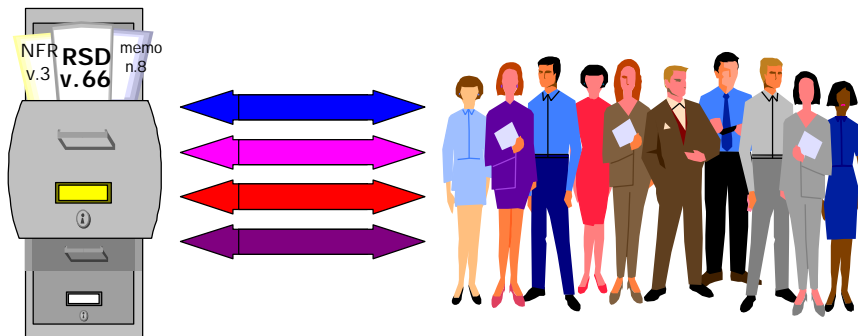


1

Modelling the Contribution Structure Underlying Requirements

Orlena Gotel & Anthony Finkelstein



REFSQ '94

2



To Avoid Initial Questions (1)...



“Requirements Traceability (RT) refers to the ability to describe & follow the life of a requirement in both a forwards & backwards direction”

(i.e., From its origins, through its development & specification, to its subsequent deployment & use, & through all periods of on-going refinement & iteration in any of these phases)

REFSQ '94

3



To Avoid Initial Questions (2)...

"Post-RS Traceability is concerned with those aspects of a requirement's life that result from its inclusion in the RS"

(i.e., Requirement deployment)



"Pre-RS Traceability is concerned with those aspects of a requirement's life prior to its inclusion in the RS"

(i.e., Requirement production)

REFSQ '94

4



To Avoid Initial Questions (3)...



"Software Quality (SQ) is the:

- Totality of features & characteristics of a sw product that bears on its ability to satisfy given needs
- Degree to which sw possesses a desired combination of attributes
- Degree to which a customer or user perceives that sw meets his/her composite expectations
- Composite characteristics of sw that determine the degree to which the sw in use will meet the expectations of the customer"

REFSQ '94

5

An Overview...

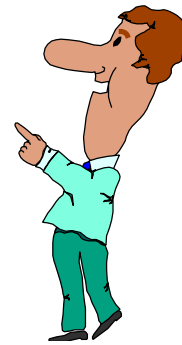
Relation between RT & SQ:

- How post-RS traceability can improve SQ
- How pre-RS traceability can improve SQ

Requirements Contribution Structure:

- What it is
- Potential for quality improvement

Workshop questions (sort of) answered



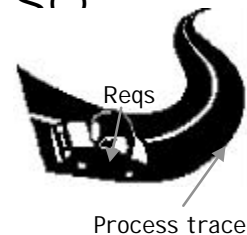
REFSQ '94

6

Relation Between RT & SQ

Quality-oriented development:

- Specify reqs
- Use to drive, control & evaluate process



Quality assurance/conformance checks:

- Meets user needs & adheres to quality attributes
- Supported by methods/techniques/paradigms/practices
- Approaches depend on some form of RT
- RT is primary quality-enabling technique

SQ influenced by techniques/tools used for RT

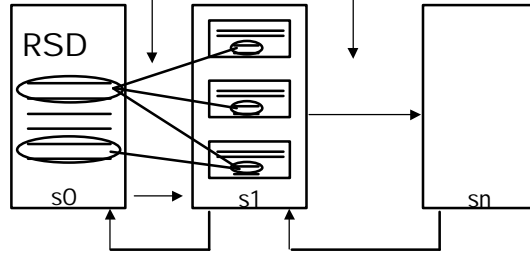
REFSQ '94

7



Post-RS Traceability & SQ (+)...

reqs artifacts produced
(related to reqs deployment process)



Quality reqs can permeate development

Can check quality conformance at each phase

Effects of changing quality reqs can be analysed/propagated

REFSQ '94

8



Post-RS Traceability & SQ (-)...

Why does sw still fail to meet anticipated levels of SQ?

