33rd IPMA World Congress 2024

Cape Town, South Africa

(27 – 29 November 2024)

Decision Making: An Area of Improvement for Project Management

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Contents

1. Introduction

- **There are many challenges are encountered in the process of managing projects** resulting in poor project performance, cases of which are abundant.
- Many of the documented causes of poor project performance can, arguably upon adequate analysis, be **tracked down to decision making, be it lack thereof or simply poor decisions**.
  - ✓ Stingl and Geraldi (2017) highlighted the "**problem of indecisiveness, delayed decisions, or defensive decision making**" in projects, & called for research to investigate the root causes.
  - ✓ We ask: How knowledgeable are the project actors about decision problem recognition and formulation, decision-making processes, and decision problem-solving techniques?
- There are a number of **international repositories of project management knowledge, quite useful** to project management actors, e.g.:
  - ✓ Association for Project Management (APM) Body of Knowledge (APMBoK) (APM, 2019);
  - ✓ International Project Management Association's (IPMA) Individual Competence Baseline (ICB) (IPMA, 2015); and
  - ✓ Project Management Institute's (PMI) A Guide to the Project Management Body of Knowledge (PMBOK Guide) (PMI, 2021), among others.

1. Introduction

❑ **Decision making is inherent to**:

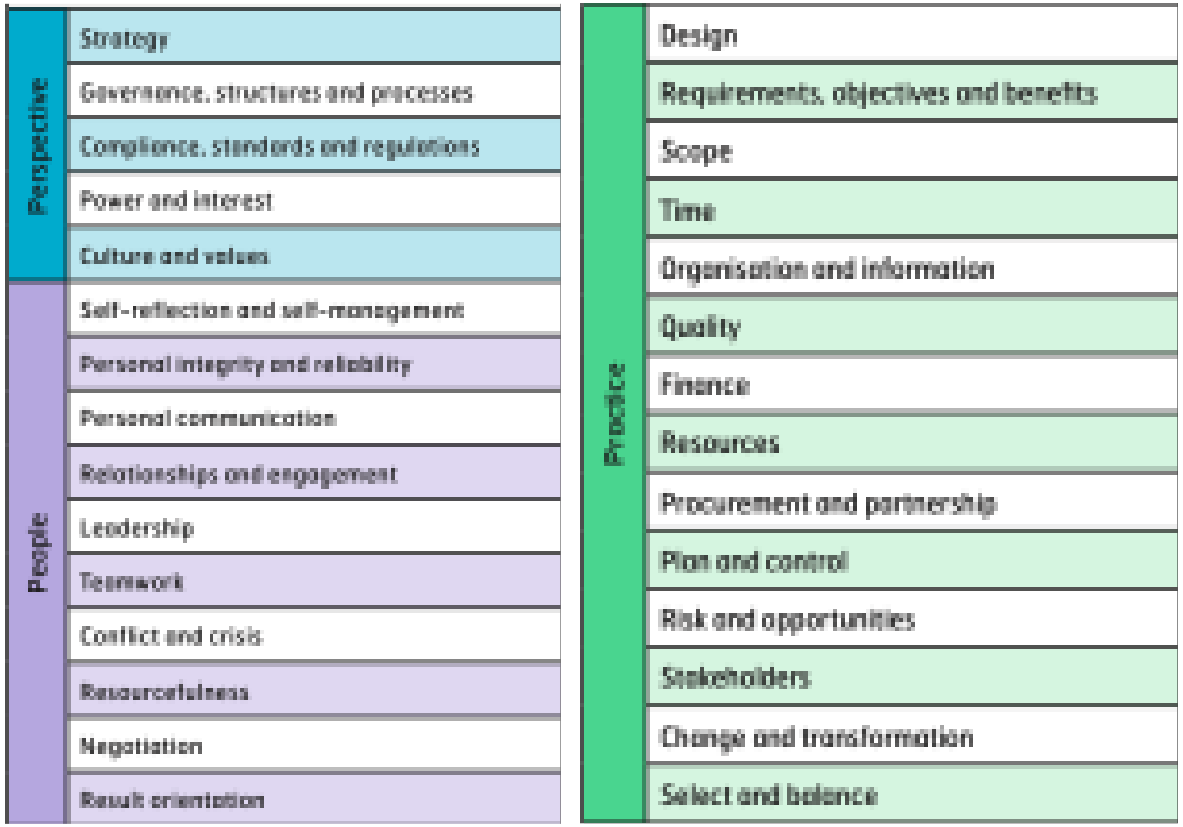
all project based working (projects, programmes & portfolios) (APMBoK 7th Ed.):

