

Systemic Risks in Mining

The effect of digital transformation in mining on systemic project risks



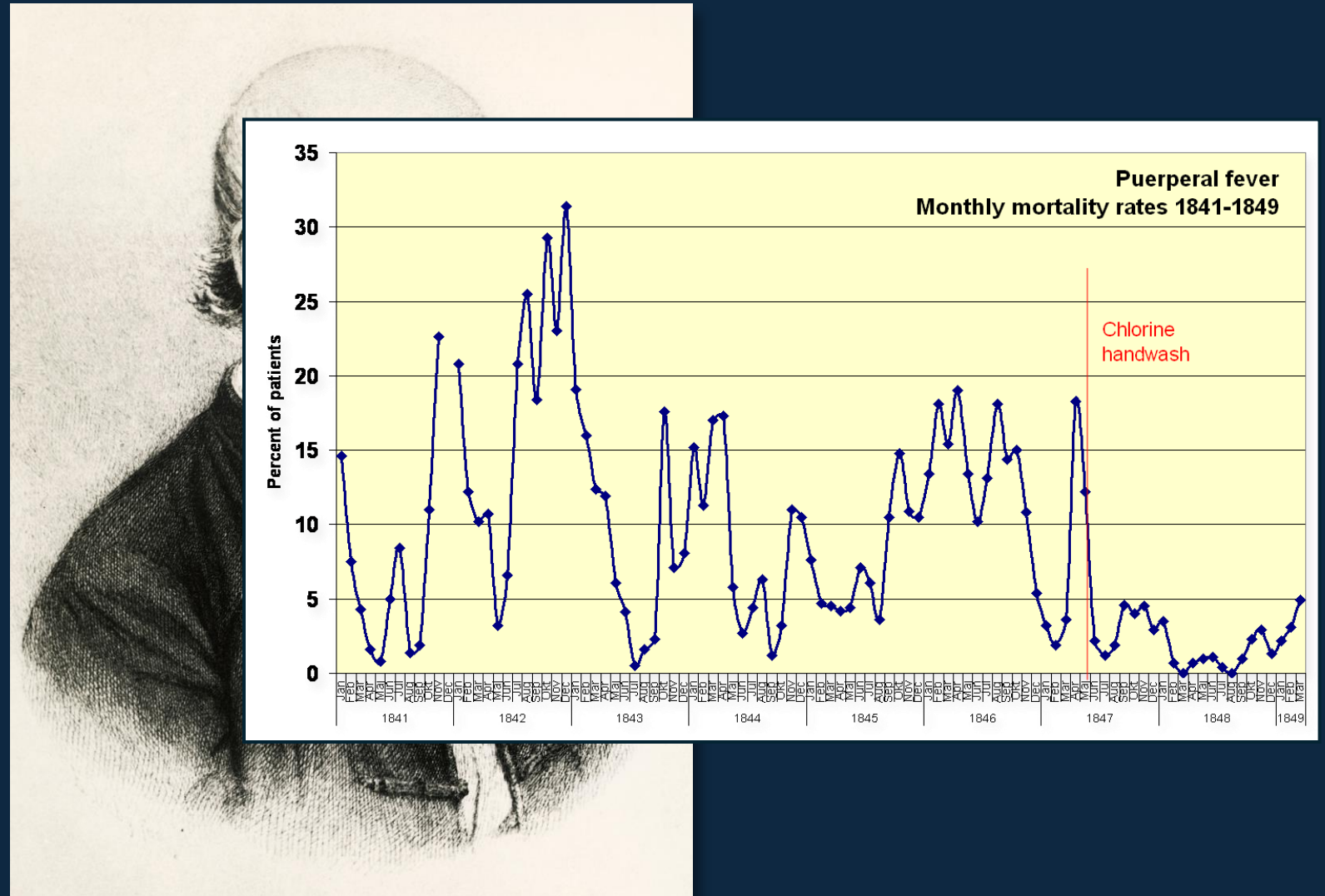
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ProjectLink
Making Project Management Work

THE INVISIBLE HAND OF RISK



Ignaz Semmelweis (1818 – 1865)

SYSTEMIC RISKS

Cost Estimate

Schedule

Project Risks

Systemic Risks

“Risks that arise from the overall structure, interdependencies, and inherent complexities of a project or project environment rather than from individual events.”

AACE International



1. Interdependencies
2. Structural Complexity
3. Governance and Decision making
4. Industry and Economic Factors
5. Resilience and Adaptability

A STUDY OF SYSTEMIC RISKS IN MINING PROJECTS

18 Factors assessing systemic risk.

Developed from several studies of capital project failure.*

241 mining projects in Feasibility Phase.

