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COMPARISON OF RISK MANAGEMENT ANALYSISBETWEEN PMBOK (2017), ISO (31000: 2018) AND AS / NZS (4360: 2009)

EndahMurtiana Sari[1], Manlian A. Simanjuntak[2], M. Agung Wibowo[3], Obsatar Sinaga[4]

[1]Construction Management of EsaUnggul University, Indonesia

[2]Civil Engineering Doctoral Program, Tarumanagara University, Jakarta, Indonesia

[3]Construction Management PelitaHarapan University, Indonesia

[4]Diponegoro University, Indonesia

[1]endah.murtiana@esaunggul.ac.id, [2]manlian.adventus@uph.edu,

[3]agung.wibowo@ft.undip.ac.id, [4]obsatar.sinaga@unpad.ac.id

EndahMurtiana Sari, Manlian A. Simanjuntak, M. Agung Wibowo, ObsatarSinaga. Comparison Of Risk Management Analysis Between Pmbok (2017), Iso (31000: 2018) And As / Nzs (4360: 2009)--Palarch's Journal Of Archaeology Of Egypt/Egyptology 17(10), 1439-1451. ISSN 1567-214x

Keywords:risk management, risk management tools, PMBOK's tools, ISO tools, AS / NZS's tools, comparative risk.

ABSTRACT

Risk management is the process of identifying, analyzing and making risk management decisions based on the results of identification and analysis which aim to maximize positive things and minimize negative things in a construction project. The purpose of this study is to provide recommendations regarding the use of analytical tools in construction project risk management using PMBOK, ISO or AS / NZS references. The analysis is developed by paying attention to existing references so that it becomes clear how to use this tool to analyze risk management. Accuracy in using risk management tools will help risk management actors make better and clearer decisions, and progress can be monitored by stakeholders involved in risk management. This research method uses a manual literature study method, and then a comparison of each of these methods is carried out. The study found that each risk management analysis tool has its advantages in each of its phases; the combined ability of each tool will enrich risk management studies.

Keywords: risk management, risk management tools, PMBOK's tools, ISO tools, AS / NZS's tools, comparative risk.

INTRODUCTION

Risk is a consequence of uncertain conditions that often cannot be predicted accurately. Therefore, it is necessary to have risk management from the beginning of a construction project, to reduce the impact of risks that may occur. Construction projects can be very complex and full of uncertainty. Construction projects are unique, specific and dynamic, and therefore projects have different levels and combinations of risks, so different responses are taken to minimize those risks and different consequences affecting project performance. The risk categories in building a project are external risk, economic and financial risk, technical and contract risk, and managerial risk (Wiguna IPA, and Scott S, 2006). Construction projects are always unique and risk increases from a number of different sources (Oyegoke, 2006). Project risk can be defined as the description of unfavorable consequences, both financial and project structure, as a result of decisions made or due to environmental conditions at the project site. Risks in a construction project are things that cannot be eliminated, but the impact can be minimized (Nurdiana A, Wibowo M.A, Hatmoko J.U.D, 2015). Risks and uncertainties have the potential to have devastating consequences for construction projects (Flanagan et al., 2006). Project risks are unavoidable and there is a consequence that these risks must be accepted and managed. Therefore, an effective and efficient risk acceptance and management method must be developed so that it can reduce losses and achieve the objectives of the project. Analysis and risk management methods must be developed and become the main features of project management, understanding the use of appropriate risk management tools will help risk management actors act more effectively and have a clear direction, so that cost, time and other resource efficiency can be achieved in managing a project's risk.

Risk management in the context of construction project management involves identification, assessment, analysis and evaluation of risks. This process is in an effort to prioritize risks by monitoring, controlling, and implementing managerial resources in a coordinated and economic way to minimize the likelihood and / or impact of unfavorable events and so to maximize the realization of project objectives (Douglas, 2009). Project risk management can use a variety of tools for its implementation starting from the technical steps in identifying the types of risks in the project.

Some of the risk management tools developed are usually based on the Project Management Body of Knowledge (PMBOK), International Organization of Standardization (ISO) and the Australian Standard / New Zealand Standard (AS / NZS). Each of these tools is widely used by risk management practitioners both in the scope of construction projects and companies in general.

The choice of tools will be important in an effort to overcome risks associated with construction activities that will be aligned with project objectives including time, cost, quality, building function, client satisfaction, work safety and security, even the long-term sustainability of projects and organizations. This paper presents the advantages of risk management tools and their analysis as well as their comparison and recommendations for their use in risk management applications in construction projects.

