

A New Quality Model for Natural Language Requirements Specification

A. Bucchiarone, S. Gnesi, G. Lami, G. Trentanni

*Istituto di Scienza e Tecnologie dell'Informazione
"A. Faedo" (ISTI - CNR)*

*Area della Ricerca CNR di Pisa, 56100 Pisa, Italy
antonio.bucchiarone@isti.cnr.it*

and

D. M. Berry

*Cheriton School of Computer Science
University of Waterloo
Waterloo, Ontario N2L 3G1, Canada
dberry@uwaterloo.ca*

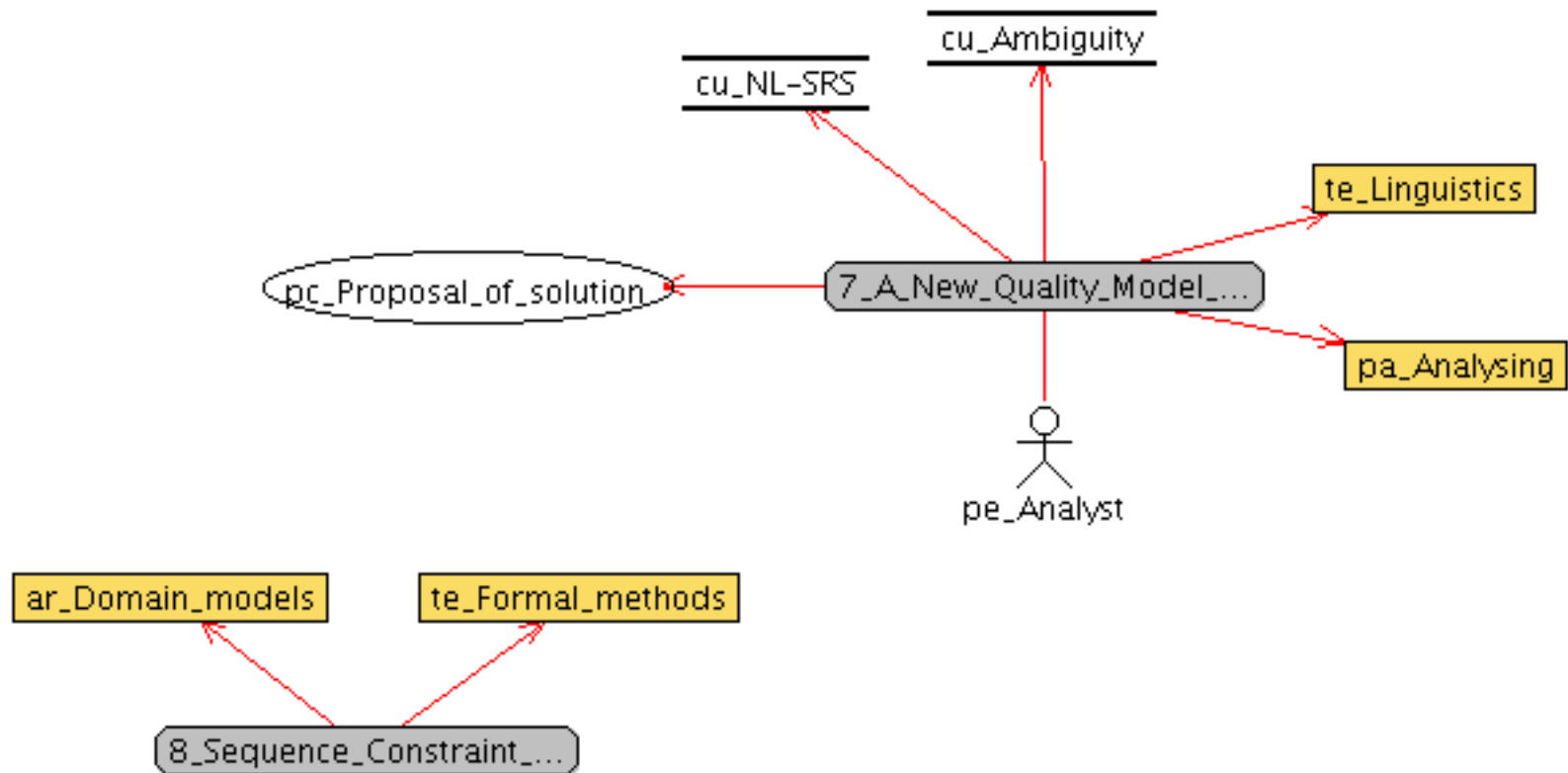


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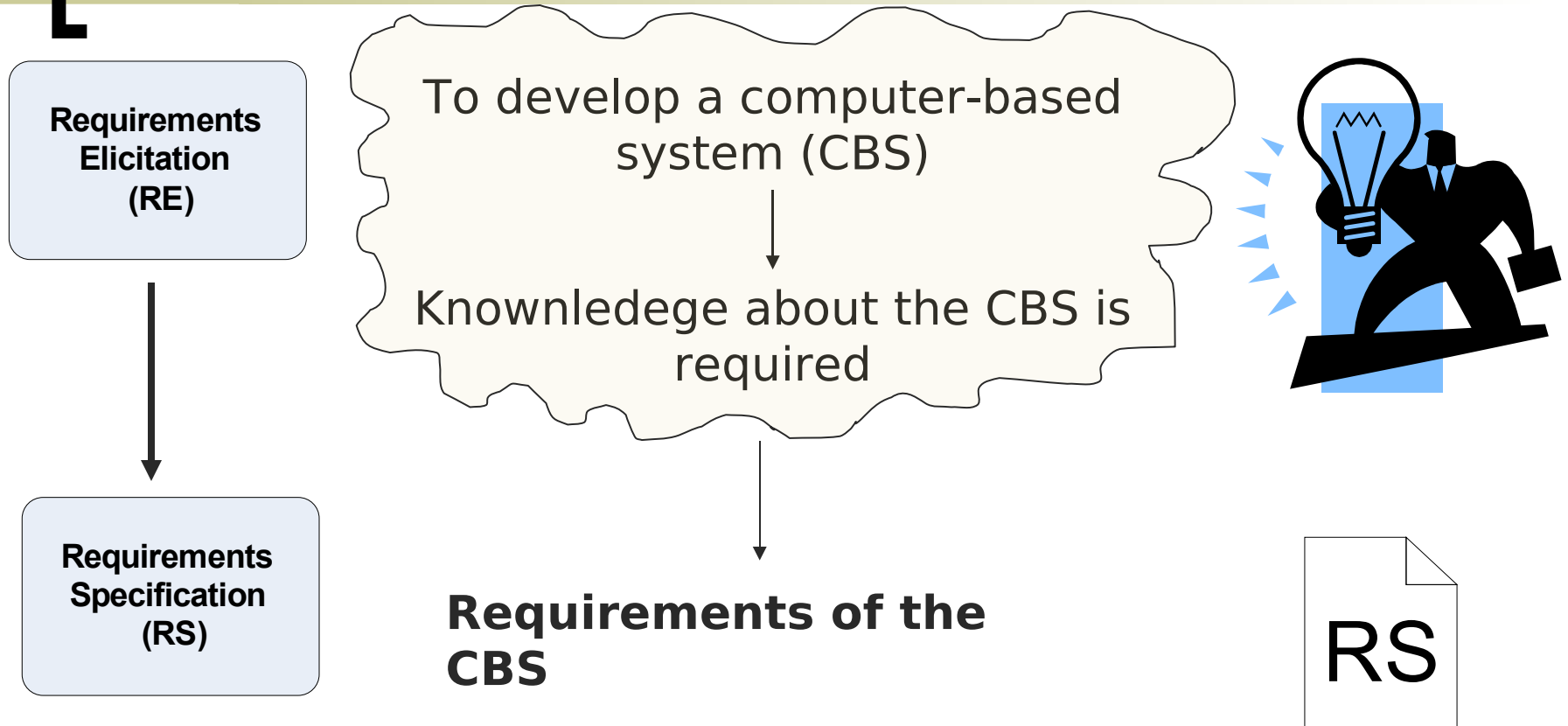
[First Slide



