Practical Project Risk Management[1]

Probability-Impact Matrices: A brief guide [2]

Purpose

Rank a list of risks in an approximate order of their significance.

A Summary of the Technique

The Probability-Impact Matrix (PIM) is based on a simplistic approach to expected value i.e. that the significance of a risk is proportional to its Probability x Impact and that these attributes can be estimated as having single values or values that fit within pre-defined bands.

The matrix is formed by developing a pair of banded scales, one for probability and the other for impact. Typically, there are five bands per scale.

The band boundary values are usually defined in a risk classification criteria table (*See separate Guidance Sheet to be published in March 2023*)

Probability			Impact				
	V High	0.8	2.4	5.6	12.8	32	80
	High	0.6	1.8	4.2	9.6	24	60
	Med	0.4	1.2	2.8	6.4	16	40
	Low	0.2	0.6	1.4	3.2	8	20
	V Low	0.1	0.3	0.7	1.6	4	10
Index numbers			3	7	16	40	100
			V Low	Low	Med	High	V High

Index numbers are developed to represent the relative significance of the bands. For example, in the above matrix, High probability risks are treated as being six times as significant as Very Low probability risks with an equivalent impact. These index numbers are multiplied to obtain risk scores - a proxy for significance that can be used for risk prioritization purposes.

Risks are then mapped to the matrix by using their probability and impact estimates and ranked in descending order of risk score. Risks with the same score are ranked equally. If a risk has impact estimates for more than one type of consequence e.g. time, cost and product impact, the worst case impact banding is used for mapping purposes.

[1] This series of articles is by Martin Hopkinson, author of the books "*The Project Risk Maturity Model"* and *"Net Present Value and Risk Modelling for Projects"* and contributing author for Association for Project Management (APM) guides such as *Directing Change* and *Sponsoring Change.* These articles are based on a set of short risk management guides previously available on his company website, now retired. See Martin's author profile at the end of this article.

[2] How to cite this paper: Hopkinson, M. (2023). Probability-Impact Matrices: A brief guide, Practical Project Risk Management series, *PM World Journal*, Vol. XII, Issue II, February.

Handling Threats and Opportunities

Opportunities might be identified and described as being positive risk events – benefits to the project outcome that might occur. A mirror-imaged extension of the Threats PIM, as shown in the example below, can be used to produce a PIM that handles both threats and opportunities.

		Threats					Opportunities						
Probability	V High	2.4	5.6	12.8	32	80	80	32	12.8	5.6	2.4	V High	Probability
	High	1.8	4.2	9.6	24	60	60	24	9.6	4.2	1.8	High	
	Med	1.2	2.8	6.4	16	40	40	16	6.4	2.8	1.2	Med	
	Low	0.6	1.4	3.2	8	20	20	8	3.2	1.4	0.6	Low	
	V Low	0.3	0.7	1.6	4	10	10	4	1.6	0.7	0.3	V Low	
		V Low	Low	Med	High	V High	V High	High	Med	Low	V Low		
		Impact					Benefit						

Limitations of the PIM

Although the PIM is in widespread use as a project risk assessment technique, it has numerous limitations that should be understood and recognized. Some of the most important are:

1. PIM results are influenced by the extent to which the various risks have been broken down by identification and description. (All risk prioritization techniques share this limitation).
2. Many risks e.g. variability risks, compound risks and event risks with a broad potential range of impact can only be mapped to a PIM if force-fitted.
3. Cells in the PIM represent broad regions of risk that overlap with adjacent cells. This causes some risks to be ranked incorrectly. The broadest cells are often those with highest impact.
4. The PIM cannot assess overall project risk or the implications of interactions between risks.
5. The PIM takes no account of other attributes that may be relevant to risk significance, e.g. urgency (lead time for action), controllability or expected response plan effectiveness.
6. The technique assumes the existence of a stable planning baseline to make risk estimates. This tends to make it a poor choice of technique during the earliest stages of a project.

Common Faults

1. Use of index numbers that do not reflect relative significance e.g. using 1,2,3,4,5 as impact index numbers when progression through the impact bands is closer to being logarithmic.
2. Drawing boundaries within the PIM to define risk appetite thresholds.
3. Including only event risks in a risk register because other risks cannot be mapped to a PIM.
4. Using risk scores for other purposes e.g. Summing risk scores to calculate “overall risk”.
5. Delaying the risk management process until such point as a planning baseline exists.

About the Author

Martin Hopkinson

United Kingdom

Martin Hopkinson, recently retired as the Director of Risk Management Capability Limited in the UK, and has 30 years' experience as a project manager and project risk management consultant. His experience has been gained across a wide variety of industries and engineering disciplines and includes multibillion-pound projects and programmes. He was the lead author on Tools and Techniques for the Association for Project Management's (APM) guide to risk management (*The PRAM Guide*) and led the group that produced the APM guide *Prioritising Project Risks.*

Martin's first book, *The Project Risk Maturity Model*, concerns the risk management process. His contributions to Association for Project Management (APM) guides such as *Directing Change* and *Sponsoring Change* reflect his belief in the importance of project governance and business case development.

In his second book *Net Present Value and Risk Modelling for Projects* he brought these subjects together by showing how NPV and risk modelling techniques can be used to optimise projects and support project approval decisions. (To learn more about the book, click here.)