From Experienced to Exceptional:
JIP33's Requirement Engineering Education Journey

QRA
engineering intelligence

International Association of Oil & Gas Producers

Part 1

Introduction

Traditionally, experience is hailed as an asset in one's career, serving as a gauge of knowledge and skills, and is considered a dependable indicator of achieving outstanding results. Nevertheless, it is essential to scrutinize whether this assumption consistently holds true or if, inadvertently, it hinders your engineering processes.

The value of experience isn't baseless. In engineering disciplines, experience imparts practical knowledge, heightened problem-solving abilities, and a comprehensive understanding of complex systems. The challenge emerges when we fail to question, refine, or optimize processes and learning models because we believe experience guarantees exceptional outcomes.

The JIP33 (Joint Industry Program 33) team of IOGP identified a significant opportunity within this challenge. They devised a method to standardize and automate the process of requirement authoring and the educational path, thereby enhancing requirement authors at any level of experience to achieve exceptional results.

About IOGP

The International Association of Oil & Gas Producers (IOGP) is the global voice of the oil and energy industry. With a membership pool that **fulfills over 40% of the world's oil and gas** demand, IOGP has strived for over 50 years to identify and share knowledge and good practice in the areas of safety, health, environment, engineering, and now, industry and energy transition.

IOGP has initiated various Joint Industry Programs that collaborate with more than 2,250 experts from its member organizations, aiming to standardize global best practices across the industry. The organization releases dozens of updated guidance documents every year, which are readily accessible in its library **containing more than 600 free reports** [1].

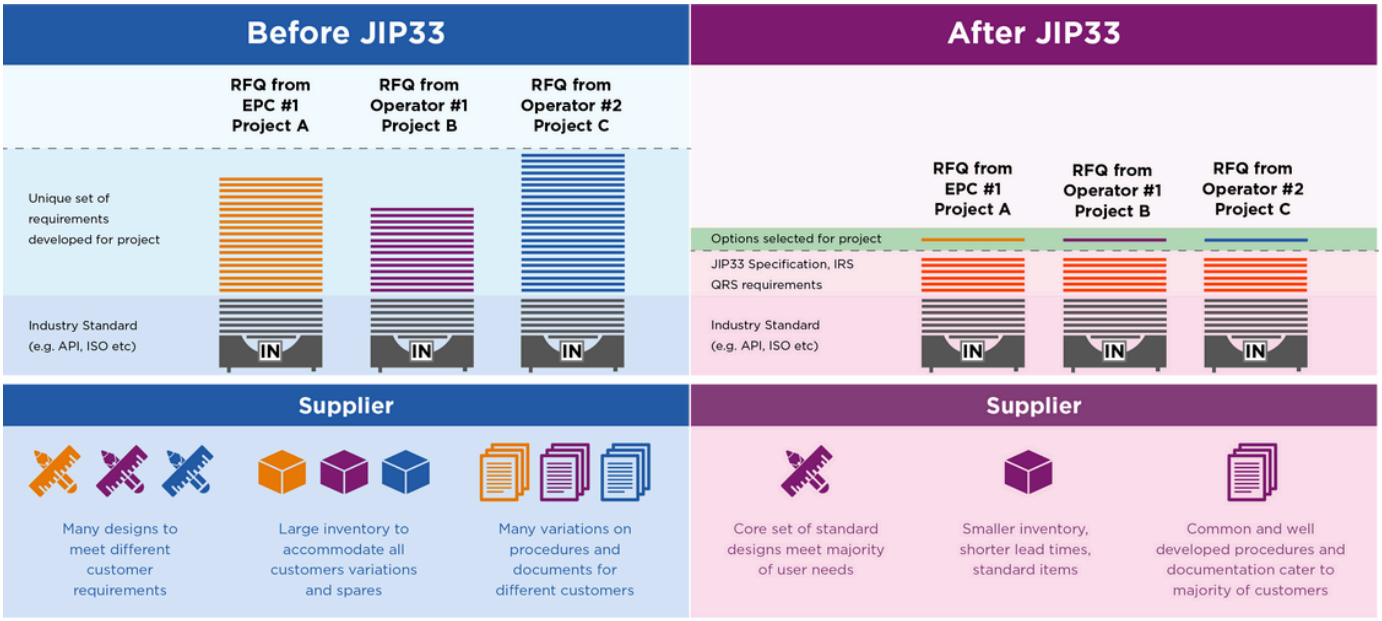
About JIP33

One specific industry improvement endeavor is the Joint Industry Program 33 [JIP33]. JIP33 is focused on industry-wide improvement in the specification, procurement, and delivery of equipment for the oil and gas industry.

The team is comprised of **524 subject matter experts (SMEs)** who have worked extensively over the past five years, producing 59 specifications that have received over **370,000 downloads**. The specifications are free to download and have encouraged industry-wide communication, garnering over 10,000 comments as part of the collaboration.

The results have been impactful. Through the refinement of specifications, JIP33's requirements have resulted in 140,000 items purchased with **an estimated value of more than $5 billion.**

JIP33 was inspired by the substantial advantages of singular, concise, complete, unambiguous, justified, and verifiable requirements. IOGP recognized repetition existed within the industry; inefficiencies that could be resolved with proper, standardized, and quality requirements industry-wide.



