



TESTING QUALITY REQUIREMENTS OF A SYSTEM-OF-SYSTEMS IN THE PUBLIC SECTOR

- Challenges and Potential
Remedies

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EXPERIENCE REPORT



- Jacob Larsson, Senior Consultant
- Test processes and management
- Requirements elicitation and analysis
- >10 years in Healthcare & Public Sector, Denmark & Sweden



RET'14 EXPERIENCE REPORT

- What challenges to RET alignment are dominant in a public sector project?

Larsson and Borg (2014), "Revisiting the Challenges in Aligning RE and V&V: Experiences from the Public Sector", In *Proc. of RET'14*.

Id	Challenge		Comment
Ch1	Aligning goals within an organization	M	GOV is a large organization. The development project is complex. Furthermore, aligning goals is a challenge.
Ch2	Cooperating successfully	M	Team work supported by shared landscapes. Still team work is even harder.
Ch3.1	Defining clear and verifiable requirements	M	GOV has a history of project financial corrections. Requirements needs more clarity.
Ch3.2	Defining complete requirements	M	Requirements elicitation, validation of user stories by business analysts, developers.
Ch3.3	Keeping requirements documentation updated	M	Enterprise Architect is a cumbersome process and maintaining the product.
Ch4.1	Full test coverage	m	Different roles interpret 80% statement coverage. Automated testing focuses on tedious manual work.
Ch4.2	Defining a good verification process	m	GOV has a mature V&V testing, exploratory testing, time between RE and testing.
Ch4.3	Verifying quality requirements	M	Verification of quality requirements is a challenge. The project maintainability.
Ch5	Maintaining alignment when requirements change	M	Changes are inevitable, GOV has a well-defined process for communicating changes.
Ch6.1	Defining requirements at abstraction level matching test		GOV has mature RE and testing.

Based on Bjarnason *et al.* (2014)

”Challenges and Practices in Aligning Requirements with Verification and Validation: A Case Study of Six Companies”

Empirical Software Engineering, 19(6)

- Do the same challenges apply to a public sector project?
- Verifying QRs reported as one major challenge