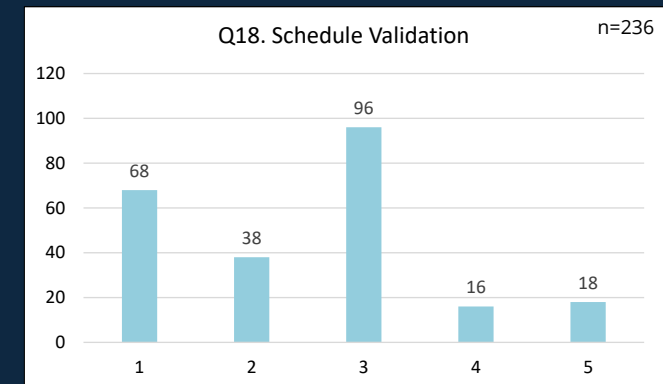
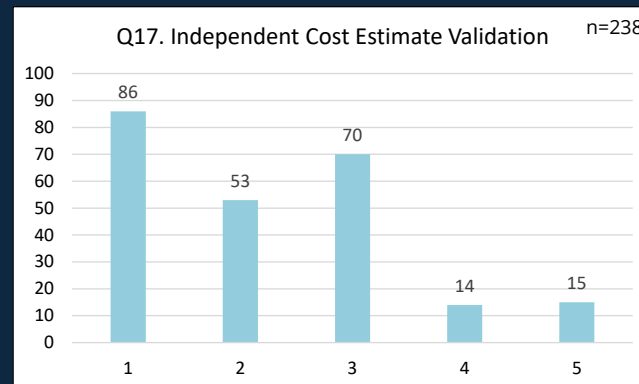
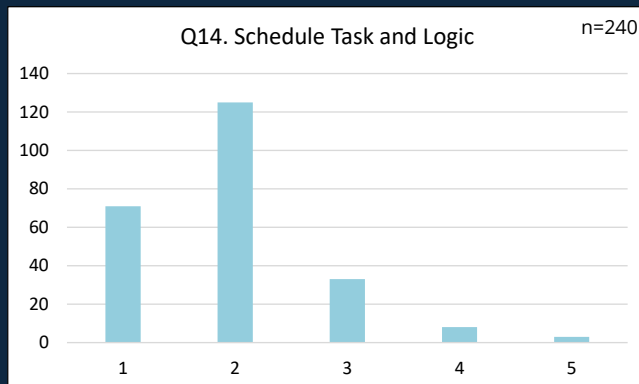
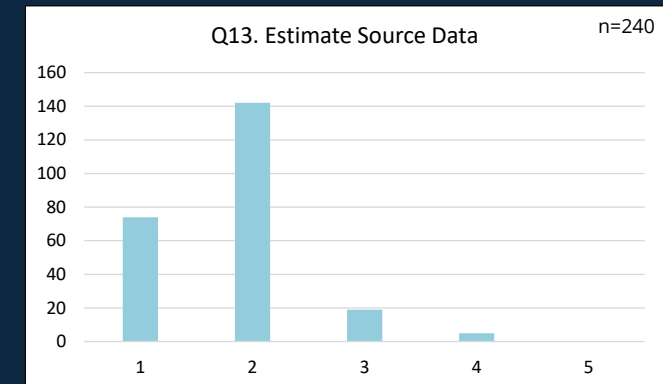
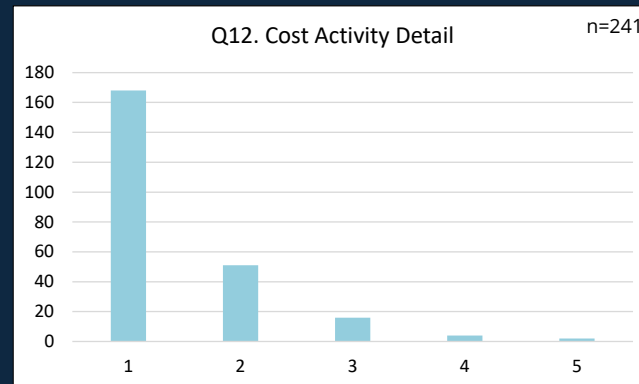
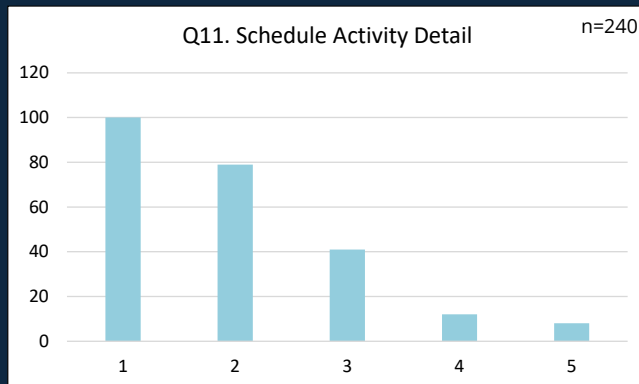
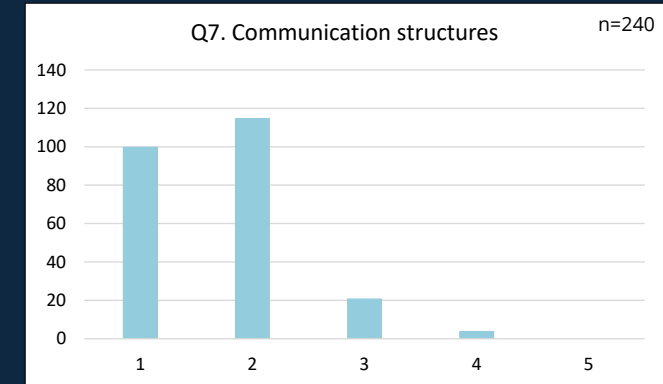
