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Improving the Test Process

The High-Velocity Testing Organization

by Nick Jenkins

The Blindspot

Testers specialize in finding other's mistakes, but often have a blind spot when it comes to finding their own. Their skills are honed to identify irregularities in other people's work, but they can be singularly blind to them in their own. Testers also tend towards dogmatic personalities with a black-and-white belief in right and wrong.

Changing any large organization is difficult. Changing an organization which consists of analytical, argumentative, pedantic professionals can be positively excruciating. Testers are often not willing to accept ideas on faith, but must be painstakingly convinced of the 'logical' benefits of a change in method.

How much easier it would be if you could let them convince themselves.

This is the basis of a 'High-Velocity' organization.

The Root Cause

Although we are naturally disposed to be inquisitive, we have done a wonderful job of creating an environment that beats the curiosity out of us. From kindergarten to university to our working life we are taught to respect the authority of 'experts'. [1]

Classrooms, for example, are designed for information transmission, and not exploration; the teacher delivers truth from the blackboard like the sermon from the Mount. And when we go to work, we are told by senior managers, technical gurus and high priced consultants what 'best practice' is and how we should work (CMMi, TMMi, ITIL, etc). Experimentation is discouraged as wasteful and making mistakes is punished by censure or ridicule.

Yet the demand for improvement and efficiency is incessant and urgent. Those that do not evolve are destined for extinction. So, organizations are expected to improve in prodigious leaps as the "next big thing" is delivered by the current crop of experts. This rarely works and is always expensive.

One trend is for 'continuous improvement', empowering teams to continually refine their own processes, raising quality and reducing waste. However, these teams often lack the practical and theoretical skills to identify and tackle problems.

How then do we build continuous improvement into an organization?

The 'Toyota' Way

In the world of engineering there are few organizations larger or more competitive than automotive firms. Amongst them, Toyota is often held up as the shining example of an organization which has risen to the top and continues to stay there (despite some recent challenges). In 2009 Toyota produced more than seven million vehicles, a million more than its nearest rivals [2].

There are many books and articles on 'The Toyota Way', 'Lean' or 'Learning Organisations', and the most convincing of these is "The High-Velocity Edge" by Steven J. Spear.

In it, Spear argues that Toyota (and others) improve not from the products of their philosophy (like kanban, kaizen and jidoka) but from the subtle and pervasive philosophy itself.

Spear's hypothesis is that High-Velocity organizations succeed by finding, confronting and overcoming the limitations that hold them back.

He summarizes it like this[3]:

1. See problems as they occur
2. Swarm and solve problems as they are seen
3. Spread new knowledge
4. Lead by developing capabilities 1, 2 and 3

A High-Velocity organization builds process improvement into every team, every process and every task. This leads to a culture in which self-reflection is encouraged, continuous improvement is ubiquitous and experimentation is rife.

1 *Ken Robinson 2010 Changing Education Paradigm, RSA animation of Ken Robinson 2010 TED talk on Creativity and Education, Royal Society for the encouragement of Arts, Manufactures and Commerce (RSA), viewed 27-Apr-2011, <http://www.thersa.org/events/vision/archive/sir-ken-robinson>*

2 *Multiple authors 2011 Automotive Industry - Automotive production worldwide by manufacturer, Wikipedia, viewed 27-Apr-2011, <http://en.wikipedia.org/wiki/Automotive_industry>*

3 *Spear, Steven J 2009 The High-Velocity Edge, chapter 4, McGraw-Hill, New York*

There are critics of the Toyota Way who point out that much of Toyota's success is driven by its commercial bargaining power, its monolithic culture and the particular devotion of its Japanese workers, not by any particular management science[4].

However, Toyota is just one example and the principles of High-Velocity or learning organizations resonate with many managers. Similar themes can be found in books like Peter Senge's 'The Fifth Discipline'.

Seeing Problems As They Occur

Testers specialize in seeing problems after the fact – finding defects by examining software for the traces left by bugs. We are deductive professionals par excellence.

What we're not very good at is seeing problems **when they happen**.