AGENDA

Case description

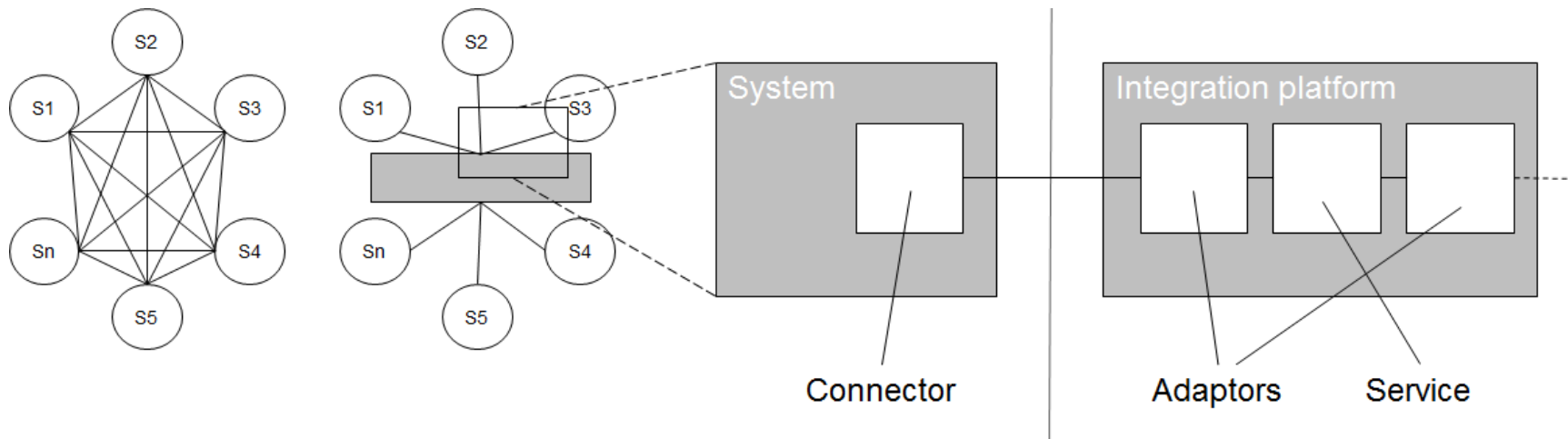
Method

Experienced challenges

Solution proposals

CASE DESCRIPTION

A SYSTEM-OF-SYSTEMS FOR MANAGEMENT OF EU GRANTS



- Combining 12 systems
- Quality focus: interoperability and performance

2016-03-02 08:01

Jordbruksverkets it-system försenat och fördyrat - 25 000 bönder väntar på pengar

f Dela på Facebook

Tweeta

in

G+

Reddit

95 delningar



Karin Lindström
REPORTER

Det strular rejält kring utbetalningarna av jordbruksstöd. Utvecklingen av det nya it-system som hanterar stödet har blivit försenat och rejält mycket dyrare. Fortfarande har över 25 000 bönder inte fått alla sina stödpengar.



(March 2, 2016)

GOVERNMENT AGENCY IN SWEDEN



- Framework agreements
 - several subcontractors
- 100-200 developers,
2/3 consultants
- RUP with some agile practices