LITERATURE REVIEW

The definitions of risk and risk management from various literatures are widely presented. Risk is the effect of uncertainty on objectives (ISO 31000: 2018). Project Risk Management includes the process of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project. The objectives of project risk management are to increase the probability and / or impact of positive risks and to decrease the probability and / or impact of negative risks, in order to optimize the chances of project success (PMBOK, 2017). Risk management is the culture, process and structure that are directed towards realizing potential opportunities whilst managing adverse effects (AS / NZS 4360: 2004). Risks arise because of the uncertainty of an event that has not yet happened. In such uncertainty, risk will always be inversely proportional to profit. Uncertainty can usually increase risk factors which can be seen as a potential for undesirable negative circumstances of an event (Uher, 1996). The definition of risk always contains two aspects, namely loss and uncertainty. Basically, risk management is not a new concept and has been implemented natively using experts (Mills, 2001). Risk management in a project includes identifying factors that affect or have the potential to cause harm, measuring its impact, analyzing and evaluating its occurrence, and implementing steps to manage it so that it will have a positive impact on project objectives.

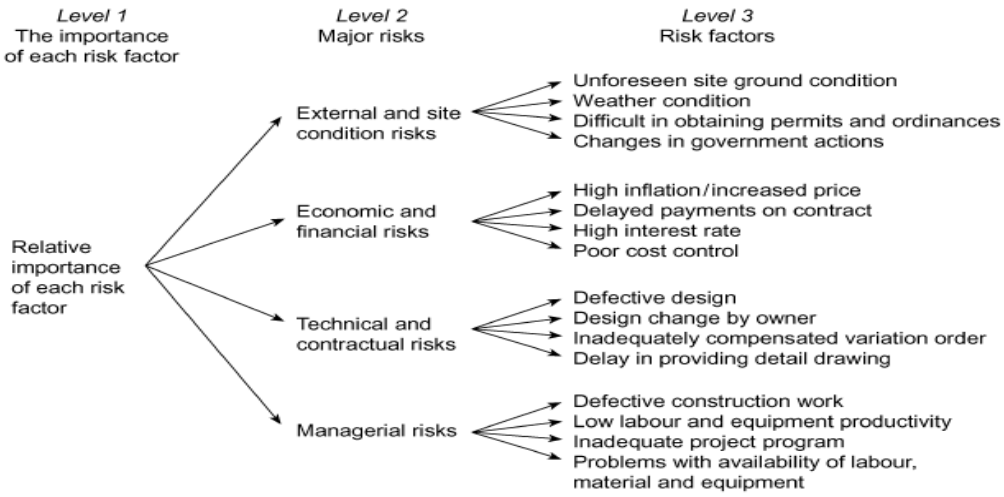

Figure 1. Hierarchy of Risk at Building Project in Indonesia (Wiguna and Scott, 2006)

Figure 1shows the risk categories and risk identification in a construction project. Risks are identified in each risk category. The risk categories in a construction project can be in the scope of financial risk, time risk, physical risk, personnel risk, design and technical risk, contract risk, political and regulatory risk, and safety risk (Cheng Siew Goh and Hamzah Abdul-Rahman, 2013). The risk category for a construction project is determined based on several considerations, including the type of construction work, the parties involved, the construction method, project resources, construction issues, and so on. Analyzing risk is important in business. In construction, risk can be seen in every aspect of work, such as work location, resources, or project

implementation schedule (Zhi, 1995). The more risky the activity is, the more costly the consequences if the wrong decision is made.

Risk = Likelihood of an event × Consequences of loss resulting from that event. Risks cannot be avoided completely, but choices can be made so that risks are minimized. Flanagan et

Al. (2006) defined a construction project as a series of non-repetitive activities with unique specifications such as long-term periods, complex processes, and unfavorable environments, financial / investment issues, and dynamic organizational structures.

Risk identification is the first step in the risk management process, where the various risk potentials that arise in the project are identified. Furthermore, risk classification is carried out with the aim of arranging risks based on events and their consequences on the project, usually sorted from minor to large impact or vice versa. Various risks are grouped into internal and external risks which have different response responses in the project.

