WEBINAR RULES

- You'll be **muted** all along the Webinar
- There's a '***Question'* section** to ask your questions whenever you want, you don't need to wait until the end. All questions will be addressed at the **end of the webinar**.
- If you have any **technical issues** please use this chatting box, or mail us at: support@reusecompany.com
- You will receive a survey either after the webinar or by mail. Your **opinion** is **EXTREMELY VALUABLE**!
- The Webinar **will be recorded**. A link to the recording will be **sent to you** in few days.

STARTING SOON

17:00

CEST

NASA VS INCOSE

DO NASA SPECIFICATIONS FOLLOW THE INCOSE GTWR RULES?

OUR JOURNEY

01 OBJECTIVE & STEPS

02 EXPERT OR MACHINE?

03 INTRODUCTION TO INCOSE GtWR

04 POTENTIAL IMPROVEMENTS DETECTED

05 NASA STRENGTHS!

06 KEY EXAMPLE

WHY?

CORE OBJECTIVE of this session will be:

1. Check the coverage of the **INCOSE GtWR rules** for a **PUBLISHED NASA document**.
2. Revise the main potential **IMPROVEMENTS** detected.
3. Showcase the result of **EXPERT & MACHINE** collaboration.
4. Discuss the **results**!

HOW TO GET THERE?

The following **STEPS** have been taken:

1. Take the **NASA PUBLIC Gateway System Requirements** document: https://ntrs.nasa.gov/citations/20190029153
2. Connect it to **SES ENGINEERING Studio**.
3. Assess the requirements quality using the **RQA according** to the **INCOSE GtWR rules**.
4. Discuss the **results**!

EXPERT OR MACHINE

...are **AWARE** of the real world...

...know the actual **USAGE** of each requirement...

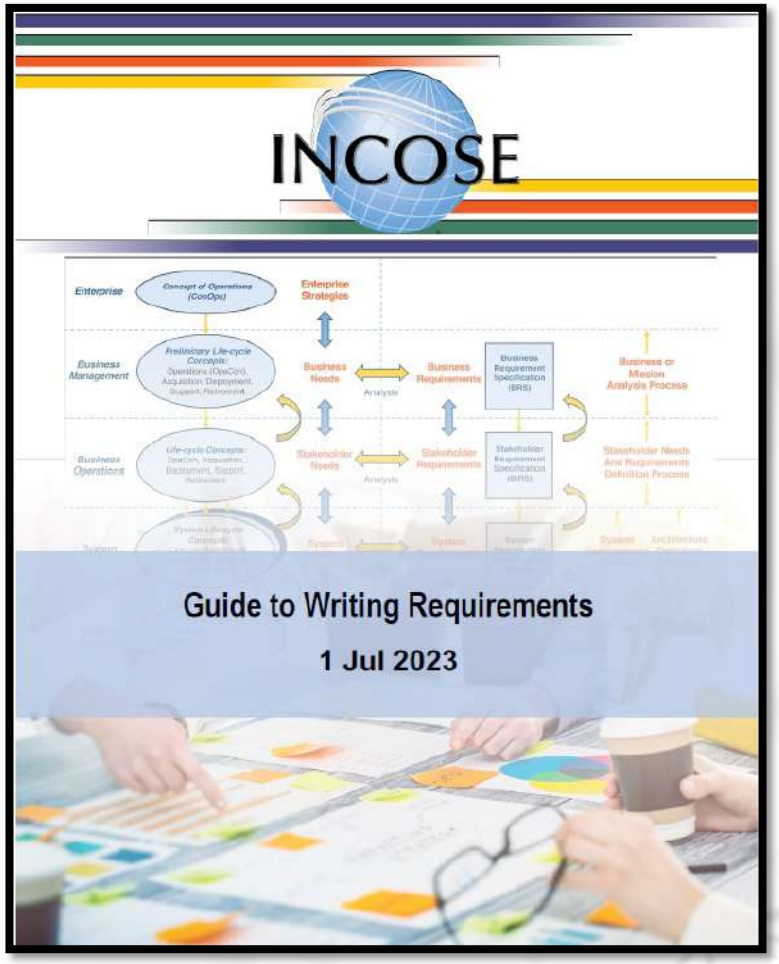
...are **OBJECTIVE** during the assessment...

...are **FAST** to evaluate huge amounts of information...

With the experts' **domain knowledge** applied to the **configuration** of advanced tools...

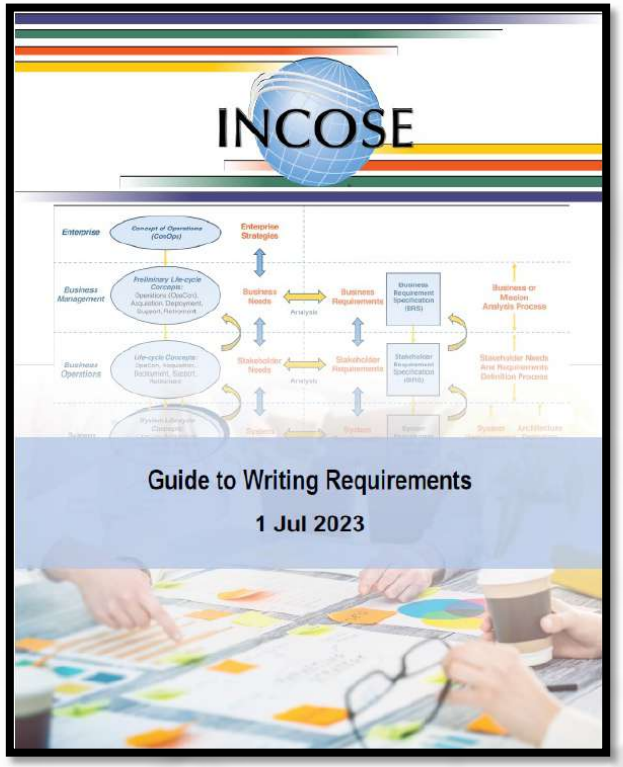
Machines become what they are intended to, tools for the knowlegeable human individual to exponentially improve **PRODUCTIVITY** and **EFFICIENCY**.

INCOSE GtWR

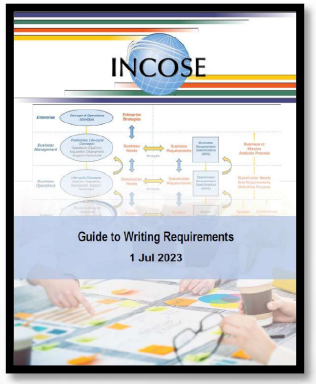


INCOSE GtWR

...describes **HOW** to **EXPRESS** needs (...) and requirements **CLEARLY** and **PRECISELY**...



REQUIREMENTS QUALITY RULES I



Accuracy

R1 - Structured Statements: Need and requirement statements must conform to one of the agreed patterns, thus resulting in a well-structured complete statement.

R2 - Active Voice: Use the active voice in the need or requirement statement with the responsible entity clearly identified as the subject of the sentence.

R3 - Appropriate Subject-Verb: Ensure the subject and verb of the need or requirement statement are appropriate to the entity to which the statement refers.

R4 - Defined Terms: Define all terms used within the need statement and requirement statement within an associated glossary and/or data dictionary.

R5 - Definite Articles: Use the definite article "the" rather than the indefinite article "a".

R6 - Common Units of Measure: 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.

R7 - Vague Terms: Avoid the use of vague terms that provide vague quantification, such as "some", "any", "allowable", "several", "many", "a lot of", "a few", "almost always", "very nearly", "nearly", "about", "close to", "almost", and "approximate". Avoid vague adjectives such as "ancillary", "relevant", "routine", "common", "generic", "significant", "flexible", "expandable", "typical", "sufficient", "adequate", "appropriate", "efficient", "effective", "proficient", "reasonable" and "customary."

R8 - Escape Clauses: Avoid the inclusion of escape clauses that state vague conditions or possibilities, such as "so far as is possible", "as little as possible", "where possible", "as much as possible", "if it should prove necessary", "if necessary", "to the extent necessary", "as appropriate", "as required", "to the extent practical", and "if practicable".

R9- Open-Ended Clauses: Avoid open-ended, non-specific clauses such as "including but not limited to", "etc." and "and so on".

Concision

R10 - Superfluous Infinitives: Avoid the use of superfluous infinitives such as "to be designed to", "to be able to", "to be capable of", "to enable", "to allow".

R11 - Separate Clauses: Use a separate clause for each condition or qualification.

Non-ambiguity

R12 - Correct Grammar, 13 - Correct Spelling, 14 - Correct Punctuation - Use correct grammar, spelling, punctuation.

R15 - Logical Expressions: Use a defined convention to express logical expressions such as "[X AND Y]", "[X OR Y]", [X XOR Y]", "NOT [X OR Y]".

R16 - Use of "Not": Avoid the use of "not."

R17 - Use of Oblique Symbol: Avoid the use of the oblique ("/") symbol except in units, i.e., Km/hr, or fractions.

Singularity

R18 - Single Thought Sentence: Write a single sentence that contains a single thought conditioned and qualified by relevant sub-clauses.

R19 – Combinators: Avoid words that join or combine clauses, such as "and", "or", "then", "unless", "but", "as well as" "but also", "however", "whether", "meanwhile", "whereas", "on the other hand", or "otherwise".

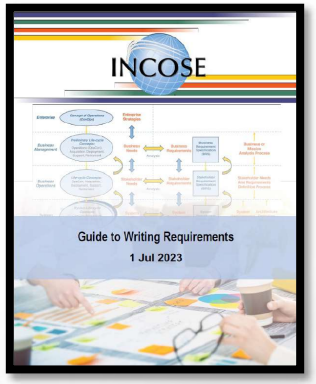
R20 - Purpose Phrases: Avoid phrases that indicate the "purpose of ", "intent of", or "reason for" the need statement or requirement statement.

R21 – Parentheses: Avoid parentheses and brackets containing subordinate text.

R22 – Enumeration: Enumerate sets explicitly instead of using a group noun to name the set.

R23 - Supporting Diagram, Model, or ICD: When a need or requirement is related to complex behavior, refer to a supporting diagram, model, or ICD.

REQUIREMENTS QUALITY RULES II



Completeness

R24 – Pronouns: Avoid the use of personal and indefinite pronouns.

R25 – Headings: Avoid relying on headings to support explanation or understanding of the need or requirement.

Realism

R26 – Absolutes: Avoid using unachievable absolutes such as 100% reliability, 100% availability, all, every, always, never, etc.

Conditions

R27 - Explicit Conditions: State conditions' applicability explicitly instead of leaving applicability to be inferred from the context.

R28 - Multiple Conditions: Express the propositional nature of a condition explicitly for a single action instead of giving lists of actions for a specific condition.

Uniqueness

R29 – Classification: Classify needs and requirements according to the aspects of the problem or system it addresses.

R30 - Unique Expression: Express each need and requirement once and only once.

Abstraction

R31 – Solution Free: Avoid stating implementation in a need statement or requirement statement unless there is rationale for constraining the design.

Quantifiers

R32 - Universal Qualification: Use "each" instead of "all", "any", or "both" when universal quantification is intended.

Tolerance

R33 - Range of Values: 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.

Quantification

R34 - Measurable Performance: Provide specific measurable performance targets appropriate to the entity to which the need or requirement is stated and against which the entity will be verified to meet.

R35 - Temporal Dependencies: Define temporal dependencies explicitly instead of using indefinite temporal keywords such as "eventually", "until", "before", "after", "as", "once", "earliest", "latest", "instantaneous", "simultaneous", and "at last".

Uniformity of Language

R36 - Consistent Terms and Units: Ensure each term and unit of measure used throughout need and requirement sets as well as associated models and other SE artefacts developed across the lifecycle are consistent with the project's defined ontology.

R37 – Acronyms: If acronyms are used, they must be consistent throughout need and requirement sets as well as associated models and other SE artefacts developed across the lifecycle.

R38 – Abbreviations: Avoid the use of abbreviations in needs and requirement statements as well as associated models and other SE lifecycle artefacts.

