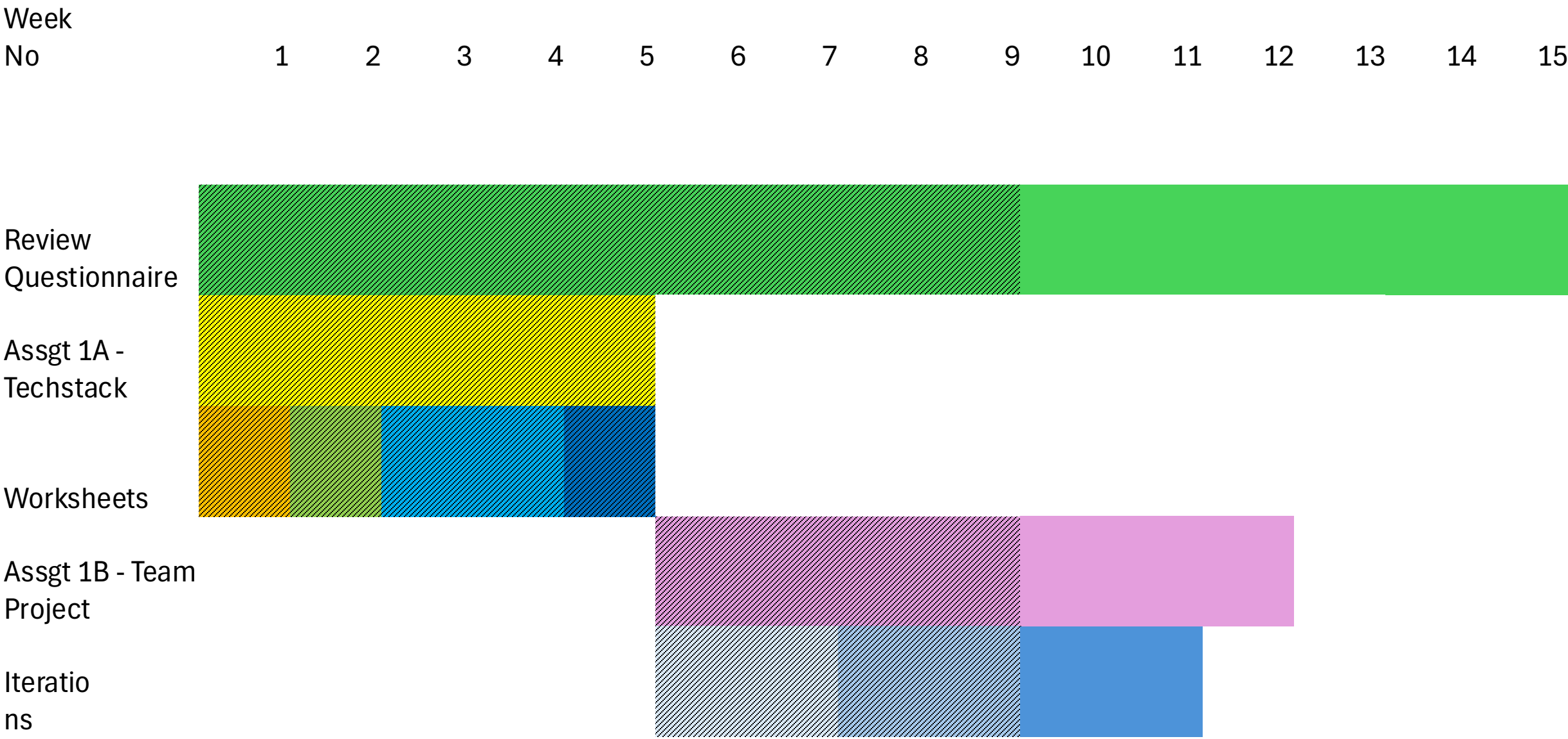
Software Risks and Scale

Week 10

Taking Stock



Software and Risk - Definitions?

In risk analysis and mitigation literature the primary focus is on the project development vision defined in terms of budget and schedule overruns and not on satisfying the customer by meeting technical requirements.

Henry [2004] defines project risk as

> "an event, development, or state in a software project that causes damage, loss, or delay."

Schwalbe [2004] also defines 'project risk' as

> "…problems that might occur on the project and how they might impede project success."

Gotterbarn, D., & Rogerson, S. (2005). Responsible Risk Analysis For Software Development: Creating The Software Development Impact Statement. *Communications of the AIS, 15*, 730-750.