In previous research, several authors focused on the identification and classification of risks involved in construction projects. Andualem Endris Yadeta (2017) collected writings from several authors including Chen et al. (2004); Ruqaya et al. 2012; Tumi et. al. (2009); Sweis et. al. (2008); Markmann et. al. (2013); Assaf and Al-Hejji(2006); Shen (2001); Koushki et al. (2005) and others to cite various risk factors that contribute to project delays and cost overruns and deterioration in quality. All of them identify different risk factors and categorize them into internal and external risks that will occur in a construction project. From the research results of the researchers above, external risks that are beyond the control of the project team are grouped into (1) political risk, (2) economic risk, (3) legal risks, (4) social risks, and (5) natural risks. On the other hand, internal risks arising from the specific nature of the project and events, and are within the control of the project team are divided into (1) design risk, (2) construction risk, (3) financial risk, (4) management risk; and (5) maintenance risk. Both external and internal risks are identified.

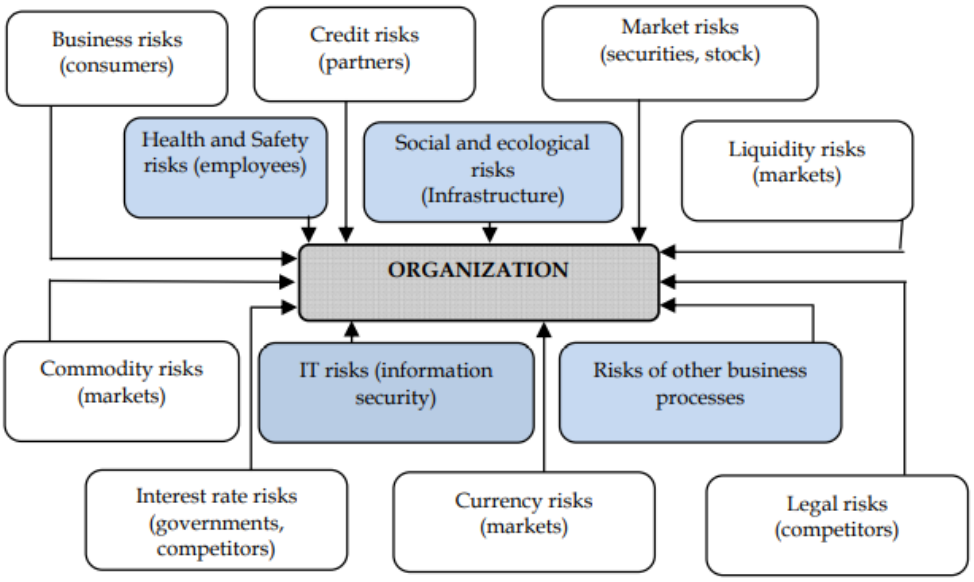

Figure 2. Different risks and standards facing an organization (adapted from Nikonov& Kogan, 2009)

Nikonov& Kogan (2009) consider that even though organizations run them in different risk categories, the same ubiquitous and unique standard risk management structure can contribute to reducing the risk of "too many standard risks". In order to eliminate the redundancy generated by a large number of standards, representatives of European risk management associations have been questioning the need for an ISO Standard since the idea was put forward more than 10 years ago. Instead, they are promoting the idea of guidelines which, in ISO terminology, are less sharp than standards. In the meantime, the types of standards or documents (guides, frameworks, etc.) have been developed to deal with certain areas of risk management and are widely accepted.

RESEARCH METHOD & ANALYSIS

The research methodology chosen was to compare the risk management process through 3 references, namely PMBOK, ISO and AS / NZS. Each of the tools will be discussed at each stage and the output generated from each stage. Each of these tools is directed at risk management analysis in construction projects. In this analysis, a matrix was developed to make it easier to read and analyze various factors in the three references.

Table 1. Overview of the Clause

Scope	**Tools Name**		
	PMBOK	ISO	AS/NZS
		5.2. Communication & Consultation	3.2. Communication and consultation
Plan Risk Management	11.1. Plan Risk Management	5.3. Establishing the context	4.1. Establishing the

Scope	Tools Name		
	PMBOK	ISO	AS/NZS
			context
Identify Risk	11.2. Identify Risk	5.4.2. Risk Identification	4.2. risk identification
Analysis Risk	11.3. Perform Qualitative Analysis 11.4. Perform Quantitative Analysis	5.4.3. Risk Analysis	4.3. Risk analysis
Risk response	11.5. Plan Risk response	5.4.4. Risk Evaluation	4.4 Risk evaluation
Risk Treatment	11.6. Implement risk responses	5.5.Risk Treatment	4.5 Risk treatment
Monitoring and Review	11.7. Monitor risks	5.6. Monitoring & Review	4.6 Monitoring and review

