

# INCOSE GtWR 4.0

Implementation of the latest concepts

“At the crossroads between needs and requirement statements”



**Ilyes Yousfi**

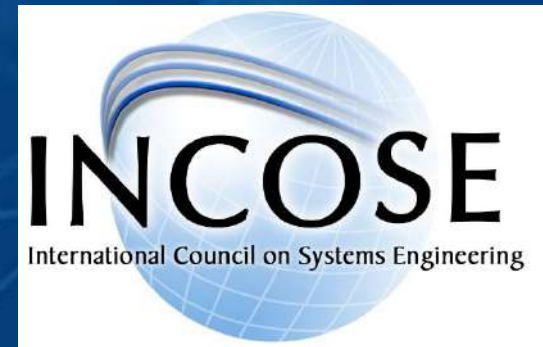
The REUSE Company

*ilyes.yousfi@reusecompany.com*

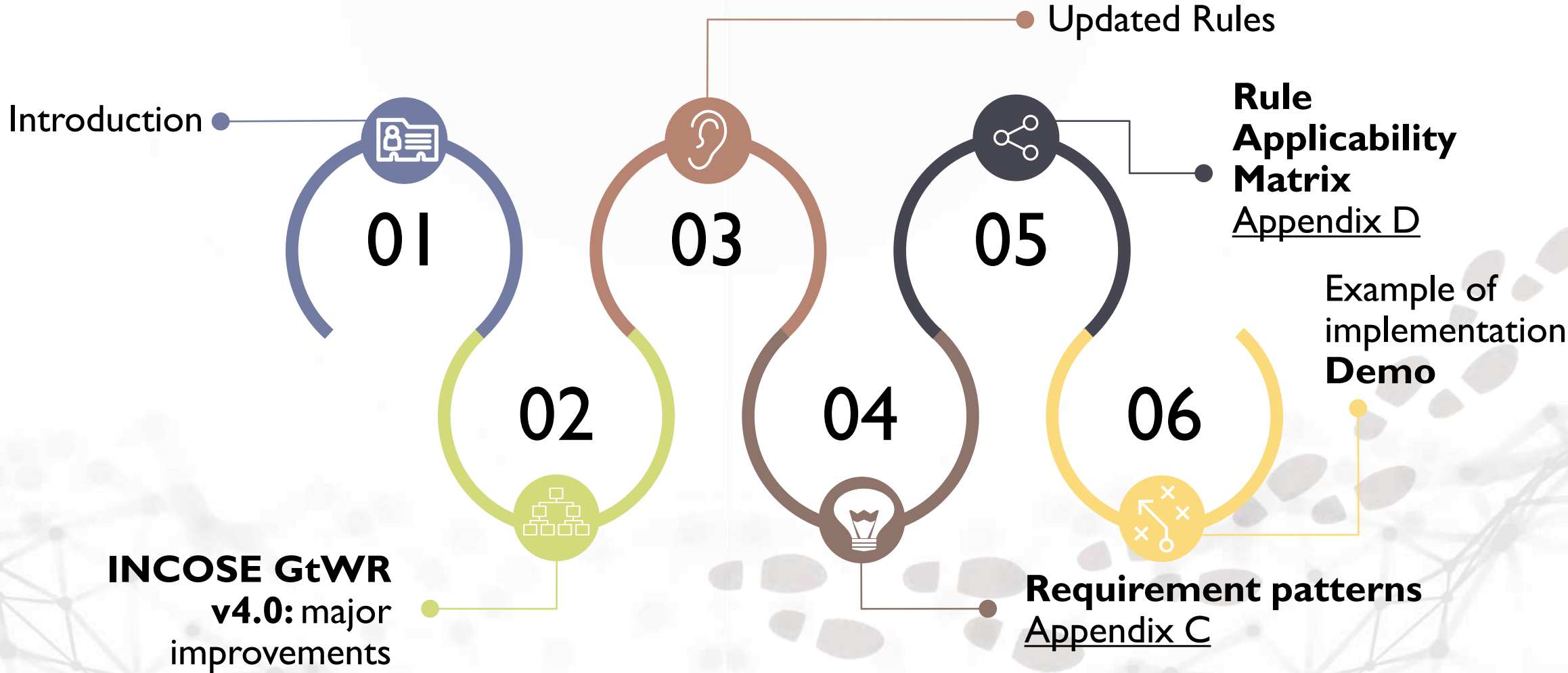


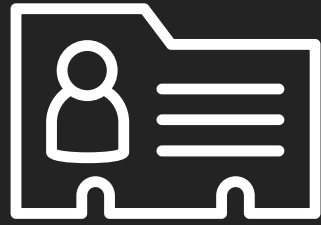
THE  
**REUSE**  
COMPANY

September 19<sup>th</sup>, 2023



# Contents





# **1. Brief intro**

## **The REUSE Company**

02

**Systems + Software Engineers**

Smart combination between  
Company staff and R&D (University)

04

To promote **reusable** solutions to  
**SMART** and Systems Engineering  
environments, by offering a  
**knowledge centric** approach.



**WHEN**

01

The company was  
established in **1999**

Spin-off of a University in  
Madrid

**WHO**



**WHERE**

03

**Headquarters:**  
Madrid (Spain)

**International offices:**  
Stockholm (Sweden)  
Tokyo (Japan) Delegation

**WHY**





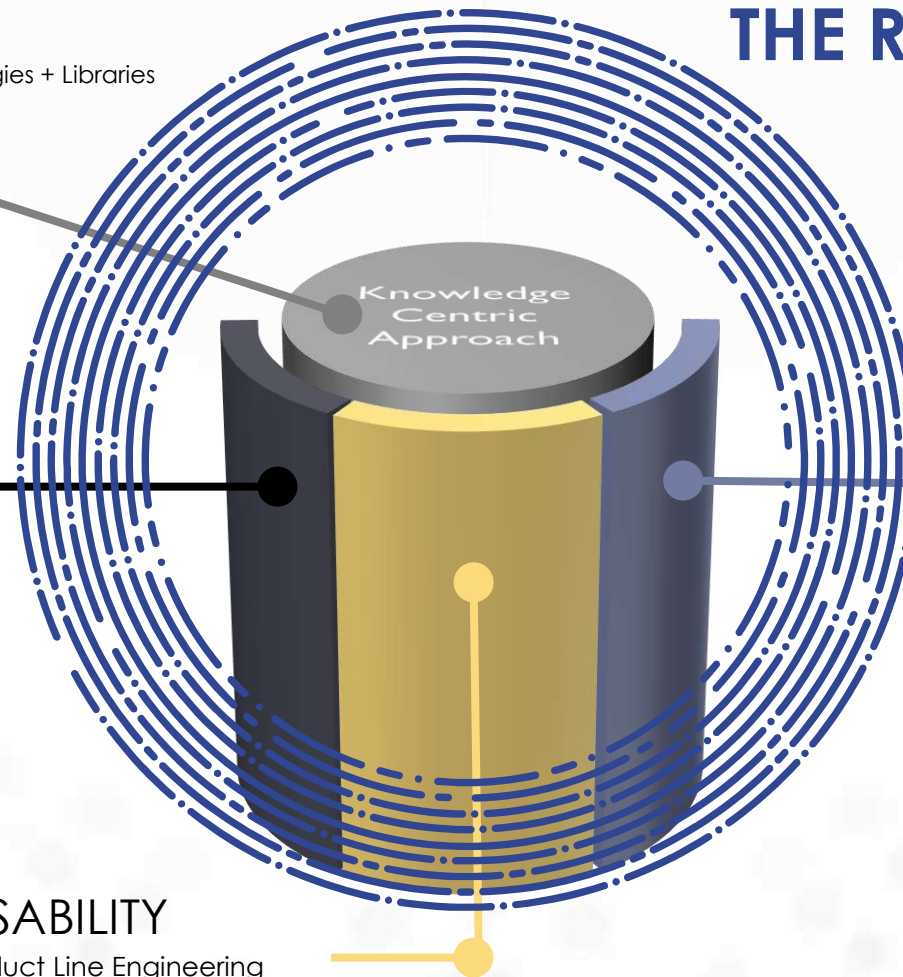
## Knowledge Centric Systems Engineering (KCSE)

- Connectivity & Interoperability
- Configuration Management
- SMART Authoring
- Lifecycle Management
- Global Repositories: Ontologies + Libraries

# THE REUSE COMPANY = TRC

## TRACEABILITY

- Links and Interoperability –
- Transformations –
- Change management –



## QUALITY

- Quality Management
- Verification & Validation management
- Alerts & Risks Management
- Decision management



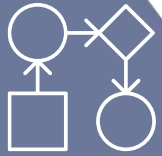
## REUSABILITY

- Product Line Engineering
- Retrieval & Archiving
- Adaptability to Existing Toolsets



# THE REUSE COMPANY = TRC

01



SES TMP –  
TMx

Technical Management  
Processes:  
Quality  
V&V  
Traces...

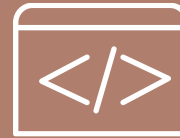
02



SES Interop –  
HUBx

Interoperability HUB  
Connectivity to  
external sources

03



SES Req Eng –  
REx

SMART Requirements  
Engineering  
Using MS Word as  
tech platform

04



SES SLCM –  
SLx

System Life cycle  
management

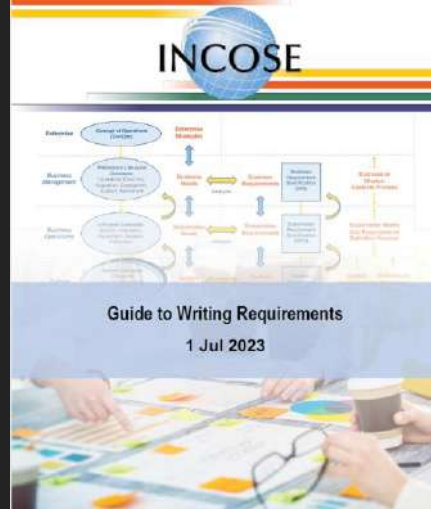
05



Knowledge –  
KMx

Knowledge and Information  
Management  
Ontologies  
Virtual Assistants  
Search eng.

The REUSE Company is specialized  
in the application of  
**semantic technologies** and  
**artificial intelligence** to improve  
the digitalization of  
the **Systems Engineering life cycle**.



## 2. INCOSE GtWR v4.0

**Major  
improvements**

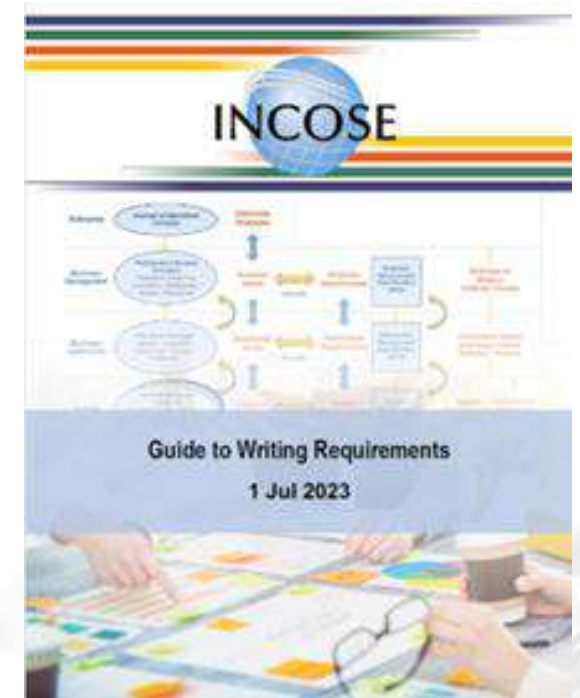
## INCOSE Guide for Writing Requirements: get to know it!