Documented in the accompanying figures, Figure 1 and Figure 2, is JIP33's process and the value it brings to suppliers. Oil and gas operators are regularly asked to deliver against a different set of requirements for each order. Similar requirements, but small variations that necessitate different designs, larger inventory, increased documentation, and additional quality intervention.

An incredibly inefficient process, but an excellent opportunity.

By standardizing the requirements used for procuring industry equipment, the supply chain can be optimized, and industry-wide goals aligned. The new requirements result in shorter lead times, smaller inventory, and well-developed documentation that caters to a majority of customers.

Many major operators [2] are in support of the project. Among the many companies and suppliers participating in JIP33, several major operators have committed to supporting and resourcing JIP33.

Thus far, JIP33 has been widely successful with "From its initial 12 operator members, JIP33 will now be open to participation from all 95 IOGP members, enabling broader and more widespread adoption."

About QRA and QVscribe

QRA develops advanced engineering tools that simplify complicated, tedious processes and strengthen requirements quality. Focused on high-complexity and regulated industries such as Oil & Gas, Aerospace, Automotive, and MedTech, QRA's solutions streamline authoring, analysis, and validation to help teams reduce errors, save time, and deliver with confidence.

QVscribe, QRA's flagship product, makes high-quality requirements achievable for engineers at every experience level. Through real-time guidance, automated checks, and actionable feedback, it helps teams write clear, compliant, and consistent requirements. The result is fewer rework cycles, more predictable outcomes, and standardized practices that scale across projects and teams.

QRAcloud extends these capabilities by making requirements quality visible and measurable. With Snapshots and Timelines, teams can track progress, demonstrate improvement, and communicate measurable impact to leadership, bringing clarity, transparency, and credibility to the requirements process.

ReqWriter in QRAcloud was built for teams that are embracing AI. The challenge isn't just writing requirements, but reviewing them critically and objectively. ReqWriter provides AI-assisted rewrites for authors and reviewers that refine requirements while documenting how outputs are verified, reviewed, and improved over time.

Every ambiguity or incomplete requirement written today can ripple through tomorrow's models. By embedding expert, objective feedback directly into the authoring process, ReqWriter helps teams produce clearer, more consistent, and compliant requirements faster while supporting responsible AI adoption and stronger engineering outcomes.

After their successful implementation and evaluation of QVscribe, the JIP33 team sat down with QRA to detail the team's road to success.

During QRA's meeting with the team, JIP33 SMEs shared a new perspective on QVscribe, which is not merely as a requirement error-detection tool, but as an educational aid that deepens understanding of requirement authoring and helps SMEs and project engineers (PE), both experienced and new, reach an exceptional level of proficiency.

Harnessing the power of automation and Natural Language Processing (NLP), JIP33 incorporated QVscribe into its existing workflow, advancing its requirements authors and optimizing the review process.

Part 2

JIP33's Original Requirement Development Process

Before the introduction of QVscribe, JIP33 utilized traditional approaches, using suboptimal industry methods in their requirements education, authoring, and reviewing processes.

JIP33'S Original Requirement Authoring Process

JIP33's original requirement development process began without QVscribe or formal requirement management software; the methods were manual and laborious.

Each requirement author would attempt to author requirements that aligned with reference sample requirements. These requirements would be put through a review stage, SMEs flagging requirements that did not meet the team's standards.

The uncertain factors within this process left requirement development exposed to a multitude of issues: inconsistency in authoring, subjectivity in review, time and resource wastage, communication silos, and lack of standardization. The responsibility to prevent and resolve these challenges fell on the authors, leading to an increased focus on the syntax of a requirement rather than its broader context and necessity within the scope of the project.

The monotony and specificity of the requirement authoring, and review process created challenges that even experienced engineers have trouble detecting. During the discussion about the authoring process with JIP33, the engineering team highlighted several techniques that proved tedious for the team to resolve manually.

Common requirement Issues: Copy and Paste

“Copy and paste” was initially identified as a source of requirement errors. To shorten authoring time, engineers across almost every industry reuse requirements. The JIP33 team detailed “with requirements, and everybody is guilty of this: control, and copy-paste, cut-paste, and copy-paste. Everybody does it, and that’s how specifications have historically been written.”

While the time-saving aspect of the technique may be appealing, copy and pasting requirements bring on a whole host of issues.

These issues often include:

· Misalignment with Project Scope: Requirements are often not appropriately aligned with the specific scope of the new project, leading to potential mismatches and inconsistencies.

· Misalignment with Project Scale: The scale of the new project may not be accurately reflected in the copied requirements, potentially resulting in inadequacies or overestimations.

· Unaddressed Errors from Original Project: Errors present in the original project's requirements may persist, as the copied content might not undergo necessary corrections or updates.

The team elaborated on the outcome of this trend: “You’re constantly seeing things migrate from a specification to a specification even though they add nothing to the specification.”

While you may believe you are saving time, in reality, you are simply deferring rework to later stages of the project’s lifecycle. A requirement’s true cost does not lie in the time it takes to type, but instead in the time, it takes to consider the requirement’s necessity, application, and importance within the scope of the project.

Common requirement Issues: Motherhood and Essential Content

The prevalence of motherhood statements also emerged as a notable challenge for JIP33. These statements are characterized by their superficial nature and lack of tangible value contribution. Often unquestioned and unnecessary, they result in additional requirements that cause a backlog in the approval process.