Table 2. Study Comparatives Risk Management process PMBOK, ISO and AS / NZS

No.	Tools Names	Scope
Communication & Consultation		
1	PMBOK	Do not directly initiate communication and consultation in the clause, but there are tools & technique for "meetings". Meetings are a means of communication and consultation in seeking input in the risk management process.
2	ISO	In clause 5.2. There is a commitment from the leadership so that the first step in implementing Risk Management is communication and consultation, which aims to unify perceptions of risk management. Communication seeks to increase awareness and understanding of risk, whereas consultation involves obtaining feedback and information to support decision making. Close coordination between the two must facilitate the exchange of factual, timely, relevant, accurate and understandable information, taking into account the confidentiality and integrity of information as well as individual privacy rights. Communication and consultation with external and internal stakeholders as appropriate should be put in place within and throughout all steps of the risk management process.
3	AS/NZS	The concept of 'risk communication' is generally defined as an interactive process of exchange of information and opinion, involving multiple messages about the nature of risk and risk management *. This applies inside organizations, departments or business units or external stakeholders. Risk communication will not solve all

No.	Tools Names	Scope
		problems or resolve all conflict. Inappropriate communication about risk can lead to a breakdown in trust and / or poor risk management. Consultation can be described as a process of informed communication between organization and its stakeholders on an issue prior to making a decision or determining a direction on a particular issue.
Plan Risk Management		
1	PMBOK	Plan Risk Management is the process of determining how to carry out risk management activities for a project. The Risk Management Plan process should start when a project is drawn up and must be completed early in the project. It may be necessary to revisit this process later in the project life cycle, for example at a major phase change, or if the project scope changes significantly, or if a subsequent review of risk management effectiveness determines it. The Project Risk Management process requires modification. The risk management plan is a component of the project management plan that describes how risk management activities will be structured and performed. The output of this activity is the RBS (Risk Base Structure).
2	ISO	When designing the framework for managing risk, the organization should examine and understand its external and internal context. Top management and oversight bodies, where applicable, should demonstrate and articulate their continual commitment to risk management through a policy, a statement or other forms that clearly convey an organization's objectives and commitment to risk management. The output of this activity is a framework that involves various stakeholders.
3	AS/NZS	Systematic planning of information flow. This step defines the external & internal environment in which the organization operates. It also defines the relationship between the organization and its external & Internal environment. Setting the scope and boundaries of an application of Risk Management. The output of this activity is the structure for the rest of the process, namely the grouping of activities, processes, projects or changes into a set of elements or steps to provide a logical framework that helps ensure significant risks are not neglected. The structure chosen depends on the nature of risk and space scope of the project, process or activity.
Identify Risk		

No.	Tools Names	Scope
1	PMBOK	Identifying Risks is the process of identifying individual project risks as well as sources of overall project risk, and documenting their characteristics. The key benefit of this process is the documentation of existing individual project risks and the sources of overall project risk. It also brings together information so the project team can respond appropriately to identify risks. This process is performed throughout the project. The methods used are data gathering, data analysis, interpersonal & team skills.
2	ISO	The purpose of risk identification is to find, recognize and describe risks that might help or prevent an organization achieving its objectives. Relevant, appropriate and up-to-date information is important in identifying risks. The organization should identify risks, whether or not their sources are under its control. It should be considered that there may be more than one type of outcome, which may result in a variety oftangible or intangible consequences.
3	AS/NZS	The aim is to generate a comprehensive list of sources of risks and events that might have an impact on the achievement of each of the objectives identified in the context. These events might prevent, degrade, delay or enhance the achievement of those objectives. These are then considered in more detail to identify what can happen. Having identified what might happen, it is necessary to consider possible causes and scenarios. There are many ways an event can occur. It is important that no significant causes are omitted. Approaches used to identify risks include checklists, judgments based on experience and records, flow charts, brainstorming, systemsanalysis, scenario analysis and systems engineering techniques.
Analysis Risk		
1	PMBOK	Performing Qualitative & Quantitative Analysis It identifies a risk owner for each risk who will take responsibility for planning an appropriate risk response and ensuring that it is implemented. Performing Qualitative Risk Analysis also lays the foundation for Perform Quantitative Risk Analysis if this process is required. The Perform Qualitative Risk Analysis process is performed regularly throughout the project life cycle, as defined in the Risk Management Plan. Often, in an agile development environment, the Performing Qualitative Risk Analysis process isconducted before the start of each iteration. Performing Quantitative Risk Analysis is not required for all projects. Undertaking a robust analysis depends on the availability of high-quality data about individual project risks and other sources of uncertainty, as well as a sound underlying project baseline for scope, schedule, and cost. Quantitative risk analysis usually requires specialized risk