The INCOSE RGW (**Requirements Working Group**) in line with its goal (*Expand and promote the body of knowledge of requirements engineering and its benefits within the systems engineering community*)

has developed the INCOSE GtWR (**Guide to Writing Requirements**)

The GtWR provides guidance on how to express textual needs AND requirements expressions.

The GtWR draw advice into a single, comprehensive set of **characteristics, rules and attributes** for well-formed need and requirement expressions.



# INCOSE GtWR v4.0

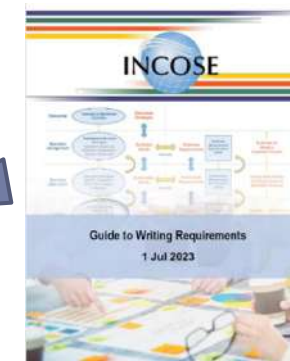
## 42 Rules / 15 Characteristics

> **15 Characteristics** of individual and sets of needs and requirements.

> **42 Rules** to help formulate individual and sets of needs and requirements.

> **49 Attributes** are attached to need or requirement statements to form need or requirement expressions.

Type	Rule Number	Rule name	C1 - NECESSARY	C2 - APPROPRIATE	C3 - UNAMBIGUOUS	C4 - COMPLETE	C5 - SINGULAR	C6 - FEASIBLE	C7 - VERIFIABLE	C8 - CORRECT	C9 - CONFORMING	C10 - COMPLETE	C11 - CONSISTENT	C12 - FEASIBLE	C13 - COMPREHENSIBLE	C14 - ABLE TO BE VALIDATED	C15 - CORRECT
Accuracy	R01	Sentence Structure		1	1			1	1	1							
	R02	Use Active Voice		1	1	1											
	R03	Subject Verb		1	1				1			1				1	
	R04	Use Defined Terms			1				1				1		1	1	1
	R05	Use Definite Articles			1				1								
	R06	Units			1	1			1	1							
	R07	Avoid Vague Terms			1	1			1								
	R08	No Escape Clauses			1	1			1								
	R09	No Open Ended			1	1	1		1								
Concision	R10	Superfluous Infinitives		1				1									
	R11	Separate Clauses		1	1			1	1								
Non Ambiguity	R12	Correct Grammar		1				1	1	1							
	R13	Correct Spelling		1					1								
	R14	Correct Punctuation		1					1								
	R15	Logical Condition		1					1								
	R16	Avoid Not		1					1	1							
	R17	Oblique		1					1								
Singularity	R18	Single Sentence		1		1		1		1					1		
	R19	Avoid Combinators		1		1											
	R20	Avoid Purpose	1			1											
	R21	Avoid Parentheses				1											
	R22	Enumeration		1		1											
Completeness	R23	Context		1	1	1											
	R24	Avoid Pronouns		1	1				1								
	R25	Use Of Headings			1												
Realism	R26	Avoid Absolutes						1	1	1				1			
	R27	Explicit				1			1	1							
Conditions	R28	Explicit Lists		1					1								
	R29	Classify										1	1				
Abstraction	R30	Express Once	1									1					
	R31	Solutionfree		1													
Quantifiers	R32	Universals			1				1	1							
	R33	Value Range			1	1			1	1				1			
Tolerance	R34	Measurable			1	1			1					1			
	R35	Temporal Indefinite			1	1			1								
Uniform Language	R36	Use Consistent Terms		1						1	1		1	1	1	1	
	R37	Define Acronyms		1						1		1	1	1	1	1	
	R38	Avoid Abbreviations								1		1	1	1	1	1	
	R39	Style Guide				1	1				1	1	1	1	1	1	
	R40	Decimal Format			1	1				1		1					
Modularity	R41	Related Requirements			1						1	1	1	1	1	1	
	R42	Structured									1	1		1	1	1	



## 49 Attributes

Attr #	Attribute	Attributes to Help Define the Requirement and its Intent	Associated with the System of Interest (SOI) Verification	Attributes to Help Maintain the Requirements	Attributes to Show Applicability and Allow Reuse
A01	Rationale*	1			
A02	SOI Primary Verification or Validation Method*	1			
A03	SOI Verification or Validation Approach	1			
A04	Trace to Parent*	1			
A05	Trace to Source*	1			
A06	Condition of Use	1			
A07	States and Modes	1			
A08	Allocation*	1			
A09	SOI Verification or Validation Level		1		
A10	SOI Verification or Validation Phase		1		
A11	SOI Verification or Validation Results		1		
A12	SOI Verification or Validation Status		1		
A13	Unique Identifier*				1
A14	Unique Name				1
A15	Originator/Author*				1
A16	Date Requirement Entered				1
A17	Owner*				1
A18	Stakeholders				1
A19	Change Board				1
A20	Change Status				1
A21	Version Number				1
A22	Approval Date				1
A23	Date of Last Change				1
A24	Stability				1
A25	Responsible Person				1
A26	Need or Requirement Verification Status*				1
A27	Need or Requirement Validation Status*				1
A28	Status (of the Need or Requirement)				1
A29	Status (of Implementation)				1
A30	Trace to Interface Definition				1
A31	Trace to Peer Requirements				1
A32	Priority*				1
A33	Criticality or Essentiality*				1
A34	Risk (of Implementation)*				1
A35	Risk (Mitigation)				1
A36	Key Driving Need or Requirement (KDN/KDR)				1
A37	Additional Comments				1
A38	Type/Category				1
A39	Applicability				1
A40	Region				1
A41	Country				1
A42	State/Province				1
A43	Application				1
A44	Market Segment				1
A45	Business Unit				1
A46	Business (Product)Line				1

## INCOSE GtWR: more details about the updates

### IS 2023 RWG Meeting

Chapter INet Pages Working Group INet Pages Discover Community Initiatives Member Publications Member Resources

Home / INet / Requirements / IS 2023

### Requirements Working Group IS2023 Site

PowerPoint Slide Show - (rwg\_mtg\_is2023\_071923.pptx)

 **33<sup>rd</sup> Annual INCOSE**  
international symposium  
hybrid event  
Honolulu, HI, USA  
July 15 - 20, 2023

INCOSE Requirements Working Group

## IS2023 RWG Meeting

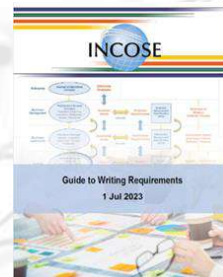
0:01 / 1:05:32

INCOSE\_RWG\_IS2023\_Session\_071923

- ❖ Change summary
- ❖ Details about the updated definitions and concepts
- ❖ Added figures in Elaboration section of Characteristics & Rules

### MEMBERS ONLY

<https://www.incose.org/inet/working-groups/requirements/requirements-meetings/is-2023>



## INCOSE GtWR v4.0 release: focus of this presentation

### i) Rules:

- Updated Rules: R06 (Units), R33 (Tolerance)
- **\*\*New Rule\*\*** : R40 (DecimalFormat)

### ii) Requirement Patterns (Appendix C)

### iii) Rule Applicability Matrix (Appendix D) : Needs vs. Requirements and Data Dictionaries

### **\*\*\*THE CHALLENGE\*\*\***

“address both need and requirement statements and understand the differences between the two”

INCOSE GtWR sect. 1.8



### 3. Rules

## Updates in v4.0 release

### ➤ Updated Rule

#### ➤ Rule 06/ Common Units of Measure

##### Definition:

When stating quantities, all numbers should have appropriate and consistent units of measure explicitly stated using a common measurement system in terms of the thing the number refers.

- Added the triplet  $\{Component, Property, MeasurementUnit\}$  consistency concept

##### Example:

- REQ-001 "The Fuel\_System shall have a maximum Fuel\_Tank volume of 60 l." →  $\{Fuel\_System, Fuel\_Tank\ volume, l\}$
- REQ-002 "When the Sensor detects the Fuel\_Tank volume is less than 50 dl, the Sensor shall light the Low-Fuel\_indicator within 1 second." ❌
- REQ-003 "While the Fuel\_System has a Fuel\_Tank volume higher than 60 l, the Low-Fuel\_indicator light shall be Off." ✅
- REQ-004 "While the engine is on, If the Cooling\_System\_volume is lower than 3400 ml, the Water\_Pump shall transit to Emergency mode." ✅

## Updates in v4.0 release

### › Updated Rule

#### › Rule 33 / Range of Values (Tolerance)

##### *Definition:*

Define each quantity with a range of values appropriate to the entity to which the quantity applies and against which the entity will be verified or validated.

#### › Uniformity of Format

##### › Use a consistent format for tolerances

#### Example:

REQ-004 "The Fuel\_System shall have a maximum weight of 600 lb  $\pm 5\%$ ."

REQ-005 "The Fuel\_System shall have a maximum power consumption of 2.4 kW (-0.0 kW / +0.4 kW)"

#### › Unit for each value?

#### › Numerical vs. textual format : "between...and..." / "from....to..." etc.



## Updates in v4.0 release

### ➤ New Rule

#### ➤ Rule 40 / DecimalFormat

##### Definition:

Use a consistent format and number of significance digits for the specification of decimal numbers.