[Agenda

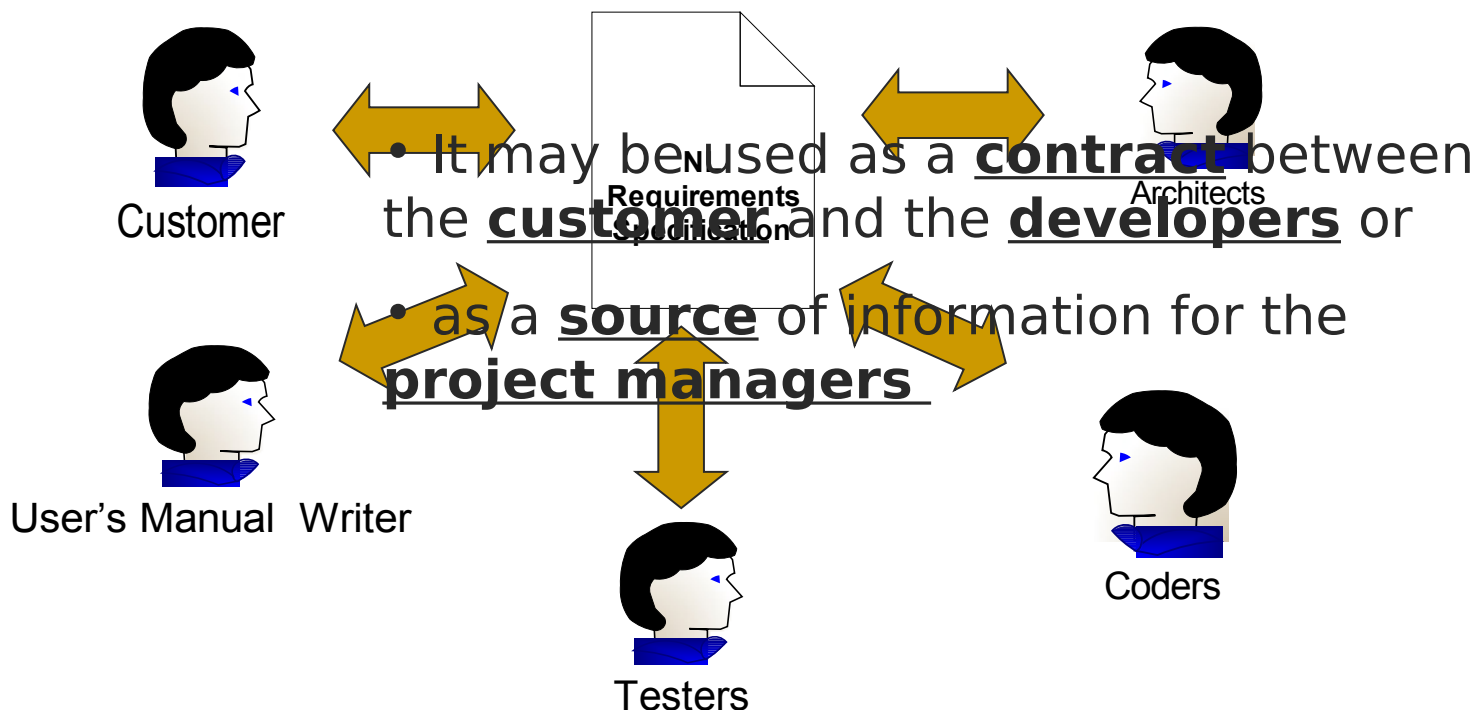
- Introduction and Motivations
- General QM for NL RSs
- The new QM (after some feedbacks from Industries)
- Future Work

[Introduction – I



[Motivations - I

- The usual product of the RE is a natural language (NL) document, the RS, that contains the knowledge of the CBS under construction.



