Demystifying Quality Management Mindsets in Japanese Large-Scale Manufacturers to Software Testers

11th-12th Oct 2021
Pacific Northwest Software Quality Conference (PNSQC) 2021

Yasuharu NISHI
The University of Electro-Communications, Tokyo
@YasuharuNishi / Yasuharu.Nishi@uec.ac.jp
Who is Nishi?

• University (assistant) professor on software testing and QA

• Consultant on software testing and QA for hardware manufacturers in Japan
  – Automotive, industrial automation, consumer electronics, medical devices etc.
  – 20+ year experiences

• Serial community-founder on software testing in Japan
  – Mailing list, Conference, Volunteer organization, ISTQB Japan, ISO domestic committee etc.

• A goodfella in “TQM Mafia” for hardware manufacturers in Japan
Quality manufacturers in Japan

• You have a vague impression about high quality in Japanese hardware manufacturers
  – automotive industry, industrial automation etc.

• They have established sets of principles of quality management
  – TQM (Total Quality Management)
  – TPS (Toyota Production System)
  – Taguchi methods
  – Other companies’ own quality management frameworks
History of TQM in Japan

- **Dr. Edward Deming**
  - came to Japan in 1947
to teach statistical quality control to Japanese factories

- **Dr. Joseph Juran**
  - came to Japan in 1954
to teach company-wide application of concepts of quality control

- **Dr. Kaoru Ishikawa**
  - constructed TQM (formerly called TQC) principles
    expanding concepts taught by Deming and Juran
  - Dr. Ishikawa is the godfather of TQM mafia in Japan
    - Dr. Kano (a.k.a. Kano model) is a great guru in TQM mafia

[Links](https://www.juse.or.jp/deming_en/award/)
[Links](https://www.juse.or.jp/qc_circle/case/)
[Links](https://www.agilityiq.io/product-management/the-kano-model-for-prioritization/)
[Links](https://www.sme.org/technologies/articles/2005/masters-of-manufacturing-joseph-m-juran/)
Concepts of TQM in Japan

- 品質
- 品質第一
- カイゼンサイクルと標準化
- 方針管理
- 目的指向とプロセス主義
- 水平展開による品質の作り込み
- 全員参加と「後工程はお客様」
- 事実に基づく管理と5ゲン主義
- 自律と小集団活動
- 人間性尊重
- 悪さの知識
Concepts of TQM in Japan

- Interpretation of Quality
- Quality first
- Kaizen cycle (a.k.a. PDCA cycle) and standardization
- Management by policy
- Purpose-oriented and process-oriented
- Frontloading insight by reuse of lessons learned
- Involvement with everyone and internal customer
- Management by fact and data, and 5-gen methodology
- Teamwork based on personal autonomy
- Respect and warmth
- Negative insight
Mindsets in high quality manufacturers in Japan

- Journey into quality forever
- Make everyone perseveringly smarter
- Enhance co-confidence
- Nestle weakness
Journey into quality forever

• What is quality?
  – In software development, people often say “Only users can judge quality”
  – Gerry Weinberg said “Quality is value to some person”

• Japanese TQM thinks “all types of quality matter”
  – Dr. Ishikawa said “Quality of products, quality of work, quality of services, quality of information, quality of process, quality of organization, quality of people from front-lines to executives, quality of system, quality of policy, quality of management etc.”
  – QA people think exhaustively about what quality is and whose quality it is

• Do users know quality?
  – Of course
    • Japanese manufacturers have constructed processes of getting feedback from users
  – Yes
    • But as immediate feedback is technically impossible, they have “simulated” users
  – Partly no
    • Users sometimes say “I have never imagined such a product! I really want this!”
  – No
    • Users can’t know internal quality like product-line-friendly architecture
Journey into quality forever

- Japanese manufacturers have constructed processes of getting feedback from customers by customer support or marketing division.
Journey into quality forever

• Some consumer electronics companies built a house in its factory site
  – QA engineers lived in the house as various “simulated” families
Some Japanese manufacturers have already constructed or are starting to construct IT-based large feedback cycles:

- Some construction, mining, and agricultural machinery companies automatically collect field data and use them to improve machinery and their customers’ business.
- Some automotive companies have started to build CI/CD and DevOps cycles with real-world driving data.
- Some have begun to apply Scrum-like iterative hardware development with modular hardware design.
Journey into quality forever

• **Japanese quality manufacturers struggle to realize all types of quality in the long term**
  – Temporally they have to make compromise and trade-off
  – They have a strong will to realize all types of quality in the long term by continuous kaizen and innovation

• **QA people always walk around and do whatever is necessary for quality**
  – To talk to all stakeholders
  – To understand them
  – To make all people understand each other
  – To make all people think quality is everyone’s mission
  – To make all people realize all types of quality
Journey into quality forever

• It’s a never ending journey of us, QA people
Make everyone perseveringly smarter

- Japanese TQM thinks “all types of quality matter” including quality of organization and people

- QA people should ensure the organization makes itself perseveringly smarter
  - Involvement with everyone
  - Teamwork
  - Internal customers
  - Multi layered feedback cycles and Frontloading

- QA people should ensure people make themselves perseveringly smarter
  - TQM in Japan says people will get perseveringly smarter in their journey into quality
  - TQM in Japan includes methodologies which make people perseveringly smarter
    - Statistics
    - 5 whys
    - 5-gen methodology
    - Anti-patterns
Make organization perseveringly smarter

- **Involvement with everyone**
  - Beware of little lack of concern about quality; A small leak will sink a great ship (modified Benjamin Franklin)
  - Break silos of “I’m a developer, so quality isn’t my business”
    - Silos are not limited to developer’s silo and tester’s silo.