To illustrate, a JIP33 member provided an example of a red pipe requirement: “Sometimes we would say the pipe had to be red because the sun was shining that day and, on that day, we wanted it to be red.” Such requirements lack necessity and fail to add value.

Motherhood statements run counter to the JIP33’s objective of essential content. The term essential content in engineering refers to the fundamental set of components, features, or specifications required for a system, product, or process to function and fulfill its basic intended purpose.

The concept of essential content is crucial as engineering systems become increasingly complex. Projects and products that have reached an essential content employ complexity when necessary; core functionalities are met without unnecessary features or complications. This, in turn, optimizes resources, minimizes costs, and maintains focus on the key requirements. In the case of JIP33, essential content guarantee requirements can be utilized by anyone in the industry without the fear of irrelevant features.

Attaining essential content can be difficult in practice, especially when dealing with convoluted industry requirements. JIP33 engineers are tasked with identifying the essential elements indispensable for the system to achieve its primary objectives.

Dissecting requirements and their purpose have since taken up a large portion of JIP33's time. Copy and pasted requirements and non-essential motherhood statements are not always as visible as in the red pipe example. Uncovering a requirement's true purpose can be difficult when the writing is littered with vague language, disorganized thoughts, and inconsistent referencing.

Unnecessary requirement complexities and errors have substantial consequences, especially for JIP33's efforts to appease numerous international stakeholders. Each stakeholder's review process is time-consuming, and poorly written requirements only exacerbate the effort.

Achieving success for JIP33 hinged on addressing and rectifying these problematic requirements. However, their conventional methods involved authors manually identifying and correcting these errors. To elevate the standards of the oil and gas industry's requirements, JIP33 also had to elevate its requirement processes, including requirement education.

JIP33's Original Requirement Education Process

Engineers are not often formally educated on requirement election in their degrees. This knowledge, this experience is gathered in the field, and the engineer learns from an organization's specific, internal process.

This organizational instruction is frequently not formalized. Organizations will strategically develop their requirement authoring process, but exclude the requirement education process, creating an educational vacuum for new engineers or engineers new to the requirement field.

When any requirement-focused team welcomes a new engineer, it must find a way to balance current team productivity with effective requirement education, along with the general onboarding procedure. Whether this process is developed actively or passively, every team has one, and JIP33 is no exception.

JIP33, like most in the industry, previously used passive education techniques, which the team coined the “read and learn” method to teach engineers proper requirement specifications and authoring techniques. The team shared that new hires would receive requirement educational documentation and supplementary guidance from a senior requirement author.

The engineers would read the requirement documentation to inform proper techniques. When the new team members began authoring, project leaders would offer corrections and further guidance when able, but at the sacrifice of their own time. Thus, the largely passive “read and learn” method.

This type of learning, passive learning [3], is widely regarded as a lesser learning style [4] than active learning. Passive learning is a form of education where learners are passive recipients of information. It typically involves listening to lectures, reading textbooks, or watching educational videos. There is little opportunity for interaction or exploration.

In turn, active learning refers to a process in which individuals engage in activities that necessitate their participation in the learning material. It encompasses hands-on experiences, problem solving, critical thinking, and active involvement with the subject matter. By assuming an active role, learners can achieve enhanced comprehension, retention, and the ability to apply knowledge in real-world scenarios.

In JIP33’s previous educational approach, active learning was only applied when experienced requirement authors personally engaged with the new author. As a result, active learning was directly dependent on senior authors’ availability and time commitment.

The world of engineering demands precision, but that demand is not extended to requirement education processes. With such a formidable impact on project ROI [5], requirement quality, and therefore requirement education, necessitates as much innovation and precision as the technology it is documenting.

Part 3

JIP33 and QVscribe

The JIP33 team embraces change without hesitation but emphasizes change should only be pursued if it adds value. One of the team's engineers stated, "Change is one of the greatest things to do, but it's essential to ensure that our motivation for change goes beyond trendiness."

JIP33 had an existing requirement education and authoring system in place, but the team recognized the opportunity to refine their processes. They saw potential in their process and QVscribe. By marrying the two, the team was able to take their requirements and requirement authors from acceptable to excellent, integrating quality into the entirety of the development process.