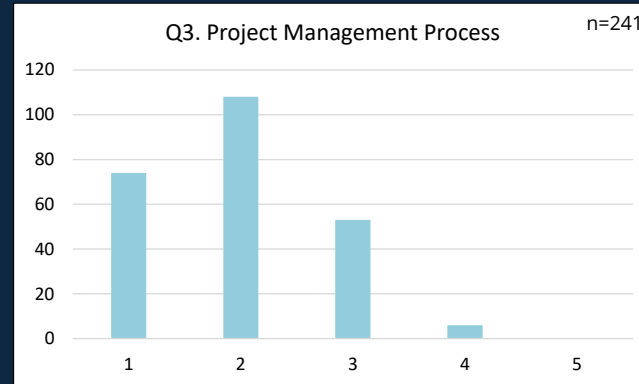
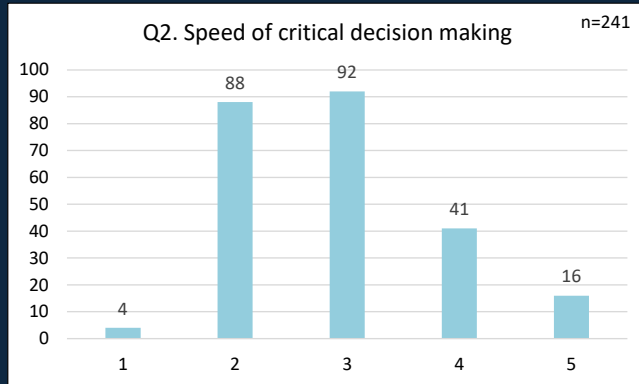
*Notably the following: Trost and Oberlender (2003), Arif et al. (2015), Doloi (2013), Lindhard and Larsen (2016), Radujković et al. (2021), Rehan, Thorpe, Heravi (2024)