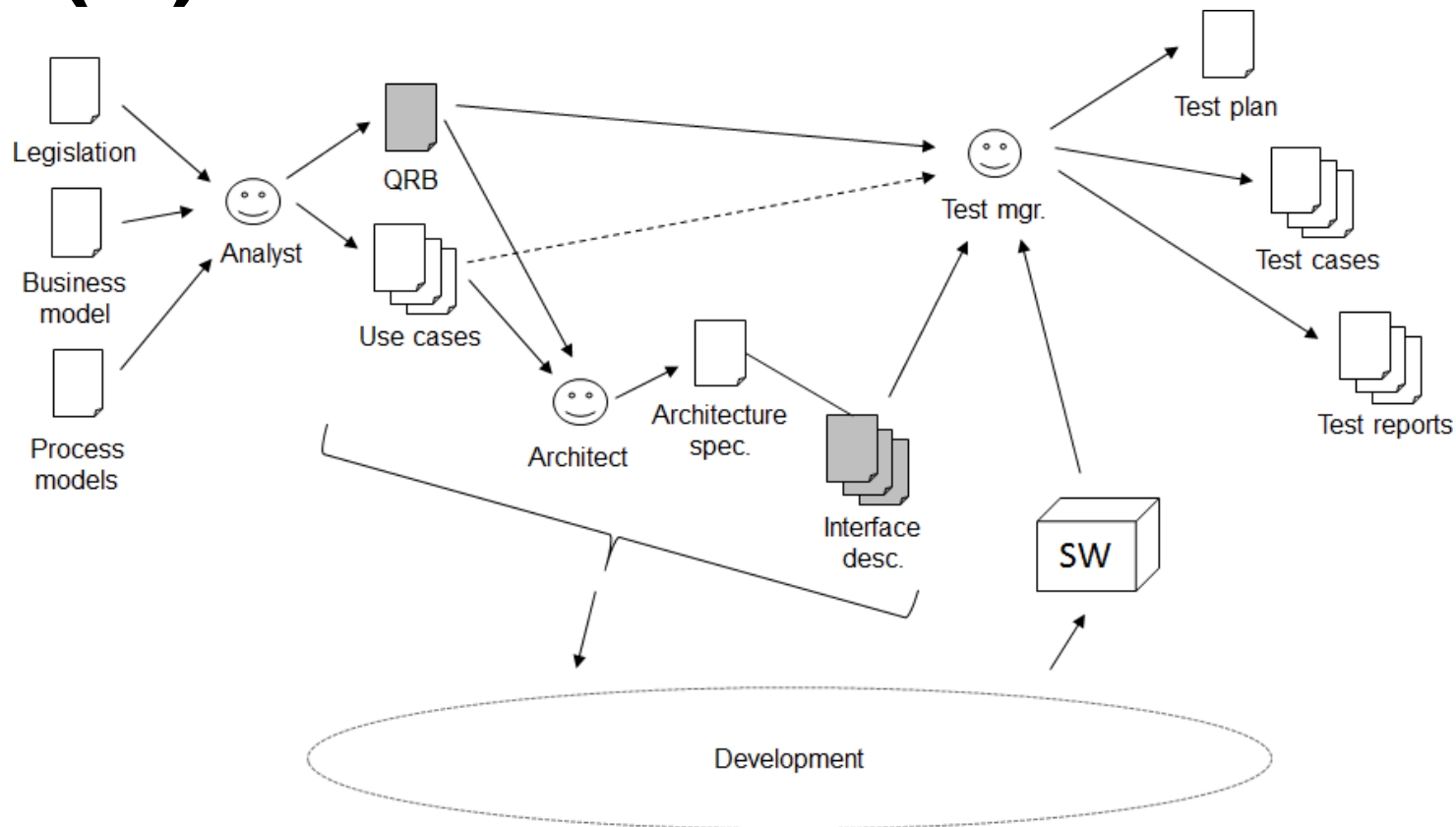
METHOD

METHOD

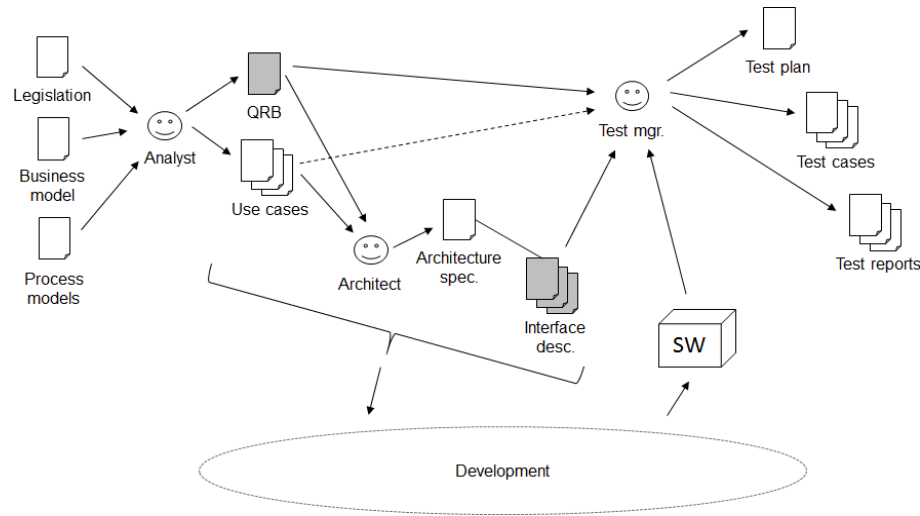
- Experiences of the 1st author
- Supporting evidence from documents (2nd and 3rd authors)
 - General process documentation
 - One system for in-depth analysis
- Model of the RET information flow
(Stapel and Schneider, 2012)
- Reviewed literature to identify solution proposals

EXPERIENCED CHALLENGES

(Q)RET INFORMATION FLOW



TESTING QRS – FIVE CHALLENGES



- Ch1: The RE documents evolve while testing is planned and ongoing.
- Ch2: Test managers need to understand the business.
- Ch3: QRs are not quantified.
- Ch4: QRs are not prioritized.
- Ch5: Hard to simulate all operational states.