[Motivations - II

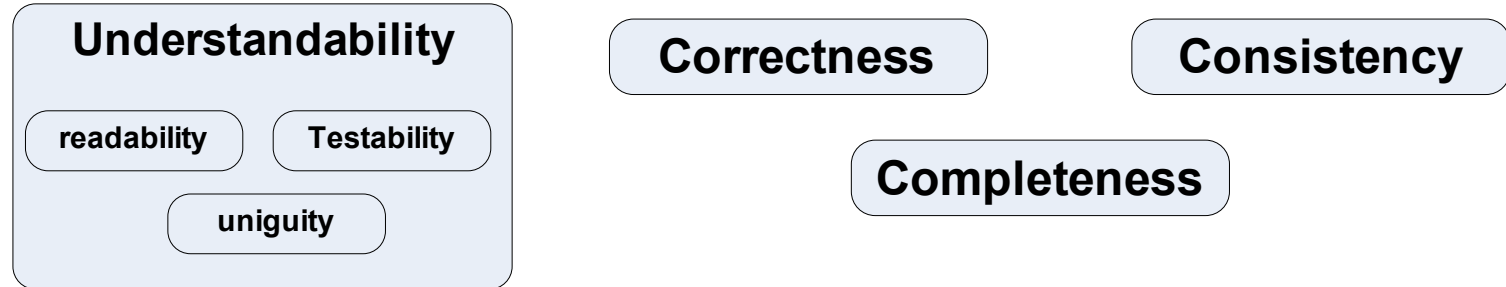
- NL is used in the software industry for specifying CBS Requirements
- There are some problems with NL RSs
 - the **volatility** of a CBS's requirements during the CBS's development, leading to **many changes** (not only of NL RSs),
 - the **large variation** in people's writing skills, leading to **large variations in the linguistic quality** of a RS,
 - the **large number of sources**, leading to **inconsistent linguistic styles**,
 - **ambiguity** and **informality** that make determining a NL's document correctness difficult.

[Objective

- There is a certainly a need to evaluate and improve the quality of any NL RS.
- Two different approaches have been used to construct automatic NL text processors:
 - linguistic approach: based on a parse of the text
 - statistical approach: based on frequencies of elements of the text
- We provided a linguistic method, based on a **quality model (QM1)**
- For QM1 some of these authors have implemented QuARS (Quality Analyzer of Requirement Specification) .
- **QM2** includes ambiguities described by Berry, Kamsties,

[General QM for NL RSs]

- A general model for the quality of a NL RSs is composed of four families of quality characteristics:



- Each family or subfamily can have up of four manifestations in the NL RS at hand.
 - Lexical: involving words in the NL RS
 - Syntactic: involving the parses of sentences
 - Structural: involving physical relationships between parts of the NL RS
 - Semantic: involving meanings of parts of the NL RS

[From QM1 to QM2: why?]

Quality Characteristics		Manifestation			
Family	Subfamily	Lexical	Syntactic	Structural	Semantic
Understandability	Readability				
	Uniguity				
	Testability				
Consistency					
Completeness					
Correctness					

- The portion of this general QM that is used in the tool **QuARS** exclude the last , “Semantic”, column of the table.
- It is necessary to take semantics into account to determine if any potential problem is needed a real problem.

[QM

- Time does not permit going through the tables that define QM1 and QM2; besides, you would be bored to tears!
- So, I give only the names of the indicators in QM1 and of the indicators that are added to make QM2
- The proposal for each indicator consists of :
 - a title serving as a proposed name for the indicator in the QM
 - a brief description of the indicator and
 - one or more examples

[QM1

INDICATOR	NEGATIVE EXAMPLE
Implicity	the <u>above</u> requirements shall be verified by test
Optionality	the system shall be such that the mission can be pursued, <u>possibly</u> without performance degradation
Subjectivity	<u>in the largest extent as possible</u> , the system shall be constituted by commercially available software products
Vagueness	the C code shall be <u>clearly</u> commented
Weakness	the results of the initialization checks <u>may be</u> reported in a special file
Underspecification	the system_ shall be able to run also in case of <u>attack</u>
Multiplicity	the mean time needed to remove a faulty board <u>and restore service</u> shall be less than 30 minutes
Undereference	the software shall be designed <u>according to the rules of the Object Oriented Design</u>
Unexplanation	the handling of any received valid <u>TC</u> packet shall be started in less than 1 <u>CUT</u>

[QM2 Add-Ons]

Coordination - I

Unclear precedence for the conjunctions “and” and “or” when more than one of either or both of them occurs in one sentence.