There is power in observing problems directly in the context of process, place and time; the more distance in each, the more contextual information is lost. Rebuilding that context is a classic example of waste. If we can identify problems when they happen, we can isolate the root cause from the symptoms easily.

We can then resolve or counter the problem at its root.

For a long time people have pointed out that solving problems earlier in the life cycle is cheaper (Barry Boehm) and that testing should move further up the lifecycle (TMMi et al). Normally this is characterized by breaking a waterfall process into some kind of incremental review where errors are still detected after the fact, albeit earlier in the lifecycle (V-model etc).

In a High-Velocity organization, problems are assessed in the moment they are detected. In the context of a Toyota factory, this is typified by 'andon' cords attached to work stations. When a cord is pulled, the assembly line stops, a red light signals the location of the problem and engineers assemble there.

Swarming the Problem (and Solving it)

In traditional organizations, leaders are left to deal with problems alone. In a learning organization, an individual that discovers a problem calls on colleagues to diagnose the cause, select options and predict outcomes.

The team 'swarms' the problem to bring its collective mind to bear.

Rather than identify a single option, the method emphasizes generating multiple options (hypotheses), predicting the outcomes and rapidly testing the options to select the best solution (experiment). Experimenting supplies this evidence and avoids blind alleys and false starts; it also exposes assumptions and constraints for critical examination.

The role of observers is not to offer solutions but to critique the problem holder's method – to sharpen their problem solving skills. This avoids the trap of expert authority dominating the solution. The purpose is to refine the group's collective problem solving skills and not necessarily to find the 'perfect' solution to the problem.

Give a man a fish; you have fed him for today. Teach a man to fish; and you have fed him for a lifetime.

Share the Knowledge

Swarming a problem leads to the sharing of knowledge as a circle of colleagues discusses options and techniques. This reinforces the continuous nature of personal improvement in a learning organization and leverages existing knowledge.

However, it's also important to share the knowledge outside of the immediate circle. All too often what is learnt in one part of the organization will be needed in another, as the same problems are faced by many teams.

An organization must have a way to communicate what is new across its length and breadth. Quality circles, knowledge bases or documented quality improvements can all support knowledge sharing, but the most powerful methods involve face to face sharing across teams.

This does happen in contemporary organizations, but occasions are limited and the focus is often poor. Teams are usually preoccupied with saving face or creating a good impression. Rarely, if ever, do teams come together for a critical and reasoned debate.

To support the learning organization, it is important to share not only problem and solution but context, reasoning, hypotheses, experiments and outcomes. This builds the corporate memory of the organization and inhibits reinventing the wheel.

Lead by Teaching 1, 2 & 3

Spear emphasizes the role of leaders in coaching the methods of problem solving. This is the heart of what he sees as a High-Velocity organization. A leader doesn't lead by command and control but by mentoring in problem resolution.

In one example from a Toyota plant, a senior manager inducts a new senior manager by telling him, 'Everyone knows you're the boss, but I want you to manage as if you had no power over your subordinates.' The VP of Engineering would have to 'sell' his ideas on the shop floor[5].

In a learning organization, the manager is not the expert source of knowledge, they are the facilitator of a learning process in which the subordinates develop their skills. When it comes to a problem, the leader's opinion is no more authoritative than the subordinate's. It is in the technique of problem solving that he or she excels.

This resonates positively with the challenges many organizations find training and retaining qualified employees. Employees often leave employment not for reasons of pay or conditions but for the lack of challenge and opportunity in the job. A learning organization tackles both the organisation's need for constant improvement and the individual's need for constant challenge.

The High-Velocity Testing Organisation

So how does this apply to software testing?

To truly contribute to software development, testers must move back up the value chain of the software development lifecycle

4 *Nomura Masai, AMPO Japan-Asia Quarterly Review, Vol 25 No .1*

5 *Spear, Steven J 2009 The High-Velocity Edge, p293, McGraw-Hill, New York*

(SDLC). Relegated to the end of the SDLC, they seek mainly to limit harm, not add value.