SOLUTION PROPOSALS

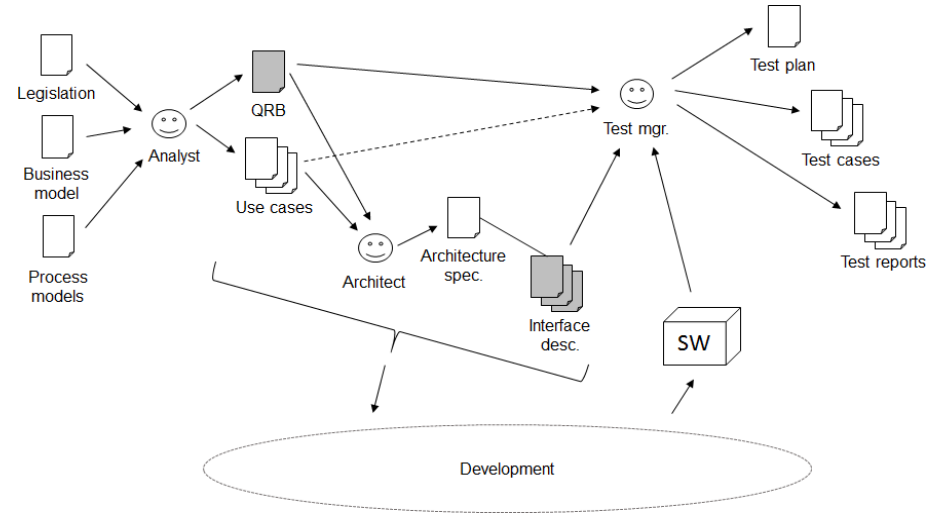
CH1 – EVOLVING QRS

Integrated requirements engineering

(Sommerville, 2005)

- Continuous maintenance of reqts.

=> turn QRB and IDs into
living documents
ensure RET communication



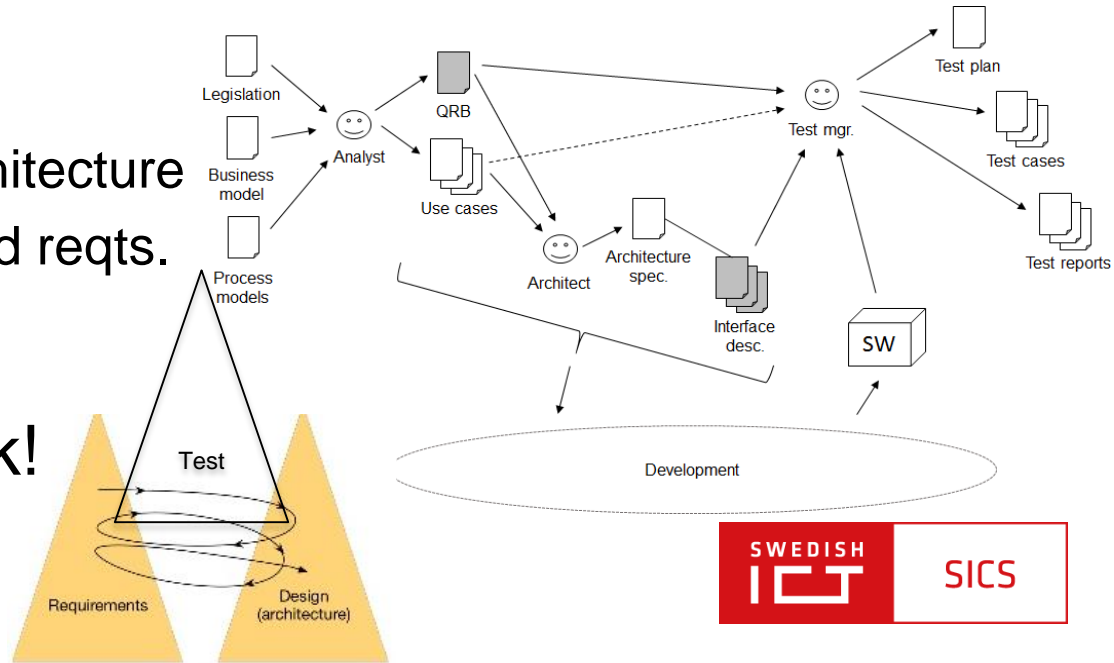
CH2 – TEST MANAGERS MUST UNDERSTAND THE BUSINESS

Twin Peaks model

(Nuseibeh, 2001)

- Interleaving of RE and architecture
- Progressively more detailed reqts. and architecture

=> add the test peak!