No.	Tools Names	Scope
		software and expertise in the development and interpretation of risk models. It also consumes additional time and cost. The use of quantitative risk analysis for a project will be specified in the project's risk management plan. It is most likely appropriate for large or complex projects, strategically important projects, projects for which it is a contractual requirement, or projects in which a key stakeholder requires it. Quantitative risk analysis is the only reliable method to assess overall project risk through evaluating the aggregated effect on project outcomes of all individual project risks and other sources of uncertainty.
2	ISO	Risk analysis can be undertaken with varying degrees of detail and complexity, depending on the purpose of the analysis, the availability and reliability of information, and the resources available. Analysis techniques can be qualitative, quantitative or a combination of these, depending on thecircumstances and intended use. Risk analysis provides an input to risk evaluation, to decisions on whether risk needs to be treated and how, and on the most appropriate risk treatment strategy and methods. The results provide insight for decisions and / or choices and the options involved in the different types and levels of risk.
3	AS/NZS	Using Qualitative, semi Quantitative and Quantitative analysis Qualitative analysis may be usedas an initial screening to identify risks which require more detailed analysis; where this kind of analysis is appropriate for decisions,or where the numerical data or resources are inadequate for a quantitative analysis.In semi-quantitative analysis, qualitative scales such as thosedescribed above are given values. The objective is to produce amore expanded ranking scale than is usually achieved inqualitative analysis, not to suggest realistic values for risk suchasattempted in quantitative analysis. Quantitative analysis uses numerical values (rather than the descriptive scales used in qualitative and semi-quantitative analysis) for both consequences and likelihood using data from a variety of sources. The quality of the analysis depends on the accuracy and completeness of the numerical values and the validity of the models used.
Risk Response		
1	PMBOK	Planning Risk Responses is the process of developing options, selecting strategies, and agreeing on actions to address overall project risk exposure, as well as to treat individual project risks. The key benefit of this process is that it identifies appropriate ways to address overall project

No.	Tools Names	Scope
		risk and individual project risks. This process also allocates resources and inserts activities into project documents and the project management plan as needed. This process is performed throughout the project.
2	ISO	The term 'Risk Evaluation' is used. The purpose of risk evaluation is to support decisions. Risk Evaluation involves comparing the results of the risk analysis with the established risk criteria to determine where additional action is required. Decisions should take account the wider context and the actual and perceived consequences to external and internal stakeholders. The outcome of risk evaluation should be recorded, communicated and then validated at appropriate levels of the organization.
3	AS/NZS	Called Risk Evaluation, the purpose of Risk Evaluation is to make decisions, based on the outcomes of risk analysis, about which risks need treatment and the priority of each risk. Risk evaluation involves comparing the level of risk found during the analysis process with the risk criteria established when the context was considered. The objectives of the organization and the extent of opportunity that could result should be considered. Where a choice is to be made between options, higher potential losses may be associated with higher potential gains and the appropriate choice will depend on an organization's context. Decisions should take account of the wider context of the risks and include consideration of the tolerability of the risks borne by parties other than the organization that benefit from it. In some circumstances, the risk evaluation may lead to a decision to undertake further analysis.
Risk Treatment		
1	PMBOK	Planning Risk Responses is the process of developing options, selecting strategies, and agreeing on actions to address overall project risk exposure, as well as to treat individual project risks. The key benefit of this process is that it identifies appropriate ways to address overall project risk and individual project risks. This process also allocates resources and inserts activities into project documents and the project management plan as needed.Five alternative strategies may be considered for dealing with threats are escalate, avoid, transfer, mitigate, accept.
2	ISO	The purpose of risk treatment is to select and implement options for addressing risk. Selecting the most appropriate risk treatment option(s) involves balancing the potential benefits derived in relation to the achievement of the objectives against costs, effort or disadvantages of implementation. When selecting risk treatment options, the organization should consider the values, perceptions and potential involvement of stakeholders and the most appropriate ways to communicate and consult with them.

