NORTH ATLANTIC TREATY ORGANIZATION

SCIENCE AND TECHNOLOGY ORGANIZATION

AC/323(SAS-093)TP/774

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**STO TECHNICAL REPORT** **TR-SAS-093-Part-I**

# Analysis Support Guide for Risk-Based Strategic Planning

(Guide d'analyse pour la planification stratégique basée sur le risque)

Designing the Risk-Based Framework for Strategic Planning to support NATO and national defence planning processes.

Published March 2018

*Distribution and Availability on Back Cover*

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# The NATO Science and Technology Organization

Science & Technology (S&T) in the NATO context is defined as the selective and rigorous generation and application of state-of-the-art, validated knowledge for defence and security purposes. S&T activities embrace scientific research, technology development, transition, application and field-testing, experimentation and a range of related scientific activities that include systems engineering, operational research and analysis, synthesis, integration and validation of knowledge derived through the scientific method.

In NATO, S&T is addressed using different business models, namely a collaborative business model where NATO provides a forum where NATO Nations and partner Nations elect to use their national resources to define, conduct and promote cooperative research and information exchange, and secondly an in-house delivery business model where S&T activities are conducted in a NATO dedicated executive body, having its own personnel, capabilities and infrastructure.

The mission of the NATO Science & Technology Organization (STO) is to help position the Nations' and NATO's S&T investments as a strategic enabler of the knowledge and technology advantage for the defence and security posture of NATO Nations and partner Nations, by conducting and promoting S&T activities that augment and leverage the capabilities and programmes of the Alliance, of the NATO Nations and the partner Nations, in support of NATO's objectives, and contributing to NATO's ability to enable and influence security and defence related capability development and threat mitigation in NATO Nations and partner Nations, in accordance with NATO policies.

The total spectrum of this collaborative effort is addressed by six Technical Panels who manage a wide range of scientific research activities, a Group specialising in modelling and simulation, plus a Committee dedicated to supporting the information management needs of the organization.

- AVT Applied Vehicle Technology Panel
- HFM Human Factors and Medicine Panel
- IST Information Systems Technology Panel
- NMSG NATO Modelling and Simulation Group
- SAS System Analysis and Studies Panel
- SCI Systems Concepts and Integration Panel
- SET Sensors and Electronics Technology Panel

These Panels and Group are the power-house of the collaborative model and are made up of national representatives as well as recognised world-class scientists, engineers and information specialists. In addition to providing critical technical oversight, they also provide a communication link to military users and other NATO bodies.

The scientific and technological work is carried out by Technical Teams, created under one or more of these eight bodies, for specific research activities which have a defined duration. These research activities can take a variety of forms, including Task Groups, Workshops, Symposia, Specialists' Meetings, Lecture Series and Technical Courses.

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Published March 2018



ISBN 978-92-837-2102-4

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# List of Acronyms

| | |
|---|---|
| C4I | Command, Control, Communications, Computers and Intelligence |
| CBP | Capability-Based Planning |
| DND | Department of National Defence (Canada) |
| FSE | Future Security Environment |
| HAZOP | Hazard and Operability studies |
| ISO | International Standard Organisation |
| J-DARTS | Joint Defence planning Analysis and Requirements Tool Set |
| KPI | Key Performance Indicator |
| MCDA | Multi-Criteria Decision Analysis |
| MoD | Ministry of Defence (Norway, Poland, UK) |
| MoE | Measure of Effectiveness |
| MoP | Measure of Performance |
| NATO | North Atlantic Treaty Organization |
| NC3A | NATO Consultation, Command and Control Agency |
| NCIA | NATO Communications and Information Agency |
| NDPP | NATO Defence Planning Process |
| NRA | National Risk Assessment (UK) |
| NRR | National Risk Register – publicly available version of the National Risk Assessment (UK) |
| NSRA | National Security Risk Assessment (UK) |
| OODA | Observe, Orientate, Decide, and Act |
| SAS | System Analysis and Studies (Panel) |
| SME | Subject Matter Expert |
| SWOT | Strengths, Weaknesses, Opportunities and Threats |
| ToR | Terms of Reference |
| UK | United Kingdom |
| VIPOR | Visual Investment Plan Optimization and Revision (Canada) |