1. Setting Up for Success.
2. Preparing for Change.
3. People and Behaviours.
4. Planning and Managing Deployment.

all the 8 project performance domains (PMBOK Guide 7th Ed.):

1. Stakeholders
2. Team
3. Development Approach & Life Cycle
4. Planning
5. Project Work
6. Delivery
7. Measurement
8. Uncertainty

all the 29 competence elements for each of the three domains – project*, programme and portfolio management (ICB Version 4.0



* 'Select and balance' is not applicable to project management.

❑ Do the current repositories of project management knowledge adequately cover decision making?

1. Introduction

- The objectives of this paper are to:
  1. **investigate the different types** of decision problems in projects.
  2. **investigate the appropriate process and techniques** for making rational and optimal decisions.
  3. **assess if the existing** key international repositories of project management knowledge adequately cover the identified decision problems, decision-making process and techniques for making rational and optimal decisions.

2. Research Method

- Systematic literature review:
  - ✓ **Literature sources from the top 3 project management journals**, with regards to the Journal Citation Report (JCR) 2022 Journal Impact Factor (JIF) Ratings searched though Web of Science Core Collection:

Journal	JCR Journal Impact Factor (JIF)	JCR JIF Without Self Citations
International Journal of Project Management	8.0	5.9
Project Management Journal	5.0	4.3
International Journal of Managing Projects in Business	2.7	2.3

  - ✓ **Search keyword: "decision*",** similar to Stingl and Geraldi (2017).
  - ✓ Time period set for the keyword searches: **January 2019 to May 2024**.
  - ✓ **835 journal articles identified**; reduced to 79 through abstract and keyword screening, and finally to 27 following reading and checking for relevance to our research questions.
  - ✓ **12 additional articles identified through reference snowballing**, similar to Stingl and Geraldi (2017), yielding a final sample of 39 articles.

2. Research Method

- Subsequent to the literature review, we **assessed the following 3 leading international repositories of project management knowledge** to reveal whether they adequately cover the findings from the literature review:
  - ✓ APM's APMBoK 7th Edition,
  - ✓ IPMA's ICB Version 4.0, and
  - ✓ PMI's PMBOK Guide 7th Edition.

3. Literature Review

3.1 Decision problems in projects

- A wide range of decision problems in project environments (presented later in the Results section):
  - ✓ from project selection (Barton et al., 2019); Liu et al., 2019; Volden, 2019);
  - ✓ to project termination (Delerue & Sicotte, 2020); Gonzalo Ruiz Dıaz, 2020; Cornelio et al., 2023).

3.2 Decision-making processes

- **Two main modes of decision making** (Barton et al., 2019; Lawani et al., 2023):

