ESEM09 Poster

Quantitative Basis of a Software Development Process Based on Hierarchical Process with each Characteristics

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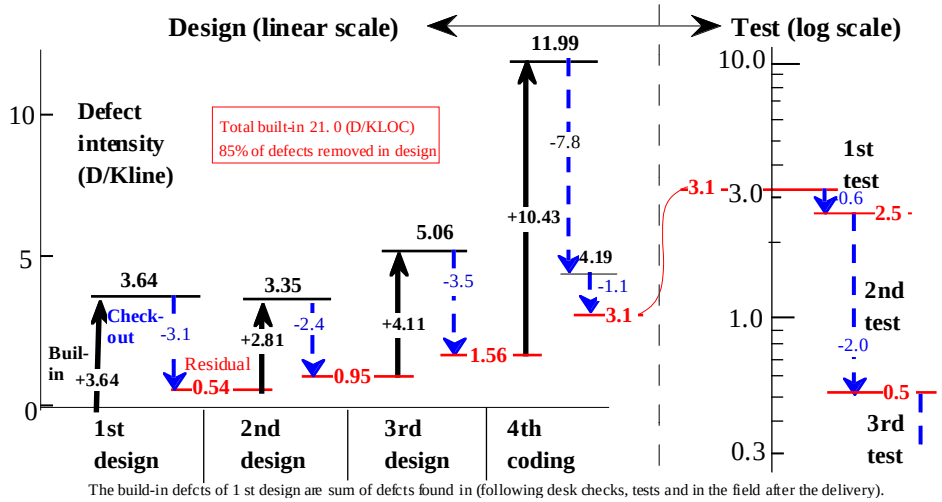
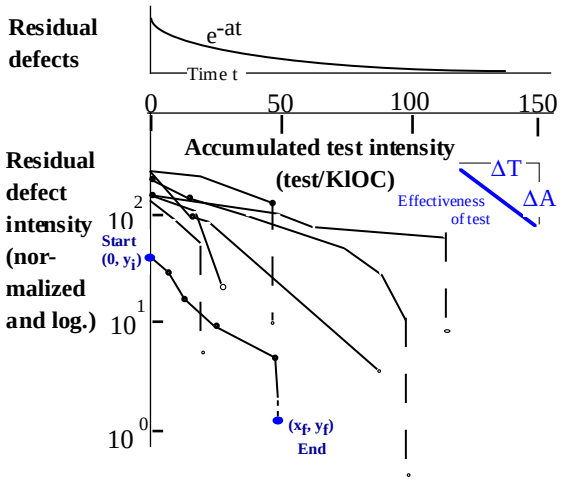
Zenya Koono: Creation Project, koono@vesta.ocn.ne.jp and http://www.CreationProj. org
Hui Chen: Kokushikan University, chen@kokushikan.ac.jp and Hassan Abolhassan: Sharif University of Technology, abolhassani@sharif.ir

Objective: Quantitative representation of external characteristics of a process. **Implementation means:** Empirical and quantitative relationships based on each mechanism.



The build-in defcts of 1 st design are sum of defcts found in (following desk checks, tests and in the field after the delivery).

Quantitative process characteristics (defect intensity) after a project ends



Quantitative characteristics of test

* **Check and test** = Attenuator of defect intensity.
The attenuation is *the second kind of error*.
* **Time vs. Defect intensity:** Negative exponential decay.
* **Test intensity** = (Number of test)/LOC
* **Gradient of a trend line on log-scale** = **Effectiveness of test** = Δ Attenuation / Δ test intensity
* **Start point:** ($x=0$, y_i=Residual defect intensity after desk check prior to test)
* **End point:** (x_f= Total test intensity, y_f = Residual defect intensity found after delivery until near saturation.)

* **Linear process:** In design, the upper graph shows pairs of built-in and checkout in each design. In test, the upper graph shows the attenuation by each test on logarithmic scale.

* **Average values** • **Constancies of characteristics:** Productivity = constant. Defect built-in intensity = constant and so on.
• **Logarithmic learning effect:** The effect is quantitatively evaluated. As experience or knowledge accumulates, the performance is improved.

* **Variation** • **Lognormal distribution, ranging from 1/3 times to 3 times of the average** The best / the worst ratio is around 9. The situation is the same as Pareto' s.
--Improvements--> • **(Normal distribution: ±3 (sigma) of the average)**
--Improvements--> • **(Normal distribution: ±(∓0)..)** ---Present day H/W-

Merits

1. Quantitative approaches are essentially the same as those in hardware and others.
2. Rational, quantitative and scientific measurements, evaluations and improvements.
3. Visualization, tunable from coarse to fine, makes accurate cause analyses possible.
4. Improvements and corresponding advancements in step by step toward better performance.

Demerit

1. Data collections from each process, person and their systems are indispensable. An appropriate support system is required.

Let's repeat quantitative measurements and thus rational improvements.

For further detail, please refer to URL http://www. creationproj.org/PaperList/Somet07KoonoPt1corrected.pdf and the continuing Pt2.

Ref. *Z. Koono, H. Chen and H. Abolhassani, An Introduction to the Quantitative, Rational and Scientific Process of Software Development (Part 1), Proc. Of SoMeT 07, pp.361-371: H. Fujita and D. Pisanelli (Eds) New Trends in Software Methodologies, Tools and techniques, IOS Press, 2007. (Part 2. pp.372-390)*