#### ➤ Symbol for decimals

’ VS. •

#### ➤ ...and symbol for thousands !

#### ➤ Set a convention

’

•

#### Example:

	9,499		9.499
•	9,499.99	’	9.499,99

## Updates in v4.0 release

### ➤ New Rule

- Rule 40 / DecimalFormat
- Decimal format for numbers between -1 and 1
  - ,99 vs. **0,99**



## **4. Requirements patterns**

**INCOSE GtWR appx. C**

## Benefits of requirement patterns

- › Sets an internal standard for well-formed requirements
- › Help identifying keywords (i.e. the subject before the “shall”)
- › Customizable for every domain, customer and content of each requirements document
- › **Pattern Libraries**

Condition Keyword

Condition

Agent

Shall

Action

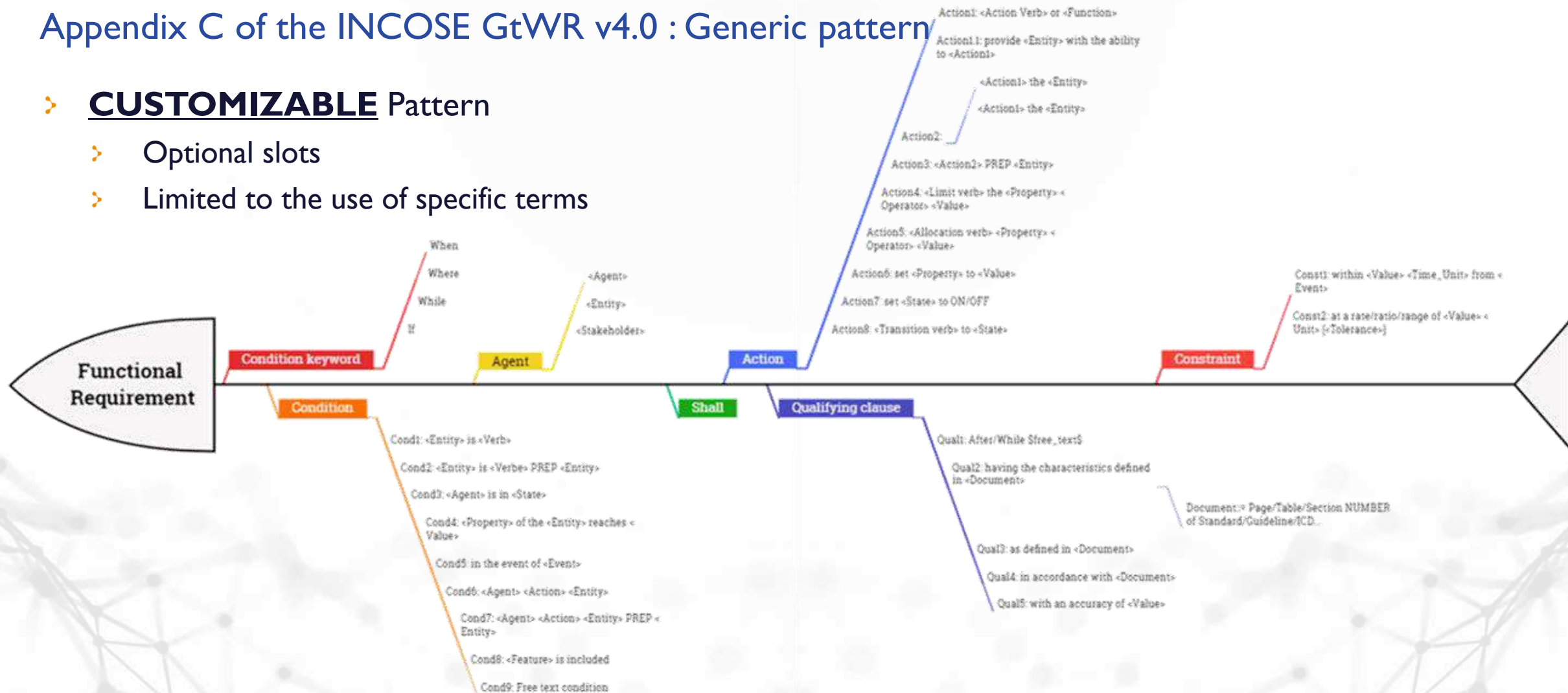
Qualifying Clause

Constraint

## Appendix C of the INCOSE GtWR v4.0 : Generic pattern

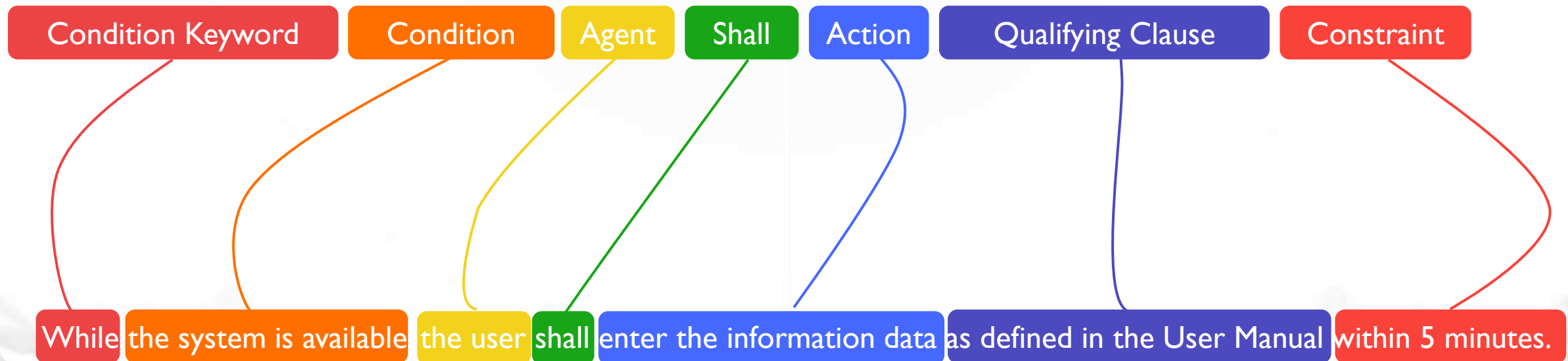
### ➤ **CUSTOMIZABLE** Pattern

- Optional slots
- Limited to the use of specific terms



## Appendix C of the INCOSE GtWR v4.0 : Generic pattern

### ➤ **CUSTOMIZABLE** Pattern



## Appendix C: Example of slot restriction

### ➤ Importance of a Defined Data Dictionary

Condition

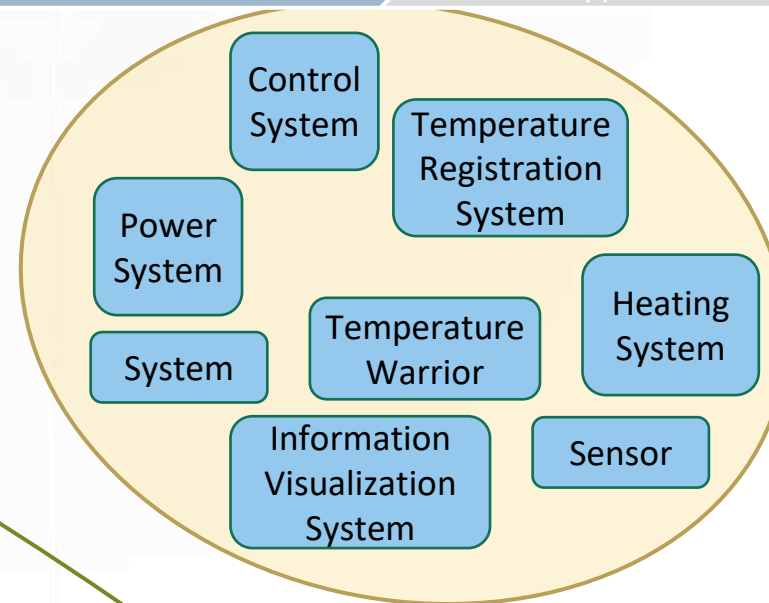
**<<AGENT>>** in **<<STATE>>**



Ontology

#### Examples matching this part of the pattern:

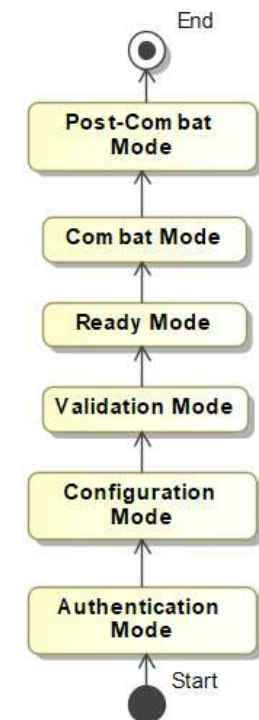
- “Control System in Ready Mode”...
- “Temperature Warrior in Combat Mode”...
- “Information Visualization System in Configuration Mode”...



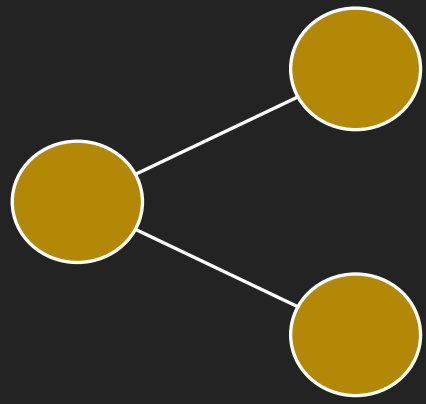
**<<AGENT>>**



Data dictionary



**<<STATE>>**



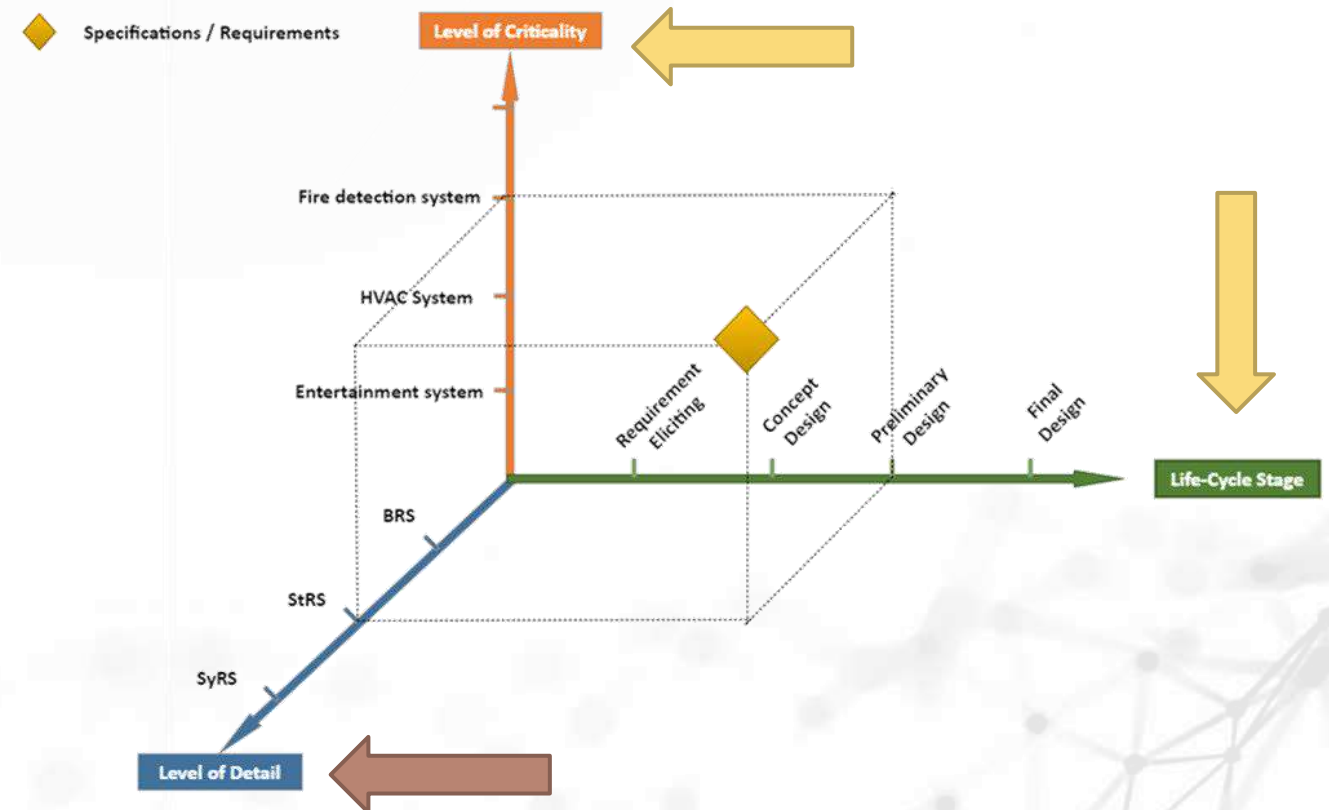
**5.  
Rule  
Applicability  
Matrix  
(Appendix D)**