No.	Feature	Intuitive decision making	Analytical decision making
1	Also known as	Naturalistic Decision Making or Recognition-primed decision making	Rational decision making
2	Description	It is based on previous experience and involves rapid recognition of patterns and cues from the decision maker's stored memory.	It involves a logical process that includes generation of alternative solutions, gathering appropriate data, evaluation of alternatives based on set criteria and subsequent selection of the best alternative.
3	Makes use of	Previous experience, 'gut feel' and sentiments, seeking satisfaction.	Data, facts, standards and software, seeking optimisation.
4	Modelling and simulation type	Mental	Formal (e.g., mathematical models and Monte Carlo simulation).
5	Speed of execution	Fast	Slow
6	Process	Neither systematic nor structured.	Systematic and structured.
7	Usage of cognitive resources	Economical as it makes use of stored memory, 'gut feel' and 'educated guesses'.	Demanding as it makes use of reflective reasoning.
8	Criticisms	Higher risk of cognitive biases, e.g., personal, confirmation, and optimism.	Bounded rationality. Sometimes subjective assignment of weights to alternative/option selection criteria. Sometimes the required data is inadequate, or use of inappropriate data.

3. Literature Review

3.2 Decision-making processes

- Snowdon and Boone (2007):
  - ✓ Cynefin framework for making decisions in different contexts: simple, complicated, complex and chaotic.
  - ✓ **intuition is not enough in contexts characterised by complexity** (e.g., projects) – leaders also need appropriate approaches and tools to enhance their decision making to succeed.
- **Analytical decision-making processes are also more appropriate when dealing with optimisation** problems (Barton et al. 2019; Le et al. (2021), cases of which are plenty in projects, e.g., in scheduling, budgeting, resourcing, etc.
- Identified two analytical decision-making processes (Barton et al. 2019; Lunenburg, 2010) - (presented in the Results section).

3. Literature Review

3.3 Analytical decision problem-solving techniques

- Hazir (2015):
  - ✓ lamented that **mathematical modelling of project monitoring and control** has not received sufficient attention from previous researchers.
  - ✓ makes the point that effective project control requires determining "the **optimal** timing and magnitude of project control activities".
  - ✓ reviewed and highlighted a number of **analytical techniques and models** that can assist project managers to **decide** on appropriate project control strategies (corrective actions or interventions) to minimise deviations from project plans, e.g., **optimal control theory, dynamic programming, simulation and stochastic optimisation**, etc.
  - ✓ called for more research focussing particularly on **optimisation models** for the **uncertain project environments**.

3. Literature Review

3.3 Analytical decision problem-solving techniques

- ❑ Galli (2020):
  - ✓ also called for more application of **mathematical modelling in project decision making.**
  - ✓ highlighted the different types of applicable mathematical modelling, including **mathematical programming (linear / nonlinear / dynamic programming)** which can be used in planning **optimal** allocation of limited resources; **probabilistic modelling** (e.g., Markov analysis, queuing theory); and **statistical modelling** (e.g., NPV, internal rate of return, Monte-Carlo simulation).
- ❑ Artificial intelligence (AI) is also increasingly aiding decision making in project environments (Müller et al., 2024).
- ❑ Identified a number of analytical decision problem-solving techniques (presented in the Results section).