R39 - Style Guide: Use a project-wide style guide for individual need statements and requirement statements.

R40 - Decimal Format: Use a consistent format and number of signification digits for the specification of decimal numbers.

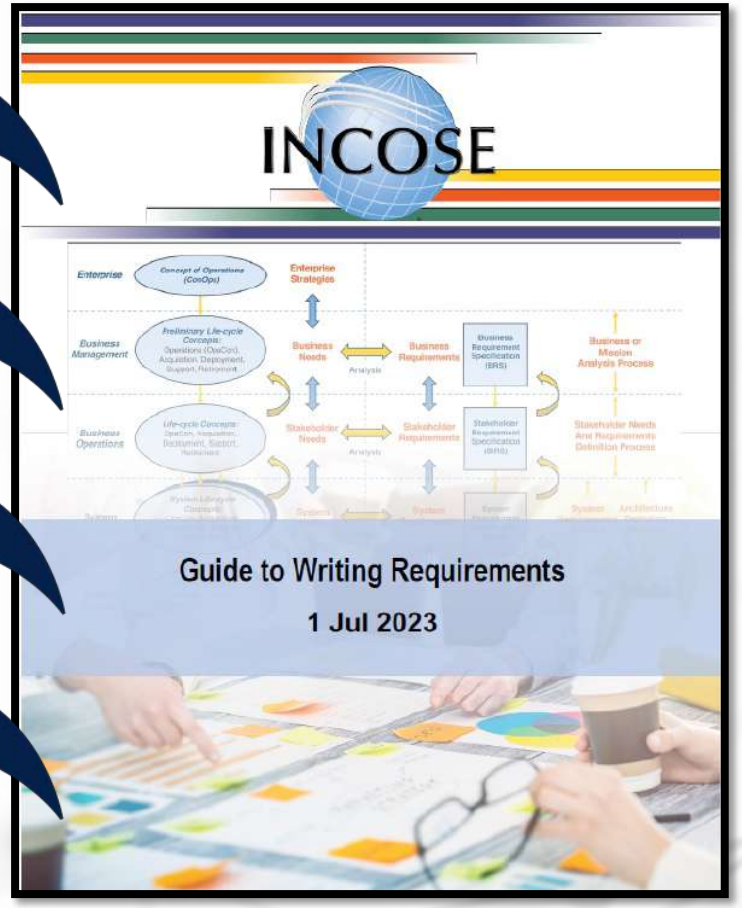
Modularity

R41 - Related Needs and Requirements: Group related needs and requirements together.

R42 – Structured Sets: Conform to a defined structure or template for organizing sets of needs and requirements.

HOW DO WE APPLY THOSE RULES?

Tid	Type	INCOSE Rule	Rule short name	Metric Number	Metric Name	Metric Type
T01	Accuracy	R01	Sentence Structure	TRC-M010	Enforce the use of a complete sentence structure	Non-parameterized
				TRC-M385	Avoid the use of Banned Modal Verbs	Parameterized - Cluster
		R02	Use Active Voice	TRC-M050	Avoid the use of Passive Voice	Parameterized - Pattern matching
				TRC-M085	Avoid the use of Passive Voice after the modal verb	Parameterized - Pattern matching
				TRC-M040	Avoid the use of Passive Voice out of the condition block	Parameterized - Cluster
		R03	Subject Verb	TRC-M050	Determine if the subject is a recognized Agent term	Parameterized - Cluster
				TRC-M055	Detect inappropriate subject at the document level	Parameterized - Sub terms
				TRC-M065	Avoid the use of Vague Verbs after Modal Verbs	Parameterized - Pattern matching
				TRC-M120	Determine if the main verb is a Controlled Action Verb	Parameterized - Pattern matching
		R04	Use Defined Terms	TRC-M225	Avoid Unclassified Terms	Parameterized - Term tag
				TRC-M030	Enforce the use of Define Terms by avoiding Synonyms	Non-parameterized
		R05	Use Definite Articles	TRC-M020	Avoid the use of Indefinite Articles	Parameterized - Term tag
				TRC-M180	Avoid the use of Indefinite Articles in front of an Agent	Parameterized - Pattern matching
		R06	Units	TRC-M140	Ensure Numbers are followed by Units or noun qualifications	Parameterized - Term tag
				TRC-M150	Detect Inadequate Unit for a Characteristic	Parameterized - Relationships
				TRC-M160	Avoid mixing up different measurement systems	SCM-compliant Measurement units consistency metric
		R07	Avoid Vague Terms	TRC-M060	Avoid the use of Vague Verbs	Parameterized
				TRC-M170	Avoid the use of Vague Adjectives	Parameterized - Cluster
				TRC-M180	Avoid the use of Vague Adverbs	Parameterized - Cluster
				TRC-M250	Avoid the use of Vague Terms	Parameterized - Cluster
		R08	No Escape Clauses	TRC-M190	Avoid the use of Escape clauses	Parameterized - Special Sentences
		R09	No Open Ended	TRC-M200	Avoid the use of Open-Ended clauses	Parameterized - Special Sentences
T02	Concision	R10	Superfluous Infinitives	TRC-M210	Avoid the use of Superfluous infinitives	Parameterized - Pattern group matching
		R11	Seperate Clauses	TRC-M010	Enforce the use of a complete sentence structure	Non-parameterized
				TRC-M215	Check the number of condition clauses	Parameterized - Cluster
T03	Non-ambiguity	R12	Correct Grammar	TRC-M230	Avoid inadequate grammar structures	Parameterized - Pattern group matching
		R13	Correct Spelling	TRC-M240	Avoid incorrect spelling	Non-parameterized
		R14	Correct Punctuation	TRC-M260	Facilitate readability	Non-parameterized
				TRC-M260	Review incorrect punctuation	Non-parameterized
		R15	Logical Conditions	TRC-M270	Set a convention for logical expression forms	Parameterized - Cluster
				TRC-M350	Avoid the use of Combinators out of the condition block	Parameterized - Cluster
		R16	Avoid Not	TRC-M280	Avoid the use of Not and other negative expressions	Parameterized - Cluster
				TRC-M285	Avoid the use of Negative Expressions out of the condition block	Parameterized - Cluster
		R17	Oblique	TRC-M290	Avoid the use of oblique Symbol "/"	Parameterized - Term tag
T04	Singularity	R18	Single Sentence	TRC-M320	Check the text length by counting paragraphs	Non-parameterized
				TRC-M330	Check the text length by counting words	Non-parameterized
				TRC-M340	Control the number of Action Verbs out of the condition block	Parameterized - Pattern matching
				TRC-M360	Check the number of Modal Verbs	Parameterized - Term tag
		R19	Avoid Combinators	TRC-M350	Avoid the use of Combinators out of the condition block	Parameterized - Cluster
				TRC-M370	Multiple subject detection	Parameterized - Pattern matching
				TRC-M375	Multiple verbs detection	Parameterized - Pattern matching
		R20	Avoid Purpose	TRC-M380	Avoid phrases that indicate the purpose	Parameterized - Special Sentences
		R21	Avoid Parentheses	TRC-M350	Avoid the use of Parentheses out of the condition block	Parameterized - Cluster
T05	Completeness	R24	Avoid Pronouns	TRC-M070	Avoid the use of Pronouns to refer to nouns	Parameterized - Term tag
		R25	Use Of Headings	TRC-M010	Enforce the use of a complete sentence structure	Non-parameterized
				TRC-M070	Avoid the use of Pronouns to refer to nouns	Parameterized - Type
T06	Realism	R26	Avoid Absolutes	TRC-M430	Avoid unachievable Absolutes expions impossible to verify	Parameterized - Cluster
				TRC-M535	Ensure tolerance value are within an adequate value range	Parameterized - Custom-code
T07	Conditions	R27	Explicit	TRC-M360	Check the number of Modal Verbs	Parameterized - Term tag
				TRC-M450	Avoid lists of actions after a condition activation	Parameterized - Pattern matching
		R28	Explicit Lists	TRC-M455	Avoid lists of conditions after an action	Parameterized - Pattern matching
T08	Uniqueness	R29	Classify	TRC-M460	Enforce an attribute type is not empty	Parameterized - Attribute
		R30	Express Once	TRC-M480	Avoid overlapping among the requirements	Overlapping consistency metric
T09	Abstraction	R31	Solutionfree	TRC-M490	Avoid stating a solution	Parameterized - Cluster
				TRC-M500	Avoid the use of Firm sentences	Parameterized - Cluster
T10	Quantifiers	R32	Universal	TRC-M510	Avoid the use of Ambiguous Universal Keywords	Parameterized - Cluster
T11	Tolerance	R33	Value Range	TRC-M520	Force to include tolerance value for the units that required tolerance	Parameterized - Pattern group and pattern matching
				TRC-M535	Ensure tolerance value are within an adequate value range	Parameterized - Custom-code
				TRC-M530	Confirms the value for a property is within a controlled range	Properties consistency metric
T12	Quantification	R34	Measurable	TRC-M540	Avoid the use of Imprecise Quantifiers	Parameterized - Cluster
				TRC-M545	Avoid the usage of Imprecise Quantifiers applied to a property	Parameterized - Pattern matching
		R35	Temporal Indefinite	TRC-M560	Avoid the use of Temporal Indefinite keywords out of the condition block	Parameterized - Cluster
T13	Uniformity of Language	R36	Use Consistent Terms	TRC-M030	Enforce the use of Define Terms by avoiding Synonyms	Non-parameterized
		R37	Define Acronyms	TRC-M580	Avoid the use of unknown acronyms	Non-parameterized
		R38	Avoid Abbreviations	TRC-M590	Avoid the use of unknown abbreviations	Non-parameterized
		R39	Style Guide	TRC-M010	Enforce the use of a complete sentence structure	Non-parameterized



APPLICABILITY MATRIX

NEEDS

Quality Assurance - Metrics set templates

Metrics set templates:

Search...

Identifier	Name
187	1A - INCOSE GtWR v4.0 CROSS-DOMAIN METRICS x NEED Statements
188	1B - INCOSE GtWR v4.0 CROSS-DOMAIN METRICS x REQUIREMENT Statements
189	2A - INCOSE GtWR v4.0 CROSS-DOMAIN & DOMAIN-SPECIFIC METRICS x NEED Statements
190	2B - INCOSE GtWR v4.0 CROSS-DOMAIN & DOMAIN-SPECIFIC METRICS x REQUIREMENT Statements

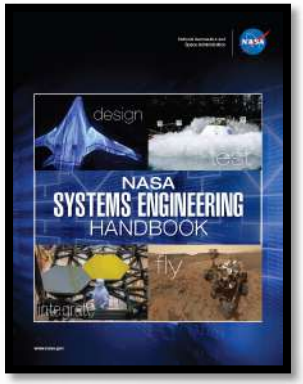
Reqs verification

YELLOW Belt Metrics

BLACK Belt Metrics

REQUIREMENTS

NASA RULES



C.1 Use of Correct Terms

- ☐ Shall = requirement
- ☐ Will = facts or declaration of purpose
- ☐ Should = goal

C.2 Editorial Checklist

Personnel Requirement

- ☐ The requirement is in the form "responsible party shall perform such and such." In other words, use the active, rather than the passive voice. A requirement should state who shall (do, perform, provide, weigh, or other verb) followed by a description of what should be performed.

Product Requirement

- ☐ The requirement is in the form "product ABC shall XYZ." A requirement should state "The product shall" (do, perform, provide, weigh, or other verb) followed by a description of what should be done.
- ☐ The requirement uses consistent terminology to refer to the product and its lower-level entities.
- ☐ Complete with tolerances for qualitative/performance values (e.g., less than, greater than or equal to, plus or minus, 3 sigma root sum squares).
- ☐ Is the requirement free of implementation? (Requirements should state WHAT is needed, NOT HOW to provide it; i.e., state the problem not the solution. Ask, "Why do you need the requirement?" The answer may point to the real requirement.)
- ☐ Free of descriptions of operations? (Is this a need the product should satisfy or an activity involving the product? Sentences like "The operator shall…" are almost always operational statements not requirements.)

