Quality of Product vs Quality of Process

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Paradigm Shift

Essay
"Outline of a Paradigm Change
In Software Engineering"

Christiane Floyd

ACM SigSoft Newsletter
April, 1988

2 Perspectives on Software Quality

- Quality is associated with features of product.
  - Product-oriented, developer's view
- Quality is associated with processes of using the product.
  - Process-oriented, user's view.

Reliability Workshop
in Wakayama (3/6-7)

Most presentations ware talking about quality of product or how to produce high quality product via process improvement.

Almost no reference about processes of using software product.

Wakayama is the Hometown of

Wakayama Ramen
（和歌山ラーメン）
&
Mr. Kumagusu Minakata
（南方熊楠）
World renowned naturalist
（Botanist and Anthropologist)
http://en.wikipedia.org/wiki/Minakata_Kumagusu

Minakata's Method of Comparative Study

Some examples from his posting to "Note and Queries" (Oxford Journal)
- Breaking wine glass or mortar
- Footprints of God
- "Wata" is a foreign word or not?

Lessons learned
- There are different processes behind same looking products

Case Study on Structured Programming

The trigger was:
- "Structured theorem" by Italian mathematicians published in early 1960s

Different views on
program execution "process"
- Edgar Dijkstra
- Michael Jackson
- Kouichi Kishida

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Views on "Method"

Product-oriented view
- Methods are general purpose products
- Proper (customized) use of methods will lead to uniform results.

Process-oriented view
- There are no methods, only process of method development and use.
- These processes influence the result of using the method.

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Dijkstra's Case

Make process visible and readable to verify correctness of the program

- GOTO statement considered harmful
- Debug cannot be an alibi of bugs
- PV operation for cooperating sequential processes

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Jackson's Case

Focus on business data processing

- Module structure of program compatible to data structure
- From program design to system design

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Kishida's Case

Searching for hidden unified structure of program execution process

- Towards standardized structure of business data processing program
- Unification of the structure of system program (assembler and compiler)

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Case Study on Software Process

"Which process are you talking about?"

- Program execution process
- Software development process
- Software evolution process
- Technology transfer process
- Social process of software usage

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Waterfall and other Process Models

- Focus on software development and maintenance process.
- Based upon material manufacturing paradigm.
- Limited concern on producing a single version of product.

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Evolution Dynamics by M.M.Lehman

- Classification of S-type and E-type.
- Laws of software evolution.
- Feedback-oriented eternal evolution loop.

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Quality of Product

- Reliability
  - Number of bugs remained
- Reliability growth model
  - Estimating product quality by counting number of bugs found in testing process.
- Test coverage
  - Quantification of test data to estimate status of testing process.

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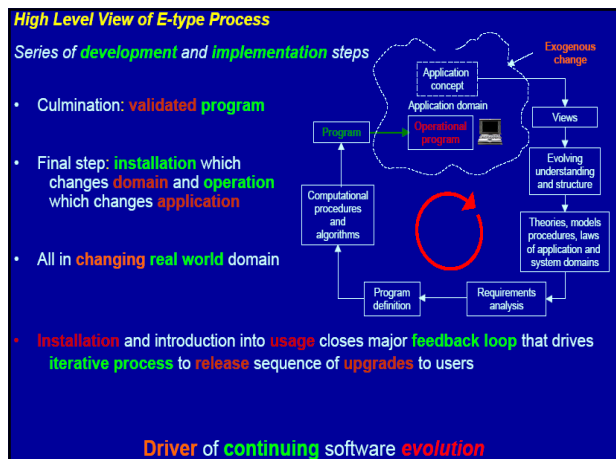
Product Specification

- Starting point of V-shape development model.
- It's OK for S-type software.
- But, how about in the case of E-Type software?

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E-type Software

- Embedded into an application.
- Specification will change constantly, because user needs will change in the real world.
- Infinite loop of development-usage is inevitable.

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High Level View of E-type Process

Series of development and implementation steps

- Culmination: validated program
- Final step: installation which changes domain and operation which changes application
- All in changing real world domain
- Installation and introduction into usage closes major feedback loop that drives iterative process to release sequence of upgrades to users

Driver of continuing software evolution

Technology Transfer Process

2 interesting models proposed at the 3rd ISPW in Rocky Mountain.

– Process Programming by L.Osterweil
– CMM by W.Humphrey

Process Programming

- Towards precise description of software development process.
- Process-centered environments
  - coordination support
    - production-oriented paradigm
  - cooperation support
    - focus on communication process
  - co-construction support
    - on-the-fly redefining process itself

Capability Maturity Model

- Strong management orientation.
- Still based upon manufacturing paradigm
- Similarity with classic management frameworks (eg. Neo-Confucianism)

Book of Great Learning
17th Century China

- Those who wish to conquer the world would first bring order to their states.
  – ISO and CMM
- Those who wish to bring order to their states would first regulate their families.
  – Team Software Process
- Those who wish to regulate their families would first cultivate their personal lives.
  – Personal Software Process

Open Issue

How can we grasp whole picture of software process?
Qualitative or quantitative evaluation of:
　conceptualization process
　development process
　maintenance process
　use process
　and evolution process

Clear and Present Issue

Social process around web-based software systems, such as SOA, SaaS, Cloud Computing, etc.