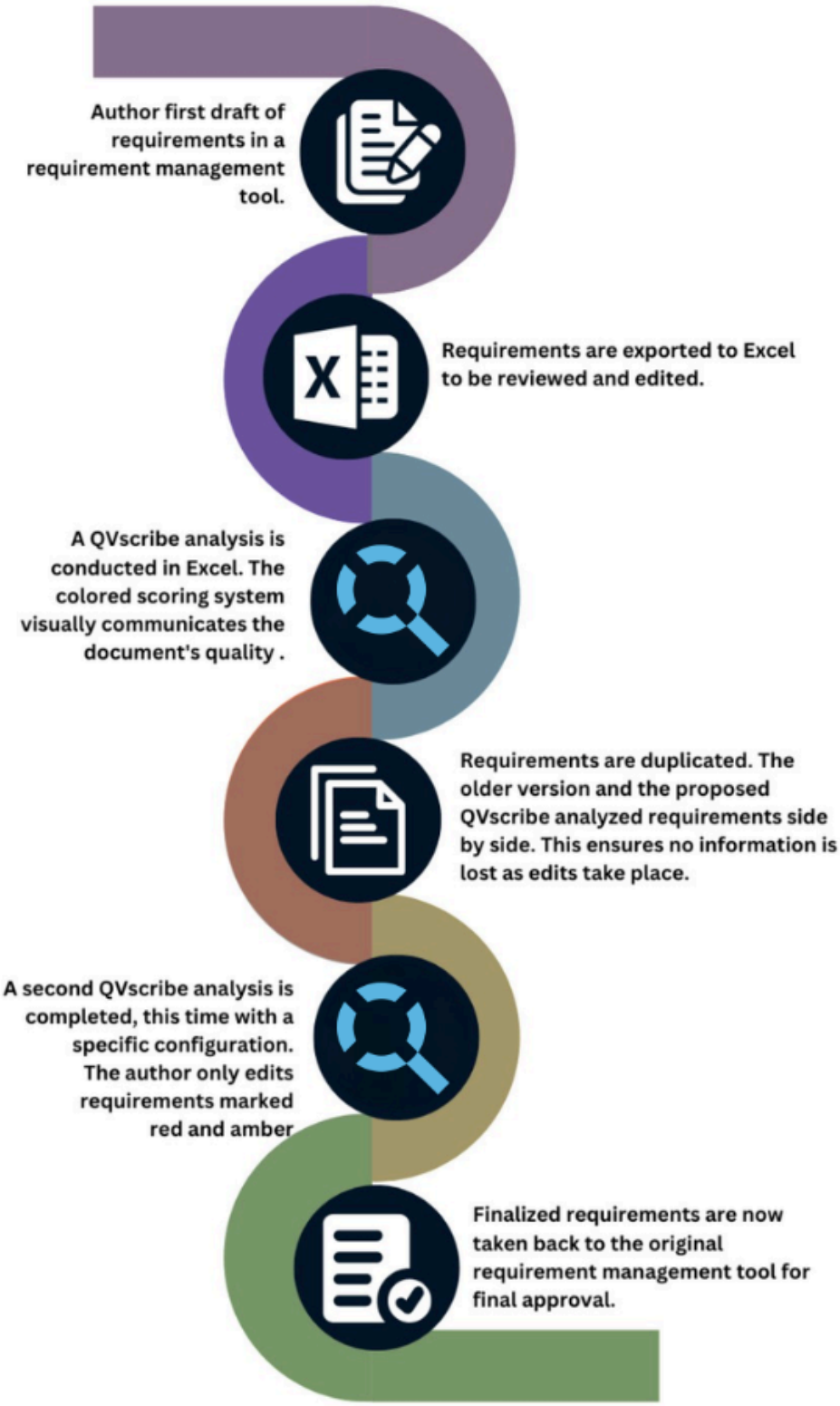
When implementing QVscribe, JIP33's team took a pivotal step. They fully embraced the software and used it with intention [6]. QVscribe was not simply an incidental tool used after completing a requirement; instead, it serves as a tool utilized during the authoring of specifications, inspiring authors to enhance their skills and knowledge in requirements authoring and revision.

JIP33's Initial QVscribe Process

JIP33's requirement authoring and revision with QVscribe has evolved alongside the software, and QVscribe's integration into requirement management platforms is a key growth point.

A condensed explanation of JIP33's evolving process is illustrated in Figure 4 and 5. Although much has changed with this procedure since the first application of QVscribe, JIP33's emphasis on quality has remained consistent.

Figure 4: JIP33's Initial QVscribe Process



When initially implementing QVscribe, JIP33 would author the first draft of requirements within a requirement management tool. The requirements were then exported to Excel, and a general QVscribe analysis was completed.

The requirements in the Excel sheet were duplicated, original in one column and a copy in the next. QVscribe-informed edits are applied to the “copy” requirements, allowing a quick comparison against the original text, and ensuring no information was lost within the editing process. The revised requirements undergo another QVscribe analysis, this time with a configuration specified to the relevant industry.

The revision is now complete, and requirements are transferred back into the original requirement management tool for final approval.

This process did result in quality requirements but at the price of time and labor. QVscribe’s integration into requirement management platforms removed this issue, eliminating the need to leave the requirement management platform.