Example Product Requirements

- ☐ The system shall operate at a power level of…
- ☐ The software shall acquire data from the…
- ☐ The structure shall withstand loads of…
- ☐ The hardware shall have a mass of…

C.3 General Goodness Checklist

- ☐ The requirement is grammatically correct.
- ☐ The requirement is free of typos, misspellings, and punctuation errors.
- ☐ The requirement complies with the project's template and style rules.
- ☐ The requirement is stated positively (as opposed to negatively, i.e., "shall not").
- ☐ The use of "To Be Determined" (TBD) values should be minimized. It is better to use a best estimate for a value and mark it "To Be Resolved" (TBR) with the rationale along with what should be done to eliminate the TBR, who is responsible for its elimination, and by when it should be eliminated.
- ☐ The requirement is accompanied by an intelligible rationale, including any assumptions. Can you validate (concur with) the assumptions? Assumptions should be confirmed before baselining.
- ☐ The requirement is located in the proper section of the document (e.g., not in an appendix).

C.4 Requirements Validation Checklist

Clarity

- ☐ Are the requirements clear and unambiguous? (Are all aspects of the requirement understandable and not subject to misinterpretation? Is the requirement free from indefinite pronouns (this, these) and ambiguous terms (e.g., "as appropriate," "etc.," "and/or," "but not limited to")?)
- ☐ Are the requirements concise and simple?
- ☐ Do the requirements express only one thought per requirement statement, a stand-alone statement as opposed to multiple requirements in a single statement, or a paragraph that contains both requirements and rationale?
- ☐ Does the requirement statement have one subject and one predicate?

Completeness

- ☐ Are requirements stated as completely as possible? Have all incomplete requirements been captured as TBDs or TBRs and a complete listing of them maintained with the requirements?
- ☐ Are any requirements missing? For example, have any of the following requirements areas been overlooked: functional, performance, interface, environment (development, manufacturing, test, transport, storage, and operations), facility (manufacturing, test, storage, and operations), transportation (among areas for manufacturing, assembling, delivery points, within storage facilities, loading), training, personnel, operability, safety, security, appearance and physical characteristics, and design.
- ☐ Have all assumptions been explicitly stated?

Compliance

- ☐ Are all requirements at the correct level (e.g., system, segment, element, subsystem)?
- ☐ Are requirements free of implementation specifics? (Requirements should state what is needed, not how to provide it.)
- ☐ Are requirements free of descriptions of operations? (Don't mix operation with requirements: update the ConOps instead.)
- ☐ Are requirements free of personnel or task assignments? (Don't mix personnel/task with product requirements: update the SOW or Task Order instead.)

Consistency

- ☐ Are the requirements stated consistently without contradicting themselves or the requirements of related systems?
- ☐ Is the terminology consistent with the user and sponsor's terminology? With the project glossary?

POTENTIAL IMPROVEMENTS DETECTED

IMPORTANT before we begin:

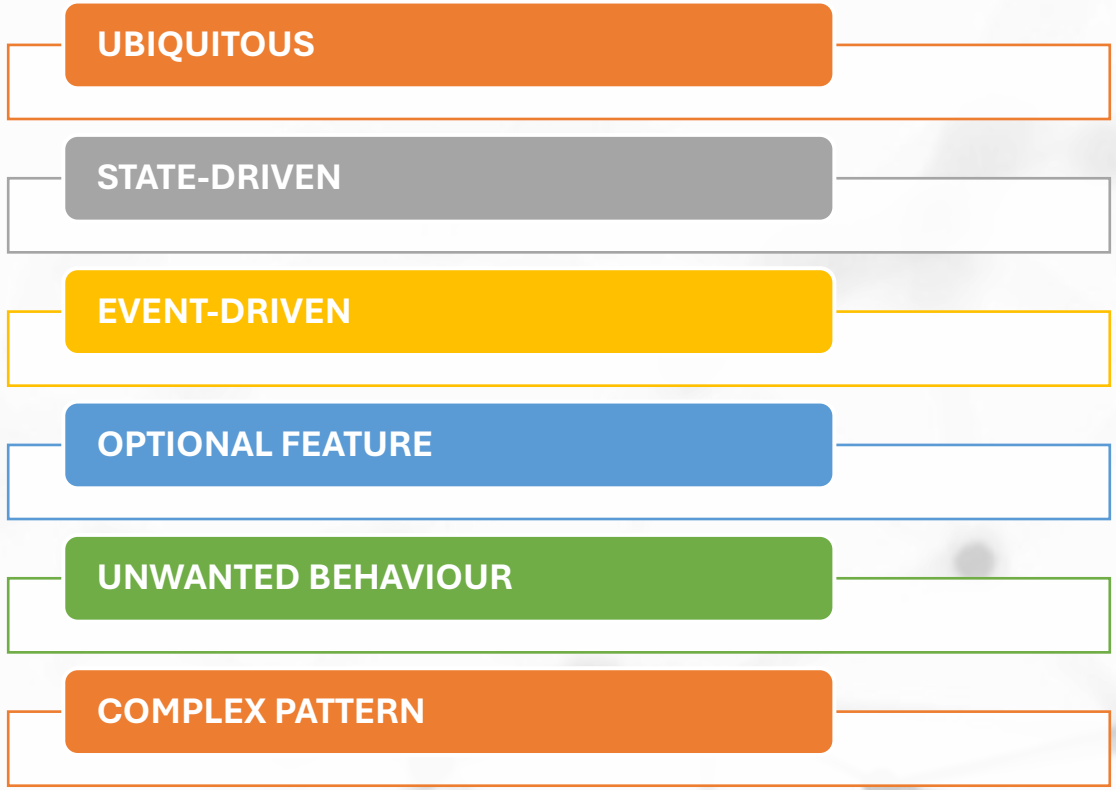
1. These **suggestions** were made by our **team** supported by the **RQA tool**.
2. These are improvements detected **according** to the **INCOSE GtWR**.
3. The vast majority of improvements are **MINOR ISSUES**.

UBIQUITOUS REQUIREMENTS

Pattern Coverage Metric: EARS (Open) – 01. Ubiquitous Requirement

UBIQUITOUS REQUIREMENTS

- Every requirement in the document is expressed as Ubiquitous Requirement.
- Which means, it's always "activated" (https://alistairmavin.com/ears/).
- Even if ubiquitous is a valid syntax for system requirements, there is no trace of other structures:



UBIQUITOUS REQUIREMENTS

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UBIQUITOUS

STATE-DRIVEN

WHILE the TW is in **attack mode**, the power system **shall show** the temperature of the battle sensor.

EVENT-DRIVEN

OPTIONAL FEATURE

UNWANTED BEHAVIOUR

COMPLEX PATTERN

UBIQUITOUS REQUIREMENTS

- Every requirement in the document is expressed as Ubiquitous Requirement.
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UBIQUITOUS

STATE-DRIVEN

EVENT-DRIVEN

WHEN the TW **receives an attack** from the enemy, the TW **shall enter** into defense mode.

OPTIONAL FEATURE

UNWANTED BEHAVIOUR

COMPLEX PATTERN

- Every requirement in the document is expressed as Ubiquitous Requirement.
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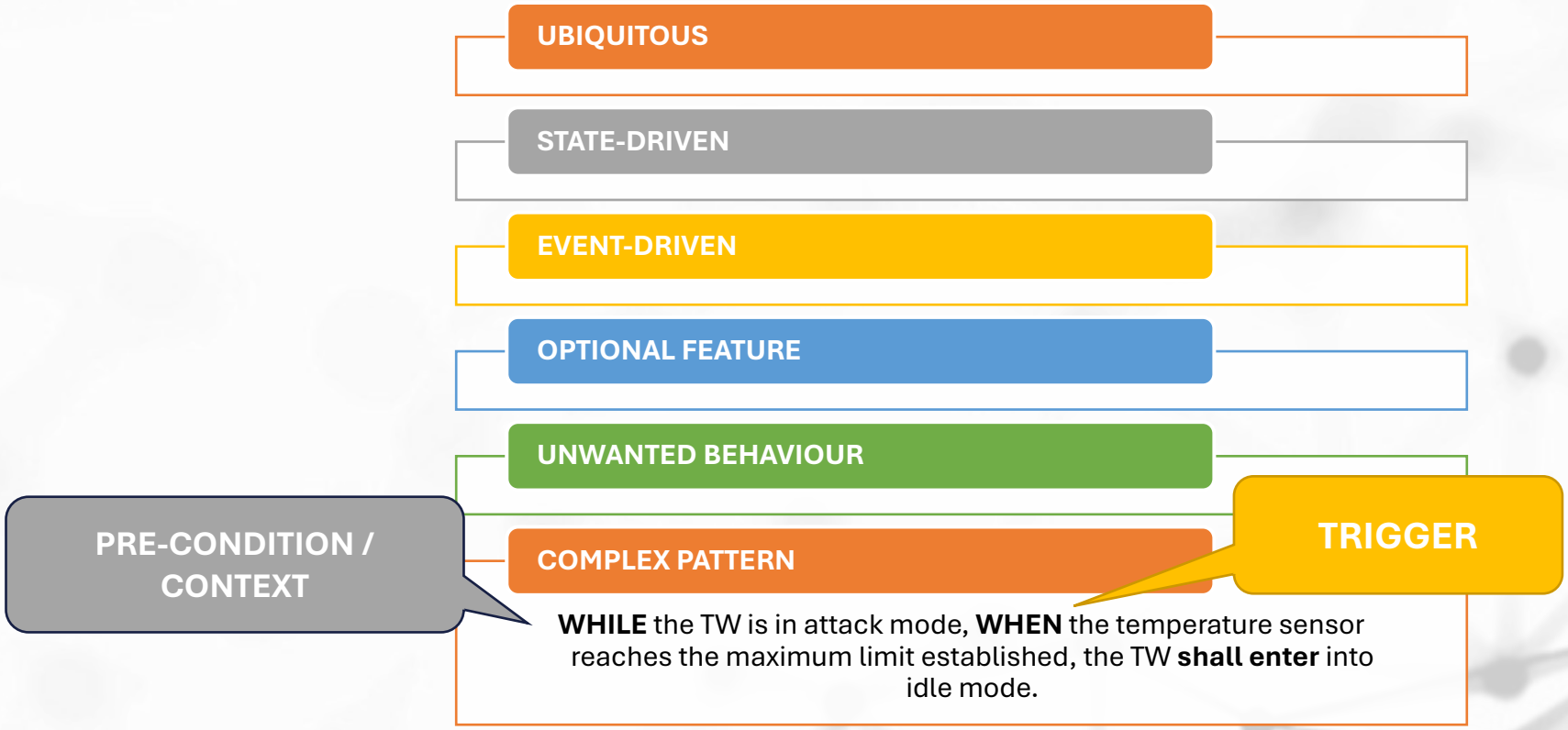


- Every requirement in the document is expressed as Ubiquitous Requirement.
- Which means, it's always "activated" (https://alistairmavin.com/ears/).
- Even if ubiquitous is a valid syntax for system requirements, there is no trace of other structures:

UBIQUITOUS	**L2-GW-0013** Gateway Transition to Crew-Ingress Configuration The Gateway shall remotely transition from an uncrewed state to accommodate a safe crew ingress.
EVENT-DRIVEN	**L2-GW-0013** Gateway Transition to Crew-Ingress Configuration When commanded by the Ground Station, the Gateway shall transition from an uncrewed state to accommodate a safe crew ingress.

- Every requirement in the document is expressed as Ubiquitous Requirement.
- Which means, it's always "activated" (https://alistairmavin.com/ears/).
- Even if ubiquitous is a valid syntax for system requirements, there is no trace of other structures:

L2-GW-0079 Gateway Nominal Power

The Gateway shall provide a minimum of 32kW for Gateway use when SEP is inactive.

- When vs While:
  - ✓ When for instant triggers (not this case).
  - ✓ While for states/models (context).

L2-GW-0079 Gateway Nominal Power

The Gateway shall provide a minimum of 32kW for Gateway use while SEP is inactive.

