Risk Management and Project Life Cycle [1]

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Abstract

Despite the growing awareness of the importance of Risk Management across most industries, all the sophisticated tools and techniques, not to mention assistance available from professional bodies, Project Risk Management (PRM) still proves so ineffective the string of failed projects keeps growing longer by the day. Poor Risk Management is a constant feature of project failures, even in well-established organisations. One of the pernicious causes of ineffective application of PRM could stem from its processes not being reconciled to Project Life Cycle methodologies—it shall become an integral part of every phase, process group and aspect of managing the project.

Necessity of Project Risk Management

ISO 31000 Standard for Risk Management defines "risk" as "*the effect of uncertainty on objectives*"; and would further state that, "*An effect is a positive or negative deviation from what is expected*". This notion is relevant, particularly in Large Infrastructure Projects (LIPs) owing to their VUCA characteristics—i.e., their ever-increasing Vulnerability, Uncertainty, Complexity, and Ambiguity. It is no longer a question as to whether the project outcomes might deviate from its objectives, goals, and other expectations, but more about the *quantum* of likely deviations and their consequences. Putting an emphasis on "objectives", ISO 31000 Standard will define Risk Management as follows:

> "Risk Management increases the likelihood of an organisation performing as planned by identifying and managing barriers to meeting objectives in advance [...]" (ISO 31000, 2018)

We ought to not only *pertinently* identify risks, but also *effectively* manage the performance (i.e., the activities and resources) of the said organisation towards achieving the intended objectives. In the context of Large Infrastructure Projects, the organisation is the project team (i.e., Realisation-System), whereas the objectives are, among others, job creation, provision of goods and services, increase in exports and reduction in imports, and contributions to the country's economic growth:

> "Investments in modern infrastructure lay the foundations for economic development and growth. Building roads, bridges, power transmission lines and making other improvements create jobs. When completed, these projects help a society increase its wealth and its citizens' standard of living." (U.S. DoS, 2012)

Two important messages are noted: (1) The works involved in delivering infrastructure result in job creation; e.g., the Daxing Airport (Beijing, China) created 40,000 direct jobs during construction; and (2) when completed, modern infrastructure projects increase the wealth (of the host-nation) and standard of living of citizens. Further, "Infrastructure creates value when it contributes to addressing social needs or facilitates economic activity. Choices regarding infrastructure development must therefore be focused on user [and stakeholders] needs." (OECD, 2017). Such important "objectives" should not be *deviated from* owing to risks. No wonder Risk Management constitutes a tool of choice in ensuring that investments in infrastructure provide benefits to stakeholders *by meeting objectives*.

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Thus, the Project Management Body of Knowledge defines Project Risk Management as follows:

> "Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning, and monitoring and control on a project. The objectives of Project Risk Management are to increase the probability and impact of positive events, and decrease the probability and impact of negative events in the project." (PMI, 2013)

Again, the emphasis is on "*managing both positive and negative events*" to steer the project toward its objectives, as discussed earlier. On such note, one may suggest that Project Risk Management (PRM) constitutes the "immune system" of the infrastructure project; it provides the "intelligence" to detect and protect the project against anything (or lack thereof) that could prevent/hinder and/or diminish/delay the achievement of project objectives—*Should PRM fail, the project will soon suffer*.

Therefore, bad or poor project outcomes, when persistent, should be seen as a sign of a failed or lack of Risk Management in large and complex projects—consequently, the project manager should be actively involved in Project Risk Management, not merely delegate it to a Risk Management Team.

> "There can't be a meaningful dialogue about risk and risk management if only one party to the conversation understands the significance of what is being said." (Crouhy et al, 2006)

> "Risk Management is no longer confined solely to risk management specialists. Stakeholders ranging from employees to investors [as well as executive management] must understand how to quantify the trade-offs of risk against the potential returns. The failure to understand the essential nature of risk can have devastating consequences [on projects]." (Crouhy et al, 2006)

Accordingly, project risk managers and practitioners should not always take a *pessimistic* view of risk. "A pessimist sees difficulty in every opportunity; and an optimist sees the opportunity in every difficulty" (Winston Churchill)—"*events with likely positive effects*" (i.e., opportunities) and "*events with potentially negative effects*" (i.e., threats) on "objectives" must be addressed in LIPs. Therefore, "Project managers may need encouragements to be open to opportunities and to manage both threats and opportunities proactively" (INCOSE SEH, 2011)—for a "holistic" view is essential.

Project Risk Management Frameworks

Organisations should consult with the relevant stakeholders when developing an appropriate Risk Management framework. The approach to managing risk in any organisation, including in Large Infrastructure Projects would be highly dependent on the complexity of methods and the extent of analysis required—and on the nature of the organization, its governance and style of management.