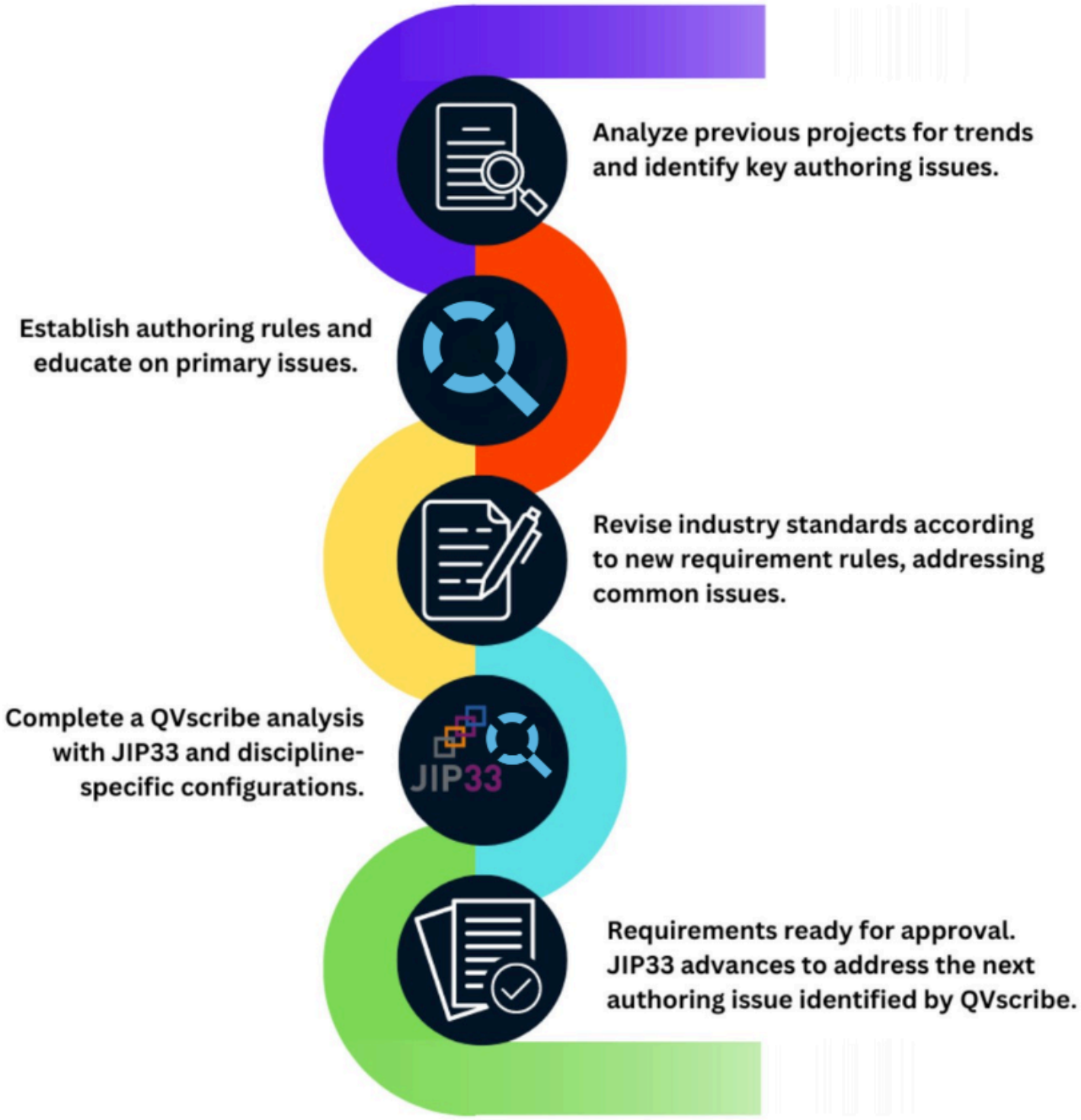
JIP33’s Current Requirement Development Process

JIP33’s new process starts before a new requirement project is even launched. The team performs a QVscribe analysis on older JIP33 projects, searching for top authoring issues.

During the first iteration of this process, JIP33’s identified key issues were:

- Immeasurable quantification
- Vague words
- Cross-referencing pronouns
- And imperatives.

Figure 5: JIP33'S Current QVscribe Process



After a preliminary revision has occurred, the engineers run a second QVscribe analysis with an industry-specific configuration. The diversity of JIP33's work necessitates different requirements strategies depending on the disciplines involved. QVscribe's configurable analysis allows the team to align their review process and automated analysis to any engineering discipline. JIP33's long-term goal is to develop QVscribe configurations for all the relevant disciplines, for example, electrical, mechanical, civil, etc.

Discipline-specific QVscribe configurations ensure adherence to industry-specific standards and domain-specific vocabulary, and enable the tool to recognize and validate terminology unique to the field. Additionally, the configurations remove the instances of false negatives, authoring issues that may be incorrect in the greater context of requirement engineering but are permitted within a discipline-specific context.

During the second round of analysis, the engineers narrow their revisions to the high-risk requirements, those highlighted in red and amber by QVscribe. The software color-codes requirements in accordance with their quality score, red and amber signifying a high-risk requirement.

Even in early versions of the software, the JIP33 team noted the visual aspects of QVscribe, citing the colored system as an effective means of communication. The color-coded grading system quickly communicates the document's quality to the onlooking engineer. A swath of green and an engineer can relax, the quality of the document assured. With an abundance of red, the requirements require more revision.

Requirements are then ready for final approval. This marks the end of the requirement authoring process, but the team is not finished yet. JIP33 once again reviews requirement documentation, evaluating if their top issues have been addressed. If the issues were eradicated, the team identifies three new requirement concerns, and the cycle continues.

Requirements are drafted directly in JIP33's management platform with a QVscribe analysis occurring in real time. The software flags issues as requirements are being authored. Although engineers were keeping the identified key issues top of mind, the software reinforces what they had learned through immediate error detection and guidance.