Defn SQ supported - "meeting the RSD" - no guarantee

Problems:

User satisfaction subjective/collective /few metrics

Defn SQ/metrics change/constructed downstream

Reasons:

Deals with restricted phases of a reqs life

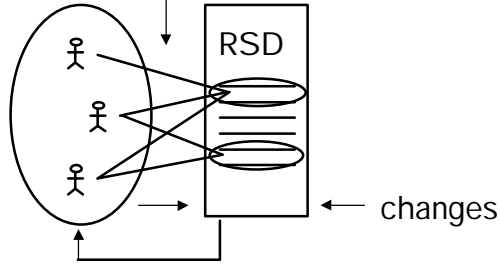
Poor foundation to achieve/assess SQ

REFSQ '94



Pre-RS Traceability & SQ (+)...

reqs artifacts produced
(related to reqs production process)

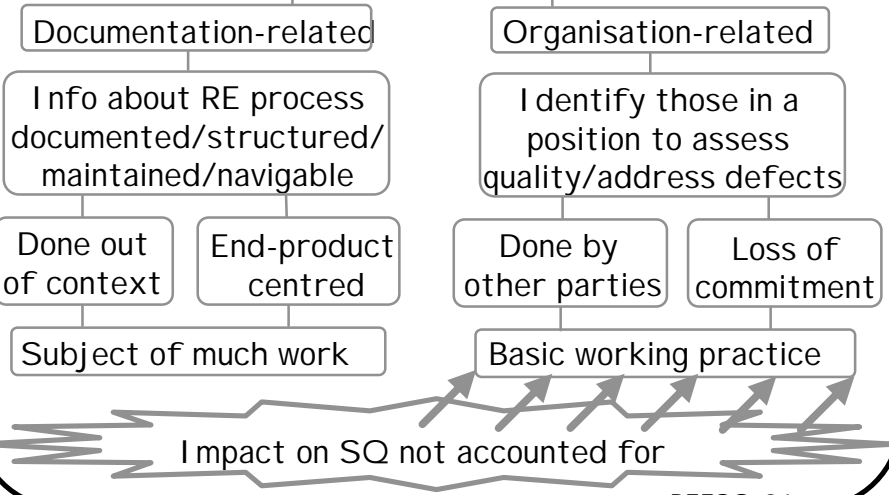


- Quality-oriented approaches built in from onset
- Foundation to achieve & assess SQ
- Change from source & re-propagate through ALL phases



Pre-RS Traceability & SQ (-)...

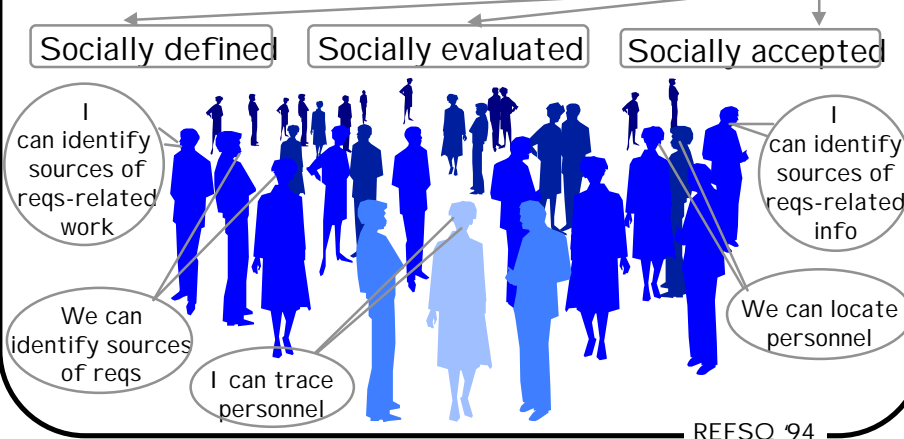
2 aspects of QA activities



11

Traceability of Requirements Contributors & Contributions...

Model social infrastructure of RE process - as quality:



12

Basic Our Work (1)... Concepts

Model Contribution Structure underlying reqs artifacts

Augment with agent details:

- Schema of analytical capacities in which contribute
- Defined through interactive mark-up

Development of CS:

- Infer finer-grained social capacities & commitments
- Impact of taxonomy of intra/inter-artifact relations

Requirements:

- Ongoing definition & re-definition
- Evolvable & emergent
- Inference & interrogation

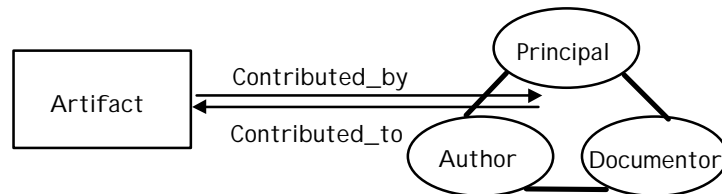


REFSQ '94

13

General Our Work (2)... Approach

(A) Define contribution format of artifact



P: agent whose position or belief is established by the information the artifact expresses

A: agent responsible for choosing & organising the content & structure of the artifact