- Every requirement in the document is expressed as Ubiquitous Requirement.
- Which means, it's always "activated" (https://alistairmavin.com/ears/).
- Even if ubiquitous is a valid syntax for system requirements, there is no trace of other structures:

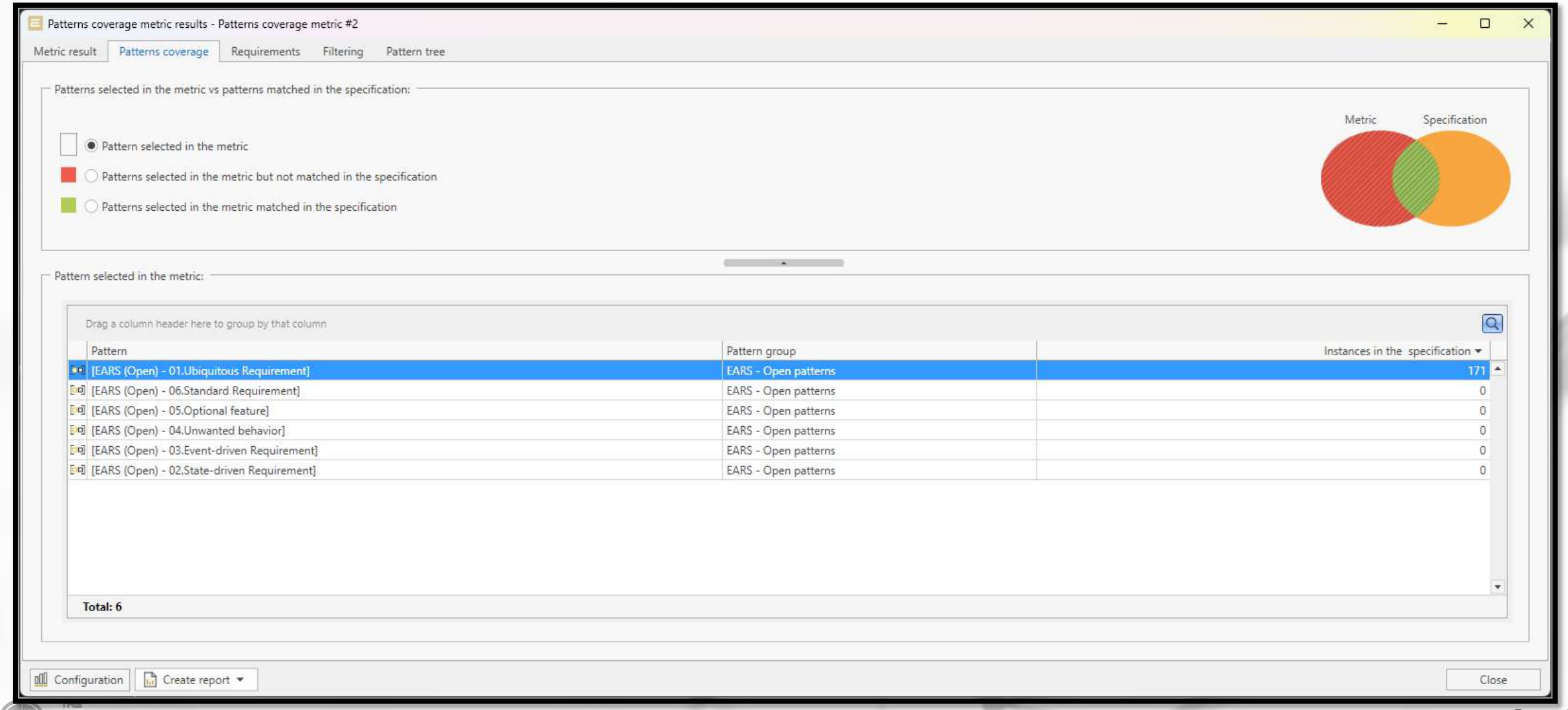
L2-GW-0079 Gateway Nominal Power

The Gateway shall provide a minimum of 32kW for Gateway use when SEP is inactive.

- When vs While:
  - ✓ In any case, the whole document shall be consistent with this.

L2-GW-0301 Workmanship-Exterior Cleanliness

The Gateway shall be designed so that exterior Gateway surfaces are cleaned before close-out, including areas that are inaccessible in the final assembly and that may act as contamination sources while on orbit.



MULTIPLE MODAL VERBS

Singularity R18 / Conditions R27 / TRC-M360: Check the number of Modal Verbs

PASSIVE VOICE

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

- Avoid using **2 MODAL VERBS** in the same requirement:

L2-GW-0026 Propulsion System Capability

The Gateway shall provide a fuel capacity that would support performing a minimum of two round-trip uncrewed low-energy cislunar orbit transfers between a near-rectilinear halo orbit (NRHO) and a distant retrograde orbit (DRO) and orbit maintenance for a period of 15 years between refueling **<TBR-HEOR-002>**.

L2-GW-0154 Stowage System

The Gateway shall provide a stowage system that can be monitored via the IMS.

L2-GW-0154-1 Stowage System

The Gateway shall provide a stowage system.

L2-GW-0154-2 Stowage System monitoring

The Gateway shall monitor the stowage system via the IMS.

MISSING MEASUREMENT UNITS

Accuracy R06 / TRC-M140: Ensure Numbers are followed by Units or noun qualifications

L2-GW-0002: Crew Size
"The Gateway shall support a crew of two, three, and four."

Contains no further information on **which measurement unit** is assigned to those n

We can assume it is refering to the crew **MEMBERS**, right?

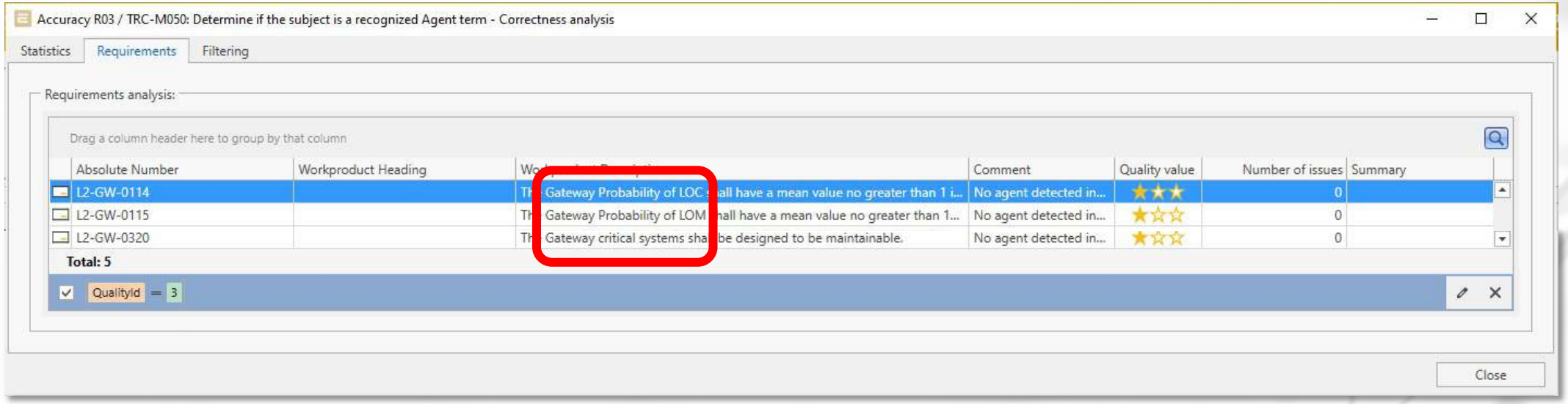
Well...

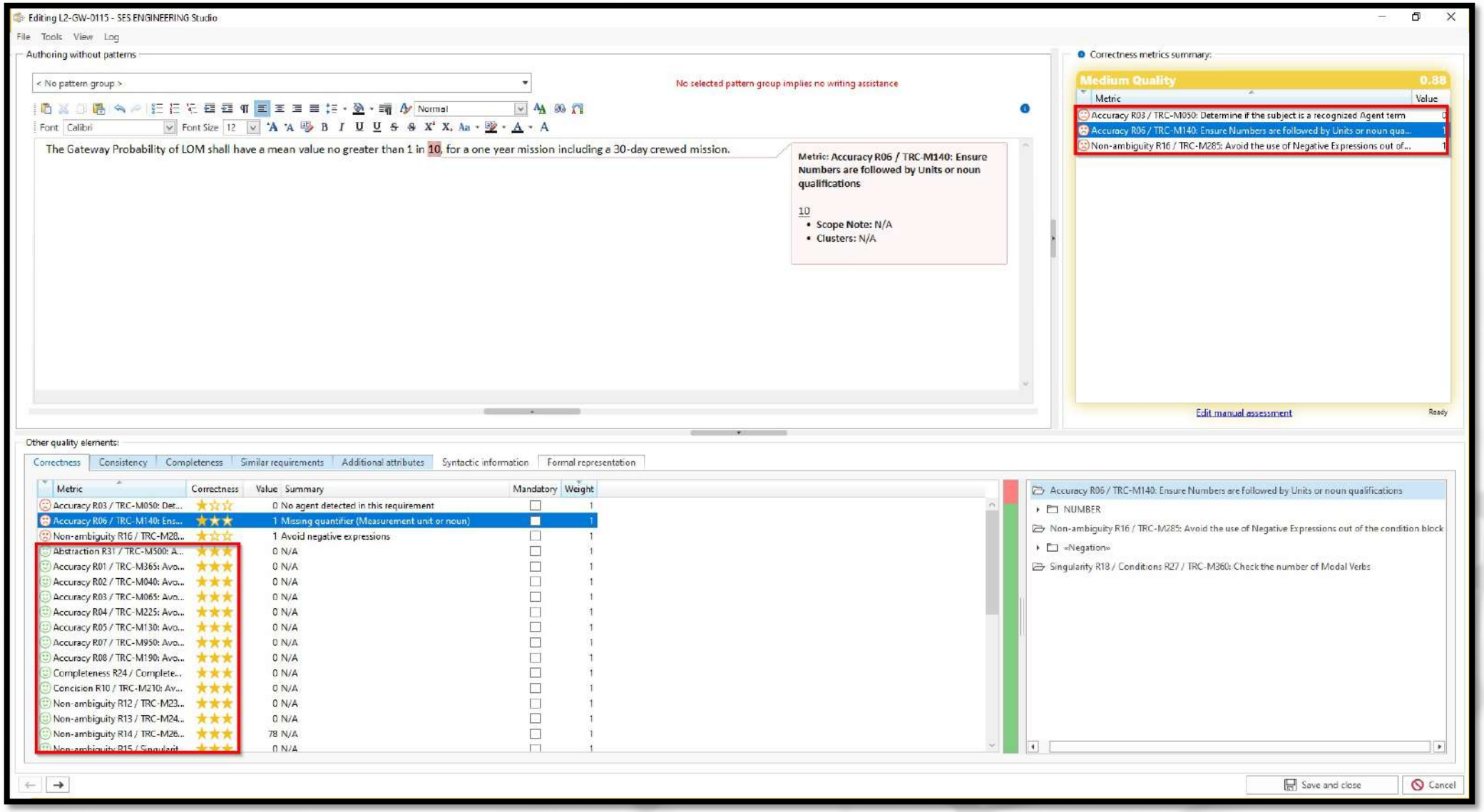
It could also mean **PERSON**...