This helps authors on two fronts:

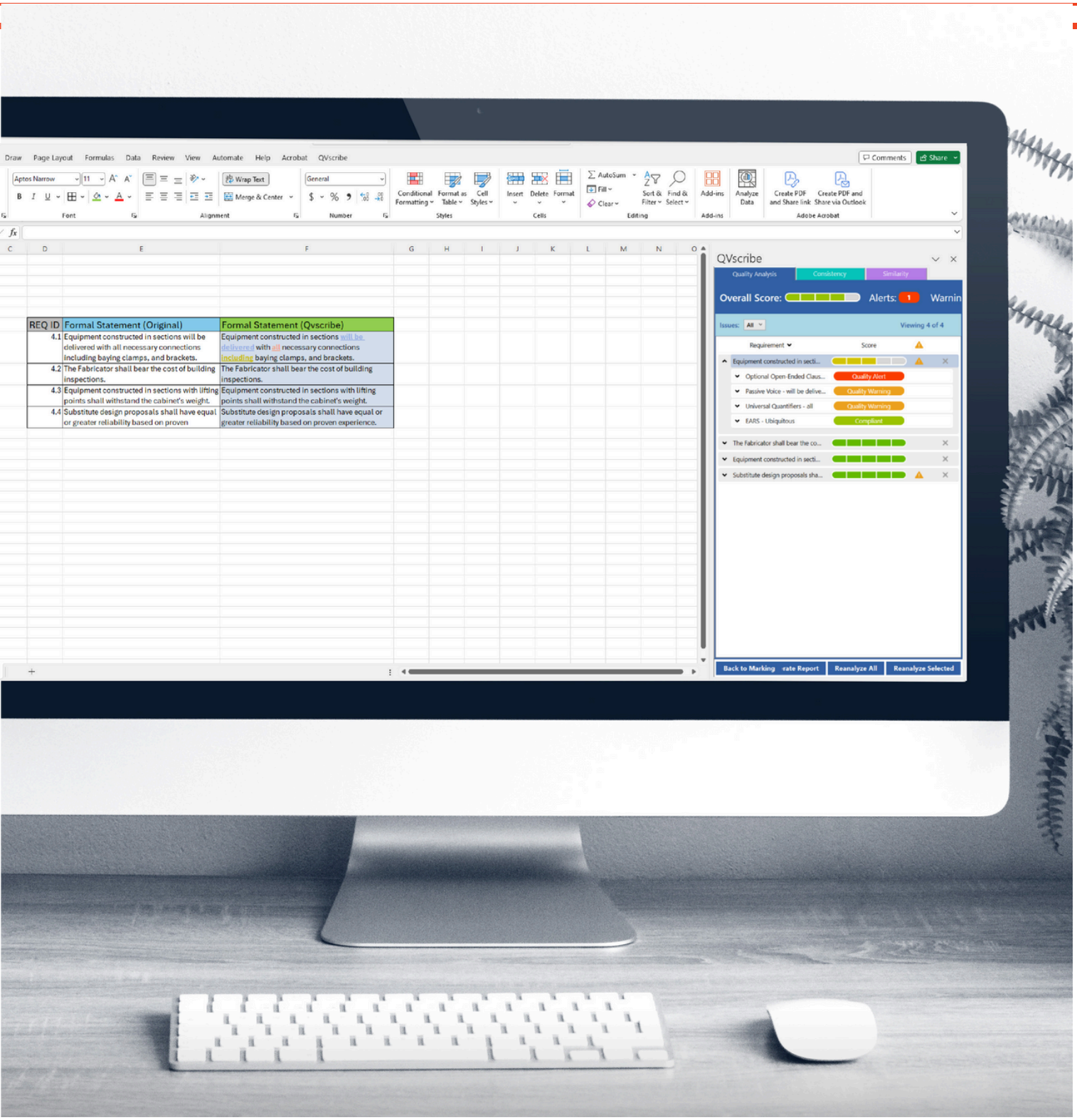
1. Creates an environment of active learning, reinforcing previous training and educating on new issues.

2. Provides integrated guidance, limiting navigation outside the requirement management tool and streamlining the authoring and revision process.

JIP33's current requirement process is markedly shorter than the previous one while enhancing quality and consistency throughout. Although, this process also offers an additional, yet pivotal benefit. With the software handling lower-level corrections during the authoring stage, requirement engineers have more time to evaluate if the requirements meet the essential content.

They can determine whether a requirement is truly needed, complete, or if it merely represents a general statement without essential value. This perspective enables engineers to finalize only the necessary requirements. Requirements that are clear, concise, and accurately convey the intended message.

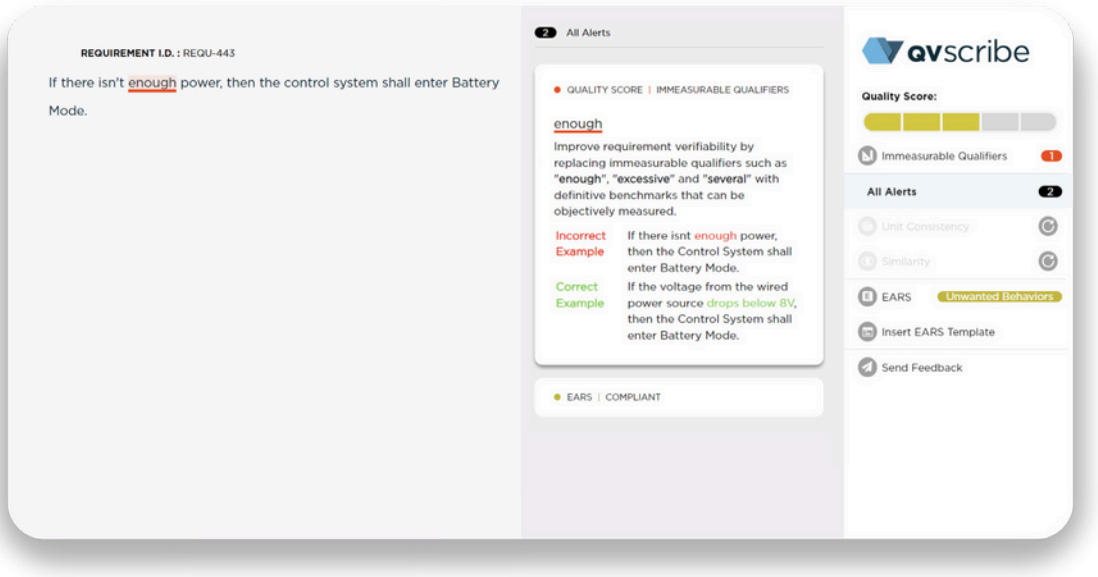
Only the requirements that provide value and meet the essential content progressed through to the next step of the specification process.


