

ISO 31010 Risk assessment techniques

Technique	Description	Application	Risk Process				
			Risk Identification	Risk Analysis			Evaluation
				Consequence	Likelihood	Risk Rating	
ALARP/ SFAIRP	Criteria for deciding significance of risk and means of evaluating tolerability of risk.	Evaluate risk	NA	NA	NA	NA	SA
Bayesian analysis	A means of making inference about model parameters using Bayes' theorem which has the capability of incorporating empirical data into prior judgements about probabilities.	Analyse likelihood	NA	NA	SA	NA	NA
Bayesian networks/ Influence diagrams	A graphical model of variables and their cause-effect relationships expressed using probabilities. A basic Bayesian network has variables representing uncertainties. An extended version, known as an influence diagram, includes variables representing uncertainties, consequences and actions.	Identify risk; estimate risk; Decide between options	NA	NA	SA	NA	SA
Bow tie analysis	A diagrammatic way of describing the pathways from sources of risk to outcomes, and of reviewing controls.	Analyse risk; analyse controls; Describe risk	A	SA	A	A	A
Brainstorming	Technique used in workshops to encourage imaginative thinking.	Elicit views	SA	A	NA	NA	NA
Business impact analysis	The BIA process analyses the consequences of a disruptive incident on the organisation which determines the recovery priorities of an organisation's products and services and, thereby, the priorities of the activities and resources which deliver them.	Analyse consequence; Analyse controls	A	SA	NA	NA	NA
Causal mapping	A network diagram representing events, causes and effects and their relationships.	Analyse causes	A	A	NA	NA	NA
Cause-consequence analysis	A combination of fault and event tree analysis that allows inclusion of time delays. Both causes and consequences of an initiating event are considered.	Analyse causes and Consequence	A	SA	SA	A	A
Checklists classifications, taxonomies	Lists based on experience or on concepts and models that can be used to help identify risks or controls.	Identify risk or controls	SA	NA	NA	NA	NA
Cindynic approach	Considers goals, values, rules, data and models of stakeholders and identifies inconsistencies, ambiguities, omissions and ignorance. This form systemic sources and drivers of risk.	Identify risk drivers	SA	NA	NA	NA	NA
Consequence/ likelihood matrix	Compares individual risks by selecting a consequence/likelihood pair and displaying them on a matrix with consequence on one axis and likelihood on the other.	Report risks evaluate	NA	A	A	SA	A
Cost/benefit analysis	Uses money as a scale for estimating positive and negative, tangible and intangible, consequences of different options.	Compare options	NA	SA	NA	NA	SA
Cross impact analysis	Evaluates changes in the probability of the occurrence of a given set of events consequents on the actual occurrence of one of them.	Analyse likelihood and cause	NA	NA	SA	NA	NA
Decision tree analysis	Uses a tree-like representation or model of decisions and their possible consequences. Outcomes are usually expressed in monetary terms or in terms of utility. An alternative representation of a decision tree is an influence diagram.	Compare options	NA	SA	SA	A	A

