AACE INTERNATIONAL RECOMMENDED PRACTICE

122R-22

QUANTITATIVE RISK ANALYSIS MATURITY MODEL

AACE INTERNATIONAL

Rev. October 13, 2022 (Ed. Rev. April 22, 2024)

AACE® International Recommended Practice No. 122R-22

QUANTITATIVE RISK ANALYSIS MATURITY MODEL

TCM Framework: 7.6 – Risk Management
3.3 – Investment Decision Making

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Note: As AACE International Recommended Practices evolve over time, please refer to web.aacei.org for the latest revisions.

Any terms found in AACE Recommended Practice 10S-90, *Cost Engineering Terminology*, supersede terms defined in other AACE work products, including but not limited to, other recommended practices, the *Total Cost Management Framework*, and *Skills & Knowledge of Cost Engineering*.

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1. INTRODUCTION

1.1. Scope

This recommended practice (RP) of AACE International (AACE) defines a quantitative risk analysis (QRA) maturity model (QRAMM) for assessing the level of capability for quantifying the uncertainty and risks associated with projects, programs, and portfolios within the risk management (RM) function of a capital investment or project management organization. Maturity models for general risk management are widely published, but less common for the QRA step of RM processes such as presented in chapter 7.6 the AACE Total Cost Management (TCM) Framework [1]. This RP is intended to fill that gap.

The QRAMM is not prescriptive to specific QRA methods; to the contrary, it highlights that many options exist and provides examples of how various methods may be considered at various maturity levels as appropriate. There are many AACE quantitative risk analysis RPs to consider; these are outlined in AACE Professional Guidance Document No. 02 (PGD-02) [2].

The QRAMM is also not a maturity model for assessing the depth of capability for any particular QRA method selected by an organization. Instead, the QRAMM offers a road map to facilitate continuous improvement. Each QRAMM capability level can be applied with various degrees of rigor or maturity depending on the organizational needs [3]. The QRAMM assumes that to achieve a high level of QRA maturity, an organization must clearly understand its RM needs and apply a QRA method to the degree that is fit-for-purpose for those needs.

1.2. Purpose

This RP is intended to provide guidelines, not a standard, for assessing the level of organizational QRA capability that most practitioners would consider to be good practice to satisfy stakeholder expectations. Applying this model in practice should outline a fit-for-purpose QRA approach and reasonably reliable prediction accuracy relative to project, program and portfolio complexity, available resources, and anticipated risk exposure. This model serves to provide a means for capability improvement planning and also validate a suitable QRA approach.

The QRAMM will support quality assurance and benchmarking of QRA processes. This model is not specific to any QRA methodology; there is no single recommended QRA approach. The QRAMM assumes an organization will need a suite of methods for various project, program, and portfolio types, sizes, and phases. It applies to cost, schedule, escalation, and other elements of uncertainty and risk being evaluated. It may be good practice for organizations to employ at least two QRA methods so that the results of one approach can be used to corroborate the other.

The QRAMM employs a continuous improvement approach such that higher maturity levels represent having an understanding and consideration of current recommended practices but also establish reasonable stretch goals for methods on the near horizon (e.g., advanced analytics or artificial intelligence).

1.3. Background

The application of maturity models to assess an organization's capabilities is a well-established area of knowledge.[1] These RM models usually include the assessment of QRA capability, but only as one general item considered amongst many RM elements. This RP provides more detail for the QRA step and methods of RM. Maturity models are often

[1] For example, an article by Stephenson in 2012 shared a cost engineering maturity model (CEMM) [4]. For RM maturity, an article by Hartono, et. al. references six different published RM maturity models [5]. The RM maturity model most often referenced is perhaps that by Hillson [6]. An article by Arrow on "risk intelligence" in 2012 offers additional perspective on project risk management maturity and also references Hillson [7].

used as a tool to support process quality assurance and control (QA/QC). For risk management (including QRA) the topic of QA/QC is addressed in RP 77R-15 [8]. With respect to quality, an important element of this QRAMM is its focus on continuous process improvement and continuous learning. This RP incorporates a key improvement aspiration or stretch goal for QRA to effectively incorporate unconventionally large datasets and advanced analytics, i.e., data science methods using approaches such as machine learning (ML), a form of artificial intelligence (AI). Given the importance of data to this objective, project historical database development [10], including the capture of risk information and timely dissemination, is therefore a related topic to this RP.

