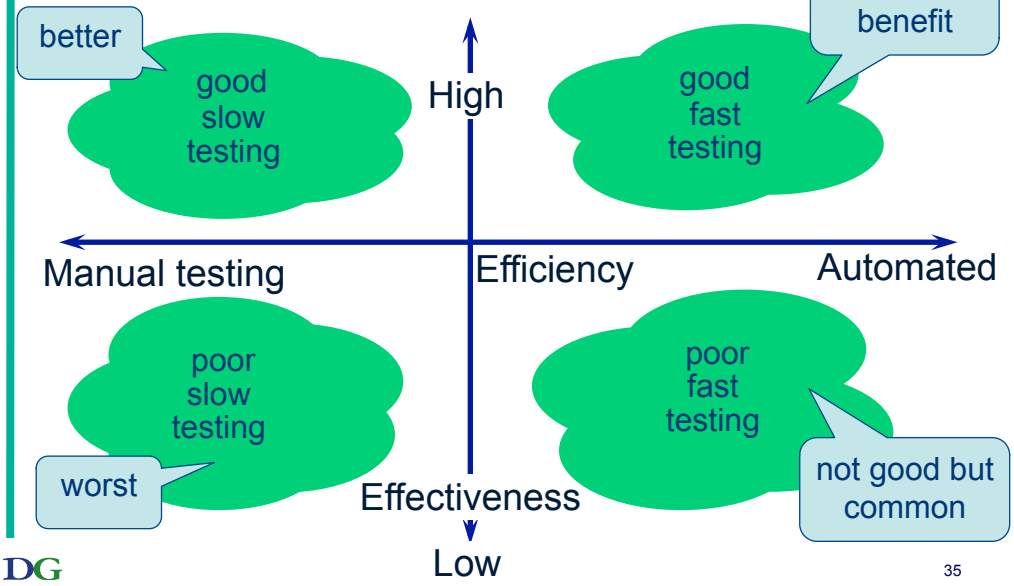
Efficiency and effectiveness



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When is "find more bugs" a good objective for automation?

- when the first run of a given test is automated
  - Model-Based Testing (MBT), exploratory test automation, automated test design, monkey testing
  - keyword-driven (e.g. users populate spreadsheet)
- find bugs in parts we wouldn't have tested?
  - indirect result of automation
  - direct result of running more tests

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Tools will replace testers?

- "we can reduce the number of testers once we have the tool"
  - what are your testers like?
    - mindless mechanical machines, or
    - intelligent investigators?
  - need more skills, not fewer
    - development skills to work directly with tools
  - automation can free testers to do more test design, exploratory testing
    - and find more bugs
  - tools don't replace testers, they support them

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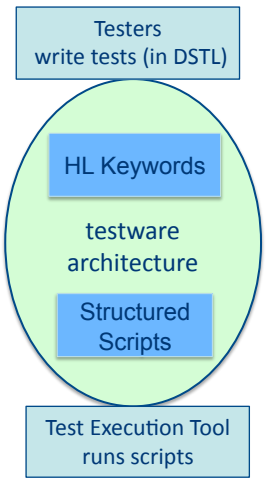
Testware architecture

- use your tool's scheme?
  - locked in, great for vendor!
  - define what's best for you
- a poor architecture gives high maintenance cost
  - often leads to shelfware
- two layers of abstraction are critical for success
  - technical: for long life
  - human: for wide use



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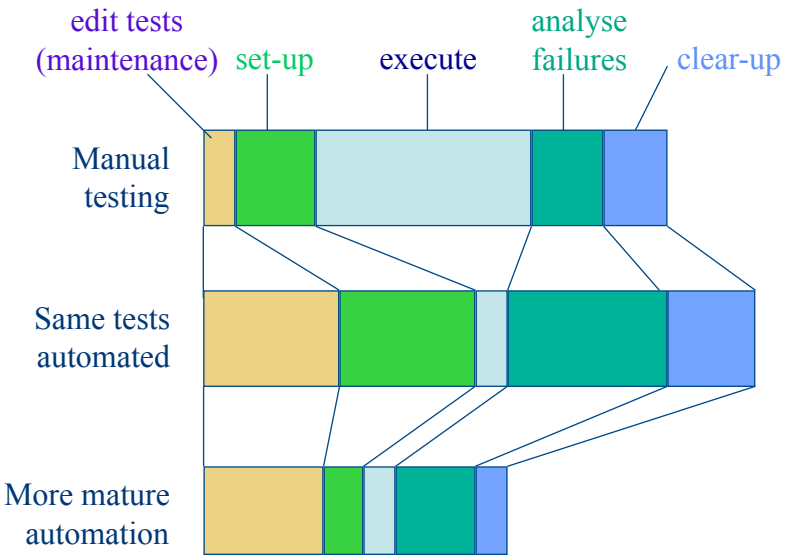
Automation is more than execution