In the main, organisations involved in "risky" initiatives (e.g., projects, mergers-and-acquisitions, military conquests) should develop and implement risk treatments to reduce residual risks to levels acceptable to most stakeholders and monitor (and adjust) to ensure efficiency and effectiveness. Thus, appropriate and effective assessment steps, including developing and documenting methods and techniques to identify, analyze, and evaluate pertinent risks, will be defined and implemented:

(i) Risk Identification—i.e., sources of risk, areas of great impacts, and causes and consequences
(ii) Risk Analysis—i.e., evaluation of current controls, factors shaping consequences, or likelihood
(iii) Risk Evaluation—i.e., comparison of risk profiles to criteria, decisions to treat or accept risks

Processes such as 'Monitoring and Control', as well as 'Communication', are commonly added to the "core assessment" steps to enhance their implementation and to ensure successful outcomes.

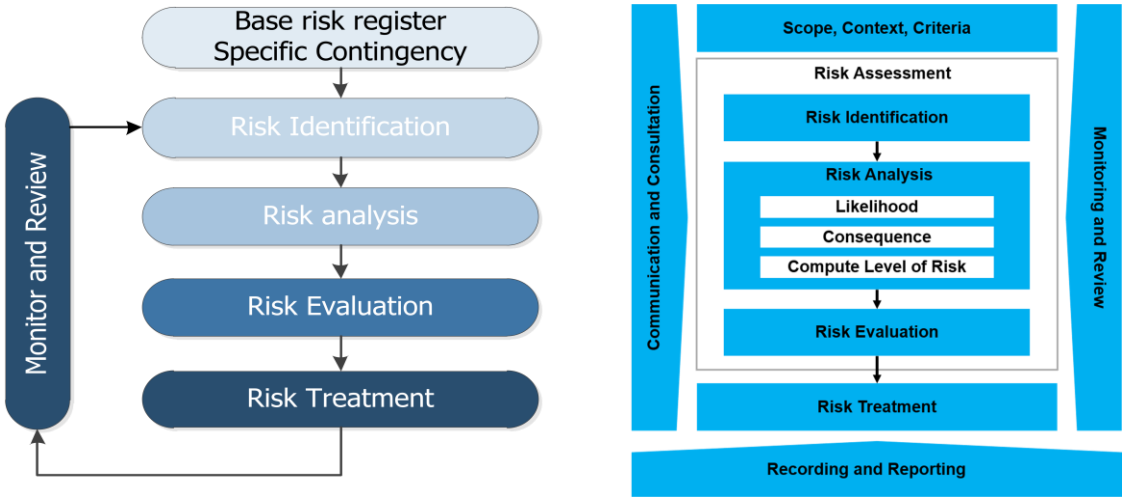

Figure 1 - ISO 31000 Standard: Risk Management, 2009 versus 2018 Versions

The above Figure 1 depicts the core elements of ISO 31000 as a Risk Management Framework; one can notice the "improvements" accommodated between the 2009 and 2018 versions of same. Several frameworks are readily available to risk practitioners—some standardised, some bespoke.

It is common cause that ISO 31000 is the "most-known" Risk Management Standard; however, in view of the Eleven Principles of Risk Management (ISO 31000, 2018), AS/NZL 4360 could be the "most-suitable" framework for infrastructure projects. It best meets the following principles:

(i) Explicitly address any uncertainty—i.e., facilitates a deep understanding of project context
(ii) Be systematic and structured—i.e., includes discrete steps and their to-and-fro interactions
(iii) Be transparent and all-inclusive—i.e., covers all phases/processes of project delivery cycle
(iv) Be continually monitored and improved upon—i.e., promotes constant Monitor and Control