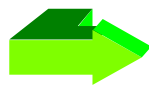
D: agent responsible for physical manifestation of the artifact (i.e., captures or records it)

REFSQ '94

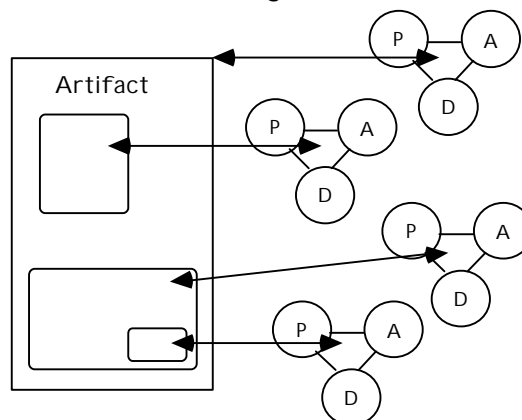
14

General Our Work (3)... Approach

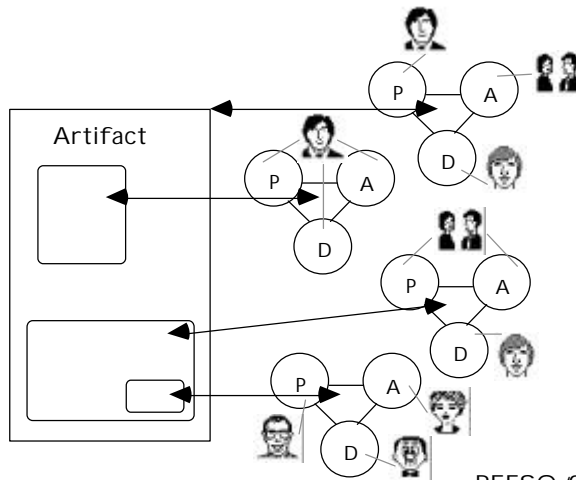
Contribution format of artifact & internal components



Collection of PAD agents:

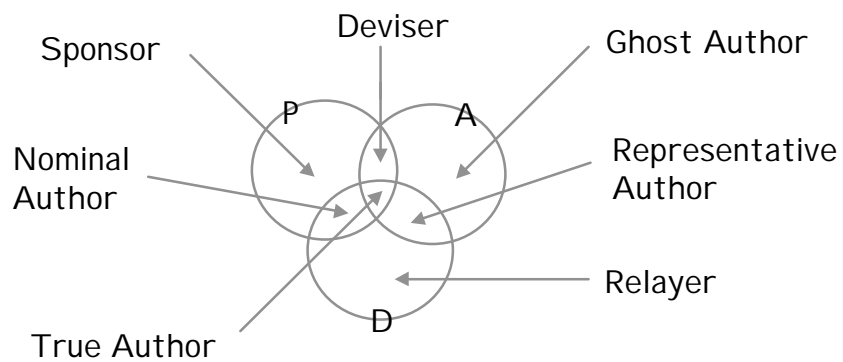


REFSQ '94



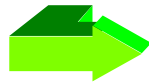
General Our Work (4)... Approach

(B) Infer contribution roles of agents wrt artifact



General Our Work (5)... Approach

Contribution roles of agents



Examples:

2

P = Olly	}	Olly is:
A = Olly		Deviser
D = Dave		Dave is:
		Relayer

1

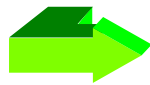
P = Olly	}	Olly is:
A = Olly		True Author
D = Olly		

3

P = Olly	}	Olly is:
A = Paddy		Sponsor
D = Paddy		Paddy is:
		Representative

General Our Work (6)... Approach

(C) Infer agent commitment to artifact



Who to involve/inform in queries/changes:

True Author:	<input checked="" type="checkbox"/> Physical appearance	<input checked="" type="checkbox"/> Anticipated/realised effect
	<input checked="" type="checkbox"/> Structural form	<input checked="" type="checkbox"/> Semantic content
Deviser:	<input checked="" type="checkbox"/> Physical appearance	<input checked="" type="checkbox"/> Anticipated/realised effect
	<input checked="" type="checkbox"/> Structural form	<input checked="" type="checkbox"/> Semantic content
Relayer:	<input checked="" type="checkbox"/> Physical appearance	<input checked="" type="checkbox"/> Anticipated/realised effect
	<input checked="" type="checkbox"/> Structural form	<input checked="" type="checkbox"/> Semantic content

More

Our Work (7)...