Draw Page Layout Formulas Data Review View Automate Help Acrobat QVscribe
Comments Share
Aptos Narrow 11 Wrap Text General
Merge & Center
Conditional Formatting Format as Table Cell Styles
Insert Delete Format
AutoSum Fill Clear
Sort & Filter Find & Select
Add-ins Analyze Data
Create PDF and Share link Create PDF and Share via Outlook
Font Alignment Number Styles Cells Editing Add-ins Adobe Acrobat
REQ ID
Formal Statement (Original)
Formal Statement (Qvscribe)
4.1 Equipment constructed in sections will be delivered with all necessary connections including baying clamps, and brackets.
Equipment constructed in sections will be delivered with all necessary connections including baying clamps, and brackets.
4.2 The Fabricator shall bear the cost of building inspections.
The Fabricator shall bear the cost of building inspections.
4.3 Equipment constructed in sections with lifting points shall withstand the cabinet's weight.
Equipment constructed in sections with lifting points shall withstand the cabinet's weight.
4.4 Substitute design proposals shall have equal or greater reliability based on proven
Substitute design proposals shall have equal or greater reliability based on proven experience.
QVscribe
Quality Analysis
Consistency
Similarity
Overall Score:
Alerts: 1
Warnin
Issues: All
Viewing 4 of 4
Requirement
Score
Equipment constructed in secti...
Optional Open-Ended Claus...
Quality Alert
Passive Voice - will be delive...
Quality Warning
Universal Quantifiers - all
Quality Warning
EARS - Ubiquitous
Compliant
The Fabricator shall bear the co...
Equipment constructed in secti...
Substitute design proposals sha...
Back to Marking rate Report
Reanalyze All
Reanalyze Selected

Part 4

JIP33's Current Requirement Education Process

JIP33 harnesses QVscribe for another purpose: a novel approach to requirement education. Instead of the passive learning techniques used before, new authors use QVscribe as cognitive scaffolding, which guides them while they write.



New engineers, with the assistance of QVscribe, are given a small subset of requirements to author, usually ten. The software provides suggestions and corrections as they write.

QVscribe analyzes the requirements, applying industry and organizational standards to the new author's work. The engineers receive immediate feedback on their requirements, allowing them to make the needed corrections as they author.

A senior requirement author receives the ten requirements for review, and based on their assessment, they provide further instruction and request an additional ten requirements. With QVscribe taking care of the basic authoring aspects, senior team members can provide more advanced and valuable instruction to the engineers.

When referring to a new engineer in this context, it pertains to an engineer newly involved in the JIP33 project. The team doesn't equate experience to performance.

"Just because you are experienced in a field doesn't mean you excel in that field," one of the senior engineers remarked. "Whether they are a novice, intermediate, or experienced is not that relevant."

JIP33's education process is distinct from others in the industry. It does not assume any author's level of ability. Instead, it allows the software to provide corrective guidance exactly when and where an author needs it, transforming engineers' experience or otherwise, into exceptional requirement authors without sacrificing time or productivity.

JIP33 Conclusion

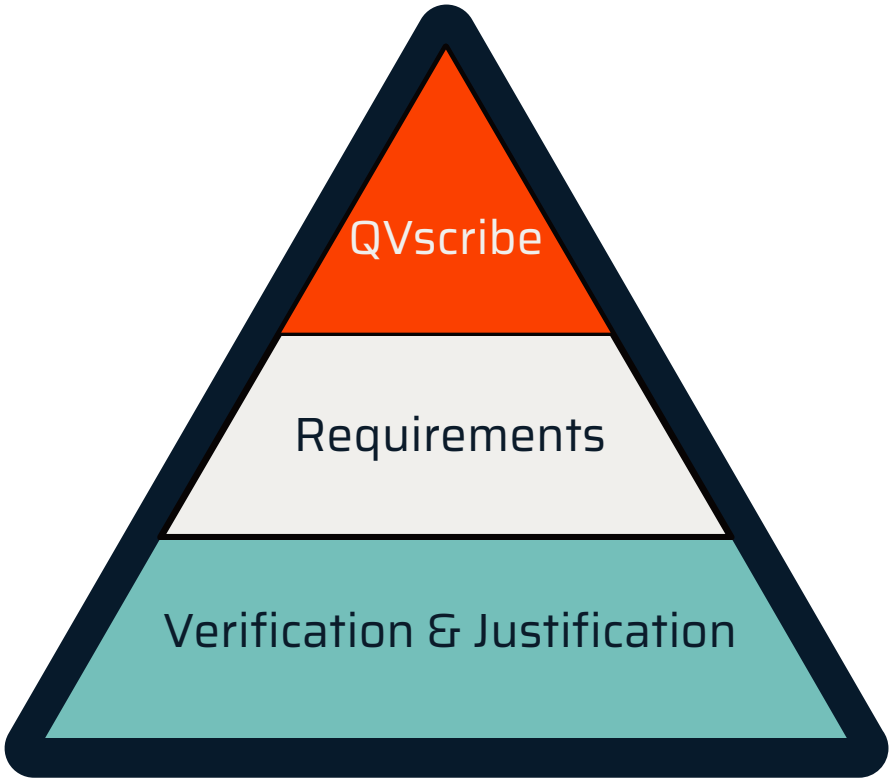
These processes have been working for JIP33 since 2020, improving the team and its authoring skills.