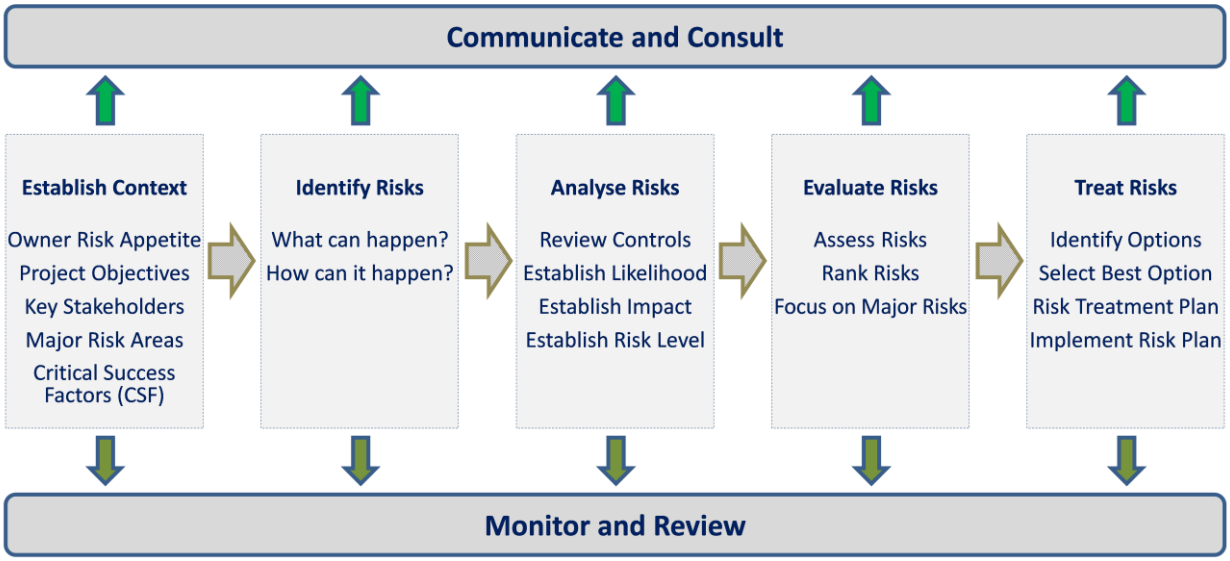

Figure 2 - AS/NZL 4360: Risk Management Standard (2018)

Due to the above considerations and practical experience, the author will propose AS/NZL 4360 Standard as the "preferred" framework for managing risk in large, complex infrastructure projects.

Risk Management and Life Cycle

The PMBoK (5th Ed.) states: "A project life cycle is the series of phases that a project passes through from its initiation to its closure"; it also suggests that such a "life cycle" should consider Operations:

> "The project life cycle is independent from the life cycle of the [physical] product produced by or modified by the project. However, the project should take the current life-cycle phase of the product into consideration." (PMI, 2013) [*Underlining added by author for emphasis*]

Indeed, by mentioning "[…] *the project should take the current life-cycle phase of the product into consideration*", PMBoK impels the reader to rather take an "operational" outlook of the life cycle. One major implication of this perspective is that project teams ought to consider how the product (i.e., system, asset, facility, infrastructure) would be operated, maintained, and eventually retired. Projects are exposed to risks throughout their entire life cycle, not just at Initiation or Concept Phase:

> "The purpose of the Risk Management Process is to identify, analyze, treat and monitor the risks continuously. The Risk Management Process is a continuous process for systematically addressing risk throughout the [entire] life cycle of a system product or service. It can be applied to risks related to the acquisition, development, maintenance or operation of a system […]" (ISO/IEC 15288, 2015)

It makes sense that project risks should be managed throughout the life cycle, *from-womb-to-tomb*. However, the ISO 31000 Standard submits that, "This Framework is not intended to prescribe a management system, but rather to assist the organization to integrate risk management into its overall management system". In other words, ISO 31000 leaves it to the organisation to incorporate the components of the PRM processes into their (life cycle based) project delivery framework. Unfortunately, this critical adjustment is not always adequately pursued; thus, project teams find themselves applying PRM processes just once (at Initiation)—if not repeating them over and over. As a result, even where risk management systems are in place, they often prove quite ineffective.

The current and widely prevalent practice encourages "*dealing with project risks merely at the beginning of the project*". The team will attend a Risk Workshop and produce some "sacred" Risk Register (which is often signed-off, laminated, and framed on the wall of the project office, as one would hang a trophy). Hardly anything is done further, except to exhibit it to auditors upon request.

Not only is the remainder (or some other interesting part) of the life cycle not managed *risk-wise*, but most identified risk-items (and proposed treatment measures) also revolve around Construction. Not only are the identified threats and opportunities ignored in ensuing decision-making processes, but no clear, management-approved framework might even be made available to the project team as to *why, what, when, where, by who/with whom, and how* risk considerations shall serve as "input" into other project activities. Project delivery methodologies should indicate "*how*" the Project Risk realm (e.g., Identify and Control Risks) intersects with areas/processes such as Project Documents, Project Management Plan, Integrated Change Control, or Monitoring and Control over the life cycle.

The undue focus on Construction/Execution risks is narrow-minded and often proves misleading. The author was once told, "*I only manage construction risks because at least I can measure them*"; but the whole thing was supposed to be about "managing", not merely measuring (i.e., calculating). It reminds of the proverbial drunk man who had lost his keys twelve yards away from a lamppost but went searching there, because there was light. The *where* we look for solutions (i.e., risk-items) often precludes effective solutions to problems (i.e., risk treatment), Ackoff (1978) would admonish.