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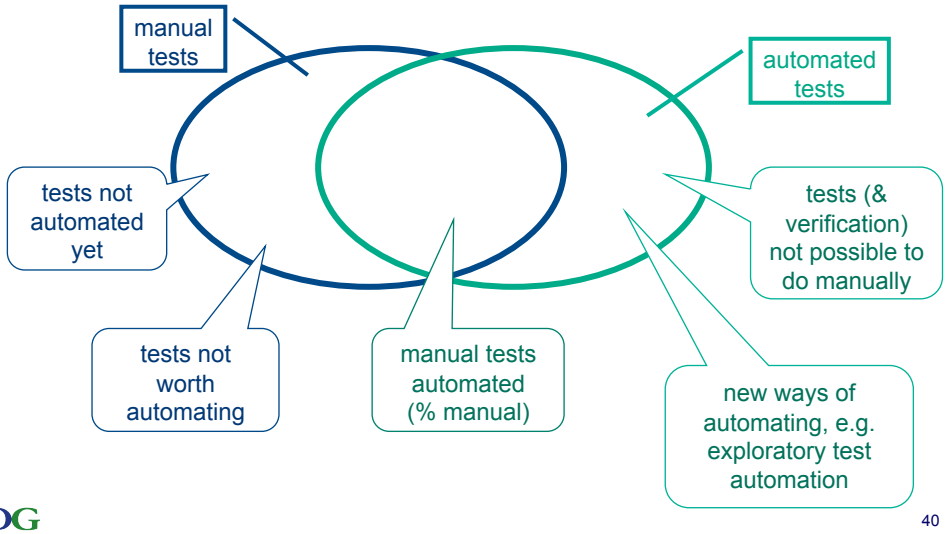
Automate manual tests?



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Is this Return on Investment (ROI)?

- tests are run more often
- tests take less time to run
- it takes less human effort to run tests
- we can test (cover) more of the system
- we can run the equivalent of days / weeks of manual testing in a few minutes / hours
- faster time to market

ROI = (benefit – cost) / cost

these are (good) benefits but are not ROI

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How important is ROI?

- ROI can be dangerous
  - easiest way to measure: tester time
  - may give impression that tools replace people
- "automation is an enabler for success, not a cost reduction tool"
  - Yoram Mizrachi, "Planning a mobile test automation strategy that works, ATI magazine, July 2012
- many achieve lasting success without measuring ROI (depends on your context)
  - need to be aware of benefits (and publicize them)

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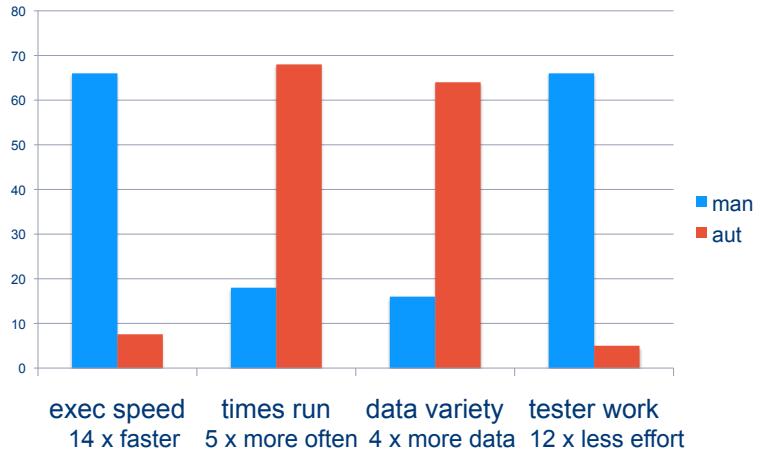
An example comparative benefits chart



ROI spreadsheet – email me for a copy

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Challenges for the future: testing

- technical challenges
  - cloud, virtualization, SoLoMo
  - Agile, Continuous Integration, DevOps
  - Testing in Production (TiP)
- different focus for testing
  - consumer-driven focus: usability, quality?
    - Service-Driven Test Management (Martin Pol)
  - testing as a Service
  - tests to be a commodity? (James Whittaker)
    - download from iTest?

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Challenges for the future: automation

- more automation
  - unit tests with continuous integration
  - routine for regression tests to be automated
- better automation - levels of abstraction
  - structured and efficient for any tester to use
    - MBT, DSTL, Exploratory Test Automation, “scriptless”
  - good design principles for minimal maintenance
- wider scope
  - “outside the box”, not just traditional automation
  - manual tests supported/surrounded by automation

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Challenges for the future: testers

- the tester's role may change
  - out of a job?
    - because developers now test so well…?
    - all testers have now become developers??
  - crowd-sourcing, social media, user testers
    - communication, collaboration
  - technical advisors to developers/co-working?
    - design for testability / automatability
  - root cause analysis & defect prevention
  - customer/business facing at the highest level?

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Summary: key points

- software testing has come a long way
  - from unnoticed and unappreciated
  - to respected and qualified
- measure the value of testing (e.g. DDP)
- beware of "intelligent mistakes" in test automation
- the future looks very interesting!
  - for testing, testers, and automation

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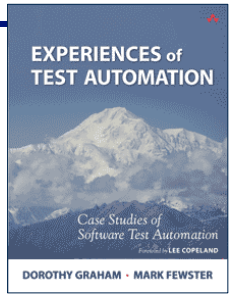
More information



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