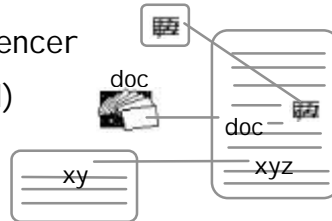
Details

Qualifiers (or modes) for contribution format



Infer more about types/degrees of commitment:

- Principal status (signatory-related)
 - approved/pending/not approved
- Authorial status (related to inter/intra artifact links)
 - primary - creator
 - n-ary - adopter/adaptor/referencer
- Documentor status (mood-related)
 - assumptive/emphatic
 - quotative/reportive
 - indefinite/questioning



REFSQ '94

Current

Our Work (8)...

Directions



Markup to overlay contribution format, etc.

Supporting CS evolution & maintenance:

- Augment artifact-based traceability to deal with associated CS at each step
- Rules to recompute & update CS

Meeting traceability reqs:

- Use of layers for selective traces
- Priority structs for change handling

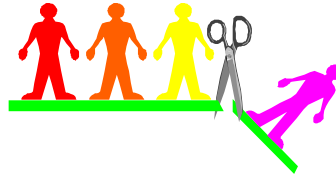
Tool to evaluate & refine approach

REFSQ '94

Summarising Quality Implications...

Quality depends on post-RS & pre-RS Traceability

Further leverage if
tie people into the
traceability equation

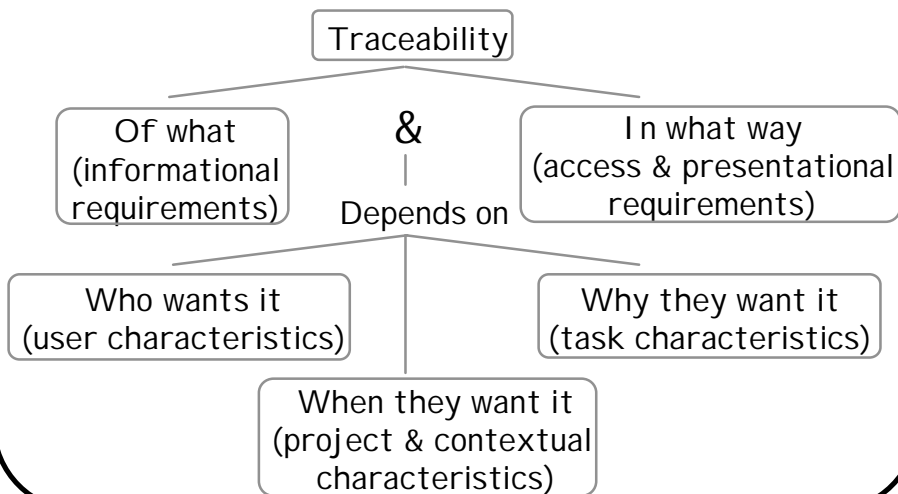


Modelling CS provides traceability of contributors
& their contributions:

- Fine/rapid location of personnel to perform QA activities, address quality defects, etc.
- Continuous defn, redefn, assessment & re-assessment of SQ throughout a project's life

Questions (1)...

Q: What is the "right" data to be made traceable?



a1

Answers (1)...

A: No such thing as "right" data - only required data

More pertinent questions we should ask:

(1) How can we identify required data?

- More empirical studies with project-specific selection



(11) How can we deal with absence of required data?



- Provide potential for informal communication



REFSQ '94

q2

Questions (2)...

Q: How should trace data be recorded?

- Manually



- Automatically



Q: Who/what should record trace data?

- Those involved/ others/forms



- Technology



Q: When should trace data be recorded?

- During process



- Later reviews



REFSQ '94

a2

Answers (2)...

A: Automatically record all that is practical as by-product of mainstream activities

- Supplement with manual input

A: Use technical solutions (forms, etc.) to record where possible as reqs for provider/end-user conflict

- Consolidate with participants

A: Do eager & lazy recording as complimentary

- Balances objective & subjective

Q becomes how best to combine approaches?



- RT = a team-shared effort
- RT = a computer-assisted activity



REFSQ '94

q3

Questions (3)...



Q: How can all this improve quality?

Q: Where are the examples of quality improvement?

REFSQ '94

a3

Answers (3)...

With RT - Quality can be built in from project onset

Examples?

- Repeated calls for RT improvements by industry indicates RT must impact SQ positively

Why no/few examples?

- The vital first step of education is only just beginning

& that's
our job!



REFSQ '94

last

but

???

More Questions...

???

How can we rescue those projects in which RT info has not been managed & maintained?

RT solutions assume a centralised info base - will these solutions apply if the info base is distributed?

When is our next coffee break?



not

REFSQ '94

least