## Introduction to the Rule Applicability Matrix

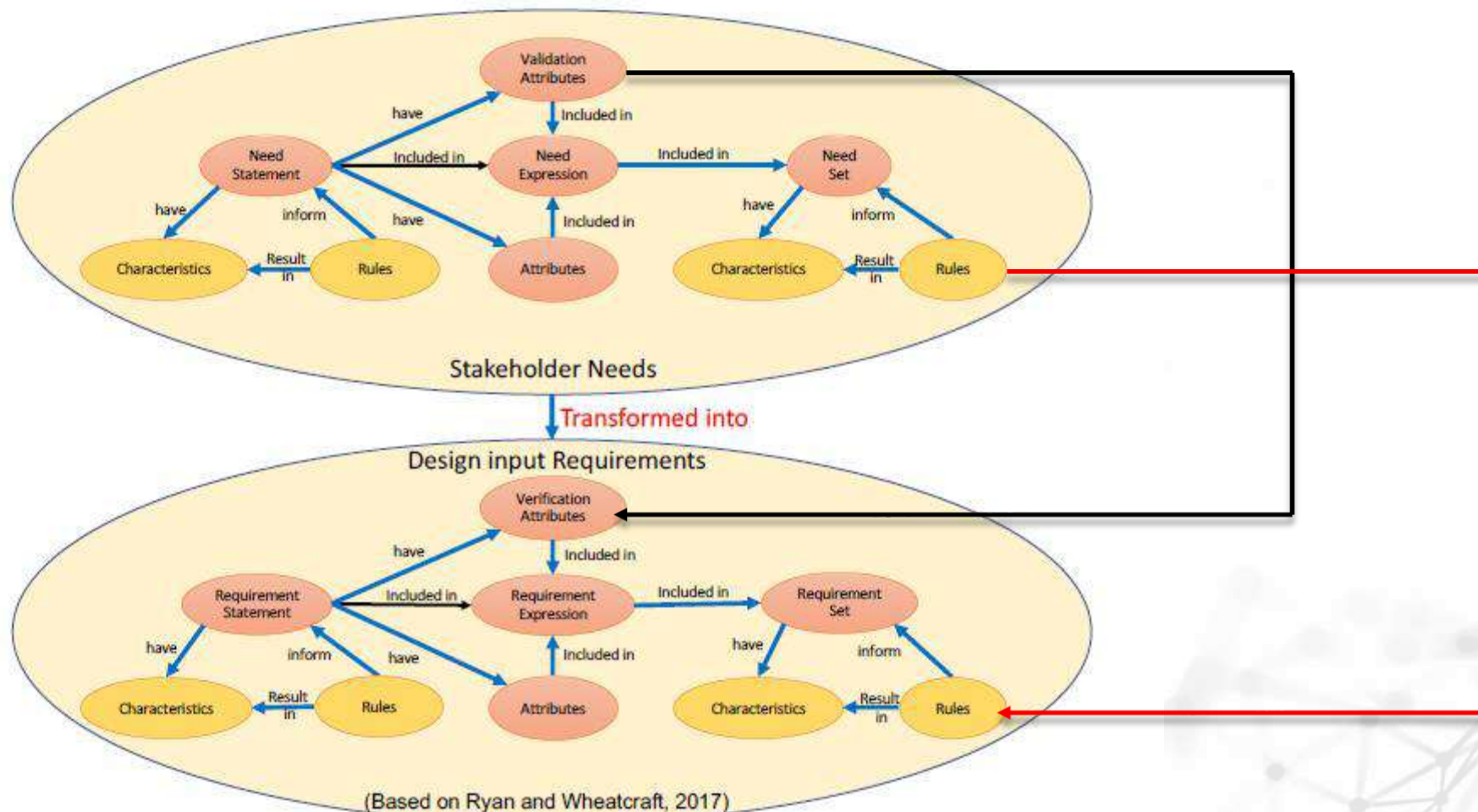
- Guidelines/**Recommendations** to apply a tailored set of rules to either Needs or Requirements
  - *Optional / Recommended* rule for Needs
  - *Compulsory* rules for Requirements
- **Tailoring** to either Needs or Reqs
- Is a **Project Data Dictionary** needed?
  - 1. check cross-domain aspects
  - 2. check domain-specific aspects



**Tailoring Guide**  
(Link to download the book) :



## Needs & Requirements – what is the difference?



**Figure 4: Entity-Relationship Diagram for Needs and Requirements Terms.**

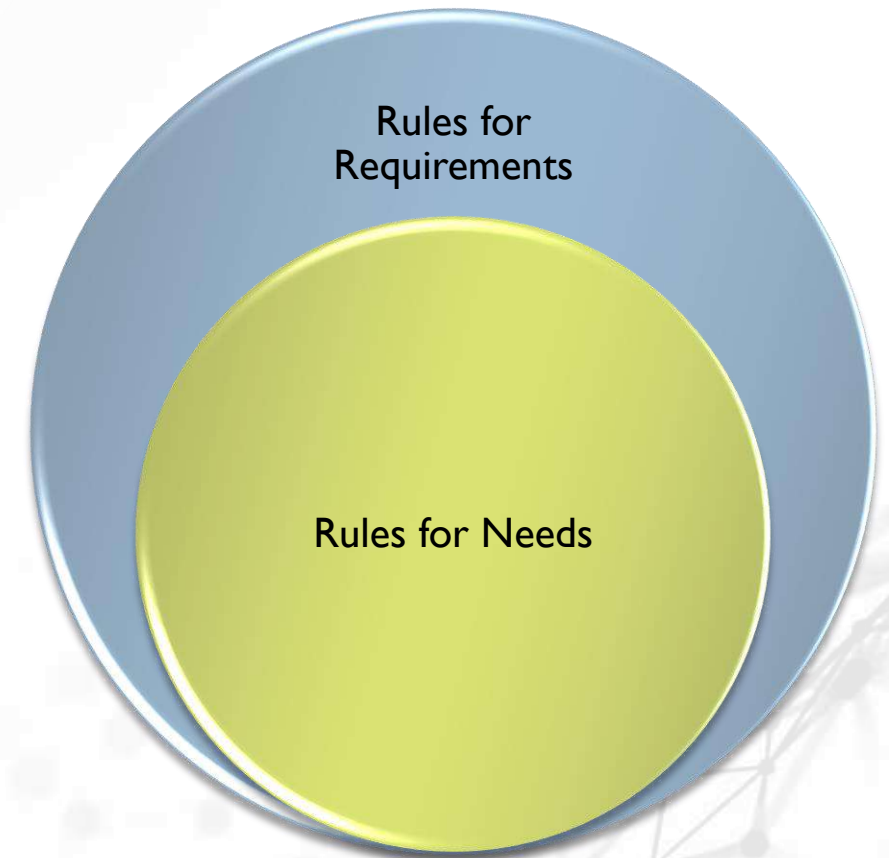
## Characteristics of Needs and Requirements

- Different purposes
  - Needs -> Meet the business expectations
  - Requirements -> What to do to achieve the needs.

### But...

Requirements translate needs ('Derived Requirements')

- Rules that apply to needs would also apply to requirements.
- I Need -> X Requirements!
- Which ones? Based on which characteristics?
  - ❑ REQUIRES TO DEFINE **RULE APPLICABILITY FOR NEEDS AND REQUIREMENTS!**



## Main Content of the Rule Applicability Matrix

- Rule ID / Name / Description
- **RULE APPLICABILITY**
  - CNCR = Compulsory for Needs AND Requirements
  - RNCR = Recommended for Needs; Compulsory for Requirements [+Comments]
  - CR = Compulsory for Requirements (Optional for Needs)
- **RULE SCOPE** : Requires Project Data Dictionary, Glossary, Models or Ontology?
  - Y/N

## Main Content of the Rule Applicability Matrix: Example

RULE #	RULE NAME	RULE SHORT DESCRIPTION	RULE APPLICABILITY	APPLICABILITY COMMENTS	RULE SCOPE Requires Project Data Dictionary, Glossary, Models or Ontology? (Y/N)	SCOPE COMMENTS
R01	Sentence Structure	Use the form of a complete sentence: subject, verb, object.	<b>CNCR</b>		N	
R02	Use Active Voice	Use the active voice in the main sentence structure with the responsible entity clearly identified as the subject.	<b>RNCR</b>	<p><b>Needs:</b> The use of active voice can have a higher tolerance when considering needs, although it is recommended to avoid it in both cases.</p>	N	

## Main Content of the Rule Applicability Matrix: Elaboration





### › **Rule 01 – Sentence Structure**

- › Both Needs and Requirements need a proper, standardized sentence structure
- › Project Data Dictionary: Not required

### › **Rule 02 – Use Active Voice**

- › Requirements shall use active voice (identify SOI, express functionality, etc.)
- › Needs might use passive voice
- › Project Data Dictionary: Not required (generic syntax checking)

## Example #1: Needs vs. Requirements

		APPLICABILITY	SCOPE (Requires Project Data Dictionary?)
Rule 02 <i>Use Active Voice</i>		<b>RNCR</b>	<b>No</b>
Rule 05 <i>Use Definite Articles</i>		<b>RNCR</b>	<b>No</b>
Rule 07 <i>Avoid Vague Terms</i>		<b>RNCR</b>	<b>No</b>
Rule 21 <i>Avoid Parentheses</i>		<b>RNCR</b>	<b>No</b>

➤ **Example:** “When invited to enter user credentials, the user shall be notified by a large screen (above 30”) connected to the management system.”

## Example #1: Needs vs. Requirements

Editing 169 - SES ENGINEERING Studio

File Tools View Log

Authoring without patterns

< No pattern group >

No selected pattern group implies no writing assistance

Font Calibri Font Size 12 Normal

When invited to enter user credentials, the user shall be notified by a large screen (above 30") connected to the management system.

Metric: Accuracy R02 / TRC-M040: Avoid the use of Passive Voice out of the condition block

N/A

Correctness metrics summary:

**Low Quality 0.95**

Metric	Value
✓ Accuracy R02 / TRC-M040: Avoid the use of Passive Voice out of the condition block	1
✓ Accuracy R05 / TRC-M020: Avoid the use of Indefinite Articles	1
✓ Accuracy R07 / TRC-M950: Avoid the use of Vague Terms	1
✓ Singularity R21 / TRC-M390: Avoid the use of Parenthesis out of the condition block	2

[Edit manual assessment](#)

Ready

Save and close Cancel

## Example #1: Needs vs. Requirements

Editing 169 - SES ENGINEERING Studio

File Tools View Log

Authoring without patterns

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Font Calibri Font Size 12

When invited to enter user credentials, the user shall be notified by a large screen (above 30") connected to the management system.