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Delphi technique	Collects judgements through a set of sequential questionnaires. People participate individually but receive feedback on the responses of others after each set of questions.	Elicit views	SA	NA	NA	NA	NA
Event tree analysis (ETA)	Models the possible outcomes from a given initiating event and the status of controls thus analysing the frequency or probability of the various possible outcomes.	Analyse consequence and controls	NA	SA	A	A	A
Failure modes and effects analysis	Considers the ways in which each component of a system might fail and the failure causes and effects. FMEA can be followed by a criticality analysis which defines the significance of each failure mode (FMECA).	Identify risks	SA	SA	NA	NA	NA
Failure modes and effects and criticality analysis	Considers the ways in which each component of a system might fail and the failure causes and effects. FMEA can be followed by a criticality analysis which defines the significance of each failure mode (FMECA).	Identify risks	SA	SA	SA	SA	SA
Fault tree analysis (FTA)	Analyses causes of a focus event using Boolean logic to describe combinations of faults. Variations include a success tree where the top event is desired and a cause tree used to investigate past events.	Analyse likelihood; Analyse causes	A	NA	SA	A	A
Frequency / number (F/N) diagrams	Special case of quantitative consequence/likelihood graph applied to consideration of tolerability of risk to human life.	Evaluate risk	A	SA	SA	A	SA
Game theory	The study of strategic decision making to model the impact of the decisions of different players involved in the game. Example application area can be risk-based pricing.	Decide between options	A	SA	NA	NA	SA
Hazard analysis and critical control points (HACCP)	Analyses the risk reduction that can be achieved by various layers of protection.	Analyse controls monitor	SA	SA	NA	NA	SA
Hazard and operability studies (HAZOP)	A structured and systematic examination of a planned or existing process or operation in order to identify and evaluate problems that might represent risk to personnel or equipment or prevent efficient operation.	Identify and analyse risks	SA	A	NA	NA	NA
Human reliability analysis (HRA)	A set of techniques for identifying the potential for human error and estimating the likelihood of failure.	Analyse risk and sources of risk	SA	SA	SA	SA	A
Interviews	Structured or semi- structured one-to-one conversations to elicit views.	Elicit views	SA	NA	NA	NA	NA
Ishikawa analysis (fishbone diagram)	Identifies contributory factors to a defined outcome (wanted or unwanted). Contributory factors are usually divided into predefined categories and displayed in a tree structure or a fishbone diagram.	Analyse sources of risk	SA	A	NA	NA	NA
Layers of protection analysis (LOPA)	Analyses the risk reduction that can be achieved by various layers of protection.	Analyse controls	A	SA	A	A	NA
Markov analysis	Calculates the probability that a system that has the capacity to be in one of a number of states will be in a particular state at a time t in the future.	Analyse likelihood	A	A	SA	NA	NA
Monte Carlo analysis	Calculates the probability of outcomes by running multiple simulations using random variables.	Analyse likelihood	NA	A	A	A	SA

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Multi-criteria analysis (MCA)	Compares options in a way that makes trade-offs explicit. Provides an alternative to cost/benefit analysis that does not need a monetary value to be allocated to all inputs.	Decide between options	A	NA	NA	NA	SA
Nominal group technique	Technique for eliciting views from a group of people where initial participation is as individuals with no interaction, then group discussion of ideas follows.	Elicit views	SA	A	A	NA	NA
Pareto charts	The Pareto principle (the 80–20 rule) states that, for many events, roughly 80 % of the effects come from 20 % of the causes.	Set priorities	NA	A	A	A	SA
Reliability centred maintenance (RCM)	A risk-based assessment used to identify the appropriate maintenance tasks for a system and its components.	Evaluate risk; Decide controls	A	A	A	A	SA
Risk indices	Rates the significance of risks based on ratings applied to factors which are believed to influence the magnitude of the risk.	Compare risks	NA	SA	SA	A	SA
Scenario analysis	Identifies possible future scenarios through imagination, extrapolation from the present or modelling. Risk is then considered for each of these scenarios.	Identify risk; Consequence analysis	SA	SA	A	A	A
S-curves	A means of displaying the relationship between consequences and their likelihood plotted as a cumulative distribution function (S-curve).	Display risk; Evaluate risk	NA	A	A	SA	SA
Structured what if technique (SWIFT)	A simpler form of HAZOP with prompts of "what if" to identify deviations from the expected.	Identify risk	SA	SA	A	A	A
Surveys	Paper- or computer-based questionnaires to elicit views.	Elicit views	SA	NA	NA	NA	NA
Toxicological risk assessment	A series of steps taken to obtain a measure for the risk to humans or ecological systems due to exposure to chemicals.	Measure of risk	SA	SA	SA	SA	SA
Value at risk (VaR)	Financial measure of risk that uses an assumed probability distribution of losses in a stable market condition to calculate the value of a loss that might occur with a specified probability within a defined time span.	Measure of risk	NA	A	A	SA	SA

A: applicable; SA: strongly applicable; NA: not applicable.