- **Teamwork**
  - Pair or mob work will encourage people to kaizen quality by close conversations
  - “Quality circle” is a scheme of mob-kaizen in TQM

- **Internal customers**
  - Next process knows a lot of things to kaizen your process
    - If you treat the next process as customers, you will be encouraged to kaizen your process

- **Multi-layered feedback cycles**
  - Japanese quality manufacturers maintain several layers of feedback cycle
    1. Whole business layer
    2. Inter-divisional layer
    3. Neighborhood process layer
    4. Single process layer
Make organization perseveringly smarter

- Feedback cycle on whole business layer
  - e.g. by building lean and open organization
Make organization perseveringly smarter

- Feedback cycle on inter-divisional layer
  - e.g. by concurrent engineering
Make organization perseveringly smarter

- Feedback cycle on neighborhood process layer
  - e.g. by frontloading a.k.a. shift-left
Make organization perseveringly smarter

- Feedback cycle on single process layer
  - e.g. by mob-kaizen a.k.a quality circle
Make people perseveringly smarter

- Feedback? Frontloading? Shift-left? How? Is it just an early starting?
  - One way for successful feedback is to give insight
    - But without any methodology, you could make just a shallow and poor idea
  - TQM in Japan provides methodologies to extract insights
    - Statistics / 5 Whys / 5-gen methodology / Anti-patterns

- Statistics
  - Statistics make insights from iterative work, e.g. mass production
    - Statistics sometimes give wrong impressions

- 5 whys (a root cause analysis)
  - Multiple whys guides essential causes and insights
    - Too many whys will lead meaningless cause, e.g. “because we are human”

- 5-gen methodology
  - A set of words helps to extract insights by shaking abstraction level
    - 3 reality: Actual location (Gemba in Japanese) / Actual object (Gembutsu) / Actual situation (Genjitsu)
    - 2 essence: Nature (Genri) / Principle (Gensoku)
Make people perseveringly smarter

- Anti-patterns matter to QA people
  - Expert engineers have both “positive insights” and “negative insights”
    - Positive insights are patterns how you can succeed, e.g. design patterns in software dev.
    - Negative insights are patterns how you will fail, e.g. code smells in software dev.
  - Developers will avoid, hate and forget negative insights
    - QA people will focus on, re-use and love negative insights
  - Japanese quality manufacturer store and re-use anti-patterns
    - Various failure modes for FMEA which is far from Western FMEA
    - Bad design patterns in 3D-CAD

[Image showing a conflict or contradiction]
Make people perseveringly smarter

- We have maintained “software trap” as negative insights that shows bug-prone requirement or design
  - “Rip Van Winkle” trap (“Urashima-taro” in Japanese)
    - RVW is an American short story written in 1819
      - After Rip returned from a walk into a mountain, everything is changed
    - “Process that requires physical time forked from short-lived process will lost the original position”
      - “Eject disc” process forked from “Navigation” process can’t return and fails by General Protection Fault because Navigation process ends during mechanical ejection movement
Make people perseveringly smarter

• Embrace conflicts and make insights
  – All the methodologies to extract insights includes conflicts inside
    • Statistics / 5 Whys / 5-gen methodology / Anti-patterns
  – Conflict is a source of insight, though trade-off is necessary
Enhance co-confidence

- Test and process can’t assure quality
  - Exhaustive testing is impossible though expert testers can do their best
  - Process tends to be bureaucratic though people there know it’s bureaucratic

- Quality Assurance work only needs everyone’s co-confidence
  - If everyone gains confidence in doing the best and they knows others did the best each other, they can achieve as high quality as they can
  - Insight can increase confidence
  - Discomfort and uneasiness are signs of lack of confidence

- Mission of QA people is to gain and keep everyone’s co-confidence
  - Not to make everyone compliant to rules, standards and processes
  - Testing is a melting pot of insights extracted and created by everyone
  - Process is a tool to share insight with everyone
  - In other words, mission of QA people is to circulate and expand insights in people and organization
Nestle weakness

• To err is human
  – “To Err is Human; to Forgive, Divine” (Alexander Pope)
  – Bounded rationality – Everyone is imperfect, everyone has weakness
  – Everyone alone can’t overcome his/her weakness

• QA people should nestle everyone’s weakness and support everyone in overcoming his/her weakness
  – Penalty or punishment doesn’t work or avoid any failure
  – Don’t throw bug information in order to make developers fix it
  – Talk to developers who made bugs. Ask them if they have co-confidence. Listen to reasons why they couldn’t tell discomfort or uneasiness.
  – Support them in extraction of negative insight
What are differences between QA and tester

- Mindsets in high quality manufacturers in Japan are very similar to mindsets in modern testing and agile testing
  - Journey into quality forever
  - Make everyone perseveringly smarter
  - Enhance co-confidence
  - Nestle weakness
QA is an unchained tester from testing activities

- **Journey into quality forever**
  - Do whatever is necessary for quality

- **Make everyone perseveringly smarter**
  - Construct multi-layered feedback cycles and extract anti-patterns

- **Enhance co-confidence**
  - Don’t make everyone compliant to rules, standards and processes

- **Nestle weakness**
  - Talk to developers who made a bug
  - Ask them if they have co-confidence
  - Listen to reasons why they couldn’t tell discomfort or uneasiness.