Metric: Accuracy R05 / TRC-M020: Avoid the use of Indefinite Articles

- Term Tag: INDEFINITE ARTICLE
- Scope Note: N/A
- Clusters: N/A

Correctness metrics summary:

**Low Quality 0.95**

Metric	Value
✓ Accuracy R02 / TRC-M040: Avoid the use of Passive Voice out of the condition block	1
✓ Accuracy R05 / TRC-M020: Avoid the use of Indefinite Articles	1
✓ Accuracy R07 / TRC-M950: Avoid the use of Vague Terms	1
✓ Singularity R21 / TRC-M390: Avoid the use of Parenthesis out of the condition block	2

[Edit manual assessment](#)

Ready

Save and close Cancel

## Example #1: Needs vs. Requirements

Editing 169 - SES ENGINEERING Studio

File Tools View Log

Authoring without patterns

< No pattern group >

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Font Calibri Font Size 12

When invited to enter user credentials, the user shall be notified by a **large** screen (above 30") connected to the management system.

Metric: Accuracy R07 / TRC-M950: Avoid the use of Vague Terms

large

- Scope Note: N/A
- Clusters: «REQUIREMENTS» | «VAGUE ADJECTIVES»

Correctness metrics summary:

**Low Quality 0.95**

Metric	Value
✓ Accuracy R02 / TRC-M040: Avoid the use of Passive Voice out of the condition block	1
✓ Accuracy R05 / TRC-M020: Avoid the use of Indefinite Articles	1
✓ Accuracy R07 / TRC-M950: Avoid the use of Vague Terms	1
✓ Singularity R21 / TRC-M390: Avoid the use of Parenthesis out of the condition block	2

[Edit manual assessment](#)

Ready

Save and close Cancel

## Example #1: Needs vs. Requirements

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When invited to enter user credentials, the user shall be notified by a large screen (above 30") connected to the management system.

Metric: Singularity R21 / TRC-M390: Avoid the use of Parenthesis out of the condition block

- Scope Note: N/A
- Clusters: «BRACKETS»

- Scope Note: N/A
- Clusters: «BRACKETS»

Correctness metrics summary:

**Low Quality 0.95**

Metric	Value
Accuracy R02 / TRC-M040: Avoid the use of Passive Voice out of the condition block	1
Accuracy R05 / TRC-M020: Avoid the use of Indefinite Articles	1
Accuracy R07 / TRC-M950: Avoid the use of Vague Terms	1
Singularity R21 / TRC-M390: Avoid the use of Parenthesis out of the condition block	2

**Checking with rules adapted to requirement statements**

[Edit manual assessment](#)

Ready

Save and close Cancel

## Example #1: Needs vs. Requirements

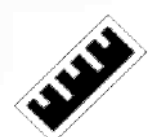
The screenshot displays the SES ENGINEERING Studio interface. The main window is titled "Editing 169 - SES ENGINEERING Studio" and contains a text editor with the following text: "When invited to enter user credentials, the user shall be notified by a large screen (above 30") connected to the management system. |". The interface includes a menu bar (File, Tools, View, Log) and a toolbar with various editing tools. A dropdown menu shows "< No pattern group >" and a red message states "No selected pattern group implies no writing assistance".

On the right side, a "Correctness metrics summary" panel is visible, showing a "High Quality" status with a score of "0.00". The panel contains a table with the following structure:

Metric	Value
<b>Checking with rules adapted to need statements</b>	

At the bottom of the metrics panel, there is a link "Edit manual assessment" and a "Ready" status. The main window also features "Save and close" and "Cancel" buttons at the bottom right.

# The need for Data Dictionaries



WHITE Belt Metrics

YELLOW Belt Metrics

ORANGE Belt Metrics

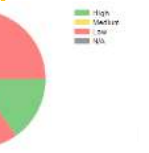
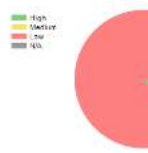
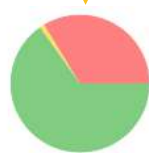
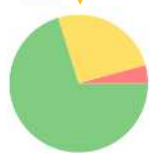
GREEN Belt Metrics

BLUE Belt Metrics

BROWN Belt Metrics

BLACK Belt Metrics

CROSS-DOMAIN

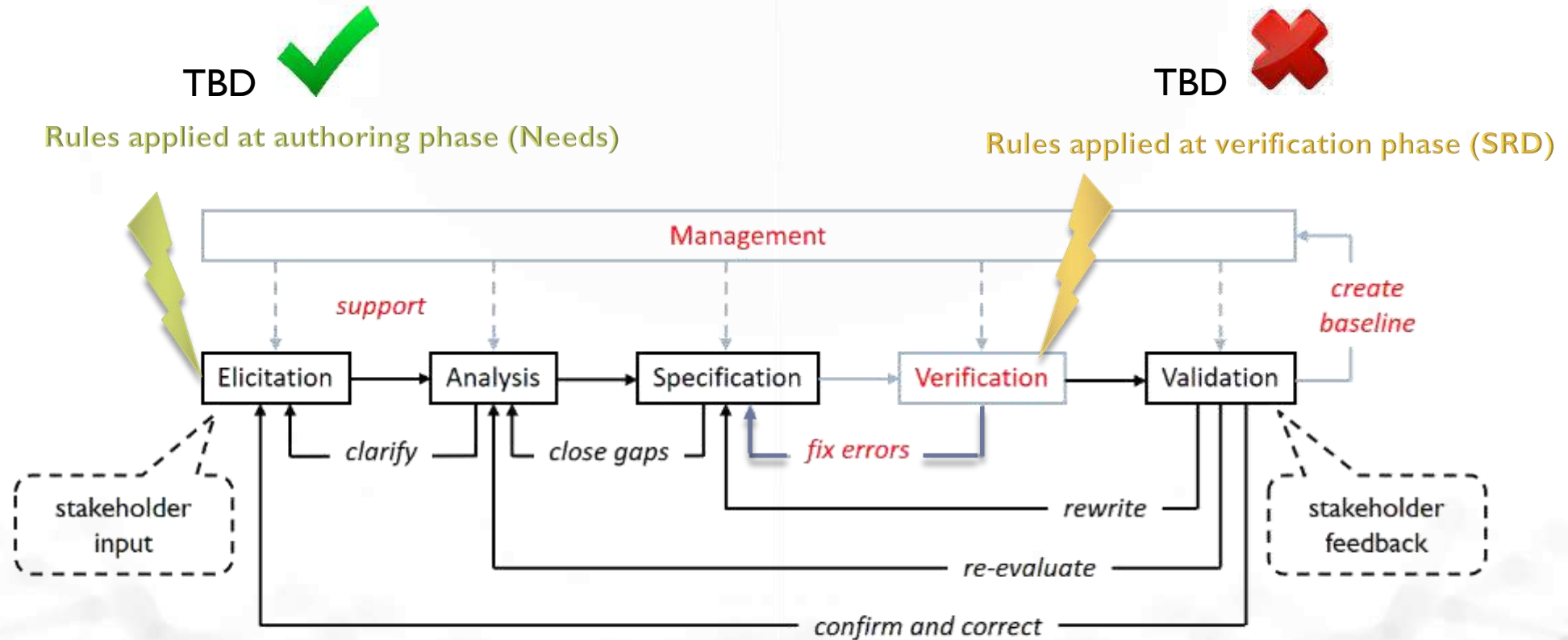


REQUIRES PROJECT DATA DICTIONARY



CORRELATED LEVELS OF RESULTS

## The 3-D tailoring space: Life-cycle Stage – Focus on needs & requirements



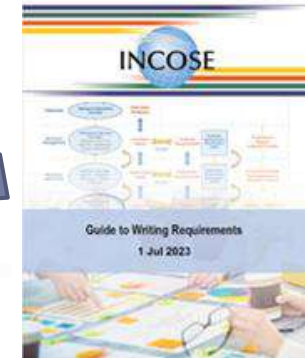
Adapted from: Karl Wieggers

# INCOSE GtWR with tailoring

- Characteristics
- Rules
- Attributes
- **Metrics:** A quality metric is a property which aims to quantify a qualitative indicator. It enables answering the question ‘How should we measure?’
- **Quality Function:** After defining the metric, the quality function is the conversion of the obtained result (quantitative value) to a quality level. Different profiles can be set (binary, concave, convex...)