No.	Tools Names	Scope
		Though equally effective, some risk treatments can be more acceptable to some stakeholders than to others. Risk treatments, even if carefully designed and implemented might not produce the expected outcomes and could produce unintended consequences. Monitoring and review need to be an integral part of the risk treatment implementation to give assurance that the different forms of treatment become and remain effective
3	AS/NZS	Risk treatment involves identifying the range of options for treating risks, assessing these options and the preparation and implementation of treatment plans. Treatment options for risks with negative outcomes are similar in concept to those for treating risks with positive outcomes, although the interpretation and implications are clearly different. Options include avoiding, changing the likelihood, Changing the consequences, to reduce the extent of the losses, sharing the risk, retaining the risk.
Monitoring & Review		
1	PMBOK	Monitoring Risks is the process of monitoring the implementation of agreed-upon risk response plans, tracking identified risks, identifying and analyzing new risks, and evaluating risk process effectiveness throughout the project. The key benefit of this process is that it enables project decisions to be based on current information about the overall project risk exposure and individual project risks.
2	ISO	The purpose of monitoring and reviewing is to assure and improve the quality and effectiveness of process design, implementation and outcomes. Ongoing monitoring and periodic review of the Risk Management Process and its outcomes should be a planned part of the risk management process, with responsibilities clearly defined. Monitoring and review should take place in all stages of the process. Monitoring and review includes planning, gathering and analyzing information, recording results and providing feedback. The results of monitoring and review should be incorporated throughout the organization's performance management, measurement and reporting activities.
3	AS/NZS	Monitoring and review also involves learning lessons from the risk management process, by reviewing events, the treatment plans and their outcomes. Monitoring and reviewing is an essential and integral part of managing risk, and is one of the most important steps of the risk management process organizationally. It is necessary to monitor risks, the effectiveness and appropriateness of the strategies and management systems set up to implement risk treatments and the risk management plan and system as a whole.

4. CONCLUSION

a. The risk management process as defined in ISO 31000: 2009, AS / NZS applicable to all organizations will ensure that good practices prevail and mistakes are managed in every organization, ISO 31000: 2009 provides general principles and guidelines on risk management and can be used by the public, private or community businesses, associations, groups or individuals. This standard is not specific to any industry or sector whereas PMBOK is directed to a Construction project-based risk management process with a risk definition based on events in a construction project.
b. There is almost no difference in the definition of risk between PMBOK, ISO, and AS / NZS. Basically, risk is the uncertainty in achieving objectives.
c. There is a difference in analyzing risk between PMBOK with ISO and AS / NZS where the risk in PMBOK is due to differences in the scope of the use of tools. PMBOK analyzes risk based on the needs of the construction project, while ISO and AS / NZS analyzes risk based on internal and external conditions of the organization. This results in differences in the tools used in risk analysis.
d. Because the problem is clear and only within the scope of the project, PMBOK emphasizes that the methods used are Qualitative and Quantitative analysis from the results of the risk analysis that has been obtained.
e. AS / NZS and ISO provide freedom in analyzing risk, but ISO is quite detailed in reporting and tabulating risk analysis results, so that the existing depiction makes it easy to read the risk analysis results report.
f. In the risk treatment, PMBOK explains 5 responses in dealing with risks based on their nature. ISO emphasizes that treatment depends on the problems at hand, while in AS / NZS 6 steps of risk treatment are presented according to their characteristics, almost the same as PMBOK.
g. Monitoring and reviews related to the implementation of risk management are almost all the same between PMBOK, ISO and AS / NZS.

RECOMMENDATIONS

a. The use of tools for risk management should be a combination tailored to the needs of the organization, both within the project scope and in any sector organization.
b. In planning risk management, it is advisable to highlight internal and external factors of the organization by conducting a SWOT analysis so that all affected factors can be described and all the risks that accompany them can be known. The ISO model can be used as a reference.
c. In analyzing risk, the PMBOK approach can be used with detailed stages so that in-depth analysis can help in the risk response stage.
d. Risk treatment is an important part, therefore grouping and tabulation can be done using guidance from ISO and then the treatment uses a combination of AS / NZS.
e. Monitoring and review aims to ensure the implementation of risk management can run well, ISO provides guidance in surveillance, assurance and risk management audits.

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