Software and Risk – Traffic Control scenario

…traffic control software to direct traffic approaching a multi-lane bridge into the least congested lanes to facilitate a maximum and continuous traffic flow across the bridge, especially in rush hours.

From this description we would identify stakeholders in this software as including:

- vehicle drivers traversing the bridge,
- Bridge maintenance people,
- and the city traffic authority.

It is also straightforward to define success criteria for this software. They might include:

- the system works well in its context;
- it does not promote vehicle accidents;
- the project was delivered on time;
- the project was within budget;
- and the cost/benefit analysis was accurate showing that those developing the system could expect a
- reasonable return on investment.

The system met all of these conditions and yet it was judged a failure. Why?

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Software and Risk - Traffic Control Gone Wrong?

The system needs to manage large amounts of traffic moving through 20 lanes. Cars go over the bridge at two levels. The computer must make continuous interactive rapid and accurate processing decisions about such quantities as lane capacity, average speed of the lane, stopped lanes, taking lanes out of use, changing directions of lanes to account for rush-hour flows.

The system was installed and worked well until the system was required to manage constant heavy traffic loads for 8 hours during **an emergency nuclear disaster evacuation exercise.**

In **the eighth hour the software changed lane directions** for lanes already filled with cars and the misdirection and accidents **clogged the bridge for almost 20 hours**.

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Software and Risk – Cold Reboot Needed?

In the eighth hour the software changed lane directions for lanes already filled with cars and the misdirection and accidents clogged the bridge for almost 20 hours.

- The crystal clock used for the timing of these decisions would
- gradually go out of synchronization with 7 or more hours of continuous use.

The developer was fully aware of this problem.

To meet the problem, **the developer specified in the User Manual that the software should be briefly stopped and restarted after 6 hours of continuous heavy traffic loads.** This action would reset the clock and no problem would be encountered.

Gotterbarn, D., & Rogerson, S. (2005). Responsible Risk Analysis For Software Development: Creating The Software Development Impact Statement. *Communications of the AIS, 15*, 730-750.

Software and Risk – Documentation Fix?

To meet schedule and budget constraints, **the bridge software developers opted merely to place a warning in the user manual rather than provide a software solution.**

The primary goals were to deliver the system on time, within budget, and satisfying the customer.

The focus of the risk analysis and mitigation narrowed to those many issues which impact these goals negatively and risks that would derail the project's development.

This narrowing of focus to development risks is canonised in many information systems and software development textbooks and risk management articles

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Software and Risk – All Stakeholders?

Software development's shift of project vision contributed to the narrowing of focus on specific types of risks, an **emphasis on quantifiable risk** almost to the **exclusion of qualitative risk**.

This emphasis on quantitative risk contributes to an underestimating or ignoring of the need to consider risks to extra-project stakeholders in the development of the software.

Schmidt points out that the "[f]ailure to identify all stakeholders: Tunnel vision leads project management to ignore some of the key stakeholders in the project, effecting requirements, and implementation, etc." [Schmidt et al. 2001 p 15]

Project risk analysis must be expanded beyond the traditional risk analysis to include a broader scope of risks and stakeholders.

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Software and Risk Generic Models?