Mapping INCOSE 2019 rules with TRC quality metrics

T-ID	Type	INCOSE Rule	Rule short name	Metric Number	Metric Name	Metric Type	
101	Accuracy	R01	Verbosity Structure	TRC-A020	Enforce the use of a complete sentence structure	Non-parameterized	
		TRC-A025	Avoid the use of Imperative Verbs	Parameterized - Cluster			
		TRC-A030	Use Active Voice	TRC-A030	Avoid the use of Passive Voice	Parameterized - Pattern matching	
		TRC-A035	Avoid the use of Passive Voice after the modal verb	TRC-A035	Avoid the use of Passive Voice after the modal verb	Parameterized - Pattern matching	
		TRC-A040	Avoid the use of Passive Voice out of the condition block	TRC-A040	Avoid the use of Passive Voice out of the condition block	Parameterized - Pattern matching	
		TRC-A055	Detect inappropriate subject at the document level	TRC-A055	Detect inappropriate subject at the document level	Parameterized - Sub-terms in SCM	
		TRC-A060	Avoid the use of vague verbs other Modal Verbs	TRC-A060	Avoid the use of vague verbs other Modal Verbs	Parameterized - Pattern matching	
		TRC-A065	Determine if the state verb is a Controlled Action Verb	TRC-A065	Determine if the state verb is a Controlled Action Verb	Parameterized - Pattern matching	
		TRC-A080	Enforce the use of Define Terms by avoiding Synonyms	TRC-A080	Enforce the use of Define Terms by avoiding Synonyms	Non-parameterized	
		TRC-A090	Avoid the use of Indefinite Articles	TRC-A090	Avoid the use of Indefinite Articles	Parameterized - Term tag	
	TRC-A100	Avoid the use of Indefinite Articles in front of an Agent	TRC-A100	Avoid the use of Indefinite Articles in front of an Agent	Parameterized - Pattern matching		
	TRC-A150	Detect inadequate Unit for a Characteristic	TRC-A150	Detect inadequate Unit for a Characteristic	Parameterized - Relationship not SCM compliance		
	TRC-A160	Avoid mixing up different measurement systems	TRC-A160	Avoid mixing up different measurement systems	Measurement units consistency metric		
	R07	Avoid Vague Terms	TRC-A200	Avoid the use of Vague Verbs	TRC-A200	Avoid the use of Vague Verbs	Parameterized - Cluster
	TRC-A210	Avoid the use of Vague Adjectives	TRC-A210	Avoid the use of Vague Adjectives	Parameterized - Cluster		
	TRC-A220	Avoid the use of Vague Adverbs	TRC-A220	Avoid the use of Vague Adverbs	Parameterized - Cluster		
	TRC-A230	Avoid the use of Vague Terms	TRC-A230	Avoid the use of Vague Terms	Parameterized - Cluster		
	TRC-A240	Avoid the use of Escape clauses	TRC-A240	Avoid the use of Escape clauses	Parameterized - Special Sentences		
	R09	No Open Ended	TRC-A260	Avoid the use of Open-Ended clauses	TRC-A260	Avoid the use of Open-Ended clauses	Parameterized - Special Sentences
	R11	Separate Clauses	TRC-A310	Enforce the use of a complete sentence structure	Non-parameterized		
TRC-A315	Check the number of condition clauses	TRC-A315	Check the number of condition clauses	Parameterized - Cluster			
TRC-A340	Avoid incorrect spelling	TRC-A340	Avoid incorrect spelling	Non-parameterized			
TRC-A350	Facility readability	TRC-A350	Facility readability	Non-parameterized			
TRC-A360	Remove incorrect punctuation	TRC-A360	Remove incorrect punctuation	Non-parameterized			
TRC-A370	Set a condition for logical expression forms	TRC-A370	Set a condition for logical expression forms	Parameterized - Cluster			
TRC-A380	Avoid the use of Combinator out of the condition block	TRC-A380	Avoid the use of Combinator out of the condition block	Parameterized - Cluster			
TRC-A390	Avoid the use of Not and other negative expressions	TRC-A390	Avoid the use of Not and other negative expressions	Parameterized - Cluster			
TRC-A400	Avoid the use of Negative Expressions out of the condition block	TRC-A400	Avoid the use of Negative Expressions out of the condition block	Parameterized - Cluster			
TRC-A410	Avoid the use of oblique Jumbo "I"	TRC-A410	Avoid the use of oblique Jumbo "I"	Parameterized - Term tag			
TRC-A420	Check the text length by counting paragraphs	TRC-A420	Check the text length by counting paragraphs	Non-parameterized			
TRC-A430	Check the text length by counting words	TRC-A430	Check the text length by counting words	Non-parameterized			
TRC-A440	Control the number of Action Verbs out of the condition block	TRC-A440	Control the number of Action Verbs out of the condition block	Parameterized - Pattern matching			
TRC-A340	Avoid the use of Combinators out of the condition block	TRC-A340	Avoid the use of Combinators out of the condition block	Parameterized - Cluster			
TRC-A370	Multiple subject detection	TRC-A370	Multiple subject detection	Parameterized - Pattern matching			
TRC-A375	Multiple verbs detection	TRC-A375	Multiple verbs detection	Parameterized - Pattern matching			
TRC-A380	Avoid phrases that indicate the purpose	TRC-A380	Avoid phrases that indicate the purpose	Parameterized - Special Sentences			
TRC-A400	Avoid the use of Pronouns to refer to nouns	TRC-A400	Avoid the use of Pronouns to refer to nouns	Parameterized - Term tag			
TRC-A410	Enforce the use of a complete sentence structure	TRC-A410	Enforce the use of a complete sentence structure	Non-parameterized			
TRC-A420	Avoid the use of Frontiers to refer to nouns	TRC-A420	Avoid the use of Frontiers to refer to nouns	Parameterized - Term tag			
TRC-A430	Avoid repetitive idiomatic expressions impossible to verify	TRC-A430	Avoid repetitive idiomatic expressions impossible to verify	Parameterized - Cluster			
TRC-A440	Ensure tolerance value are within an adequate value range	TRC-A440	Ensure tolerance value are within an adequate value range	Parameterized - Custom code			
TRC-A450	Check the number of Modal Verbs	TRC-A450	Check the number of Modal Verbs	Parameterized - Term tag			
TRC-A460	Avoid lists of actions after a condition activation	TRC-A460	Avoid lists of actions after a condition activation	Parameterized - Pattern matching			
TRC-A465	Avoid lists of conditions after an action	TRC-A465	Avoid lists of conditions after an action	Parameterized - Pattern matching			
TRC-A470	Avoid the use of empty	TRC-A470	Avoid the use of empty	Parameterized - Attribute			
TRC-A490	Avoid overlapping among the requirements	TRC-A490	Avoid overlapping among the requirements	Overlapping consistency metric			
TRC-A500	Avoid creating sub-sets	TRC-A500	Avoid creating sub-sets	Parameterized - Cluster			
TRC-A510	Avoid the use of I/O sentences	TRC-A510	Avoid the use of I/O sentences	Parameterized - Cluster			
TRC-A520	Force to indicate tolerance value for the units that required tolerance	TRC-A520	Force to indicate tolerance value for the units that required tolerance	Parameterized - Cluster			
TRC-A530	Ensure tolerance value are within an adequate value range	TRC-A530	Ensure tolerance value are within an adequate value range	Parameterized - Custom code			
TRC-A540	Check the use of a subject within a controlled clause	TRC-A540	Check the use of a subject within a controlled clause	Parameterized - Custom code			
TRC-A550	Avoid the use of Imperative Verbs	TRC-A550	Avoid the use of Imperative Verbs	Parameterized - Cluster			
TRC-A560	Avoid the use of Imperative Verbs applied to a property	TRC-A560	Avoid the use of Imperative Verbs applied to a property	Parameterized - Pattern matching			
TRC-A570	Avoid the use of Temporal Indefinite beyond out of the condition block	TRC-A570	Avoid the use of Temporal Indefinite beyond out of the condition block	Parameterized - Cluster			
TRC-A660	Avoid the use of indefinite articles	TRC-A660	Avoid the use of indefinite articles	Non-parameterized			
TRC-A670	Avoid Abbreviations	TRC-A670	Avoid Abbreviations	Non-parameterized			
TRC-A680	Enforce the use of a complete sentence structure	TRC-A680	Enforce the use of a complete sentence structure	Non-parameterized			



46 Attributes

Attribute	Definition	Category	Value	Unit	Weight
A01	Accuracy	Accuracy	1		1
A02	Condition	Condition	1		1
A03	Completeness	Completeness	1		1
A04	Consistency	Consistency	1		1
A05	Clarity	Clarity	1		1
A06	Concavity	Concavity	1		1
A07	Convexity	Convexity	1		1
A08	Correctness	Correctness	1		1
A09	Correctness	Correctness	1		1
A10	Correctness	Correctness	1		1
A11	Correctness	Correctness	1		1
A12	Correctness	Correctness	1		1
A13	Correctness	Correctness	1		1
A14	Correctness	Correctness	1		1
A15	Correctness	Correctness	1		1
A16	Correctness	Correctness	1		1
A17	Correctness	Correctness	1		1
A18	Correctness	Correctness	1		1
A19	Correctness	Correctness	1		1
A20	Correctness	Correctness	1		1
A21	Correctness	Correctness	1		1
A22	Correctness	Correctness	1		1
A23	Correctness	Correctness	1		1
A24	Correctness	Correctness	1		1
A25	Correctness	Correctness	1		1
A26	Correctness	Correctness	1		1
A27	Correctness	Correctness	1		1
A28	Correctness	Correctness	1		1
A29	Correctness	Correctness	1		1
A30	Correctness	Correctness	1		1
A31	Correctness	Correctness	1		1
A32	Correctness	Correctness	1		1
A33	Correctness	Correctness	1		1
A34	Correctness	Correctness	1		1
A35	Correctness	Correctness	1		1
A36	Correctness	Correctness	1		1
A37	Correctness	Correctness	1		1
A38	Correctness	Correctness	1		1
A39	Correctness	Correctness	1		1
A40	Correctness	Correctness	1		1
A41	Correctness	Correctness	1		1
A42	Correctness	Correctness	1		1
A43	Correctness	Correctness	1		1
A44	Correctness	Correctness	1		1
A45	Correctness	Correctness	1		1
A46	Correctness	Correctness	1		1
A47	Correctness	Correctness	1		1
A48	Correctness	Correctness	1		1
A49	Correctness	Correctness	1		1
A50	Correctness	Correctness	1		1

## INCOSE GtWR with tailoring

- Characteristics
- Rules
- Attributes
- **Metrics:** A quality metric is a property which aims to quantify a qualitative indicator. It enables answering the question *'How should we measure?'*
- **Quality Function:** After defining the metric, the quality function is the conversion of the obtained result (quantitative value) to a quality level. Different profiles can be set (binary, concave, convex...)

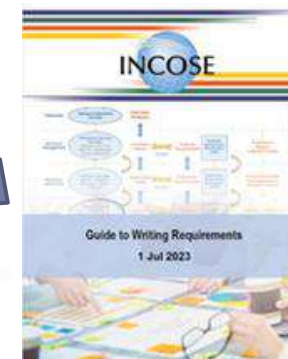
With which data?

### ...From the Project Data Dictionary!

- Defined Terms & Acronyms
- Main Terms vs. Synonyms
- Disambiguation (2 acronyms with different meanings)
- Taxonomy
- Etc.

Mapping INCOSE 2013 rules with TRC quality metrics

INCOSE 2013 Rule	TRC Quality Metric	Mapping
2013-001	2013-001	1
2013-002	2013-002	1
2013-003	2013-003	1
2013-004	2013-004	1
2013-005	2013-005	1
2013-006	2013-006	1
2013-007	2013-007	1
2013-008	2013-008	1
2013-009	2013-009	1
2013-010	2013-010	1
2013-011	2013-011	1
2013-012	2013-012	1
2013-013	2013-013	1
2013-014	2013-014	1
2013-015	2013-015	1
2013-016	2013-016	1
2013-017	2013-017	1
2013-018	2013-018	1
2013-019	2013-019	1
2013-020	2013-020	1
2013-021	2013-021	1
2013-022	2013-022	1
2013-023	2013-023	1
2013-024	2013-024	1
2013-025	2013-025	1
2013-026	2013-026	1
2013-027	2013-027	1
2013-028	2013-028	1
2013-029	2013-029	1
2013-030	2013-030	1
2013-031	2013-031	1
2013-032	2013-032	1
2013-033	2013-033	1
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2013-039	2013-039	1
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2013-043	2013-043	1
2013-044	2013-044	1
2013-045	2013-045	1
2013-046	2013-046	1
2013-047	2013-047	1
2013-048	2013-048	1
2013-049	2013-049	1
2013-050	2013-050	1
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2013-052	2013-052	1
2013-053	2013-053	1
2013-054	2013-054	1
2013-055	2013-055	1
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2013-064	2013-064	1
2013-065	2013-065	1
2013-066	2013-066	1
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2013-070	2013-070	1
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2013-077	2013-077	1
2013-078	2013-078	1
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2013-089	2013-089	1
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2013-093	2013-093	1
2013-094	2013-094	1
2013-095	2013-095	1
2013-096	2013-096	1
2013-097	2013-097	1
2013-098	2013-098	1
2013-099	2013-099	1
2013-100	2013-100	1