"A well-documented Project Lifecycle Model enables us to apply Systems Thinking to creating, planning, […], and managing the project through all of its phases, and to evaluating both the success and the value of both the project and results that the project has produced" (Archibald et al, 2012).

The Risk Register alone does not indicate at what points in the life cycle a particular risk would manifest (i.e., changing its status from *green* to *amber* or, worse still, from *amber* to *red*). This is a problem because most project teams are thus misled to treat any "red" risk as if its status will remain the same throughout the entire course of the project—or at least up to a point where it is treated. This approach results in resources being wasted (e.g., undue management focus) even during periods where such risks were not manifest or relevant. For instance, contingency monies that are no longer to be spent should be returned to the owner's treasury; keeping them liquid (in a non-interest-bearing account) may lead to ROI or ROCE Deterioration since it forms a key part of Total Capital at Risk.

The US Department of Transportation promotes a Project Delivery Life Cycle that indicates Risk Management starting early in the project life cycle, by identifying the full range of *interacting* threats and opportunities as early as at the Initiation Process (e.g., management risks) and Concept Phase (i.e., operational risks as per the Concept of Operations)—and right through to the Retirement Phase.

Figure 3 - Project Life Cycle Indicating Risk Identification Points (Adapted: Ryen, 2008)

Thus, Project Risk Management "*becomes an integral part of every aspect of managing the project, in every phase and in every process group*"—Further, PRM processes "should be repeated and the corresponding plans progressively elaborated throughout the lifetime of the project" (PMI, 2017). From the above Vee Model, it transpires that the emphasis of risk management (and, thus, of the allocation of resources) shall evolve throughout the life cycle; it shifts from "social/strategic" risks to "Financial" risks to "technical" risks to "operational" risks, and finally to "environmental" risks. The shift in emphasis is not *mutually-exclusive*, but it indicates that while every type of risks ought to be considered throughout the entire life cycle, the focus on a specific type should be heightened to reflect the considerations (e.g., strategic alignment) pertinent to the project at that point in time.

While projects should begin with the end in mind by putting empathy in operations (Scott, 2012; Mabelo, 2020b) in terms of the Problem Statement or Primary Requirement, the "focus" of Risk Management will evolve from "strategic" to "technical" to "operational" to "environmental" risks.

The "Operational Environment" where the system (i.e., product of the project) shall eventually live (i.e., deployed to operate) usually includes other systems. Such systems often end up "competing", "collaborating", "sustaining/being sustained" by the newly deployed system, *for better or for worse*. Therefore, opportunities and threats should be identified that could emanate from that environment —an earlier publication (Mabelo, 2022b) argued the basis of considering Operations in the life cycle.

Figure 4 - Shift of Risk Management Emphasis Over Project Life Cycle

The Risk Manager ("Risk Diva", in this case) should be "*changing hats*" accordingly, not failing to identify and address transition and operational risks (Okoh et al, 2016)—the *weightiest* hat, always! Another view of "focus shifting" could reflect an evolution from broader to specific risks as follows:

Institutional	To >>	Market-Related	To >>	Completion
Social Acceptance Risks		Supply Risks		Technical/Design Risks
Regulatory Risks		Market Risks		Construction Risk
Sovereign Risks		Financial Risks		Operational Risks

Figure 5 - Project Risk Management Focus Shifting (Adapted: Miller and Lessard, 2001)

The main reason why "social/strategic" (elsewise, "institutional") risk-focus should bestride FEL-1 (Concept Phase) and FEL-2 (Pre-Feasibility Phase) is that during these early phases, the project ought to be dealing with considerations of strategy, acceptability, and overall financial affordability. Likewise, "financial/technical" (elsewise, "market-related") risk-focus straddles over FEL-2 (Pre-Feasibility Phase) and FEL-3 (Feasibility Phase) because during these phases, the project ought to be dealing with considerations of technical feasibility and overall financial sustainability. Thereafter, the focus should shift to "completion/hand-over" of the system to operations, while still considering any issues/challenges of strategy, finance, or technical design that might put the project in jeopardy.

As Figure 6 shows, most "seeds" for opportunities and/or threats are planted in the early phases (i.e., upstream) of the project life cycle. However, such risks will *overtly* manifest downstream during Execution and/or Testing. Hence, "Risk Treatment" ought to be implemented at every point in the life cycle—either to anticipate (beforehand) or to address (at later stages) when such risks manifest.

Indeed, a structured and "systemic" (i.e., aligned to Systems Thinking) Project Risk Management framework is required that indicates *when* and *why* each "risk assessment" step ought to take place.