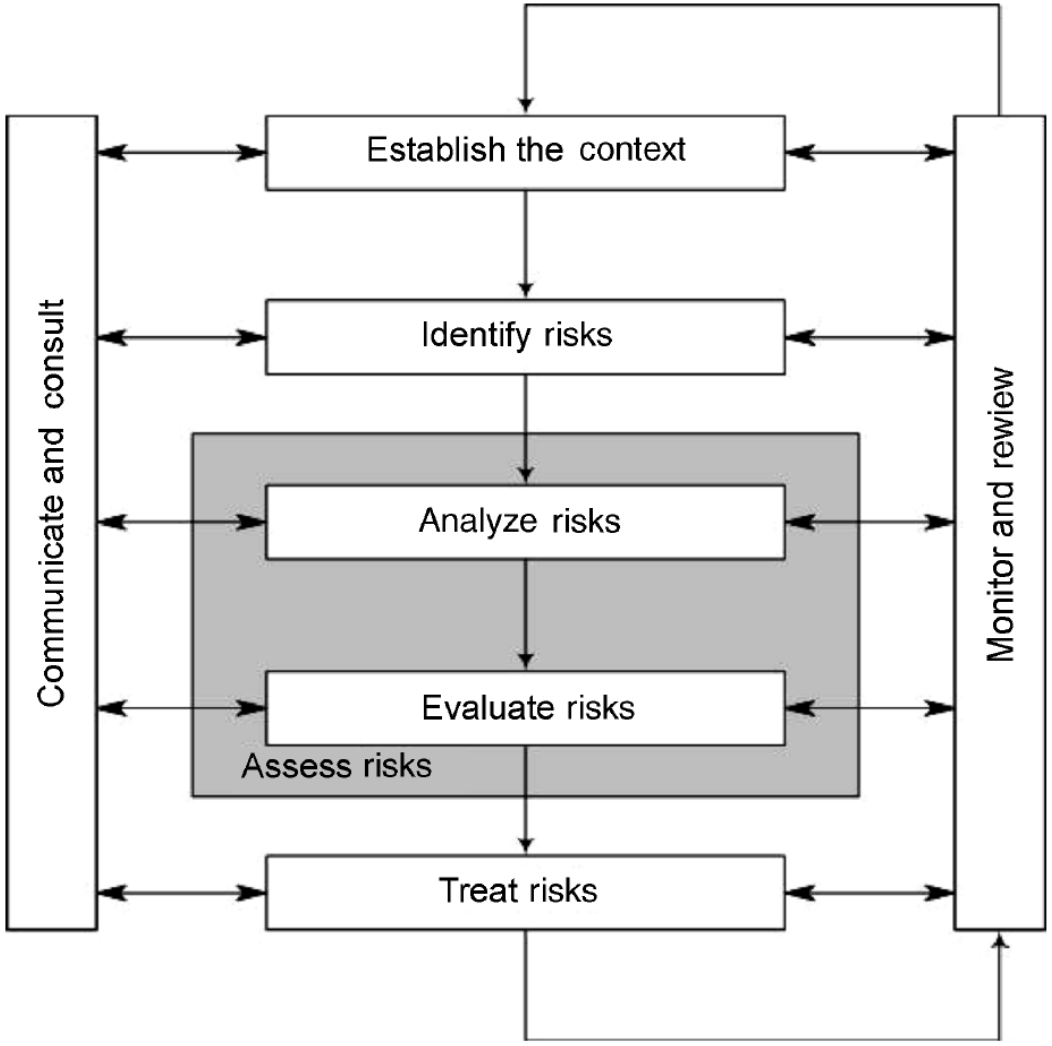

FIGURE 18.1 Risk management (AS/NZS, 1999 p.16).

Gotterbarn, D., Clear, T., & Kwan, C. (2008). A Practical Mechanism for Ethical Risk Assessment - A SoDIS Inspection In K. Himma & H. Tavani (Eds.), *The Handbook of Information and Computer Ethics* (pp. 429-472). John Wiley & Sons.

Software and Risk - Security Risk Lifecycle?