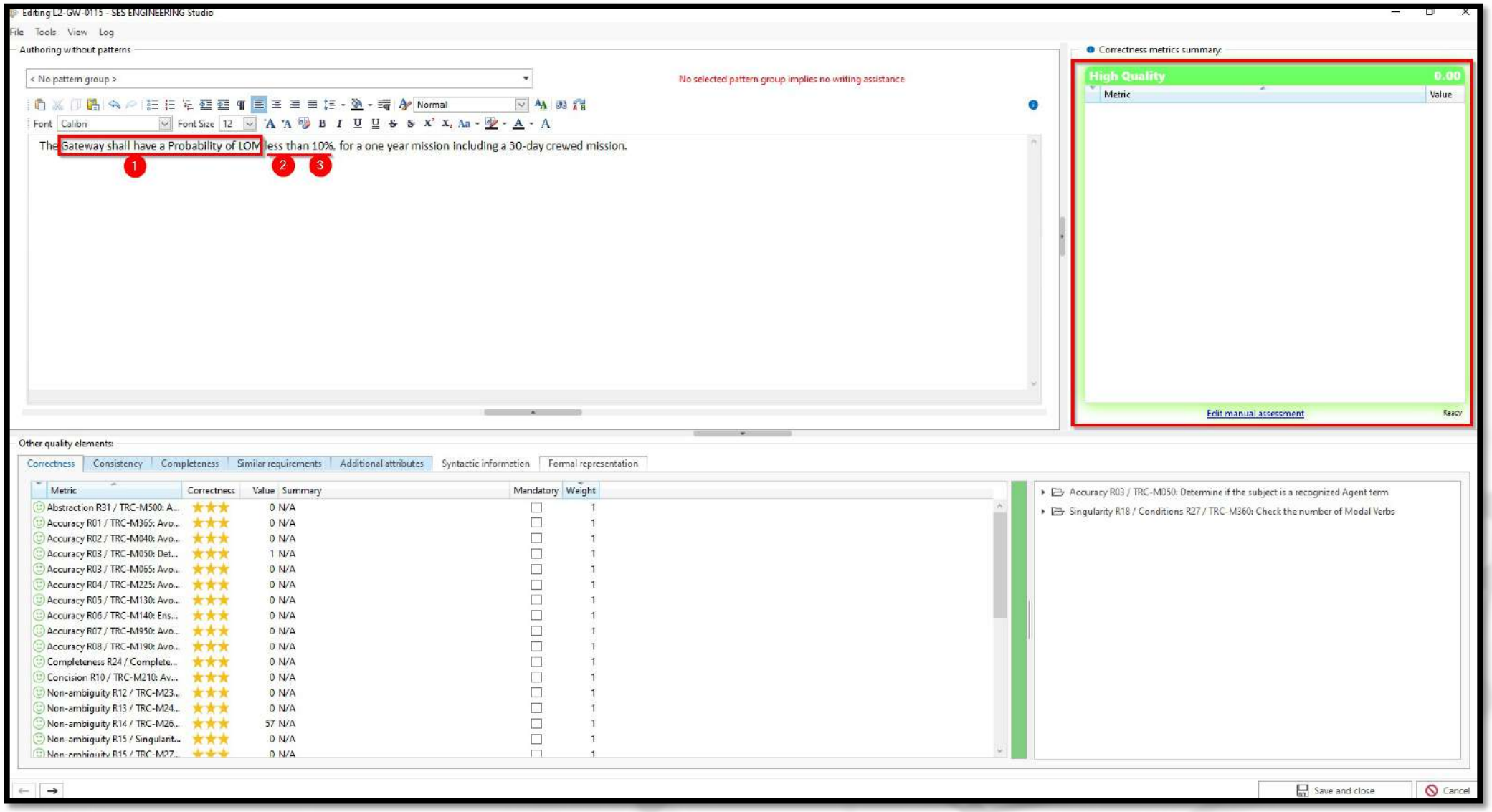
Are **ROBOTS** counted as part of the **CREW**?

RECOGNIZED SUBJECT

Accuracy R03 / TRC-M050: Determine if the subject is a recognized Agent term





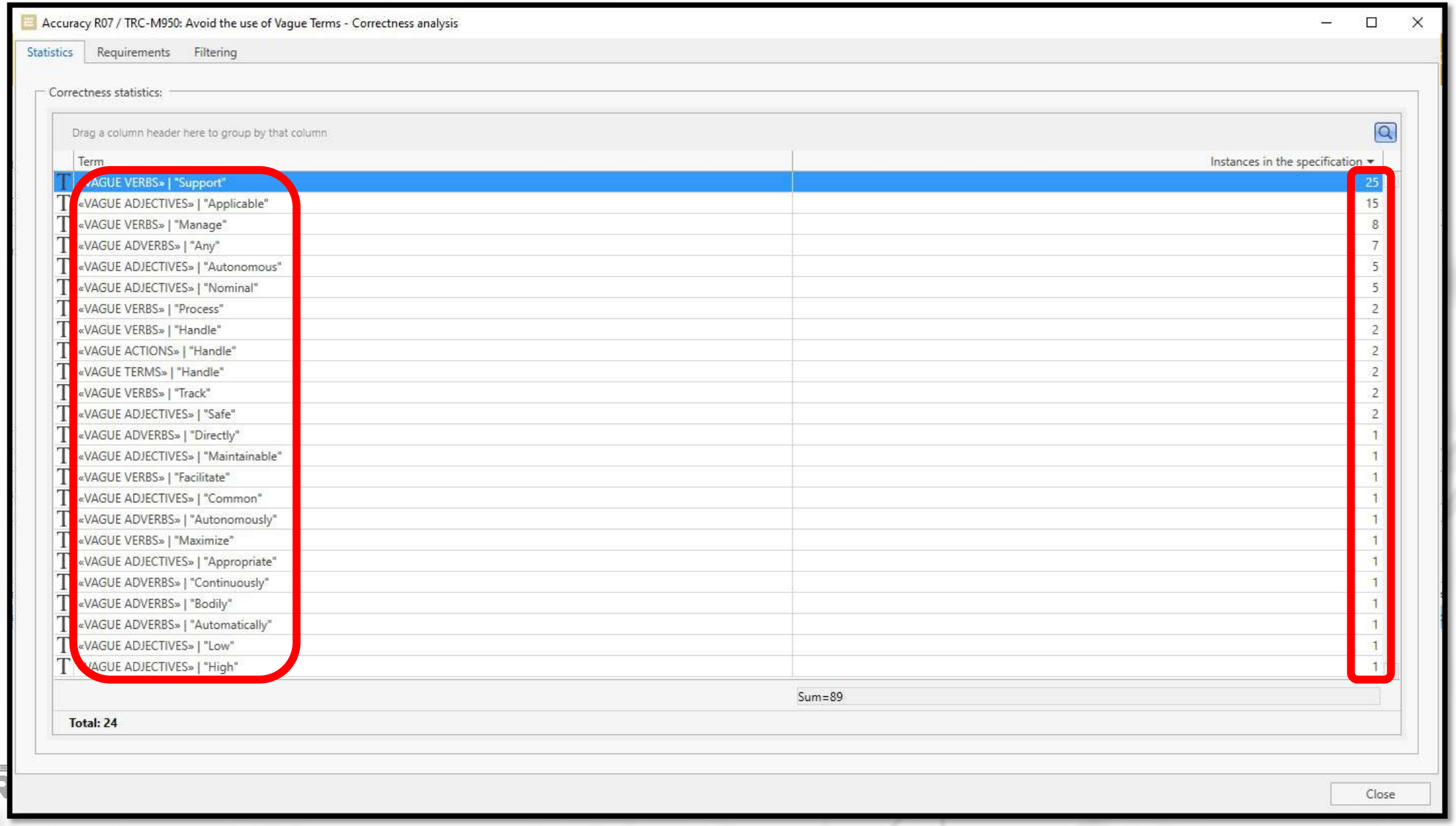


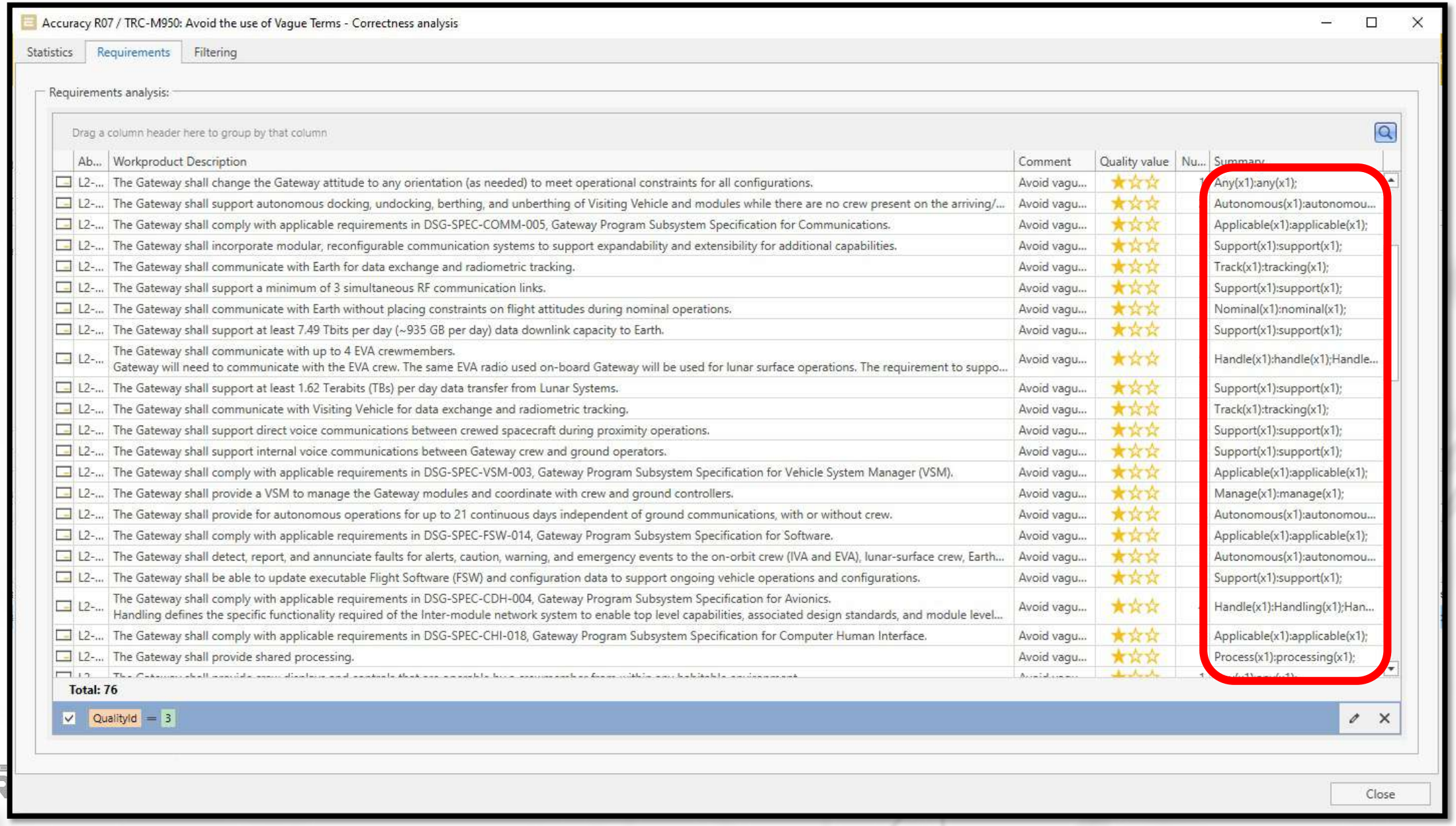
VAGUE TERMS

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

We are checking here for terms which **lack precision** when defining an action, cuantification, characteristic, constraint, etc.

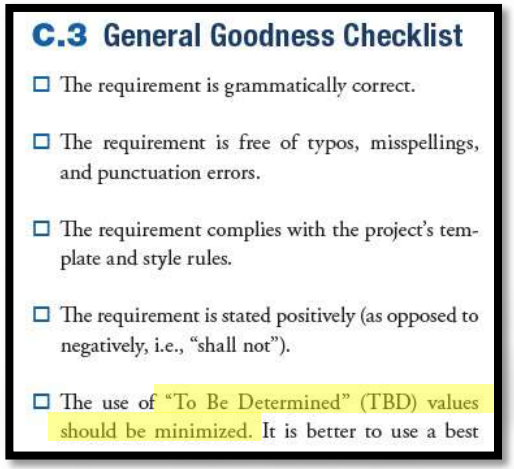
Therefore, these should be corrected to **facilitate** the **understanding** of others and the **execution** of the **V&V** processes later on.