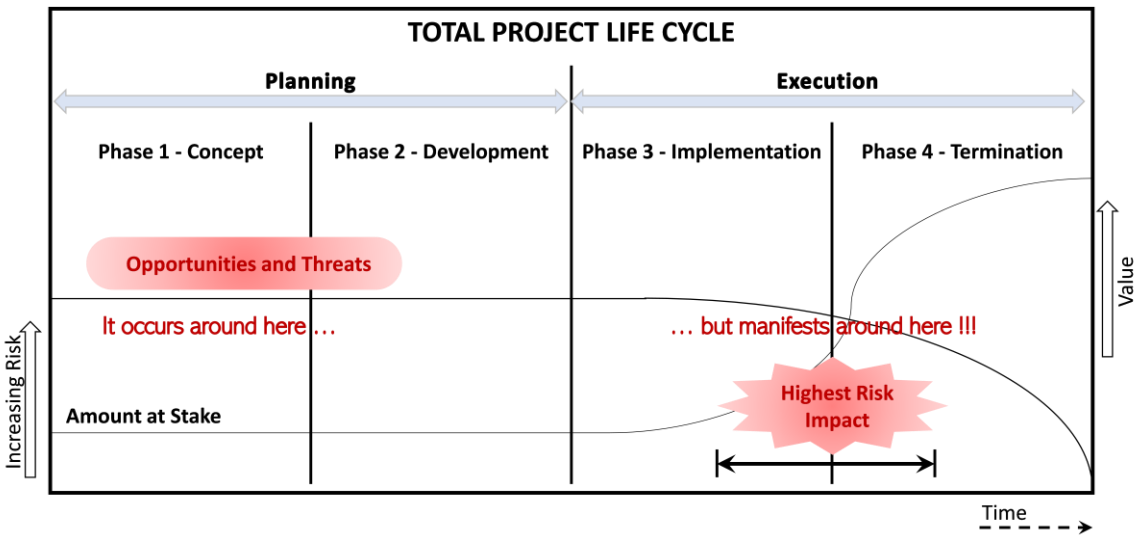

Figure 6 - Risk Occurrence versus Risk Manifestation over the Project Life Cycle

"The megaproject market is worth about $9-trillion each year, and globally big builds are in a mess. It is rare to have one completed on time and on budget" (Nevine, 2015)—How shall PRM fix this? Inspired by both theory and practical experience, the author expands on the core "risk assessment" steps relating to 'AS/NZL 4360: Risk Management Standard' to devise a Project Risk Management (PRM) approach for Large Infrastructure Projects. Such an approach answers the question that other methodologies failed to address: "*What shall the focus of Risk Management be at the various project life cycle phases*?"—Further, "*How to reconcile it with the 'Progressive Elaboration' principle?*" ("Progressive Elaboration" suggests project works ought to be planned in phases in a way that allows the outcome of one phase to inform the scope and the execution approach of any subsequent phases.)

The proposed PRM approach combines the elements of the Standard (AS/NZL 4360 or any other) with the "holistic" life cycle (refer to ISO 15288: System Life Cycle) to provide a framework that guides risk practitioners involved in LIPs in applying the right *focus* to risk considerations from one phase to the next. In so doing, the project team shall avoid the traps of *regurgitating* the same process (e.g., risk workshops to produce a Risk Register) over and over—if not doing it *merely* once at onset.