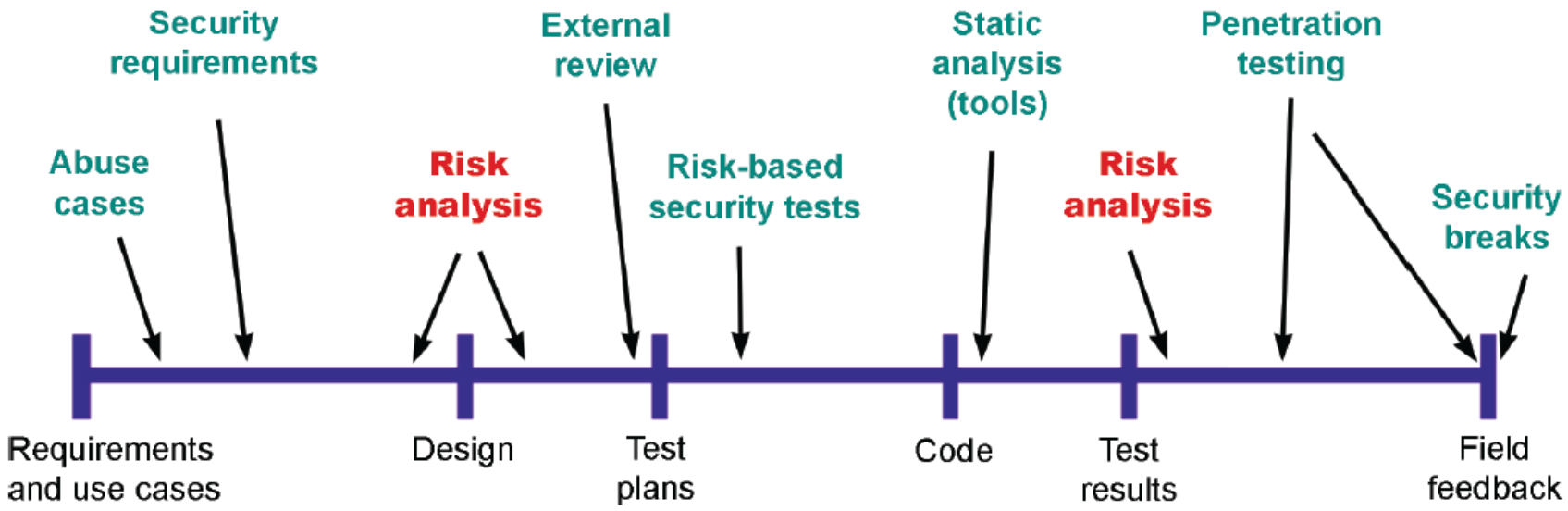

FIGURE 18.2 Hilson's security life cycle.

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Software and Risk – Stakeholders and SoDIS?

During the SoDIS Audit process, the SPA forces the analysts to first identify potential stakeholders for this project. The SPA aids the process by providing a partial list of stakeholder types that have been associated with that type of project. Once the stakeholders have been identified, the analysts examine questions that can be either task (hotspot) focused or stakeholder focused. In answering the questions the analysts seek to identify and note potential negative consequences for the identified stakeholders or for the project and, where possible, suggest solutions for the identified items.

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Software and Risk – SoDIS Inspection?