2. QRA MATURITY MODEL BASIS

2.1. Roadmap

The QRAMM illustrates five levels of maturity. Figure 1 conceptually illustrates how continuous improvement, with a goal of generating increasingly insightful analytics and ever-improving QRA prediction accuracy is a direct function of the maturity levels listed on the model's x-axis [11] [12]. Figure 1 also illustrates how organizations often take on more risks (i.e., greater risk appetite in green) in order to achieve their cost, schedule, and other goals. Taking on more risk calls for greater RM and QRA maturity. This may come with a greater risk management cost (the chart's y-axis) and decreasing residual risk impact.

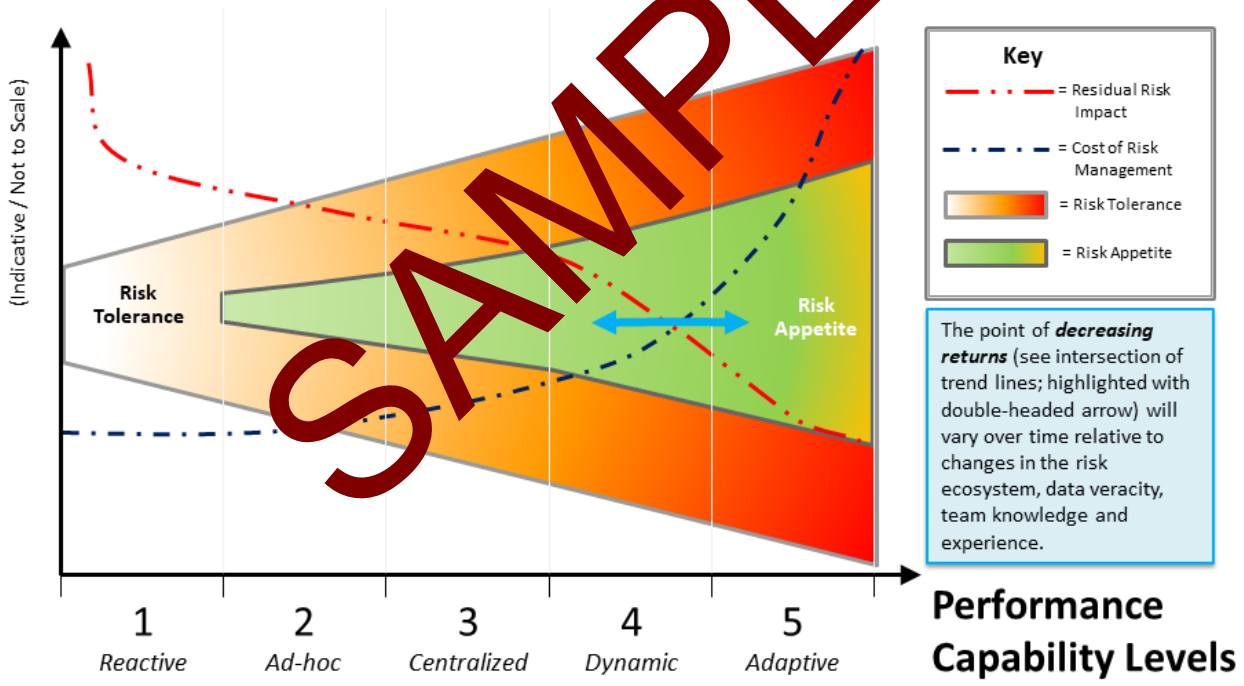

Figure 1. QRAMM Roadmap

Note that Figure 1 does not promote any particular QRA method. For a given organization, the project portfolio, risk environment, and analytic needs will differ. In short, an organization should determine which QRA method is fit-for-purpose given their specific use case, problem, project, program, or portfolio element in question.

For example, an engineering, procurement, and construction (EPC) contractor may be focused on post-sanction, execution phase risks and/or the risk costs to include in its tenders/bids; this may put an emphasis on having the