# Glossary

| Term | Meaning |
|---|---|
| Activity | When referring to strategic planning, an activity is a set of tasks that can take a significant amount of time (e.g., weeks or months), or require significant resources. |
| Aleatoric Uncertainty | Aleatoric (or statistical) uncertainty is representative of the variability that is inherent in systems due to random variation [1] such as the lack of certainty that an event will occur (unknown knowns). This type of uncertainty is usually measured using probabilities obtained, for example, by observing a set of regularly (even if rarely) occurring events and calculating their statistics. Each time we make an observation of an event there is some uncertainty in both the event occurrence and the values we are measuring contributing to the observed variability. |
| Analyst | A decision-support specialist who support planners and their efforts throughout all phases of the strategic planning process by employing scientifically sound, methods. |
| Attributes (Technique Categorisation) | A quality or feature that is a characteristic of or possessed by, in this case, a technique [2]. |
| Clumsy Solutions | Clumsy solutions are solutions to wicked problems and are characterised as being different from one another with none of the solutions better than another. Choosing one clumsy solution over another is an act of subjective judgement. |
| Consequence | A consequence is an “outcome of an event affecting objectives” [3, 4], which means it may create deviations from “the desired end” towards which efforts are directed. The ISO 31000:2009 standard adds that a “near miss” or “close call” event would be an event without consequences. |
| Effect | Effect is defined in ISO 31000:2009 as “a deviation from the expected” [3, 4] which can be either positive or negative or both (i.e., the effect can be positive with respect to one objective and negative with respect to another). |
| Emergency (UK) | An event or situation which threatens serious damage to human welfare in a place in the UK, the environment of a place in the UK, or war or terrorism which threatens serious damage to the security of the UK. |
| Enterprise Risk Management | Enterprise Risk Management is a framework for risk management, which typically involves identifying particular events or circumstances relevant to the organisation’s objectives (risks and opportunities), assessing them in terms of likelihood and magnitude of impact, determining a response strategy, and monitoring progress. |

| Term | Meaning |
|---|---|
| Epistemic Uncertainty | Epistemic uncertainty refers to incomplete knowledge about some aspect of the system being observed or the environment within which the system is being observed [5]. Black swans [6] (*unknown unknowns*) are an example of epistemic uncertainty. Since epistemic uncertainty is about our lack of knowledge, we cannot usually use traditional statistics to describe this uncertainty since there is no sample to observe. |
| Event | An event is an "occurrence or change of a particular set of circumstances" [3, 4]. In addition, an event can be single or several occurrences (or not occurrences) with one or more causes. |
| External Context | The external context represents the external environment in which the organisation operates and, thus, seeks to achieve its objectives. |
| Force Structure | The force structure encompasses the complete military organisation: military units, the material and the military support organisation. |
| Framework | An underlying structure or conceptual scheme by which methods can be organised. |
| Futurology or Futures Studies | A branch of the social sciences / management science that studies the foresight of possible, probable, preferable and to-be-avoided futures and the views, fictions and myths upon which such foresights are based. |
| Goal | A goal is a planned objective which features a defined end state and represents a milestone in the process of achieving the overall aim. |
| Hazard | A hazard is a source of potential harm [4]. Hazards cannot think. Also, see the definition of threat. |
| Intersection | The matrix cell where the steps of analytical support to strategic planning process and risk management process phases intersect. |
| Likelihood | Likelihood is the "chance of something happening" [4]. Likelihood can be "defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically" [4]. |
| Linguistic Uncertainty | Linguistic uncertainty refers to the imprecise use, or the ambiguous expression, of language. This misrepresentation, accidental or deliberate, might generate misunderstandings [5]. Measuring linguistic uncertainty may be difficult; however, it can be minimised, for example, through the iterative reassessment of likelihoods and consequences via facilitated discussions [7]. |
| Long Term Defence Planning | See Strategic Planning. |
| Matrix (or Framework Matrix) | The Risk-Based Framework for Strategic Planning matrix with intersections or cells where analytical support to strategic planning and risk management processes intersects. |
| Objective | An objective is "an end towards which efforts are directed" [8] with the addition that the end is aspirational by nature and viewed more as a direction rather than an explicitly specified end state of a system [5]. |