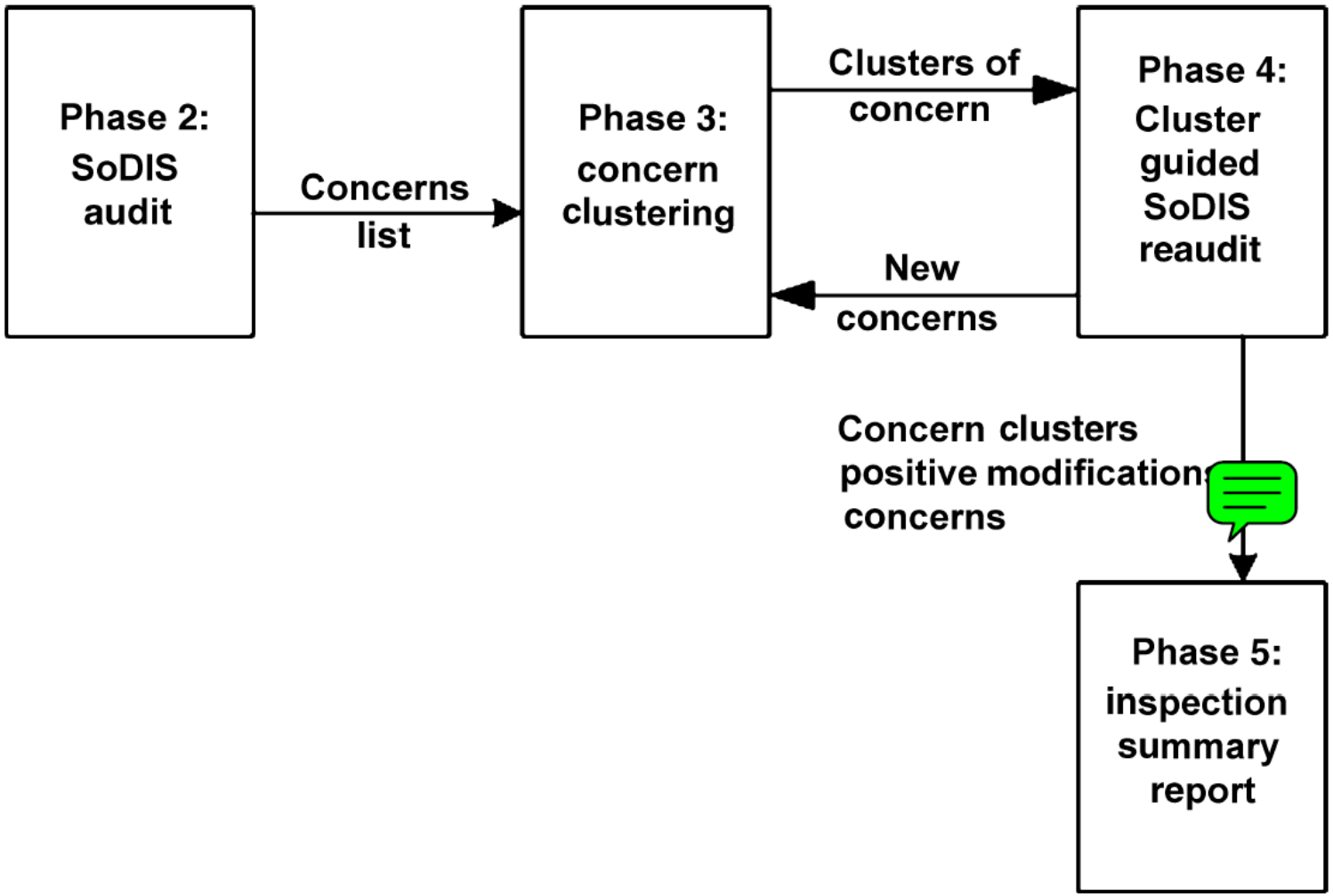

FIGURE 18.8 SoDIS inspection phases 2–5.

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Concluding: Software Projects – Student & Risks?

Recent work by New Zealand researchers

- **Student projects and risk management**
- **Derived a set of risk categories**
- **Conclusions include:**

  In terms of the Risk Framework's impact on student performance in the course, we found that ***teams with poor risk management strategies tended to perform worse in the project overall****, and had a much higher chance of contacting the course instructor during the semester to* ***report significant issues within the team****. (Kirk et al., 2024)*

- **Risk categories tabulated next slide…**

Kirk, D., Luxton-Reilly, A., & Tempero, E. (2022). *Refining a Risk Framework for Student Group Projects* Proceedings of the 22nd Koli Calling International Conference on Computing Education Research, Koli, Finland. https://doi.org/10.1145/3564721.3564730

Kirk, D., Luxton-Reilly, A., Tempero, E., Crow, T., Denny, P., Fowler, A., Hooper, S., Meads, A., Shakil, A., & Singh, P. (2024). Educator Experiences of Low Overhead Student Project Risk Management. Proceedings of the 26th Australasian Computing Education Conference,

Table 1: Kirk et al. Risk Categories Description [10, 11]

Category	*Description*
Student Contribution	Student contribution to project.
Engagement	Commit to project as a result of mental state, for example, interest, conscientiousness, motivation.
Expertise	Ability to execute tasks to be carried out. Dimensions include knowledge, experience, familiarity with technology.
Personality	Personal attributes that contribute towards team dysfunction or ineffective participation, for example, team members who prefer to work in isolation, are too shy to speak in meetings or are resistant to complying with decisions.
Availability	Degree to which student is available to the project caused by external factors. Examples are students taking several courses with limited time for the project, time differences, family illness causing student to be unable to contribute or communicate.
Wellbeing	Student health issues that affect their contribution.
Team Self-management	Ability of team to self-manage effectively.
Communication	Success of stakeholder communication. Relates to failure to plan communications mechanisms or execute these as planned.
Co-ordination	Success of coordinating project tasks. Examples include version control, responsibilities, task scheduling. Work not well coordinated on large multi-team projects.
Co-operation	How well students agree and treat each other with respect. Factors include differing viewpoints and interpretations due to cultural, background and personality differences.
Process	Success of execution of planned project tasks. Issues include uneven distribution of workload and individuals not completing agreed tasks on time.
Clarity	Degree of clarity around project activities and structure. Examples are not defining activities well, documentation expectations, confusion around role of lecturer.
Resources	Failures with required resources.
Hardware	Unforeseen issues with equipment. Examples are hard disks, internet connections and not having needed equipment.
Software	Unanticipated software issues, for example, using third party components.
Technology	Unforeseen technology issues, for example, technology changing too fast.
Stakeholder Contribution	Clients and lecturers contribution to project.
Commitment	Willingness to commit to project, for example, interest, conscientiousness, motivation.
Expectations	Stakeholder expectations of the project.
Expertise	Capability with respect to the application. Dimensions include knowledge, experience, familiarity with technology.
Availability	Degree to which stakeholder is available to the project

Questions and Comments….