4. Results and Discussion

4.1 Decision problems in projects (identified from the reviewed literature)

No.	Decision problem	Reference sources from the reviewed literature
1	Project selection	Barton, Aibinu, and Oliveros (2019); Liu, Chen, Yang, Xu and Liu (2019); Volden (2019)
2	Project manager selection	Farashah, Thomas and Blomquist (2019)
3	Project management strategy selection	Boonstra and Reezigt (2023)
4	Project organizational design /structure	Maier-Speredelozzi and Still (2021)
5	Project team member selection	Sankaran, Vaagaasar and Bekker (2020)
6	Project delivery model	Nwajei, Bølviken and Hellström (2022)
7	Design selection	Barton et al. (2019)
8	Vendor selection (consultant, supplier, contractor or subcontractor)	Le, Jarroudi, Dao, and Chaabane (2021); Subaie, Faisal, Aouni and Sabir (2023)
9	Construction supply chain optimisation (supplier selection, determination of order quantity, and whether to use third party logistics providers)	Choudhari and Tindwani (2017); Le, Jarroudi, Dao and Chaabane (2021)
10	Resource allocation	Antoniol, Cimitile, Di Lucca, and Di Penta (2004); Sankaran, Vaagaasar and Bekker (2020)
11	Budgeting	Kwon and Kang (2019).
12	Time scheduling (Extreme scheduling for blitz projects)	Hardie (2001); Hazir (2015) Li, Chi, Radujkovic, Wei and Pan (2024)
13	Project control / corrective action	Hazir (2015)
14	Conflict resolution	Hazir (2015)
15	Sustainability-related (environmental, social, governance (ESG))	Sabini and Alderman (2021); Di Maddaloni and Sabini (2022); Silvius, Kampinga, Paniagua and Mooi (2017)
16	Stage gate (go / kill / hold / recycle)	Cooper (2008)
17	Determination of time and cost contingencies	Ortiz, Pellicer and Molenaar (2019)
18	Cost contingency release	Ayub, Thaheem and Ullah (2019)
19	Trade-off analysis	Sabini and Alderman (2021)
20	Escalation of Commitment (EoC) / Reverse EoC	Cornelio, Sainati and Locatelli (2023); Liu, Liu, Gao, Gao and Li (2019)
21	Ethical challenges	Locateli et al. (2022); Sarhadi and Hasanzadeh (2022).
22	Outsourcing	Ma, Chen, Fu and Meng (2022)
23	Project manager replacement in a crisis	Pinto, Davis and Turner (2024)
24	Project termination	Delerue and Sicotte (2020); Gonzalo Ruiz Dıaz (2020)'; Cornelio et al. (2023)

Note:

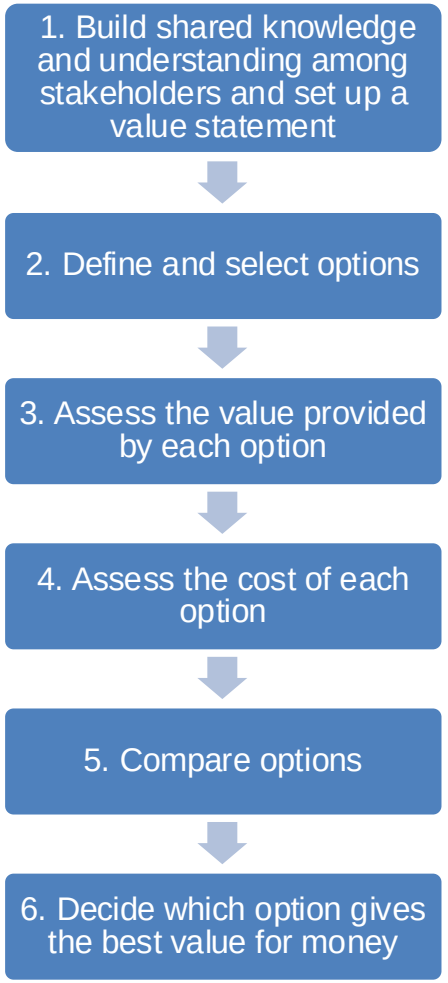
- many of these **decision problems are optimisation problems**.
- The list brings awareness to the practising project managers of the different decision problems they are likely to face in projects, **allowing for proactive decision making planning**.
- Such proactiveness can assist to **avoid the "problem of indecisiveness, delayed decisions,** or defensive decision

4. Results and Discussion

4.2 Decision-making processes (identified from the reviewed literature)

Lunenburg (2010) - analytical decision-making process:

Barton et al. (2019) – analytical decision-making process for any value for money context:



Note:

- The decision-making process discussed by Lunenburg (2010) **can be applied in many contexts,** including project environments, as it is problem-solving focussed.
- There is a growing emphasis on the **need to focus on the value delivered in projects** (Barton et al., 2019; PMI, 2021).
- Thus, the decision-making process of Barton et al. (2019) may be enhanced to a more complete and useful process, particularly for project management by, adding:
  - ✓ **decision problem definition as the first step**; and
  - ✓ **decision implementation and evaluation** (Lunenburg 2010).
- The identified analytical decision-making processes are in no way exhaustive, due to the limited literature reviewed.