| Term | Meaning |
|---|---|
| Organisation | An organisation is a group of people, or a single individual with a mission to fulfil. |
| Planner | Person or group of people who conduct and implement the strategic planning process. Planners may organise and administer the various planning methodologies, set problem boundaries and scope, provide critical context and make decisions on trade-offs. Planners have ownership of the strategic planning process and are ultimately accountable for the planning products and their contents. |
| Planning Boundaries | Planning boundaries define the boundaries and, as a consequence, the scope of a problem. Planning boundaries are defined by stakeholders of the planning process. The planning boundaries should be clearly defined by defence policy. However, the defence policy is often vague and "only in the specifics of scenarios is it possible to obtain the desired clarity" [9]. |
| Problem | A problem is commonly defined as "something that is difficult to deal with; something that is a source of trouble or worry" [10]. Strategic planning is an example of a defence problem; e.g., an action to remove or minimise the source of trouble or harm. |
| Problem Structuring | A technique which centres on integrating the most divergent views when addressing a problem situation. Problem structuring helps to discover the "right" problem by not focusing on solutions. |
| Residual Risk | Residual risk is a risk that remains after (risk) treatment. |
| Risk | In this guide, risk is defined as "the effect of uncertainty on objectives" [3, 4]. There are other risk definitions discussed in Chapters 1 and 2. |
| Risk Management | Risk management is the coordination of "activities to direct and control an organisation with regard to risk" [3, 4]. It refers to the principles, framework and processes as set out in ISO 31000:2009 and differs from "managing risk" which refers to their application to any specific risk [3]. |
| Risk Register | The risk register is a living document updated during the risk management process. It allows for tracking a risk from the time it is first identified to the time it ceases to be a risk. The risk register serves as a repository of information from which lessons learnt may be derived. |
| Risk Thinking | Risk thinking is defined as a "philosophical stance and analytical perspective" that encourages the analyst to think about risk with respect to all aspects of the analytical process [5]. It has many similarities to other concepts such as risk-based thinking [11], risk conscious culture [12] or risk management mindset [13]. |
| Risk Tolerance | Risk tolerance reflects "the organisation's or stakeholder's readiness to bear the risk after risk treatment in order to achieve its objectives" [4]. |
| Risk-Based Framework for Strategic Planning | An underlying structure for the application of scientifically sound methods and risk management principles, processes and practices in the context of defence and national security strategic planning. |

| Term | Meaning |
|---|---|
| Strategic Planning | "A process that investigates possible future operating environments and develops a force structure development plan to best adapt the defence organisation to those environments given a host of constraints – including financial ones" [9, p. 3]. |
| Technique | A tool, method or way of carrying out an analytical activity or a portion thereof in support of strategic planning. |
| Threat | A threat is "someone or something that could cause trouble or harm" [14]. Within the defence context, we usually distinguish between hazards (something) and threats (someone). Alternatively, we can think of threat to be a deliberate source of harm whereas a hazard would be an accidental source of harm. |
| Uncertainty | Uncertainty is defined by ISO 31000:2009 as "the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood" [3, 4]. In other words, it is the state of being not exactly (or definitely) known or sure [15]. There are different types of uncertainty depending on whether the source of uncertainty was inherent variability in the environment, lack of knowledge or misrepresentation due to language use. |
| Wicked Problems | Very difficult problems to solve because of a changing, incomplete and ambiguous context. The term wicked problems refers to both the problem type and type of complex system that underpins the strategic planning problem (especially in the defence domain). |

# Foreword

One of the early hallmarks of the 21st century is the pervasive, systemic crisis of planning in a world in which uncertainty looms ever larger. Quiet crisis though it may be, planning bodies across a wide swath of sectors find that previously reliable methods and rules of thumb are increasingly subject to challenges sufficient to cause loss of confidence. Whether planning massive water infrastructure in the face of climate uncertainty or attempting urban or transportation planning in an environment in which demographics, economic and financial foundations, and technologies are all in flux, the combination of reduced response times, proliferating stakeholders, an accelerating dynamic of technological change and the potential effects of unforeseen events in an increasingly connected world calls traditional approaches of planning into question.