In the context of traditional waterfall, testers struggle to become involved earlier because of their deductive nature – they are always waiting for an artefact to be delivered so they can 'test' it.

As part of a High-Velocity organization, testers can apply their deductive skills to finding and diagnosing the root cause of problems as they occur. They can be an integral part of the team, helping developers test options and critically assessing assumptions and predictions. They can help see the wood for the trees.

Imagine a software development effort which stops every time a bug is detected and the root cause is discovered, diagnosed and countered on the spot.

To some this might appear wasteful, chopping and changing tasks, but developing software is not factory work – it's a creative discipline. In creating something, you can choose to continue propagating the same error repeatedly, or you can stop, remove the source of the error and continue free from blemish. One has the hallmarks of a craftsman, the other smacks of rank amateurism.

Parallel Ideas

The concepts espoused here have parallels with contemporary software testing movements such as Context Driven Testing and Agile.

Context Driven Testing emphasizes the importance of selecting the right practice for the right task and deprecates generic "best practice". It emphasises that individuals examine the problem at hand and, using the techniques at their disposal, select the best approach to the problem[6].

Context Driven Testing also espouses the personal development of a tester as a domain expert with a wide selection of techniques at their disposal. They become a generic (test) problem solver and not an advocate of any single practice.

Agile has similar principles with flexible processes and an emphasis on individuals and interactions over processes and tools. Agile practices like standups and retrospectives have their roots in the group based problem solving of Lean & The Toyota Way .[7]

Agile also supports the notion of finding and fixing defects as they occur through techniques such as Test Driven Development (TDD) and Behavioral Driven Development (BDD). Agile teams also often sport andon cords in the form of 'build lights' which alert the team immediately to the fact a build has failed.

Conclusion

Change is hard.

We are creatures of habit and the warm safety of our occupational rut is often far too comfortable. The strength of the ideas behind learning organizations enables people to change their world in incremental steps, not Big-Bang chunks.

As one manager put it to Peter Senge [8], "People like to change. They don't like to be changed."

There are plenty of options in testing at the moment : TPI, CAST/ISEB/ISTQB, automation vs manual, Agile techniques, exploratory testing, TMMi/CMMi, context driven, cleanroom, formal methods, etc.

The ideas behind Learning and High-Velocity Organizations offer a philosophy with which to bind all of these together. By focussing on personal decision making and experimentation you encourage teams to choose their own destiny.

Instead of force-feeding your testers the next evolution of 'best practice', you can lay out a smorgasbord of options, confident that they will have a process for selecting the right tool for the right job.

The 'problem' focus of a High-Velocity organization also ensures that effort is well directed. Every problem removed from your process increases long term quality and reduces waste.

Yet, these techniques offer no silver bullet.

Breaking down the problem into stages helps, but like the generic process problem, you must observe the problem of change in your organization. What does "seeing the problem" mean in your context? How will you "swarm" problems? How can you "share new knowledge" with colleagues?

There is no doubt that the journey is long and painful when taken in small steps; there are many barriers to success. However, the lofty ambition of an organization which delivers continuous improvement along with personal development for all its employees is one worth striving for.

> biography

Nick Jenkins
started his testing career in Sydney in 1996 when he helped establish the Australian Testing Centre, the first independent test house in Australia. He also trained with James Bach at STLabs in Seattle.

Since then he has worked in London, Prague, Boston and San Fransisco for telcos, off-the-shelf software companies and in the finance sector. Currently he resides in his home town of Perth, Western Australia where he works as head of Quality and Logistics for Bankwest, a national bank.

He spends his spare time trying to keep up with his 5-month old son Henry and frolicking with kangaroos in the bush.

6 *Cem Kaner / James Bach 2010 The Seven Basic Principles of the Context-Driven School – viewed 27-Apr-2011 <http://www.context-driven-testing.com/>*

7 *Various The Agile Manifesto – viewed 27-Apr-2011 <http://agile-manifesto.org/>*

8 *Peter M Senge 1994 The Fifth Discipline, Doubleday*