4. Results and Discussion

4.3 Analytical decision problem-solving techniques (applied to project environments)

No.	Technique	Example decision problem(s)	Source(s) from reviewed literature where technique is used or recommended
1	Cost-benefit analysis, using net present value (NPV)	Project selection; equipment selection	Volden (2019); Galli (2020)
2	Value for Money	Project selection; design selection	Barton et al. (2019)
3	Linear Programming	Optimal movement of material (aggregate) in road construction (Logistics network distribution problem)	Choudhari and Tindwani (2017)
4	Mixed Integer Programming	Construction supply chain optimisation (incl. whether to use third party logistics providers)	Le et al. (2021)
5	Dynamic Programming	Project time scheduling	Sobel et al. (2009)
6	Queuing theory	Project resourcing (staffing)	Antoniol et al. (2004)
7	Markov analysis	Project time scheduling (recursive networks)	Hardie 2001
8	Simulation (Monte Carlo)	Project control strategy / corrective action / intervention	Hazir (2015); Galli (2020)
9	Optimal control theory	Project control strategy / corrective action / intervention	Hazir (2015)
10	Analytic Network Process (ANP)	Subcontractor selection	Subaie et al. (2023)
11	Evidential reasoning rule	Project selection	Liu et al. (2019)
12	Statistical process control charts	Quality assurance intervention	Hazir (2015)

Note:

- Many of them are optimisation techniques **from the Operations Research (OR) field.**
- **Project managers need to be knowledgeable about such analytical decision problem-solving** techniques and appropriately utilise them to enhance their chances of making good and optimal decisions.

4. Results and Discussion

4.4 Decision making coverage in key repositories of project management knowledge

No.	Item description	APMBoK 7th Edition (2019)	ICB Version 4.0 (2015)	PMBOK 7th Edition (2021)
1	Decision problem types	Includes some, e.g., investment decisions, decision gates. Provides some recommended reading references.	Includes some, e.g., project selection, funding, make or buy, resourcing, phase/stage transitions.	Includes some, e.g., vendor selection
2	Decision-making processes	Not directly described, but provides some recommended reading references. The issue of decision bias is included.	Not described.	Not described.
3	Decision-making techniques	Mentions some, e.g., decision trees, Monte Carlo simulation, cost-benefit analysis, NPV.	Mentions some, e.g., decision trees, Monte Carlo analysis, cost-benefit analysis, multi-criteria analysis	Mentions some, e.g., decision trees, Monte Carlo simulation, cost-benefit ratio, NPV.

Note:

- APMBoK 7th Ed., ICB Version 4.0 and PMBOK Guide 7th Ed. **all emphasise the importance of decision making in project management**.
- However, they do not seem to adequately cover decision problems in projects, **analytical decision-making process, and analytical** decision problem-solving techniques.
- Future research studies can assess whether the recommended reading references in APMBoK 7th Ed. adequately cover decision problems in projects, analytical decision-making process, & analytical decision problem-solving techniques.
- ICB Version 4.0 **does not explicitly include decision making among its 29** competence elements for each of the three domains (project, programme and portfolio management).

4. Results and Discussion

4.4 Decision making coverage in key repositories of project management knowledge

Separate, but related issue – Project Management Principles:

- there seems to be an ongoing shift towards principles-based project management:

PMBOK Guide 7th Ed. Project Management Principles themes:

1. Stewardship
2. Team
3. Stakeholders
4. Value
5. Systems thinking
6. Leadership
7. Tailoring
8. Quality
9. Complexity
10. Risk
11. Adaptability and resiliency
12. Change

Blampied et al. (2023) Project Management Principles themes:

1. Strategic alignment
2. Continuing justification
3. Continuous improvement
4. Governance
5. Resilience
6. Risk
7. Team structure
8. Teamwork
9. Organizational values
10. Management
11. Flexibility
12. Stakeholder engagement

Note:

- Decision making seems to be **not featuring prominently among these principles**.
  - ✓ Yet, decision making is quite central to effective and efficient project management.
- Arguably, however, a closer analysis of the 12 principle themes (either set) reveals they all support a common, overarching theme – decision making.
  - ✓ **The 12 principles (either set) are elements of a higher level principle centred around decision making.**
  - ✓ Decision making in projects must be based on the project management principles, i.e., principles-based project decision making.