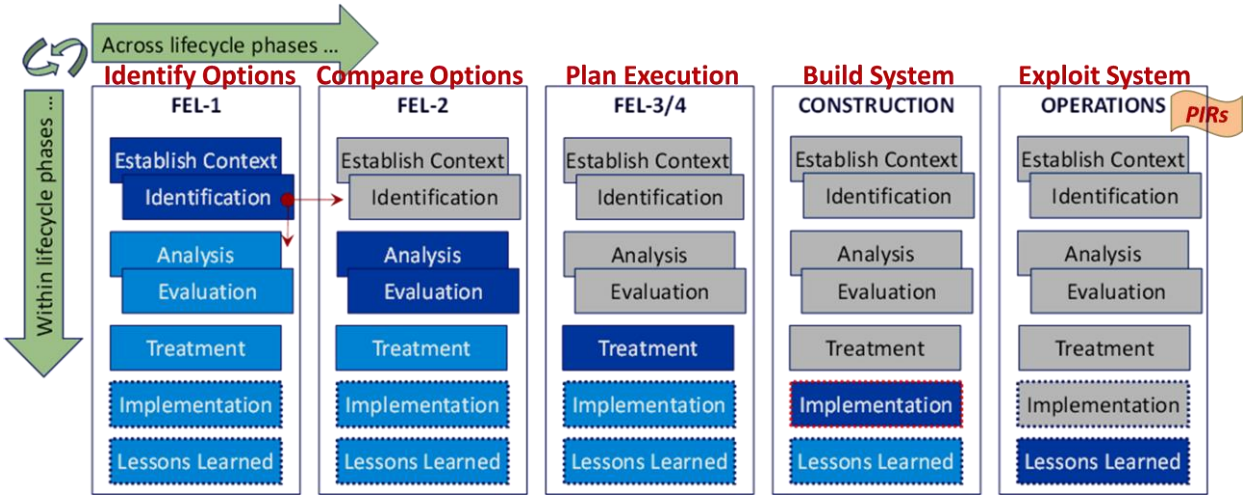

Figure 7 - Risk Process and Project Life Cycle

In accordance with the aforesaid lifecycle principle of "Progressive Elaboration", the focal PRM step should move from Identification to Analysis/Evaluation to Treatment to Implementation and, *ultimately*, to Lessons Learned. For instance, PRM at FEL-1 shall cover the full scope for that phase, as well as Risk Identification for later phases—to address any *exceptional* items from those phases. A case in point, "loan approval" is a major risk to manifest at Feasibility (FEL-3) when a bankable business case will be ready for the bank manager's perusal. Yet, it should be identified at Concept (FEL-1); a prudent Risk Manager would advise the project to already assess such a risk and approach prospective banks at that early stage to gauge their chances of securing the vital loan in due course.

Further, "Establish Context/Identification" aids in Option Identification (FEL-1), just as "Analysis" of life cycle risks supports "optioneering" (FEL-2) and "Treatment" informs Execution Planning (FEL-3/4). As the arrows in Table 1 indicate, when reviewing risks items at FEL-2 (Pre-Feasibility), the focus should be on that row (i.e., FEL-2 types of risks). However, FEL-1 risk processes (which focussed *primarily* on "Establish Context" and "Identification") should have been duly "reviewed", while any risk-elements pertaining to the subsequent rows (FEL-3 to PIR) are assessed at high-level. In so doing, this approach will accommodate both the horizontal or "longitudinal" perspective (i.e., across life cycle phases) and the vertical or "transversal" perspective (i.e., within life cycle phases).

Table 1 provides examples (pointers) of threats to be considered through the various project phases:

Project Phase	Risk Management Elements (e.g., Project Threats) [List Not Exhaustive] – To be tested at Gate Review
Conceptual (FEL-1)	▪ Proceeding with a project that will not support the strategy – or not considering its business/operational aspects ▪ Proceeding with a project that rather solves the "wrong" problem – or developing a flawed Concept (i.e. ConOps) ▪ Leaving out, prematurely discarding a "highly viable" project option – thus proceeding with "sub-optimal" ones ▪ Failure to subject a project to a suitable Stakeholder Management framework (e.g., identify all key stakeholders)
Pre-Feasibility (FEL-2)	▪ Adopting a flawed/inappropriate "Option Selection Criteria" for the selection of the "most-viable" option ▪ Selecting the wrong option for Development & Execution – or not subjecting "Option Selection" to Governance ▪ Progressing with a "precipitate" Engineering Design, attaining advanced (40-90%) development at early stages
Feasibility (FEL-3)	▪ Forward Commitment – i.e. proceeding with an option despite its lack of desirability, feasibility, or viability ▪ Undue emphasis on Execution/Construction (i.e. constructability) versus improving Operations (i.e. operability) ▪ Approving the project based on inadequate elaboration (i.e. flawed/incomplete BC, FEL-3 Report, PEP, OR Plan) ▪ Proceeding to Execution without "Capital Approval" or availability of resources (e.g., budgets, skills, workforce)
Pre- Construction (FEL-4)	▪ Proceeding to Construction despite incomplete Design & Development – e.g., strong Engineering "coupling" ▪ Proceeding to Construction despite a "compromised" Procurement Process – e.g., wrong contractor appointed ▪ Proceeding to Construction despite real possibility of stalling the Contract and/or "pulling out the contractor"
Construction	▪ Failure to meet "build-to" requirements of the project – or completing works without Verification & Validation ▪ Schedule/Cost Overruns, which could negatively impact on the desirability-feasibility-viability of the project ▪ Approving "Scope Changes" without verifying their impact(s) on the Budget and Operability (i.e. Business Case)
Close Out	▪ Closing out an inadequately and/or inappropriately completed project (e.g., not having met all requirements) ▪ Not involving the appropriate stakeholders (e.g., Sponsor, Operations Staff) in Closeout or Validation Processes
PIR	▪ Failure to gather **Lessons-Learned** for consideration in future projects – Same should apply to all prior Phases! ▪ Failure to confirm "operational environment" has improved as intended (e.g., wrong scope, timing, or **HAZOP**)

Table 1- Examples of Project Threats at Various Project Phases

Managing risks in Large Infrastructure Projects (LIPs) or in any other complex initiatives requires supplementing 'AS/NZL 4360: Risk Management Standard' with a "practical" understanding of the recommended "systemic" perspectives embodied in Figure 3, Figure 4, Figure 5, Figure 7, and in Table 1 above. Project practitioners who have embraced this approach were able (and delighted) to not only *smoothly* navigate the life cycle, but also identify, analyse, evaluate, and treat threats and opportunities in their megaprojects. All this was good progress; yet, more *adjustments* were to come!

