

**Reference:** QSE:pro.AI

**Topic:** pro.AI: Processes Understanding and Improving with Simple Language and AI (LLMs and Agentic Workflows)

**Course Type:** Bakk-/Master Thesis, ASE or CS Project

**Start:** As soon as possible

**End:** To be defined

**Contact:** Stefan Biffl ([stefan.biffl@tuwien.ac.at](mailto:stefan.biffl@tuwien.ac.at))

## Background

Improving *knowledge-intensive processes* (KiPs) [1] or complex systems requires an analyst equipped with a clear solution architecture and effective methods to elicit tacit knowledge from domain experts. However, analysts often aim to deploy advanced engineering models [2, 3] but lack deep domain knowledge, while domain experts possess critical insights but are non-experts in modeling. To bridge this gap, the analyst requires both (i) advanced models to design robust solution architectures and (ii) simple language to interact effectively with diverse non-expert stakeholders [4]. AI capabilities (such as LLMs and agentic workflows) can directly support this knowledge elicitation and validation process [5].

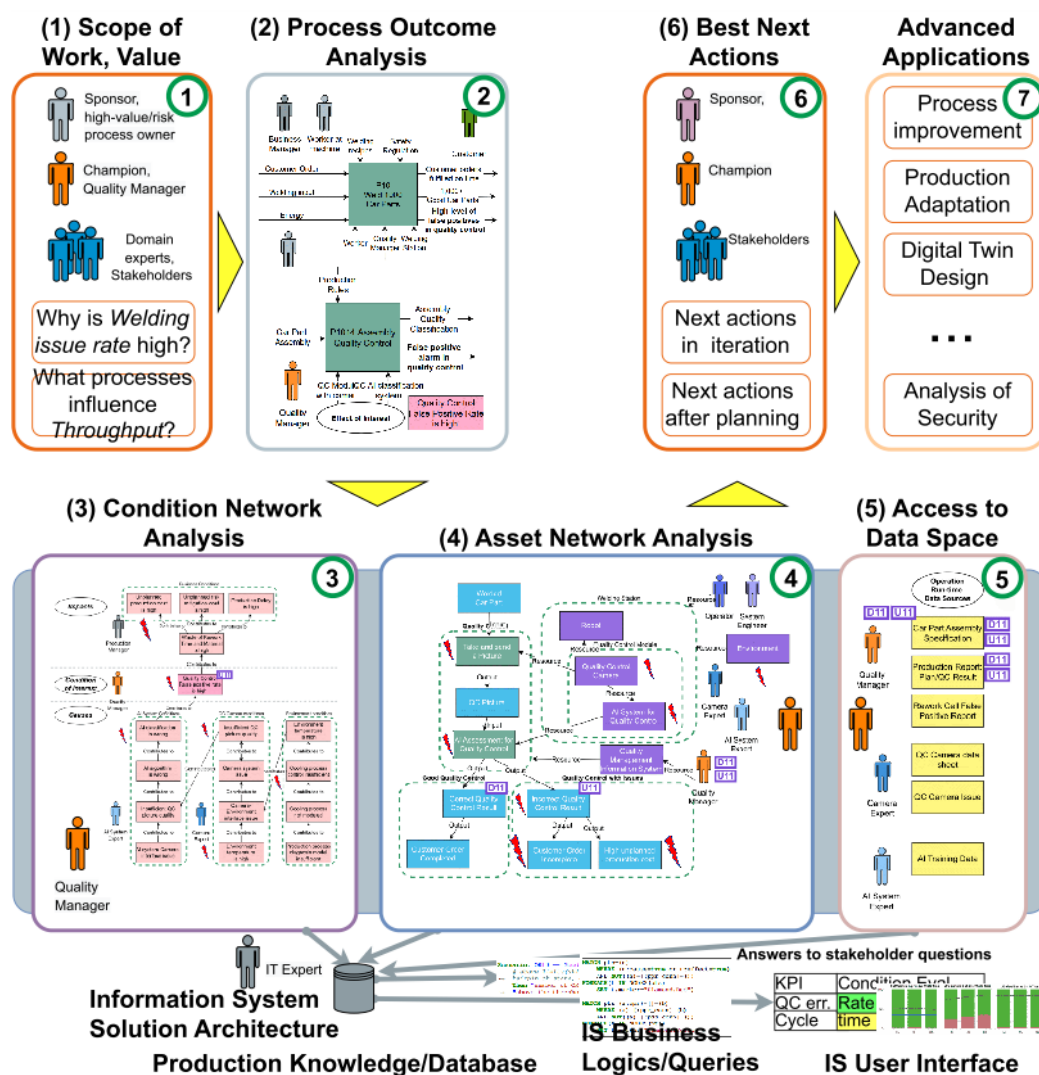


Figure 1: Business process analysis for improvement.

## Goal

The primary objective of this project is to design and validate a **tutorial for analysts** (both junior and senior experts in business process modeling) on a structured method to elicit domain knowledge required for process and system improvement [6].

The process follows structured *WinWin iterations* [6] comprising:

1. An initial meeting with the sponsor to determine the scope of work.
2. Focus on a use case selected with *key performance indicator* (KPI) pain points [8, 9].
3. Iterative *procan.do Business Intelligence* (PBI) [6] with liability shifting for the use case.
4. Scenario modeling [7] for determining the best next steps.

Key operational activities include:

- *Questionnaires*: Design questionnaires for sponsors and domain experts.
- *Analyst Modeling*: Developing formal solution architecture models (as-is and to-be).
- *Stakeholder Collaboration*: Work sessions with sponsors and domain experts.
- *Reporting*: Delivering iteration reports to the sponsor and domain experts.

## Illustrative Use Cases

To ensure grounding in practical application, candidate projects can explore one or more of the following domains:

1. *Business Process Improvement*: Improve production, service provision, teaching, or administration processes using business process performance models and data analysis.
2. *DevOps for Software-Intensive Systems*: Enhancing software development workflows as well as software operation and maintenance processes.
3. *TU Racing Team Applications*: Optimizing co-engineering processes (e.g., coordination and scheduling of high-volume simulations) and driverless electric racing car performance.

## Tasks

As a Software Engineering or Information Systems Engineering thesis project, the tasks involve:

- **Questionnaire Design**: Designing and validating questionnaires for sponsors and domain experts based on literature inputs [1, 6, 8, 9].
- **Analyst Modeling**: Designing and validating effective models for the analyst based on *procan.do Business Intelligence* etc. [3, 4, 5, 6, 7].
- **AI Solution Architecture**: Designing solution architectures evaluating key AI solution options, including LLM/prompting, agentic workflows, and AI training [5].
- **Non-Expert Method Design**: Designing and validating accessible models and methods that operate effectively when interacting with non-experts in modeling [4, 9, 10, 11].
- **Reporting Options**: Designing and validating communication and reporting options to convey analysis results to project sponsors and stakeholders [1, 2, 3].

## Expertise

This project offers students an opportunity to check their existing capabilities and build skills across:

- Business process modeling
- Solution architecture modeling
- AI solution implementation options (LLMs, prompts, agentic workflows, AI training)

For this topic, a set of skills is recommended (at least two are mandatory).

- Software development, testing and quality assurance.
- LLMs and AI agents: prompting, tool use, MCP, and agentic workflows.
- Interest in Software and systems engineering modeling standards (e.g., UML, IDEF0, SysML)
- Interest in AI-driven process improvement.

## References

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