INCOSE 2013 Rule	TRC Quality Metric	Mapping
2013-001	2013-001	1
2013-002	2013-002	1
2013-003	2013-003	1
2013-004	2013-004	1
2013-005	2013-005	1
2013-006	2013-006	1
2013-007	2013-007	1
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2013-010	2013-010	1
2013-011	2013-011	1
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2013-016	2013-016	1
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2013-020	2013-020	1
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2013-023	2013-023	1
2013-024	2013-024	1
2013-025	2013-025	1
2013-026	2013-026	1
2013-027	2013-027	1
2013-028	2013-028	1
2013-029	2013-029	1
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2013-031	2013-031	1
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2013-087	2013-087	1
2013-088	2013-088	1
2013-089	2013-089	1
2013-090	2013-090	1
2013-091	2013-091	1
2013-092	2013-092	1
2013-093	2013-093	1
2013-094	2013-094	1
2013-095	2013-095	1
2013-096	2013-096	1
2013-097	2013-097	1
2013-098	2013-098	1
2013-099	2013-099	1
2013-100	2013-100	1



# INCOSE GtWR with tailoring

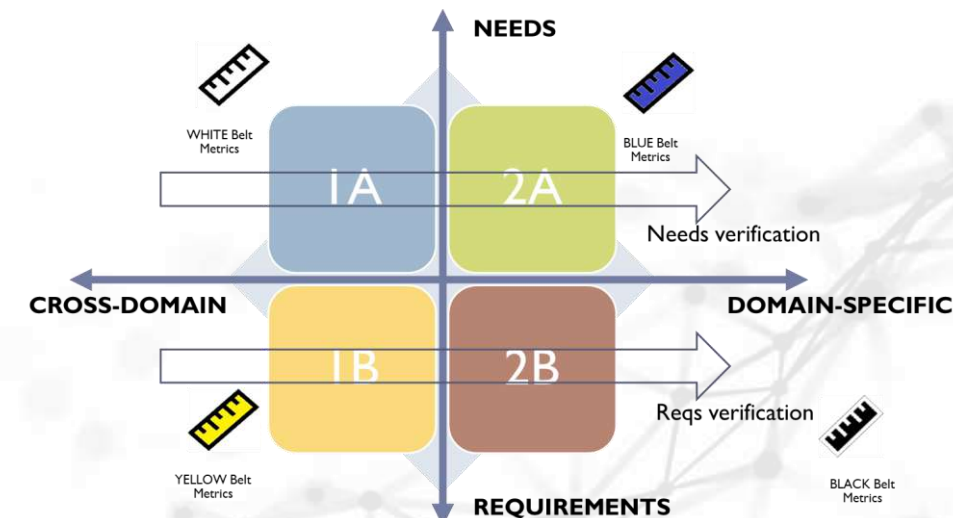
## Quality Assurance - Metrics set templates

Metrics set templates:

Search...

+ Add metric set

Identifier	Name	Description
187	1A - INCOSE GtWR v4.0 CROSS-DOMAIN METRICS x NEED Statements	1A. This subset includes cross-domain rules, which do not require domain-specific data dictionaries, and applies to NEED sta
188	1B - INCOSE GtWR v4.0 CROSS-DOMAIN METRICS x REQUIREMENT Statements	1B. This subset includes cross-domain rules, which do not require domain-specific data dictionaries, and applies to REQUIRE
189	2A - INCOSE GtWR v4.0 CROSS-DOMAIN & DOMAIN-SPECIFIC METRICS x NEED Statements	2A. This subset includes cross-domain & domain-specific rules, which require a project data dictionary, and applies to NEED
190	2B - INCOSE GtWR v4.0 CROSS-DOMAIN & DOMAIN-SPECIFIC METRICS x REQUIREMENT Statements	2B. This subset includes cross-domain & domain-specific rules, which require a project data dictionary, and applies to REQU



# INCOSE GtWR with tailoring

Metrics set template configuration: 1B - INCOSE GtWR v4.0 CROSS-DOMAIN METRICS x REQUIREMENT Statements

Metrics configuration:

Correctness Consistency Completeness

Correctness metrics:

Search + Add new Edit Delete

Metric Identifier	Custom Metric...	Name	Rationale	Weight	En...	Correctness type
32,401	N/A	Abstraction R31 / TRC-M490: Avoid stating a solution	This quality met...	1	<input checked="" type="checkbox"/>	Parameterized - Cluster
32,402	N/A	Abstraction R31 / TRC-M500: Avoid the use of Flow sentences	This metric chec...	1	<input checked="" type="checkbox"/>	Parameterized - Cluster
32,365	N/A	Accuracy R01 / TRC-M365: Avoid the use of Banned Modal Verbs	This is a metric...	1	<input checked="" type="checkbox"/>	Parameterized - Cluster
32,367	N/A	Accuracy R02 / TRC-M040: Avoid the use of Passive Voice out of the condition block	This metric chec...	1	<input checked="" type="checkbox"/>	Parameterized - Pattern matching
32,369	N/A	Accuracy R05 / TRC-M130: Avoid the use of Indefinite Articles in front of an Agent	This metric chec...	1	<input checked="" type="checkbox"/>	Parameterized - Pattern matching
32,372	N/A	Accuracy R06 / TRC-M140: Ensure Numbers are followed by Units or noun qualifications	This metric chec...	1	<input checked="" type="checkbox"/>	Parameterized - Term tag
32,371	N/A	Accuracy R06 / TRC-M150: Detect inadequate Unit for a Characteristic	hec...	1	<input checked="" type="checkbox"/>	Parameterized - Relationships not SCM comp...
32,376	N/A	Accuracy R07 / TRC-M950: Avoid the use of Vague Terms	hec...	1	<input checked="" type="checkbox"/>	Parameterized - Cluster
32,377	N/A	Accuracy R08 / TRC-M190: Avoid the use of Escape clauses	hec...	1	<input checked="" type="checkbox"/>	Parameterized - Special Sentences
32,378	N/A	Accuracy R09 / TRC-M200: Avoid the use of Open-Ended clauses	hec...	1	<input checked="" type="checkbox"/>	Parameterized - Special Sentences
32,397	N/A	Completeness R24 / Completeness R25 / TRC-M070: Avoid the use of Pronouns t	met...	1	<input checked="" type="checkbox"/>	Parameterized - Term tag
32,379	N/A	Concision R10 / TRC-M210: Avoid the use of Superfluous infinitives	hec...	1	<input checked="" type="checkbox"/>	Parameterized - Pattern group matching
32,380	N/A	Concision R11 / TRC-M215: Check the number of condition clauses	me...	1	<input checked="" type="checkbox"/>	Parameterized - Cluster
32,381	N/A	Non-ambiguity R12 / TRC-M230: Avoid incorrect grammar structures	cor...	1	<input checked="" type="checkbox"/>	Parameterized - Pattern group matching
32,383	N/A	Non-ambiguity R14 / TRC-M250: Facilitate readability	ba...	1	<input checked="" type="checkbox"/>	Non-parameterized
32,382	N/A	Non-ambiguity R14 / TRC-M260: Review incorrect punctuation	hec...	1	<input checked="" type="checkbox"/>	Non-parameterized
32,384	N/A	Non-ambiguity R15 / Singularity R19 / TRC-M350: Avoid the use of Combinators	hec...	1	<input checked="" type="checkbox"/>	Parameterized - Cluster
32,385	N/A	Non-ambiguity R15 / TRC-M270: Set a convention for logical expression forms	hec...	1	<input checked="" type="checkbox"/>	Parameterized - Cluster

No. of metrics: 38, Enabled: 38

Enabled

- + Add new metric
- Edit metric
- Delete metric(s)
- Enable Selected
- Enable all
- Disable all
- View text as paragraphs
- Search...
- Copy to
- Select all
- Select none
- Invert selection
- Copy selection to clipboard
- Export...
- Refresh

## Why do we need a Project Data Dictionary?

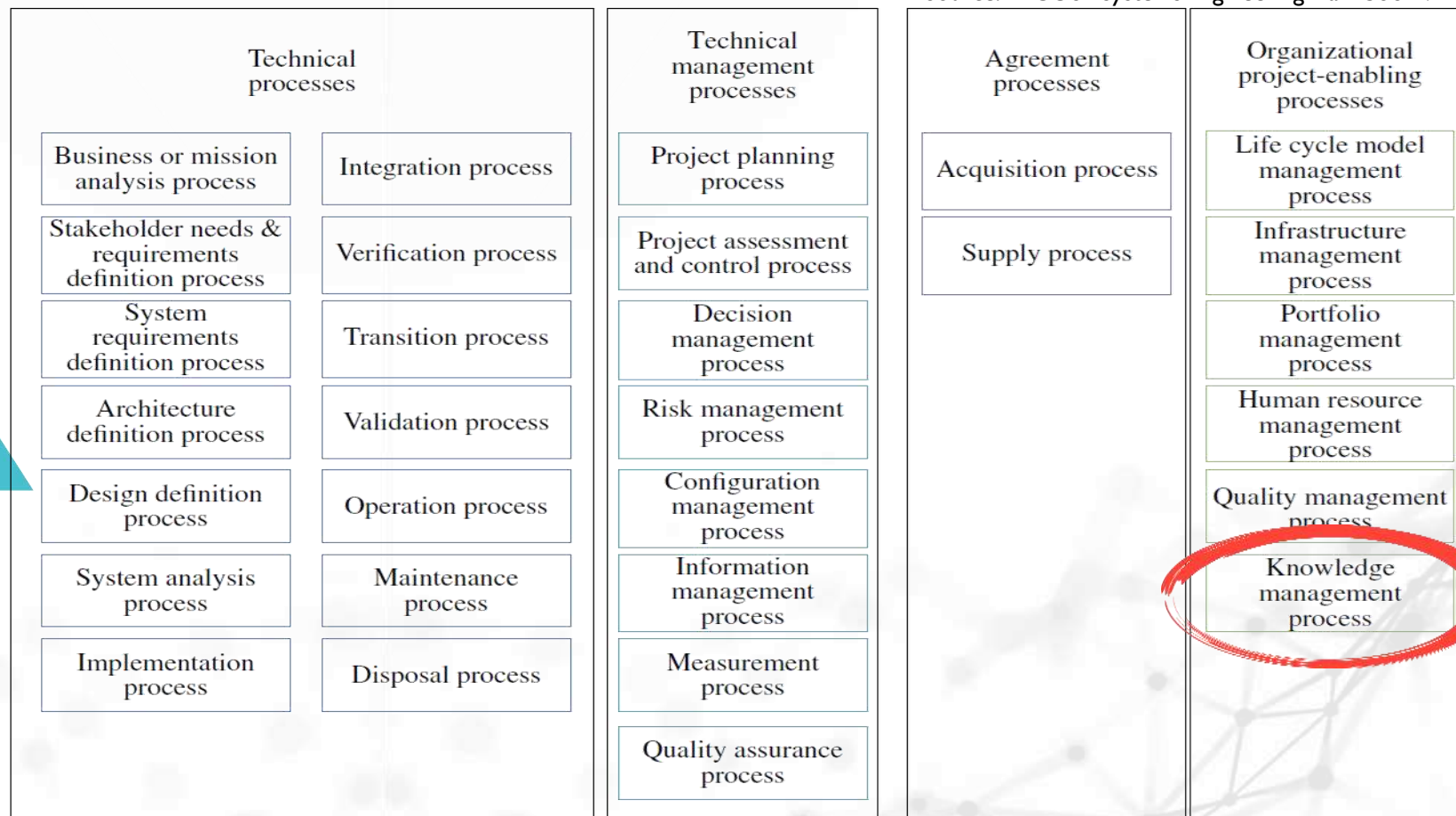
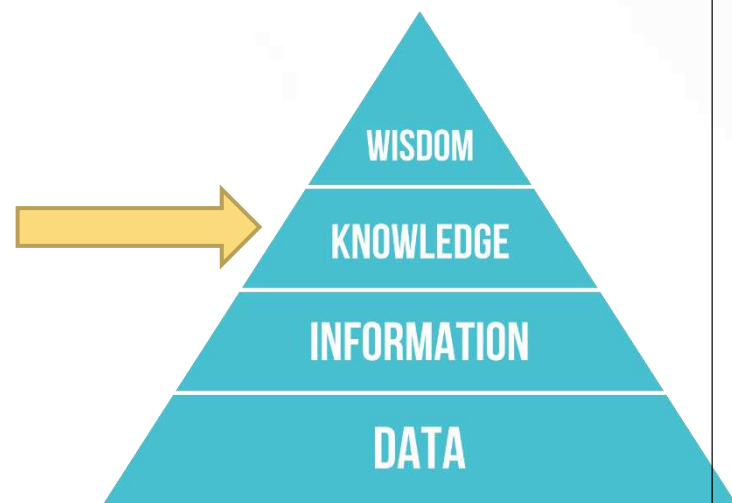
***“centralized repository of information about data such as meaning, relationships to other data, origin, usage, and format” (IBM Dictionary of Computing, 1993)***