Towards a Systems Based PRM Model

For sure, the juxtaposition of the project life cycle onto 'AS/NZL 4360: Risk Management Standard' has provided a massive, yet practical "improvement" to the Project Risk Management practice. However, the above "life cycle" improvement might not be the only potential contribution to PRM. There are many other Systems Thinking principles, concepts, and practices that could as well assist.

> "Current approaches to [project] risk management have been built over time from a large body of knowledge, but fail to address some of the common [and systemic] characteristics of risks, such as unpredictability [i.e., VUCA] and interconnectedness [...]" (Barber, 2002)

Indeed, three critical elements of Systems Thinking can be added to the PRM approach as follows:

(i) Interactions among risk-items—i.e., opportunities and threats engender and affect each other
(ii) External interactions—i.e., PRM activities can affect, be affected by the project environment
(iii) Feedback loops—i.e., effecting risk treatments and responses thereto affect project outcome

A structured and methodical implementation of these provisions has resulted in "systems-based", even *enhanced* rendition of 'AS/NZL 4360: Risk Management Standard' (2018) as shown below:

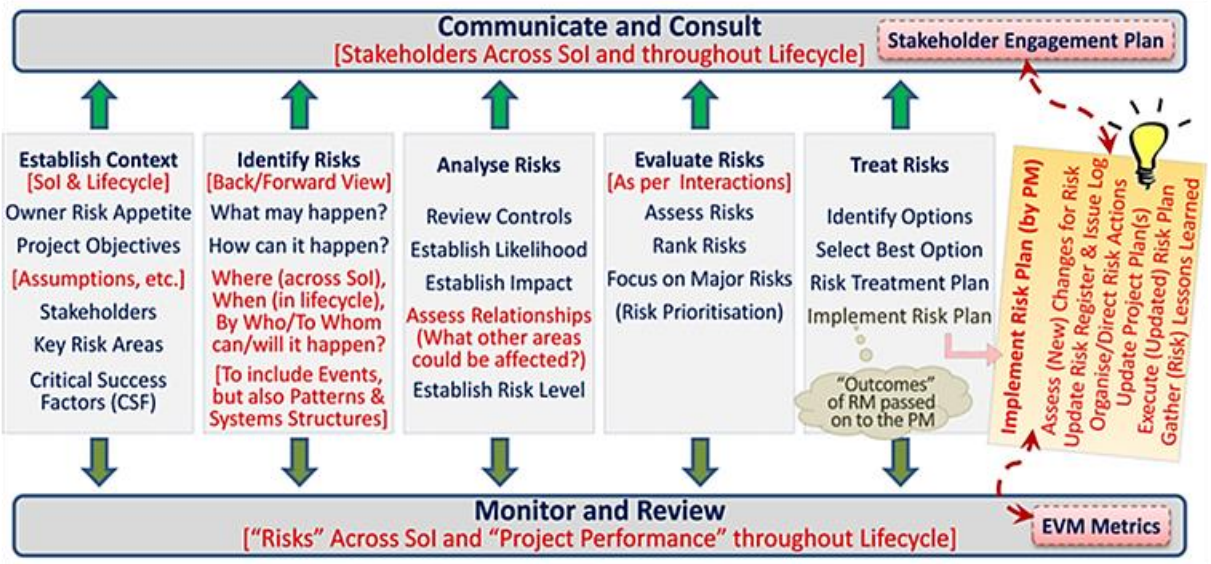

Figure 8 – Proposed Revisions to AS/NZL 4360: Risk Management Standard (2018)

The main improvements (as proposed by the author) consist in elevating the "Implementation" section of the Risk Treatment Plan to a *fully-fledged* PRM process-step—at the same level as any other steps (i.e., Establish Context, Identify Risks, Analyse Risks, Evaluate Risks, or Treat Risks).

The Risk Implementation Plan (RIP) will be reconciled and fused into the Project Execution Plan; the responsibility for its execution rests on the Project Manager, as a *single-point-of-accountability*. The outline of RIP should reflect activities such as: "Assess (New) Changes for Risk", "Update Risk Register and/or Issue Log", "Organise/Direct Risk Actions", "Update Project Plan(s)", "Execute (Updated) Risk Plan", and "Gather (Risk) Lessons Learned"—which must *liaise* with Earned Value Management (EVM) and the Stakeholder Engagement Plan in terms of overall project performance. Moreover, the Risk Register should now reflect both a "listing" and an "assessment" that consider the (strong, moderate, or nil) *connectedness* among risk-items to provide a "network-based" ranking.