When talking about the software, one senior engineer pictures it like the roof on top of a house, completing an already stable process. It provides the icing to the proverbial requirements cake.

"You can have a good requirement. We use QVscribe at the top of the triangle to make it a perfect requirement and provide extra confidence" one SME commented.

The IOGP JIP33 project has been using QVscribe since 2020, this has improved the team and its authoring skills.

If we imagine JIP33 requirement as a triangle, with the base consisting of the verification and the justification. On top of this sits the requirement itself, and at the very tip of the triangle is QVscribe, which takes a very good requirement and makes it perfect.



Lessons Learned

When used in Microsoft Word or Microsoft Excel, QVscribe was a great tool that improved the requirements authoring and reviewing. Once it became embedded in the requirements writing management system, it took the tool to a new level of usability.

By being embedded in the requirements writing tool, this improved the efficiency of the author by allowing real-time modification of requirements. Within a typical project, there can be hundreds of requirements; this real-time efficiency produced measurable reductions in the schedule.

The ability to configure the QVscribe install allows for greater efficiencies. By having configurations that are discipline-specific, words or terms unique to the discipline can be properly recognized. The ability to maintain a shared glossary allows for greater consistency. By centralizing terminology and discipline-specific jargon, teams can reduce miscommunication across projects.

The terms like “hot or cold” by default are considered to be immeasurable quantification. For example, the furnace shall be set to a **hot** temperature.

Whereas when used in the requirement, the motor shaft shall be hot rolled. This is acceptable.

Therefore, by adding ‘hot rolled’ to the glossary list, ‘hot’ is no longer flagged as a problem when used in this acceptable context. This allows authors and reviewers to concentrate on more pertinent issues.

Moving Forward

As the JIP33 project moves towards its next phase, they will focus their attention on term consistency, unit consistency, and similarity using QVscribe.

These features within QVscribe are very powerful and often quick fixes.

Term consistency - lists alphabetically all the terms used within the project. This enables author and the reviewer defined any errors but also to confirm the correct terminology. This is particularly powerful in identifying hyphenated and non-hyphenated terms.

Unit consistency - is particularly useful when working with dual units where the same value is shown using two systems. Since QVscribe will automatically surface each time a unit is found, users can quickly review each unit pair to ensure the values properly match.

Similarity - similarity has two benefits: the first is ensuring that no requirement is repeated; good requirements must be unique. The second benefit is that it quickly and visually shows similar requirements side by side, that helps the author write consistently structured requirements, whether following the EARS [7] philosophy or not.

Going forward, IOGP JIP33 will continue to work with QVscribe in helping them develop software to match the needs of the project.

Conclusion

JIP33 is an excellent example of an organizational opportunity transformed into a learning and ultimately optimization opportunity. This success story highlights the critical importance of balancing experience and constant learning in engineering disciplines. Experience alone is not enough; it must be complemented by continuous learning and the appropriate tools to achieve continual success.

JIP33's approach to standardizing and automating the requirement authoring process and educational path demonstrates how to marry the inherent value of experience with ongoing skill development. The journey of the team and the insights gained from their experience underscore the importance of a growth mindset and continuously seeking opportunities for improvement.

JIP33's confidence in their abilities and tools exemplifies the attitude required to thrive in an ever-changing industry like systems engineering. The significance of error-free and well-articulated requirements is universal. They form the foundation of successful projects in various fields, from software development to aerospace and Original Equipment Manufacturers (OEMs). The key to new heights of success and innovation lies not only in the past but also in the continuous pursuit of knowledge and improvement.

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Steps to Implement based on Case Study

- [ ] 1. Evaluate your current requirement education process.
  - [ ] A) Are your students engaged in active or passive learning?
  - [ ] B) What tools are students given? Are they effective tools?
  - [ ] C) Are your experienced requirement authors producing high quality requirements?
- [ ] 2. Implement an Active learning process.
  - [ ] A) Look for tools such as QVscribe that support learning within the Zone of Proximal Development.
  - [ ] B) Ensure they have a team lead or senior engineer providing further guidance.
  - [ ] C) Develop a learning schedule. For example, starting with an assignment of 10 requirements.
- [ ] 3. Evaluate your process.
  - [ ] A) Has your team fully embraced the new process? What could be holding them back?
  - [ ] B) Set long term team objectives based on feedback from your learning tool.
    For example, Davies used QVscribe reports to find and fix team wide authoring issues.
  - [ ] C) Do your students feel like they are receiving feedback when they need it?

QVscribe

To learn more about QVscribe, visit: https://qracorp.com/qvscribe-features/

QRA engineering intelligence

International Association of Oil & Gas Producers