SUMMARY OF RESULTS

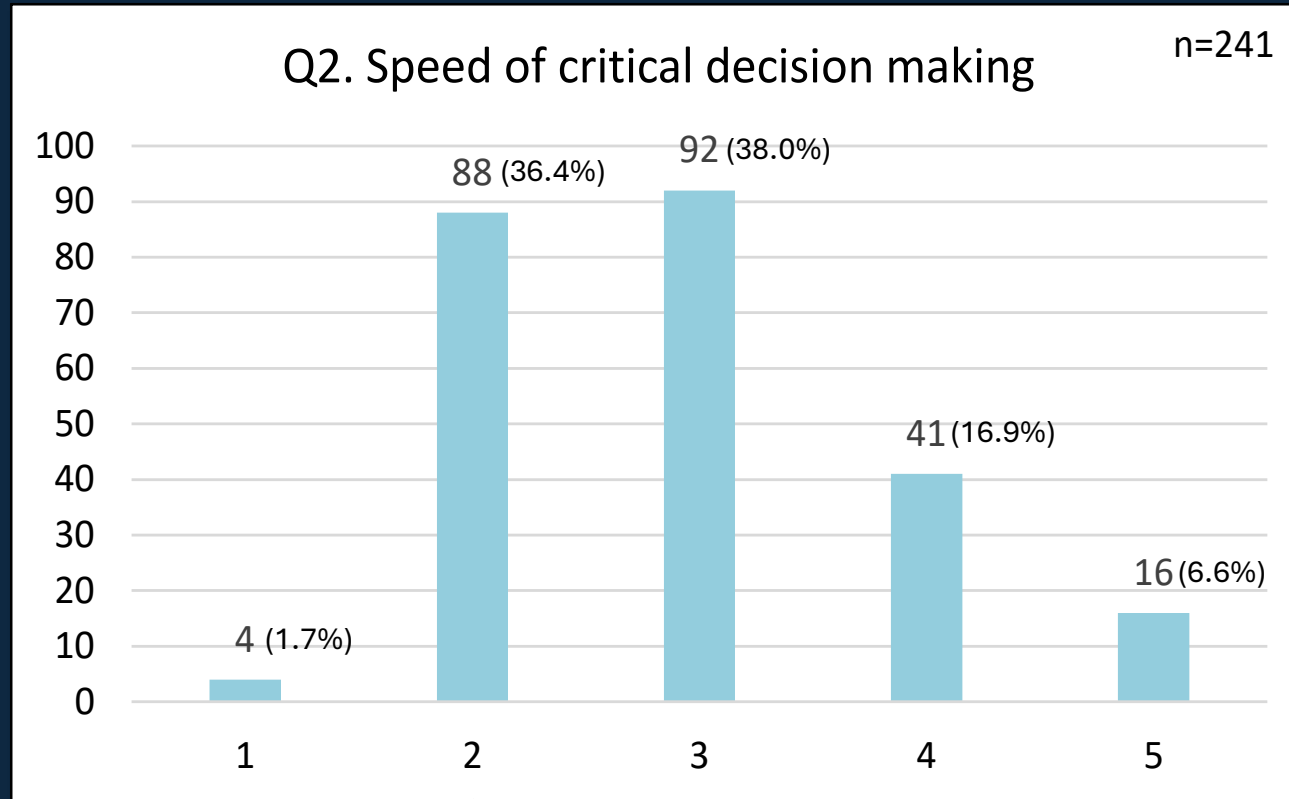
Systemic Risk Factor	1	2	3	4	5
Q1. Project team history working together	27	74	67	67	6
Q2. Speed of critical decision making	4	88	92	41	16
Q3. Project Management Process	74	108	53	6	-
Q4. WBS Representation	72	137	17	9	5
Q5. Current socio-economic environment stability	21	92	66	52	5

Systemic Risk Factor	1	2	3	4	5
Q18. Independent Schedule Validation	68	38	96	16	18
Q9. Contracting Complexity	22	140	58	10	11
Q10. Contracting Strategy	10	39	122	67	3
Q11. Schedule Activity Detail	100	79	41	12	8
Q12. Cost Activity Detail	168	51	16	4	2
Q13. Estimate Source Data	74	142	19	5	-
Q14. Schedule Task and Logi Data	71	125	33	8	3
Q15. Budget Target Values	39	111	58	21	9
Q16. Schedule Target Duration/End Date	23	84	61	42	26
Q17. Independent Cost Estimate Validation	86	53	70	14	15
Q18. Independent Schedule Validation	68	38	96	16	18

FACTORS AFFECTED BY DIGITISATION



CRITICAL DECISION MAKING



Decisions by the project sponsor:

5: More than 20 days

4: 10 to 20 days

3: 6 to 10 days

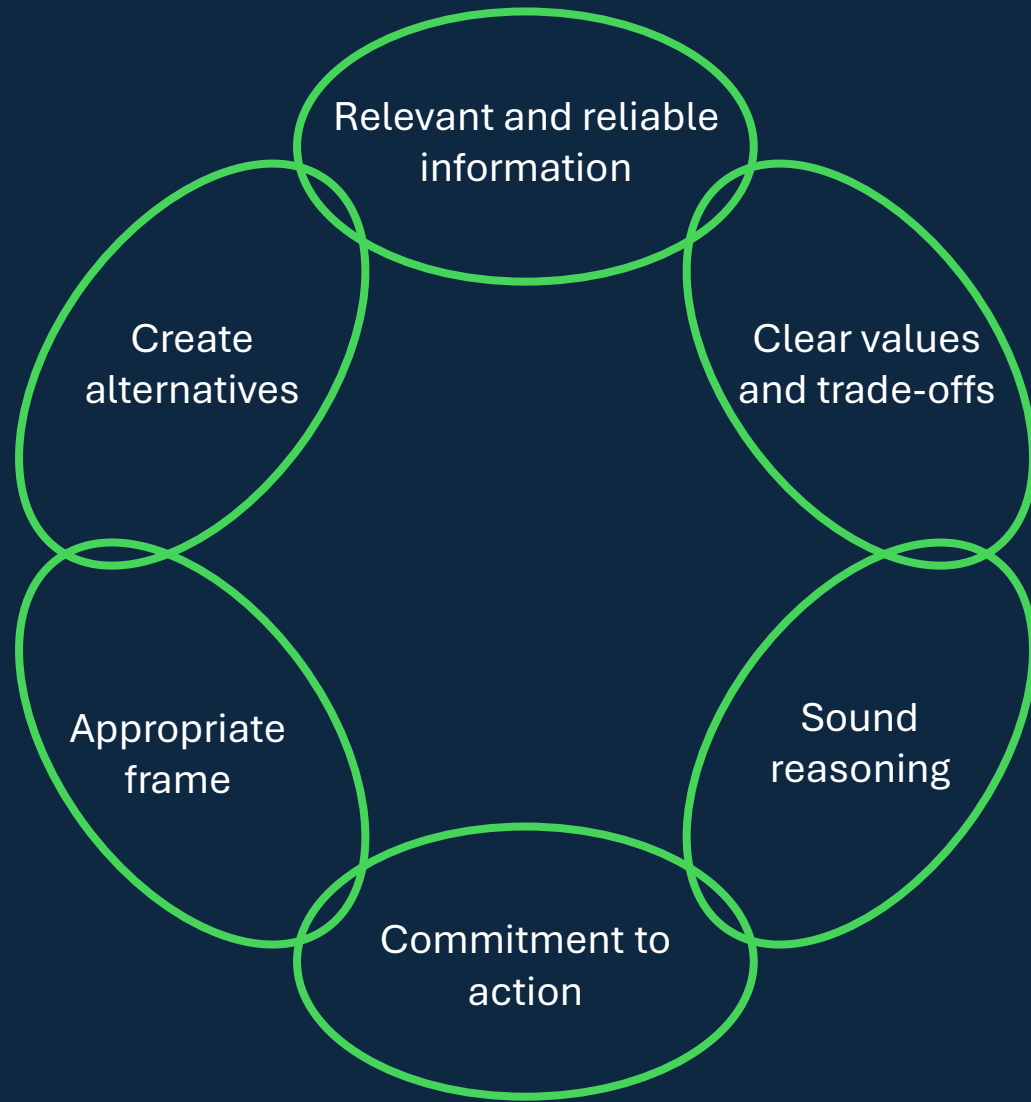
2: 2 to 5 days

1: One day



Schedule increase at P50 (uncorrelated)

QUALITY DECISIONS



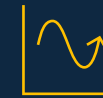
Operations



Production



Health and Safety



Commodity price



Available capital



Profitability

Spetzler, C. S., Winter, H. A., & Meyer, J. L. (2016).
Decision Quality: Value Creation from Better Business Decisions.

EFFECT OF DIGITISATION ON DECISION MAKING

	Decision Quality Element
Faster access to relevant data	Relevant and reliable information.
Improved cross-functional communication	Commitment to action. Relevant and reliable information.
Digitized governance	Clear values and trade-offs.
Real-time scenario modeling	Create alternatives. Sound reasoning.

Williams, Ackermann & Eden (2003), Pinto (2007), Kutsch & Hall (2010) , Winch (2010), Denicol, Davies & Krystallis (2021), Colombari et al. (2023), Bondar et al. (2024).

RISKS INTRODUCED BY DIGITISATION

Data quality and integrity

Tool Fragmentation & Integration Gaps

Over-reliance on Technology

Loss of Tacit Knowledge

Digital Skill Gaps

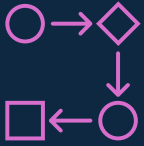
Decision Transparency & Bias in Algorithms

Cybersecurity Threats

Change Fatigue

Williams, Ackermann & Eden (2003), Pinto (2007), Kutsch & Hall (2010), Winch (2010), Denicol, Davies & Krystallis (2021), Colombari et al. (2023), Bondar et al. (2024).

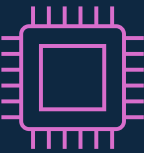
SUMMARY



Systemic Risk: when the structure of a system leads to failure.



Decision **speed** and **quality** are systemic risks.



Digitisation is essential for reducing systemic risks in mining operations and projects.

If your digital transformation journey isn't
enhancing your ability to make faster,
high-quality decisions, then it is just a journey,
not a transformation.