***“Agreed-upon set of standards and guidelines to enforce the use of common vocabulary and concepts, thus ensuring the consistency of Needs and Requirements across the project team”***

- **Consistent** wording (pre-established by the subject matter experts)
- **Extended** coverage of the INCOSE GtWR set of rules (various rules require a dictionary to be assessed).
- **Standardized** way of drafting requirements : better traceability (either manual or based on NLP), reusability and avoided redundance (duplicated or contradictory requirements).

## Why do we need a Project Data Dictionary?

### ➤ Data -> Knowledge



# Why do we need a Project Data Dictionary?



WHO



who.int

OMS



➤ Let's imagine the ambiguity that might be introduced while dealing with **Complex Systems!!**

## Example #2: Applying Project Data Dictionaries

	APPLICABILITY	SCOPE (Requires Project Data Dictionary?)
Rule 03 <i>Subject Verb</i>	<b>CNCR</b>	<b>X</b>
Rule 04 <i>Use Defined Terms</i>	<b>CNCR</b>	<b>X</b>
Rule 13 <i>Correct Spelling</i>	<b>CNCR</b>	<b>X</b>
Rule 37 <i>Define Acronym</i>	<b>CNCR</b>	<b>X</b>

➤ **Example:** “While in Combat Mode, The **TWa** shall Receive Attacks”

- Rule 03: Invalid subject (not known as a system, entity, stakeholder, function, activity, etc.)
- Rule 04: Undefined term (not defined in the glossary)
- Rule 13: Detection as misspelled word
- Rule 37: Undefined acronym

## Example #2: Applying Project Data Dictionaries

Editing 169 - SES ENGINEERING Studio

File Tools View Log

Authoring without patterns

< No pattern group >

No selected pattern group implies no writing assistance

Font Calibri Font Size 12

While in Combat Mode, The **TWA** shall Receive Attacks.

Metric: Uniformity of Language R37 / TRC-M580: Avoid the use of unknown acronyms  
N/A

Correctness metrics summary:

**Low Quality 0.71**

Metric	Value
Accuracy R03 / TRC-M050: Determine if the subject is a recognized Agent term	0
Accuracy R04 / TRC-M225: Avoid Unclassified Terms	1
Uniformity of Language R37 / TRC-M580: Avoid the use of unknown acronyms	1

[Edit manual assessment](#)

Save and close Cancel

## Example #2: Applying Project Data Dictionaries

The screenshot displays the SES ENGINEERING Studio interface. The main window is titled "Editing 169 - SES ENGINEERING Studio" and shows a requirement text: "When invited to enter user credentials, the user shall be notified by a large screen (above 30") connected to the management system." The interface includes a menu bar (File, Tools, View, Log) and a toolbar with various editing tools. A dropdown menu shows "< No pattern group >". A red message states "No selected pattern group implies no writing assistance".

On the right, a "Correctness metrics summary" panel is visible, showing a "High Quality" status with a score of "0.00". The panel contains a table with the following structure:

Metric	Value

Below the table, the text "Checking with rules adapted to need statements" is displayed in green. At the bottom of the panel, there is a link "Edit manual assessment" and a "Ready" status. The bottom of the main window has "Save and close" and "Cancel" buttons.

# Example #2: Applying Project Data Dictionaries

Editing 169 - SES ENGINEERING Studio

File Tools View Log

Authoring without patterns:

< No pattern group >

No selected pattern group implies no writing

Font Calibri Font Size 12

When invited to enter **user credentials**, the user shall be notified by a large screen (above 30") connected to the management system.

[SysR-154] The Temperature Warrior shall Configure the Round parameters. Loaded SysR



Term - Read Only Mode

Term configuration:

Identifier: 61,873 Name: User credentials

Belongs to Domain:  Ignore accents (diacritics) exception:  Keep the original format of the term:

Syntactic and semantic configuration:

Term tag: NOUN

Cluster(s): 0 cluster(s)

Relationship type:

Language: English (United Kingdom)

Gender: N/A Number: Invariant

Changes gender  Changes number

Synchronizes:  Flag 1:  Flag 2:  Flag 3:

Statistics:

TF:	0.000000	DF:	0.000000
TFxDF:	0.000000		

Synonyms: Documentation Translations

SCM Relationships

Documentation information:

Classification code:

Scope note: User credentials comprise the information required to verify the identity of a user attempting to access a network or computing resources.

History note:

Sources:

OK Cancel

# Example #2: Applying Project Data Dictionaries

Editing 169 - SES ENGINEERING Studio

File Tools View Log

Authoring without patterns

< No pattern group >

No selected pattern group implies no writing assistance

Font Calibri Font Size 12

When invited to enter user credentials, the user shall be notified by a large screen (above 30") connected to the **management system**.

[SysR-154] The Temperature Warrior shall Configure the Round parameters. Loaded SysR-153

[SysR-155] The Temperature Warrior shall manage the temperatures. Loaded SysR-154

Term - Read Only Mode

Term configuration:

Identifier: 61,558 Name: Management system

Belongs to Domain:  Ignore accents (diacritics) exception:  Keep the original format of the term:

Syntactic and semantic configuration:

Term tag: NOUN

Cluster(s): «SYSTEM ELEMENT»

1 cluster(s)

Relationship type:

Language: English (United Kingdom)

Gender: N/A Number: Invariant

Changes gender  Changes number

Synchronizes:  Flag 1:  Flag 2:  Flag 3:

Statistics:

TF: 0.000000 DF: 0.000000

TFxDF: 0.000000

Synonyms

SCM Relationships

Documentation

Translations

Documentation information:

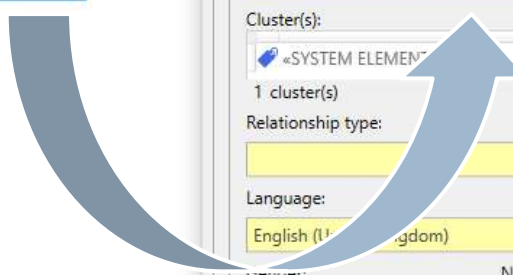
Classification code:

Scope note:  
System entity responsible for processing, storing and communicating the information gathered throughout the operation of the system.

History note:

Sources:

OK Cancel





**6.**

**Demo  
Rule Applicability  
Matrix**

## Use-cases

- Use-case #1 : Quality assessment of stakeholder needs
- Use-case #2 : Quality assessment using requirements quality rules + editing
- Use-case #3 : Live quality check + pattern-based writing assistance + data dictionary

SES ENGINEERING Studio

SES Connections Change Management Quality V&V Traceability Interoperability Reports DMS KM

Quality Assurance - Metrics set templates

TW - Stakeholder Needs

Views QUALITY Shared

Quality Assurance Project Configuration

Worksheet Selector Current State Snapshot Evolution Scoreboard Requirements Quality view Users Correctness Consistency Completeness Suggestions

StRS Quality Scoreboard Requirements Metrics Repository

Drag a column header here to group by that column

	C.		Project	Worksheet	ID	Workproduct	Correctness
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-07	The simple-form temperature ranges shall involve only one time interval.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-08	The complex-form temperature ranges shall involve more than one time interval.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-09	The maximum temperature allowed for the definition of the temperature ranges shall be 30 °C.	★★★☆☆
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-10	The minimum temperature allowed for the definition of the temperature ranges shall be 12 °C.	★★★☆☆
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-11	During the configuration state, the Temperature Warrior shall allow the input of temperature ranges as configuration param...	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-12	During the configuration state, the Temperature Warrior shall allow the input of the refresh time as configuration parameter.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-13	During the configuration state, the Temperature Warrior shall allow the input of the combat times as parameters.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-14	The configuration connection with the Temperature Warrior shall be remote.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-15	The administrator shall configure the Temperature Warrior prior to each execution.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-16	The Temperature Warrior shall receive the total combat time as a configuration parameter.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-17	The administrator shall configure the Temperature Warrior using a laptop remotely connected to a router.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-18	The Temperature Warrior shall have a Configuration state.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-19	The Temperature Warrior shall have a Ready state.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-20	The Temperature Warrior shall have a Combat state.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-21	When the input parameters are confirmed to be valid, the Temperature Warrior shall enter the Ready state.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-22	When the combat initialization is confirmed during the Ready Mode, the Temperature Warrior shall enter the Combat state.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-23	The Temperature Warrior shall refrain from involving security risks to the administrator.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-24	The support base of the Temperature Warrior shall contain electrical protection equipment.	★★★☆☆
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-25	The operators of the Temperature Warrior shall utilize insulating footwear with plastic materials.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-26	The operation of the Temperature Warrior shall refrain from using fire.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-27	The operation of the Temperature Warrior shall refrain from using water.	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-28	The temperature registered shall be inferior to 40 °C.	★★★☆☆
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-29	The temperature registered shall be superior to 12 °C.	★★★☆☆
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-30	The physical architectonic design shall fulfil the regulation specified within the document "Normas Básicas NETDUINO".	★★★★
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-31	The height of the Temperature Warrior shall be inferior to 50 cm.	★★★☆☆
	<input type="checkbox"/>	<input type="checkbox"/>	TW - Stakeholder Requirem...	StRS	SH-32	The width of the Temperature Warrior shall be inferior to 50 cm.	★★★☆☆



## Contact information



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