Accuracy R07 / TRC-M950: Avoid the use of Vague Terms - Correctness analysis
Statistics
Requirements
Filtering
Correctness statistics:
Drag a column header here to group by that column
Term
Instances in the specification
«VAGUE VERBS» | "Support" 25
«VAGUE ADJECTIVES» | "Applicable" 15
«VAGUE VERBS» | "Manage" 8
«VAGUE ADVERBS» | "Any" 7
«VAGUE ADJECTIVES» | "Autonomous" 5
«VAGUE ADJECTIVES» | "Nominal" 5
«VAGUE VERBS» | "Process" 2
«VAGUE VERBS» | "Handle" 2
«VAGUE ACTIONS» | "Handle" 2
«VAGUE TERMS» | "Handle" 2
«VAGUE VERBS» | "Track" 2
«VAGUE ADJECTIVES» | "Safe" 2
«VAGUE ADVERBS» | "Directly" 1
«VAGUE ADJECTIVES» | "Maintainable" 1
«VAGUE VERBS» | "Facilitate" 1
«VAGUE ADJECTIVES» | "Common" 1
«VAGUE ADVERBS» | "Autonomously" 1
«VAGUE VERBS» | "Maximize" 1
«VAGUE ADJECTIVES» | "Appropriate" 1
«VAGUE ADVERBS» | "Continuously" 1
«VAGUE ADVERBS» | "Bodily" 1
«VAGUE ADVERBS» | "Automatically" 1
«VAGUE ADJECTIVES» | "Low" 1
«VAGUE ADJECTIVES» | "High" 1
Sum=89
Total: 24
Close


Accuracy R07 / TRC-M950: Avoid the use of Vague Terms - Correctness analysis
Statistics
Requirements
Filtering
Requirements analysis:
Drag a column header here to group by that column
Ab...
Workproduct Description
Comment
Quality value
Nu...
Summary
L2-... The Gateway shall change the Gateway attitude to any orientation (as needed) to meet operational constraints for all configurations. Avoid vagu... Any(x1):any(x1);
L2-... The Gateway shall support autonomous docking, undocking, berthing, and unberthing of Visiting Vehicle and modules while there are no crew present on the arriving/... Avoid vagu... Autonomous(x1):autonomou...
L2-... The Gateway shall comply with applicable requirements in DSG-SPEC-COMM-005, Gateway Program Subsystem Specification for Communications. Avoid vagu... Applicable(x1):applicable(x1);
L2-... The Gateway shall incorporate modular, reconfigurable communication systems to support expandability and extensibility for additional capabilities. Avoid vagu... Support(x1):support(x1);
L2-... The Gateway shall communicate with Earth for data exchange and radiometric tracking. Avoid vagu... Track(x1):tracking(x1);
L2-... The Gateway shall support a minimum of 3 simultaneous RF communication links. Avoid vagu... Support(x1):support(x1);
L2-... The Gateway shall communicate with Earth without placing constraints on flight attitudes during nominal operations. Avoid vagu... Nominal(x1):nominal(x1);
L2-... The Gateway shall support at least 7.49 Tbits per day (~935 GB per day) data downlink capacity to Earth. Avoid vagu... Support(x1):support(x1);
L2-... The Gateway shall communicate with up to 4 EVA crewmembers.
Gateway will need to communicate with the EVA crew. The same EVA radio used on-board Gateway will be used for lunar surface operations. The requirement to suppo... Avoid vagu... Handle(x1):handle(x1);Handle...
L2-... The Gateway shall support at least 1.62 Terabits (TBs) per day data transfer from Lunar Systems. Avoid vagu... Support(x1):support(x1);
L2-... The Gateway shall communicate with Visiting Vehicle for data exchange and radiometric tracking. Avoid vagu... Track(x1):tracking(x1);
L2-... The Gateway shall support direct voice communications between crewed spacecraft during proximity operations. Avoid vagu... Support(x1):support(x1);
L2-... The Gateway shall support internal voice communications between Gateway crew and ground operators. Avoid vagu... Support(x1):support(x1);
L2-... The Gateway shall comply with applicable requirements in DSG-SPEC-VSM-003, Gateway Program Subsystem Specification for Vehicle System Manager (VSM). Avoid vagu... Applicable(x1):applicable(x1);
L2-... The Gateway shall provide a VSM to manage the Gateway modules and coordinate with crew and ground controllers. Avoid vagu... Manage(x1):manage(x1);
L2-... The Gateway shall provide for autonomous operations for up to 21 continuous days independent of ground communications, with or without crew. Avoid vagu... Autonomous(x1):autonomou...
L2-... The Gateway shall comply with applicable requirements in DSG-SPEC-FSW-014, Gateway Program Subsystem Specification for Software. Avoid vagu... Applicable(x1):applicable(x1);
L2-... The Gateway shall detect, report, and annunciate faults for alerts, caution, warning, and emergency events to the on-orbit crew (IVA and EVA), lunar-surface crew, Earth... Avoid vagu... Autonomous(x1):autonomou...
L2-... The Gateway shall be able to update executable Flight Software (FSW) and configuration data to support ongoing vehicle operations and configurations. Avoid vagu... Support(x1):support(x1);
L2-... The Gateway shall comply with applicable requirements in DSG-SPEC-CDH-004, Gateway Program Subsystem Specification for Avionics.
Handling defines the specific functionality required of the Inter-module network system to enable top level capabilities, associated design standards, and module level... Avoid vagu... Handle(x1):Handling(x1);Han...
L2-... The Gateway shall comply with applicable requirements in DSG-SPEC-CHI-018, Gateway Program Subsystem Specification for Computer Human Interface. Avoid vagu... Applicable(x1):applicable(x1);
L2-... The Gateway shall provide shared processing. Avoid vagu... Process(x1):processing(x1);
Total: 76
QualityId = 3
Close

TBDs

TRC-M990: Detection of the TBDs and TBRs



C.3 General Goodness Checklist

- ☐ The requirement is grammatically correct.
- ☐ The requirement is free of typos, misspellings, and punctuation errors.
- ☐ The requirement complies with the project's template and style rules.
- ☐ The requirement is stated positively (as opposed to negatively, i.e., "shall not").
- ☐ The use of "To Be Determined" (TBD) values should be minimized. It is better to use a best

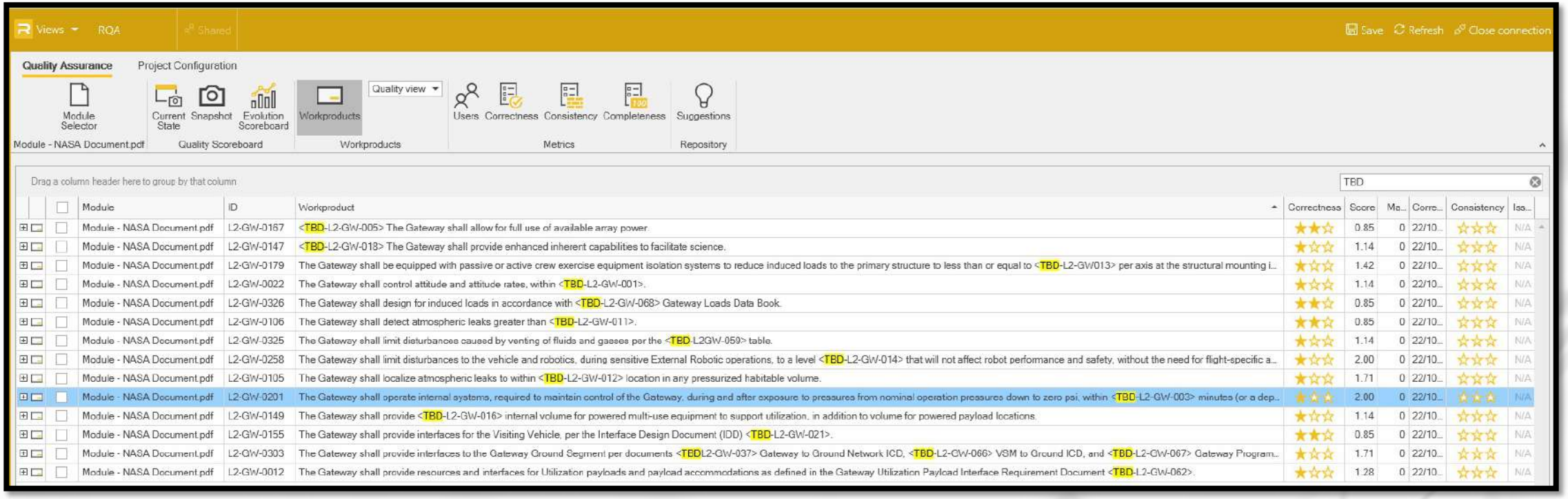
Source: NASA Systems Engineering Handbook

There are several **TBDs** and **TBRs** within this document.

During the **AUTHORING** phases, there is no issue at all to use them.

However, this is labeled as **BASELINE**, which if used, could lead to **many uncertainties** during the **development** and **verification** process.

****This result (like others) could be due to **this document being a public example** version!*



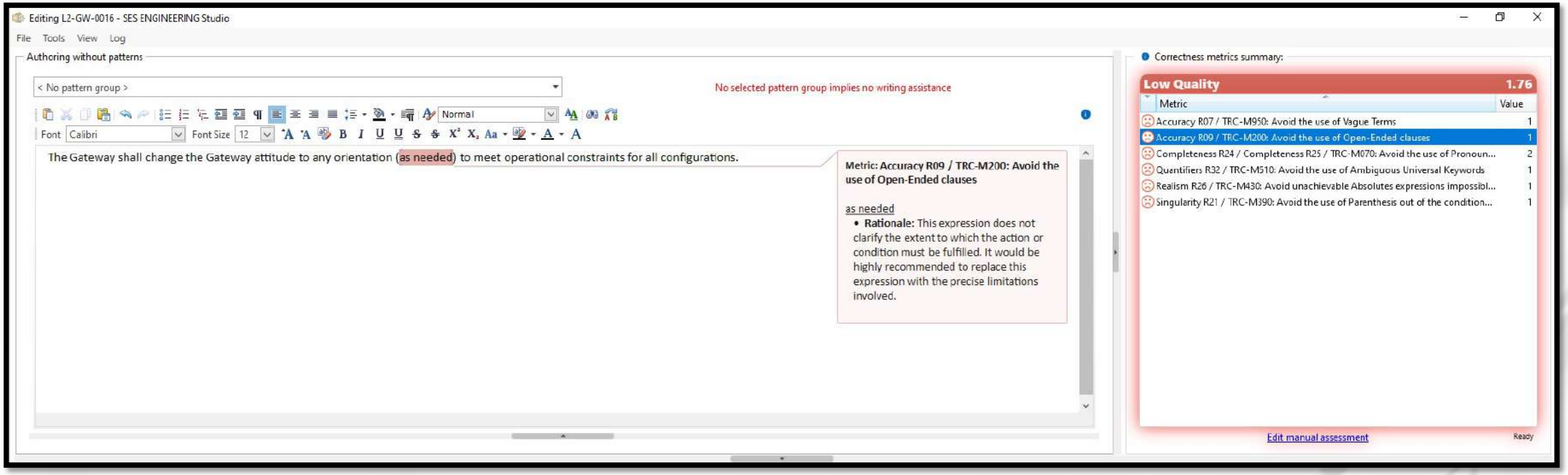
USE OF PARENTHESIS

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

ESCAPE CLAUSES

Accuracy R08 / TRC-M190: Avoid the use of Escape clauses

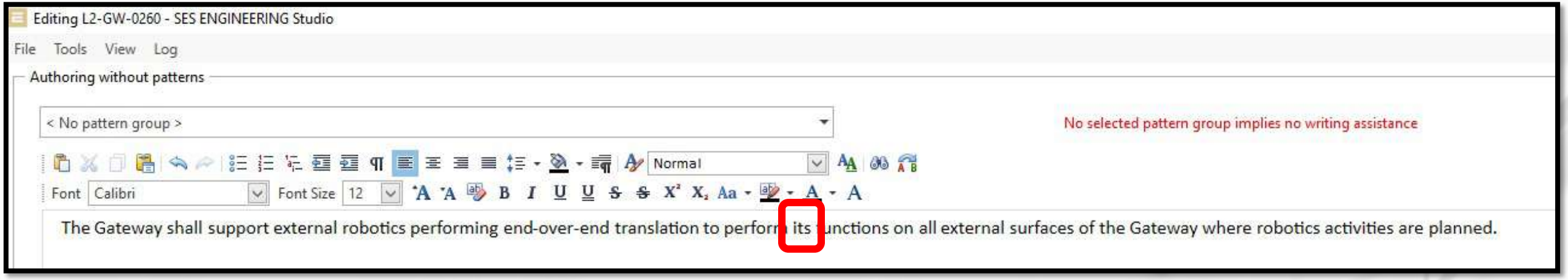
USE OF PARENTHESIS & ESCAPE CLAUSES



As soon as there is room for **DOUBT** or **INTERPRETATION** by the reader, there is a problem.

