

Sides of Software Evolution

Software Evolution – L2T1

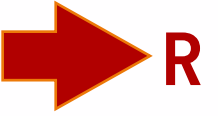
Dr. Vadim Zaytsev aka @grammarware, February 2021



Software Engineering “Lifecycle”

- “Phases”
 - **R**equirements
 - **D**esign / Architecture
 - **C**onstruction / Implementation
 - **T**esting / Integration
 - **O**perations / Deployment
 - **M**aintenance

Requirements Creep



R

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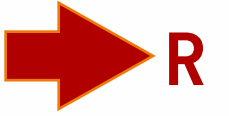
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- Most significant **risk** in SE
- Environment changes unexpectedly
- Can make a system useless
- Can allow to pursue new opportunities
- Most errors are introduced in R & D [[NIST 800-30](#)]
 - **40%** in 1984, **70%** in 2002
- Rework cost 300x
- Changing requirements are the **norm**

Types of Requirement Change



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- Stable
 - Enduring
- Changing
 - Mutable
 - Emergent
 - Consequential
 - Adaptive
 - Migration

Traceability Help

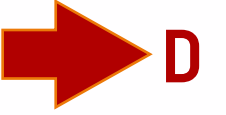
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Id	Requirement Summary		Depends On	Test Case	Bug	New Feature	Task
PA-R13 ⁽¹⁾	Functional Requirements	---	---	---	---	---	---
PA-R1 ⁽²⁾	Functional Requirement 1 v2	---	---	PA-T16 ⁽¹⁾ , PA-T3 ⁽¹⁾	PA-1	---	PA-11
PA-R2 ⁽³⁾	Functional Requirement 2 v2	Functional Requirement 2 Specs	PA-R1 ⁽¹⁾ , PA-R1 ⁽²⁾	PA-T17 ⁽¹⁾	---	PA-5	---
PA-R3 ⁽²⁾	Functional Requirement 3 v2	---	---	PA-T18 ⁽¹⁾	---	---	PA-10
PA-R4 ⁽¹⁾	Functional Requirement 4	---	---	PA-T3 ⁽¹⁾ +	PA-1 , PA-3	---	PA-11
PA-R5 ⁽¹⁾	Functional Requirement 5	---	PA-R4 ⁽¹⁾	PA-T4 ⁽¹⁾ Version 1	---	PA-8	---
PA-R14 ⁽¹⁾	Usability Requirements	Usability Guidelines	---	---	---	---	---
PA-R15 ⁽²⁾	Usability Requirement 1 v2	---	PA-R4 ⁽¹⁾	PA-T19 ⁽¹⁾	---	---	PA-9
PA-R16 ⁽²⁾	Usability Requirement 2 v2	---	PA-R1 ⁽¹⁾	PA-T20 ⁽¹⁾	---	---	---
PA-R17 ⁽¹⁾	Usability Requirement 3	---	PA-R2 ⁽²⁾	PA-T5 ⁽¹⁾ , PA-T3 ⁽¹⁾	PA-3 , PA-4	---	---
PA-R19 ⁽¹⁾	Admin Screen	---	---	---	---	---	PA-10
PA-R21 ⁽¹⁾	Dashboard	---	---	---	---	---	---
PA-R24 ⁽¹⁾	Marketing Requirements	---	---	---	---	---	---
PA-R25 ⁽¹⁾	Marketing Requirement 1	---	---	PA-T9 ⁽¹⁾	---	PA-7 , PA-6	---
PA-R26 ⁽¹⁾	Marketing Requirement 2	---	---	PA-T10 ⁽¹⁾	---	---	---
PA-R27 ⁽¹⁾	Marketing Requirement 3	---	PA-R26 ⁽¹⁾	PA-T11 ⁽¹⁾	---	---	---

<https://www.youtube.com/watch?v=G5x1qn05Yek>
<https://marketplace.atlassian.com/apps/30899/rmsis-requirements-management-for-jira>

Model Management

- Models are used to manage **complexity**
 - \Rightarrow used in **complex** projects
 - \Rightarrow often grow **complex** themselves
- Model management
 - **quality check**
 - **transform** with intent
 - **version control**



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What can be a Model?

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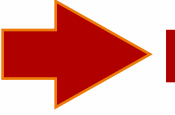
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- Model is
 - a **simplified** representation
 - of a **part** of the world
 - from a particular **view**
- Main features:
 - **mapping**
 - **reduction**
 - **pragmatic**

What can be a Model Change?

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- World changes, models becomes **incorrect**
- More data available, models misrepresent **uncertainty**
- Needs change, models must adapt to the new **view**
- Focus widens, models become too **detailed**
- Focus narrows, models too **abstract**
- **Representation** of a model is bad

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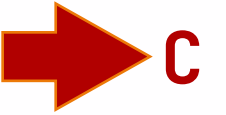
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Evolution of Code

- Refactoring
 - need guarantees for behaviour preservation
- Restructuring
 - need structure
- Reengineering
 - may involve design recovery
- Rearchitcting
 - may be based on rewriting



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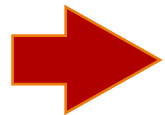
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Test Code Smells

- Mystery Guest
- Resource Optimism
- Test Run War
- General Fixture
- Eager Test
- Lazy Test
- Assertion Roulette
- Indirect Testing
- For Testers Only
- Sensitive Equality
- Test Code Duplication
- Test Implication
- Test Maverick
- . . .



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Runtime Evolution

- Customisation
- Personalisation
- Resource discovery
- Hotswap plugins
- Late binding
- Soon
 - IoT: +devices
 - Web 3.0: global semantic reasoning

R

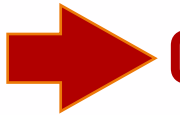
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Data Migration

- Top reasons:
 - database version upgrade
 - existing setup insufficient
 - policy change
 - cutbacks
 - unification

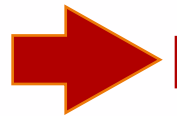
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Conclusion

- Evolution is everywhere and has many faces
- The nature of the artefact and its context
- Q&A Sessions @ Canvas
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 - ⇒ <https://discord.gg/n7VQAPNBPD>