5. Conclusion and Recommendations

- **Through a systematic literature review, we identified a number of decision problems in projects** (many optimisation problems), appropriate analytical decision-making processes and decision problem-solving techniques for rational and optimal decisions.
  - ✓ The said identified are not exhaustive, due to the limited literature reviewed. More research required.
- **The assessed APMBoK 7th Ed., ICB Version 4.0 and PMBOK Guide 7th Ed. emphasise** the importance of decision making in projects, but do not seem to adequately cover it.
- Some recommendations to improve decision making in project management (PM):
  - ✓ Repositories of PM knowledge (APMBoK, ICB, PMBOK, etc.) may explicitly describe (or at least highlight) the different decision problems in projects, appropriate analytical decision-making processes and decision problem-solving techniques (e.g., from Operations Research) for rational & optimal decisions.
  - ✓ PM professional registration/certification bodies, e.g., for IPMA Delta, PMP and ChPP, may adequately make decision making one of the required competency criteria.
  - ✓ **PM education providers may include Operations Research (or simply 'Project Decision Making',** to cover both intuitive and analytical modes of decision making, including AI) in their PM

Some References

1. Antoniol, G., Cimitile, A., Di Lucca, G.A. and Di Penta, M., 2004. Assessing staffing needs for a software maintenance project through queuing simulation. *IEEE Transactions on Software Engineering*, 30(1), pp.43-58.
2. Association for Project Management, 2019. *APM Body of Knowledge*, 7th, Buckinghamshire: Association for Project Management.
3. Ayub, B., Thaheem, M.J. and Ullah, F., 2019. Contingency release during project execution: The contractor's decision-making dilemma. *Project Management Journal, 50(6)*, pp.734-748.
4. Barton, R., Aibinu, A.A. and Oliveros, J., (2019). The value for money concept in investment evaluation: Deconstructing its meaning for better decision making. *Project Management Journal, 50(2)*, pp.210-225.
5. Blampied, N., Buttrick, R., Jucan, G., Piney, C., Stevens, C., Violette, D. and Max Wideman, R., 2023. In search of project management principles. *Project Management Journal*, 54(6), pp.588-606.
6. Boonstra, A. and Reezigt, C., 2023. A complexity framework for project management strategies. *Project Management Journal*, 54(3), pp.253-267.
7. Farashah, A.D., Thomas, J. and Blomquist, T., 2019. Exploring the value of project management certification in selection and recruiting. *International Journal of Project Management*, 37(1), pp.14-26.
8. Choudhari, S. and Tindwani, A., 2017. Logistics optimisation in road construction project. *Construction Innovation*, 17(2), pp.158-179.
9. Cooper, R. G. (2008). Perspective: The Stage-Gate® idea-to-launch process—Update, what's new, and NexGen systems*. *Journal of Product Innovation Management*, 25(3), pp 213-232.

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Cape Town, South Africa

(27 – 29 November 2024)

Thank You!

More

Column1	PM Success	Decision	qualitative/trust/	quant/knowledge
1	23	8	0	1
2	144	2	201	66
3	176	1	0	1
4	112	1	10	18
5	3	15	3	5
6	135	9	5	14
7	133	4	13	6
8	225	0	2	5
9	191	0	2	18
10	165	2	13	12
11	63	19	1	2
12	240	4	3	6
13	209	1	3	3

And

$$\Delta_{x \to 0}^{\mathcal{L}im \cdot \frac{\Delta x}{\Delta x}}$$

What does this mean for decision-making in projects?