USE OF PRONOUNS

Completeness R24 / Completeness R25 / TRC-M070: Avoid the use of Pronouns to refer to nouns



Which functions are we **REFERRING** to here?

Gateway, external robotics…

WRONG REFERENCE FORMAT

Non-ambiguity R13 / TRC-M240: Avoid Incorrect spelling

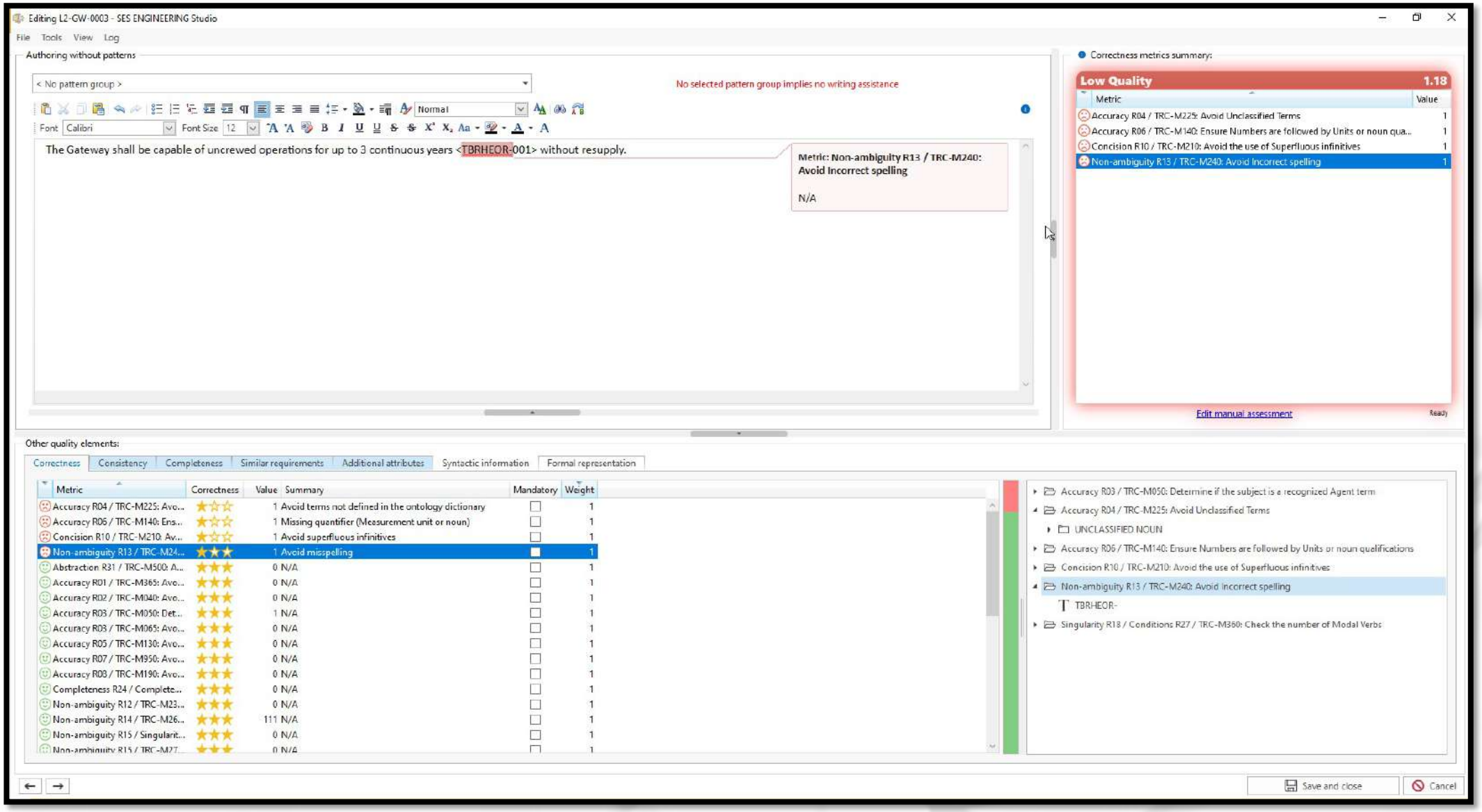
Detected through the INCORRECT SPELLING quality metric.

According to this very same document instructions, the reference structure is:

B2.0 TO BE RESOLVED

The table To Be Resolved Issues lists the specific To Be Resolved (TBR) issues in the document that are not yet known. The TBR is inserted as a placeholder wherever the required data is needed and is formatted in bold type within carets. The TBR issue is numbered based on the document number, including the annex, volume, and book number, as applicable (i.e., <TBR-XXXXX-001> is the first unresolved issue assigned in the document). As each TBR is resolved, the updated text is inserted in each place that the TBR appears in the document and the issue is removed from this table. As new TBR issues are assigned, they will be added to this list in accordance with the above described numbering scheme. Original TBRs will not be renumbered.

WRONG REFERENCE FORMAT

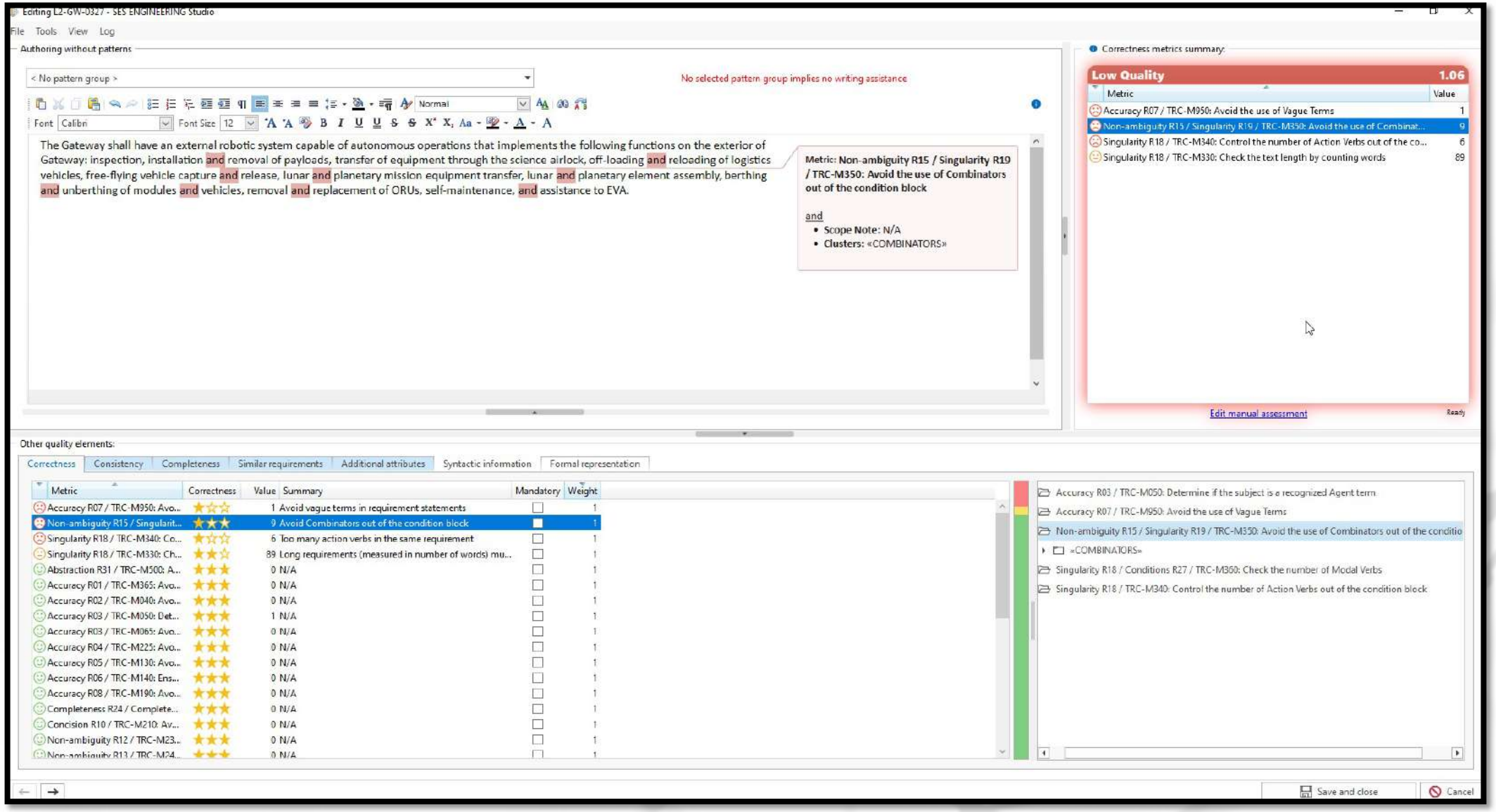


TEXT LENGTH

Singularity R18 / TRC-M330: Check the text length by counting words

USE OF COMBINATORS

Non-ambiguity R15 / Singularity R19 / TRC-M350: Avoid the use of Combinators out of the condition block

