* **If an environment does not currently engage in solid requirements engineering practices, should tools be introduced?**

No. Whatever requirements engineering tool(s) you use, it is appropriate to use the tool judiciously and follow certain best practices. An excellent set of such practices is offered by Cleland-Huang et al. (2007):

Trace for a Purpose: That is, determine which linkages are truly important; otherwise, a large number of extraneous links will be generated.

Define a Suitable Trace Granularity: For example, linkages should be placed at the appropriate package, class, or method level.

Support In-Place Traceability: Provide traceability between elements as they reside in their native environments.

Use a Well-Defined Project Glossary: Create the glossary during initial discovery meetings with stakeholders and use it consistently throughout the requirements engineering process.

Write Quality Requirements: Make sure to follow generally accepted best practices such as IEEE 29148, which are particularly important for traceability.

Construct a Meaningful Hierarchy: Experimental results show that hierarchically organized requirements are more susceptible to intelligent linking software.

bridge the Intradomain Semantic Gap: For example, avoid overloaded terminology, that is, words that mean completely different things in two different contexts.

Create Rich Content: Incorporate rationales and domain knowledge in each requirement.

Finally, be sure to use a process improvement plan for improving the requirements engineering process. Following disciplined practices can result in better results from tool usage and a framework from which processes can be improved. Every project plan should include a description of the tools to be used and how they will be used.

* **What sort of problems might you find through a traceability matrix that you might not see without one?**

A traceability matrix serves as a valuable tool in requirements management, allowing project teams to establish and visualize relationships between various artifacts, such as requirements, stakeholders, standards, and regulations. By employing a traceability matrix, several problems and challenges can be identified that might not be apparent without one:

Incomplete Requirements Coverage: A traceability matrix can reveal gaps in requirements coverage. Missing links between requirements and stakeholders, standards, or regulations can indicate areas where the project lacks clarity or alignment with external guidelines.

Inconsistencies and Conflicts: Conflicting requirements or inconsistencies between different stakeholders' needs can be highlighted through traceability. When requirements are traced back to multiple sources or stakeholders, conflicts in expectations can become evident, allowing teams to resolve these issues early in the development process.

Redundant or Overlapping Requirements: Redundant requirements, where similar functionality is specified in multiple places, can be identified through traceability. Overlapping requirements might indicate a lack of coordination among stakeholders or inefficient communication between team members.

Impact Analysis: Traceability matrices can help assess the impact of changes. When a requirement is modified, its relationships with other requirements, design elements, or test cases are affected. Traceability allows teams to analyze the potential ripple effects of a change, aiding in risk assessment and project planning.

Inadequate Test Coverage: Requirements-Test Cases Traceability helps in evaluating test coverage. If certain requirements are not linked to any test cases, it indicates that those requirements have not been adequately validated. This insight enables teams to enhance their testing strategies.

Lack of Stakeholder Involvement: Traceability matrices can reveal gaps in stakeholder involvement. If requirements are not linked to specific stakeholders, it might indicate that certain perspectives or needs have not been adequately considered, leading to potential dissatisfaction or misunderstandings later in the project.

Compliance Issues: For projects subject to safety standards and regulations (such as DO-178C, ISO 26262, and IEC61508), traceability matrices can identify non-compliance with required traceability links. This is crucial for projects where adherence to specific standards is mandatory for certification or regulatory approval.

Insufficient Rationale or Justification: Traceability matrices often include the rationale for each requirement. If a requirement lacks clear justification or rationale, it might raise questions about its necessity, leading to further analysis or clarification discussions with stakeholders.

In summary, a traceability matrix acts as a lens that magnifies the relationships between different project elements. By using it, project teams can proactively address issues related to requirements completeness, consistency, coverage, and compliance, ultimately leading to better project outcomes.

* **How is AI being proposed for knowledge acquisition and representation in requirements specifications?**

Recent research studies are investigating how human intervention in the requirement gathering processes can be reduced by using “Speech Understanding Methodology” techniques with the capability to “listen in” on a conversation and suitably collect.

Speech understanding methodology can be combined then with “Automatic Keywords Mapping,” another AI technique being investigated that can enhance the requirements elicitations. Many requirements issues are related to not having the stakeholders able to depict their requirements properly, or the ignorance of the domain experts and developers to “observable” words that lead essentially to system requirements. These issues can be eliminated by automatically mapping every keyword spoken by each stakeholder. The earlier studies released a keyword mapping technique for designers so that they can recognize the keywords used by stakeholders to assist them in making ideal requirements stakeholders’ declarations into a distinct vision

Case-based reasoning is also being investigated for requirement elicitation, which can reduce the problem of natural language understanding as well as save the time of the requirement expert. There has also been recent research on the use of machine learning algorithms to identify user preferences based on their sentiment