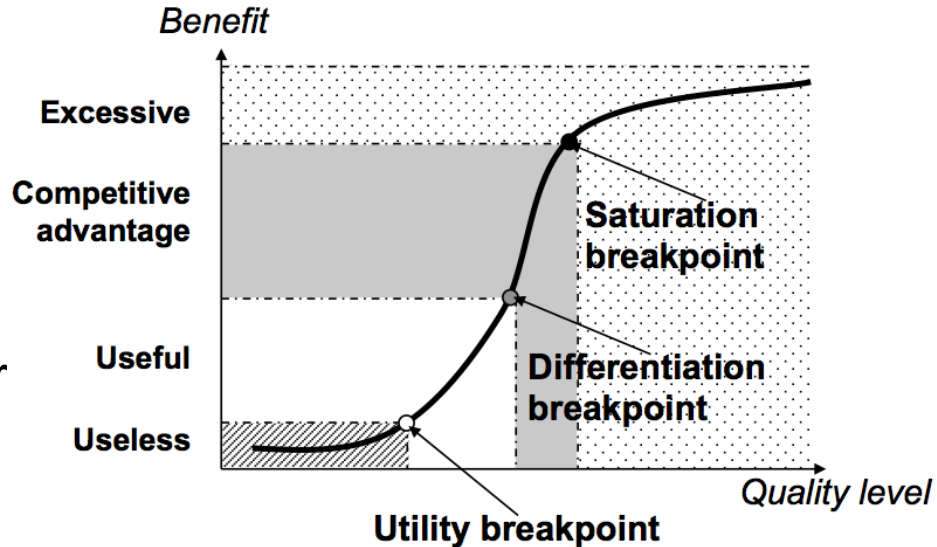
CH3 – QRS ARE NOT QUANTIFIED

QUPER model

(Regnell *et al.*, 2008)

- Support roadmapping of QRs
- Quality is continuous but non-linear

=> identify breakpoints
to help QR quantification



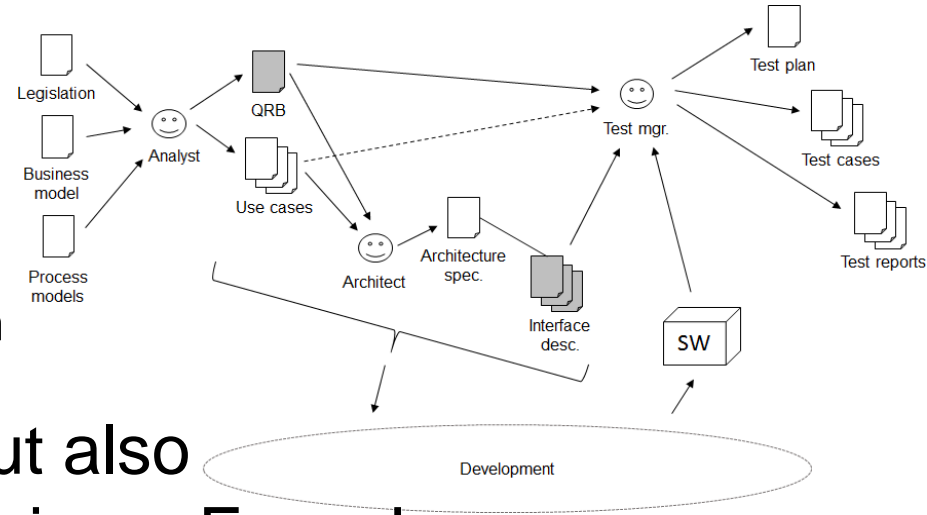
CH4 – QRS ARE NOT PRIORITIZED

Architecturally Significant Requirements (ASR)

(Chen *et al.*, 2012)

- A subset of reqts. have major impact on architecture
- Identify early, give special attention

=> some QRs are ASR, but also significant for test planning – Focus!