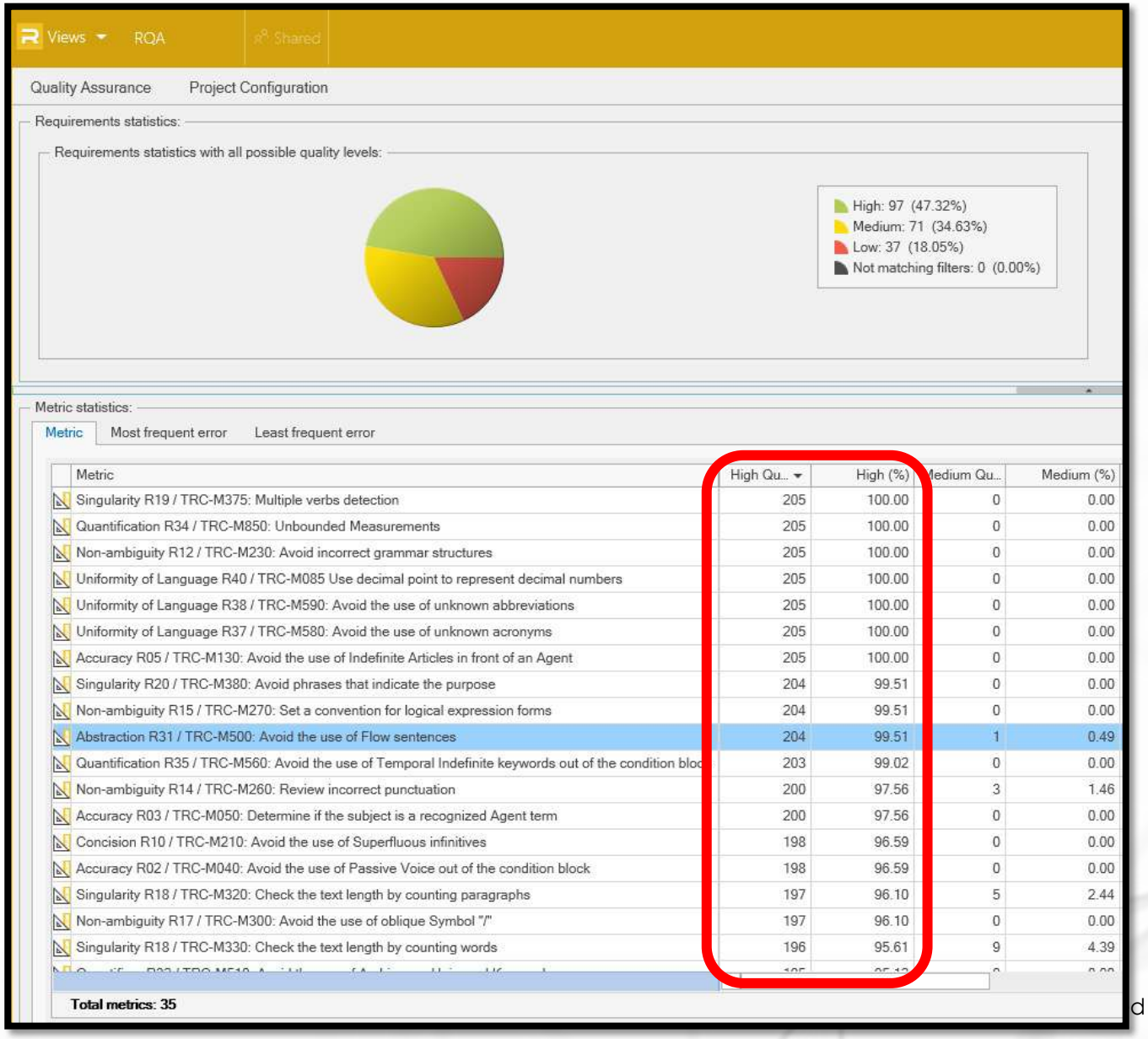


POWER POINTS

Particular requirement with several potential improvements detected.

- ✓ Mostly SHORT requirements.
- ✓ 98% of the requirements with “Gateway” as the SUBJECT.
- ✓ No UNKNOWN acronyms or abbreviations.
- ✓ One SHALL in most requirements.
- ✓ Proper representation of DECIMALS.
- ✓ 97% without PASSIVE VOICE or SUPERFLUOUS INFINITIVES.

NASA STRENGTHS!



Metric	High Qu..	High (%)	Medium Qu..	Medium (%)
Singularity R19 / TRC-M375: Multiple verbs detection	205	100.00	0	0.00
Quantification R34 / TRC-M850: Unbounded Measurements	205	100.00	0	0.00
Non-ambiguity R12 / TRC-M230: Avoid incorrect grammar structures	205	100.00	0	0.00
Uniformity of Language R40 / TRC-M085 Use decimal point to represent decimal numbers	205	100.00	0	0.00
Uniformity of Language R38 / TRC-M590: Avoid the use of unknown abbreviations	205	100.00	0	0.00
Uniformity of Language R37 / TRC-M580: Avoid the use of unknown acronyms	205	100.00	0	0.00
Accuracy R05 / TRC-M130: Avoid the use of Indefinite Articles in front of an Agent	205	100.00	0	0.00
Singularity R20 / TRC-M380: Avoid phrases that indicate the purpose	204	99.51	0	0.00
Non-ambiguity R15 / TRC-M270: Set a convention for logical expression forms	204	99.51	0	0.00
Abstraction R31 / TRC-M500: Avoid the use of Flow sentences	204	99.51	1	0.49
Quantification R35 / TRC-M560: Avoid the use of Temporal Indefinite keywords out of the condition bloc	203	99.02	0	0.00
Non-ambiguity R14 / TRC-M260: Review incorrect punctuation	200	97.56	3	1.46
Accuracy R03 / TRC-M050: Determine if the subject is a recognized Agent term	200	97.56	0	0.00
Concision R10 / TRC-M210: Avoid the use of Superfluous infinitives	198	96.59	0	0.00
Accuracy R02 / TRC-M040: Avoid the use of Passive Voice out of the condition block	198	96.59	0	0.00
Singularity R18 / TRC-M320: Check the text length by counting paragraphs	197	96.10	5	2.44
Non-ambiguity R17 / TRC-M300: Avoid the use of oblique Symbol "/"	197	96.10	0	0.00
Singularity R18 / TRC-M330: Check the text length by counting words	196	95.61	9	4.39

Total metrics: 35

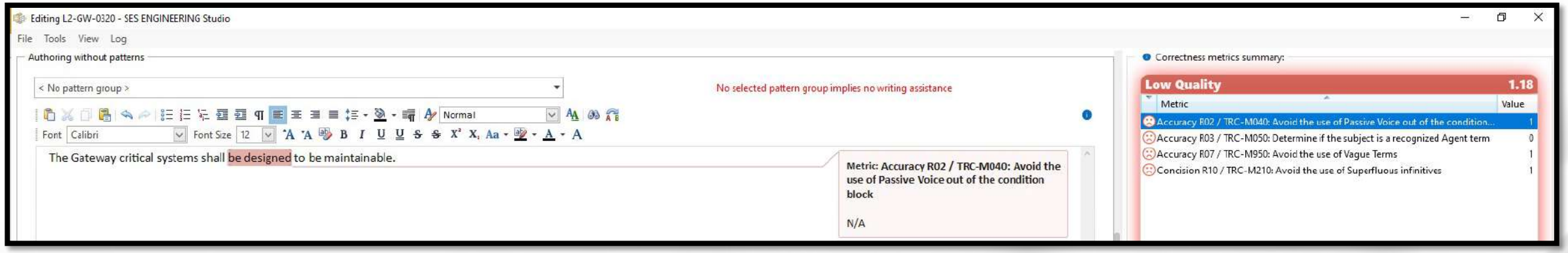
KEY EXAMPLE

Particular requirement with several potential improvements detected.

L2-GW-0320: Maintainability

"The Gateway critical systems shall be designed to be maintainable."

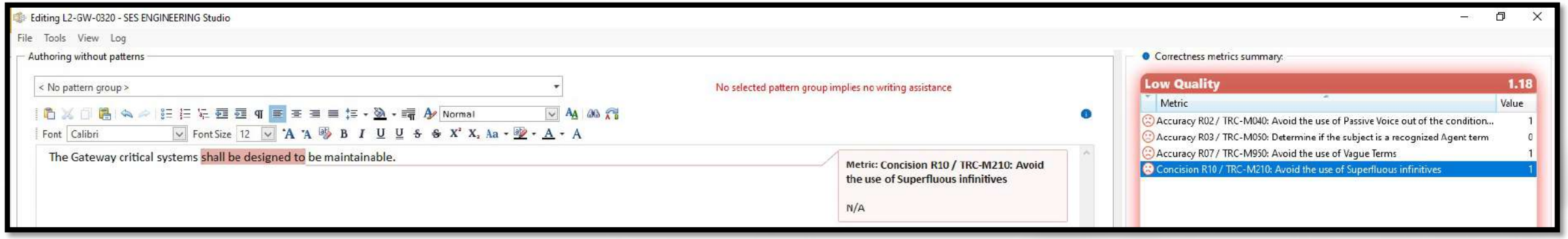
✓ **Passive Voice** out of Condition.



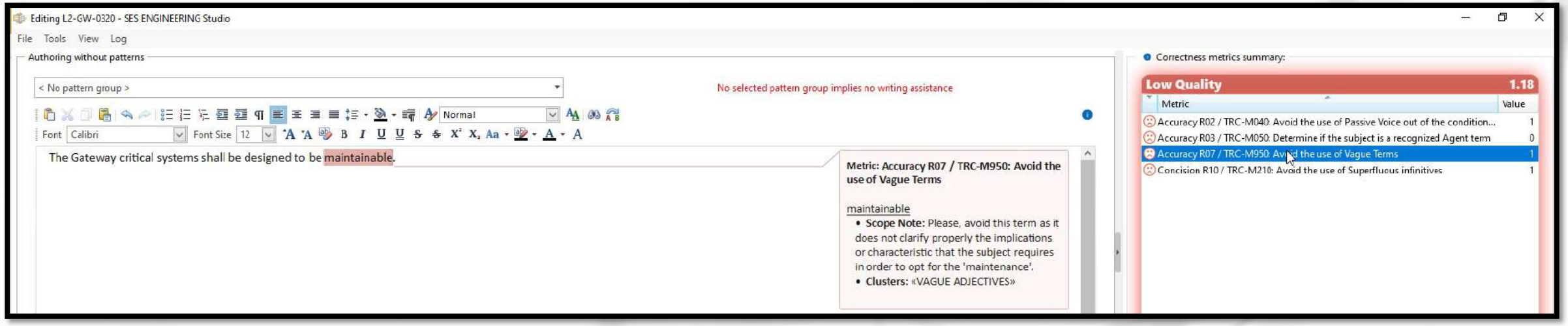
✓ No **Recognized Agent** as subject.

The Gateway critical systems... → *The Gateway* **SHALL HAVE** *critical systems* **THAT**...

✓ Use of **Superfluous Infinitives.**



✓ Use of **Vague Terms.**



CONCLUSION

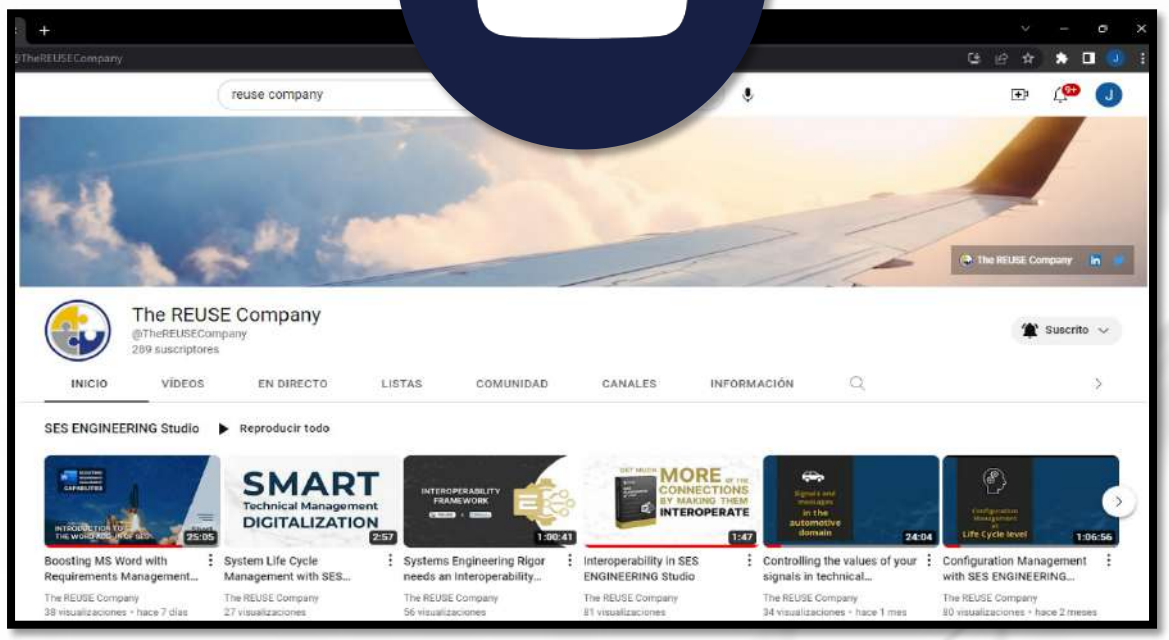
1. The document has considerable **HIGH QUALITY**.
2. The improvements detected are mostly coming from **MINOR ISSUES**.
3. Human & machine makes a **GREAT TEAM**.

****AGAIN! This result (like others) could be due to **this document being a public example** version.*

SYSTEMS ENGINEERING
INTEROPERABILITY CONFERENCE

https://se-interoperability.org/

www.reusecompany.com



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