Conclusion

It is the author's contention that bad or poor project outcomes, when *persistent* in a certain context, is generally a sign of a failed or a lack of Risk Management in Large Infrastructure Projects. Project Risk Management (PRM) constitutes the "immune system" that provides the "intelligence" to detect and protect the large project against anything (or lack thereof) that may prevent or diminish the achievement of objectives. Should the applied PRM fail, the project will *eventually* flounder or fail.

Thus, whatever the level of implementation, executive management involvement in setting direction and regularly reviewing results should be about ensuring an "appropriate" treatment of project risks. Alas, despite the growing awareness of the importance of Risk Management across the industry, all the well-developed tools and techniques, not to mention assistance available from professional bodies, Project Risk Management continue to disappoint. The string of "failed" projects has kept growing longer over the last 30 years or so, judging by the Chaos Report (Clancy, 1995; 2014).

> "A risk management strategy that is not carefully structured [i.e., reconciled to the life cycle] and monitored is a double-edge sword: if it goes wrong, it can drag a firm [or any large and complex project] down even more quickly than the underlying risk." (Crouhy et al., 2006)

A major *drawback* of common Risk Management standards (e.g., ISO 31000, AS/NZL 4360) is in their leaving it to delivery organisations to incorporate the elements of the PRM processes into their project delivery framework. Unfortunately, our current experience is that most organisations fail to articulate "*how much*" of Risk Management should be applied at a *specific* phase of the Life Cycle. As a result, project risk practitioners either only apply it at the onset (i.e., to produce a Risk Register), or will regurgitate risk-related activities over and over—focussing generally on construction risks.

The author proposes a PRM approach that combines the elements of the Standard (AS/NZL 4360 or any other) with the "holistic" life cycle (ISO 15288: System life cycle processes, 2015) to submit a framework that will guide risk practitioners involved in LIPs in applying the right "focus" to risk considerations from one phase to the next. Rather than fixating the focus on construction risks, the recommended PRM approach entails a *moving-focus* that shifts from "social/strategic" risks to "Financial" risks to "technical" risks to "operational" risks, and to "environmental" risks.

The shift in emphasis is not *mutually-exclusive*, but indicates that while every type of risks ought to be considered throughout the life cycle, the focus on a specific type should be heightened to reflect the considerations (e.g., strategic alignment) pertinent to the project at any point in time. Moreover, in keeping with the principle of "Progressive Elaboration", this PRM approach will accommodate both the horizontal or "longitudinal" perspective (i.e., across life cycle phases) and the vertical or "transversal" perspective (i.e., within life cycle phases)—both in this phase and in phases to come!

Further, a point is herein made that "life cycle considerations" is not the only Systems Thinking aspect that could enhance Project Risk Management in LIPs. Considerations of "connectedness" and "feedback loops" were also discussed and a model as to how they should be incorporated into the AS/NZL 4360 Standard was proposed. Of note is the *elevation* of the Project Implementation Plan (RIP) as a fully-fledged PRM process-step, while its outputs are to be reconciled and fused into the "overall" Project Execution Plan (PEP) under the responsibility of the Project Manager. As part of Monitoring and Control, the said RIP will also talk to both EVM and Engagement Plan.

The principles and processes set out in ISO 31000 and AS/NZL 4360, as enhanced, provide a robust system that allows entities to design and implement repeatable, proactive, and strategic programmes.

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Pascal Bohulu Mabelo, *MBA, MSc (Industrial), BSc (Civil), Pr. Eng, Pr. CPM, Pr. PMSA, PMP*, has more than 25 years of professional experience and possesses a wide range of technical and managerial skills pertaining to large and complex infrastructure projects. He has worked in large infrastructure projects as a design engineer, project/programme manager, project consultant and project management executive. Pascal was honoured to serve as the national chairman of Project Management South Africa (PMSA), the leading Project Management professional association in Southern Africa.

Pascal has published the book: "*Managing Engineering Processes in Large Infrastructure Projects*" (2021); he has also published, "*How to Manage Project Stakeholders—Effective Strategies for Large Infrastructure Projects*" (2020) and "*Operational Readiness—How to Achieve Successful System Deployment*" (2020). Through various other publications, he assiduously promotes the application of Systems Thinking and/or Systems Engineering principles and concept to unravel complexity in Large Infrastructure Projects (LIPs) in order to address their persistent risks of failure and their massive, even pernicious, cost and schedule overruns.

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