Examples

You get a soup or a salad and a vegetable.

I saw Peter and Paul and Mary saw me.

The precedences of the conjunctions are unclear

[QM2 Add-Ons (cont.)]

Coordination - II

Unclear scope of adjectives over conjunctions

Example

young man and woman

The scopes of the *adjective* and the *conjunction* are unclear

[QM2 Add-Ons (cont.)]

Coordination - III

Unclear scope of “not” over conjunctions

Example

The system shall not give out secrets and open files.

The scopes of the *not* and the conjunction are unclear

[QM2 Add-Ons (cont.)]

Misplaced “Only”

Misplaced “only”, usually before verb by default. In English, the default is to place “only” only before the verb, when usually, it should be elsewhere, before the word that is limited by the “only”.

Examples

I only nap after lunch.

I nap only after lunch.

Only I nap after lunch.

I nap after only lunch.

[QM2 Add-Ons (cont.)]

Dangerous Plural

Unclear correspondences due to plural

Examples

Three girls lift a table.

Does each of the three girls lift a table?

or

do all three girls together lift a table?

[Future Work

- The tool QuARS extension to search for the new indicators of QM2.
- The resulting new QuARS has to be tested for effectiveness and usefulness on real-life RSs.
- For an arbitrary offending sentence, QuARS could formulate a question or display an alternative construction.

RequisitePro file



[Examples

“I only nap after lunch”

QUARS

QUESTIONS

Are you sure that : I ONLY nap and not do something else after lunch?

[Examples

“You get a soup or a salad and a vegetable”

QUARS

ALTERNATIVE
S

“You get (1) a soup or (2) a salad and
a vegetable.

AND

You get (1) a soup or a salad and (2)
a vegetable”

OR

“You get (a soup) or ((a salad) and
(a vegetable)).

AND

You get ((a soup) or (a salad)) and
(a vegetable)”

...and now...
(as Dan would say)

**Let's
plunge in!!!!**



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[Last Slides

- **Which quality features are addressed by the paper?**

Quality of requirements specifications (RSs) : new kinds of ambiguities for Quality Model (QM) and QuARS

- **What is the main novelty/contribution of the paper?**

Extension of the first QM, QM1 : $QM2 = QM1 +$ new kinds of ambiguities

- **How will this novelty/contribution improve RE practice or RE research?**

RSs subjected to extended QuARS based on QM2 should have fewer ambiguities and should thus be of higher quality than before.

[Last Slides

- **What are the main problems with the novelty/contribution and/or with the paper?**

It is not certain if the entire QM2 can be implemented into QuARS, and it is not certain how effective the new QuARS will be in practice.

- **Can the proposed approach be expected to scale to real-life problems?**

The QM1 was applied in two industrial case studies

Siemens C.N.X : 2345 requirements (FREQ and NFREQ)

Modcontrol Project: 5675 requirements (FREQ and NFREQ)



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Thank you for your attention



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[QM2 Add-Ons (cont.)]

Plural pronoun for singular referent

Plural pronoun for singular referent

Example

Everybody knows their home address.

Everybody knows his or her home address.

Everybody knows his or her own home address.

...the leaders...Everybody knows their home address.

and so on.....

[QM2 Add-Ons (cont.)]

Negation of Causality

Unclear scope of “not” with “because”

Example

The witness said that the case was not brought before committee because of the incident the night before.



One way to read it is that the case was not brought before committee and the incident the night before is what caused the case not to be brought. However, is it definite that the case was not brought before committee at all? One cannot be sure

Another way to read the sentence is that the incident the night before did not cause the case not be brought, but in fact, the case was brought before committee anyway.

[QM2 Add-Ons (cont.)]

Misplaced Limiter

In English, each of the following words is often misplaced, usually just before the verb

“almost”, “also”, “even”, “just”, “mainly”, “merely”,
“nearly”, “really”, “usually”, etc.

Examples

I also nap after lunch.

I nap also after lunch.

also I nap after lunch.

I nap after also lunch.