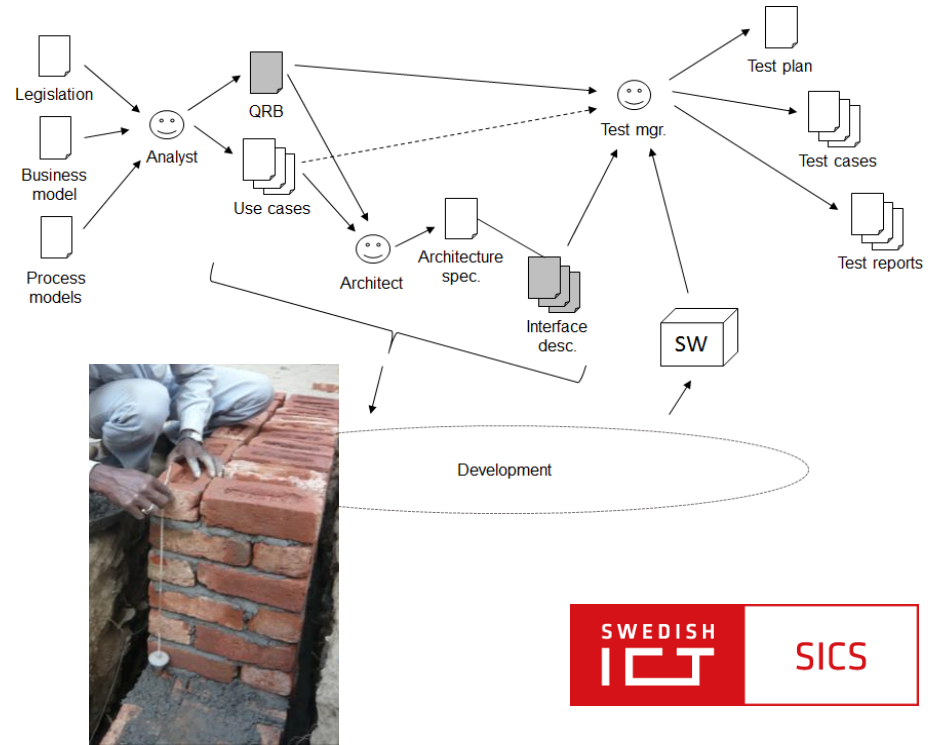
CH5 – SIMULATING OPERATIONAL STATES

Virtual plumblines

(Cleland-Huang *et al.*, 2008)

- Model system-wide quality goals
- Implement plumblines to alert when quality degrades

=> add plumblines to detect Q loss early when state changes

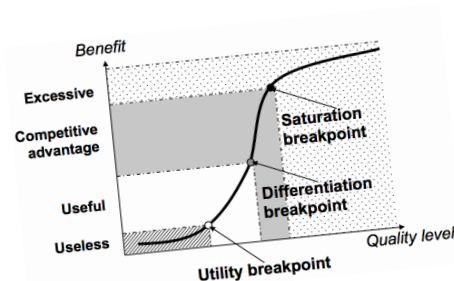


SUMMARY

CHALLENGES MEET SOLUTIONS

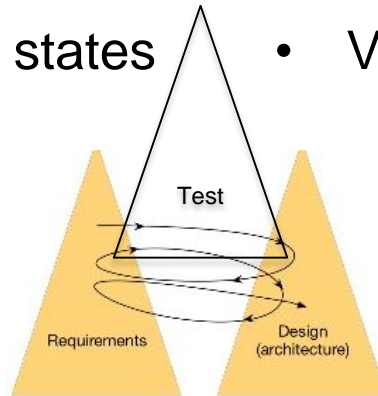
Challenges

- QRs evolve during test
- Testers must know business
- QRs are not quantified
- QRs are not prioritized
- Simulating all operational states



Solutions

- Integrated RE
- Extended Twin Peaks model
- QUPER model
- Architecturally significant reqts.
- Virtual plumbines



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THANKS!

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REFERENCES

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