This is not news to defence establishments. For millennia military leaders and theorists have recognized and confronted the problem of uncertainty and the vulnerabilities of planning. Yet, though acknowledging the problem, in many respects military staffs and defence planners have largely relied on methods that either implicitly confirmed the need to be predictive in order to plan optimal courses of action or were predicated on testing plans against only relatively few, carefully curated scenarios. We are now witnessing a shift in the internal cultures of defence establishments. Adherence to past norms is coming increasingly to be viewed as untenable. The potential negative costs from insufficient cognizance of the inherent dangers in carrying on "business as usual" combined with the opportunity costs from failing to take advantage of new possibilities for framing novel approaches to identify and weigh potential alternatives in the presence of deep uncertainty are no longer as easy to tolerate.

The present study is part of the new thinking about how to plan within defence and security establishments. It recognizes that an important element of any new infrastructure for assisting planners and decision makers in understanding what alternatives are available, the implications of uncertainties for those alternatives and their potential effect on outcomes – as well as identifying the critical factors upon which decisions should be made to ensure consistency of courses of action with long-term objectives – is to provide a conceptual framework for doing so. It does so by building on the insight that the conundrum is not so much one of ever deeper uncertainty but rather how best to grapple with uncertainty's effect on both decisions and outcomes and to do so in a manner that is tractable and practicable within hierarchic planning organizations. Doing so shifts the focus from characterizing uncertainties in terms of (often currently unknowable) probabilities to one of analyzing their implications for the decisions we make. What the authors offer is a means for making cognizance of both potential and effect an integral part of organizational awareness within the responsible planning institution – as well as creating a common linkage for rendering inter-agency process more effective in ever more complex problem spaces.

The Risk-Based Framework for Strategic Planning offered by this study is not an inflexible prescription requiring rigid application. Rather, it is a lattice around which individual planning offices may construct their own particular approaches and methods to best employ the principles the Framework embodies and elicit the full value from doing so. While conveying a best practice orientation, it invites exploration and experimentation in light of the particularities of the problems being addressed or individual planning group needs while retaining a grounded focus on operational tractability and organizational effectiveness. As such, it provides a valuable addition to the literature on planning under deep uncertainty as well a practical guide for doing so.

Steven W. Popper, Ph.D.
Senior Economist, RAND Corporation
Chair for Education and Training, Society for Decision Making under Deep Uncertainty
www.deepuncertainty.org

# Acknowledgements

The discussions which generated the framework proposed in this guide originated at the 2011 NATO Risk-Based Planning Conference in Salisbury, UK. The invited speakers, Dr. Steven Popper (RAND), Dr. Robert May, Lord May of Oxford (Member of the House of Lords, past UK Government Chief Scientific Advisor and past Non-Executive Director of MoD's Defence Science Technology Laboratory), and Dr. Roger Miles (Risk Consultant), and contributors from various NATO and partner nations presented their perspectives on risk-based planning. These varied perspectives ultimately resulted in the creation of the Risk-Based Framework for Strategic Planning and a set of case studies published separately.

We would like to acknowledge the key contributors to the Analysis Support Guide for Risk-Based Strategic Planning. Dr. Wesolkowski was the overall editor of this work and was responsible for merging all revised content into a single document. The guide was written jointly by Dr. Slawomir Wesolkowski (Canada), Mr. Jim Maltby (UK), Dr. John Donohue (Canada), Dr. Gunn Alice Birkemo (Norway), Mr. Francois Van Zeebroeck (NATO) and BGen Prof. Dariusz Skorupka (Poland).

We appreciate that Dr. Patrick Dooley (Canada), Dr. John Steele (Canada), LCol Dariusz Becmer (Poland), and Dr. Murray Dixson (Canada) took the time to carefully review various versions of this guide. We thank Mr. Francois Van Zeebroeck for keeping us firmly rooted in our objective of producing a practical guide that would be of use to NATO and its member nations. This guide would not have been possible without the extensive discussions with Dr. Axel Bender (Australia) whose ideas on the use of participatory techniques to elicit stakeholder views at various stages of planning are crucial for risk management to understand the human element in risk-based planning. Finally, we are indebted to Mr. Robert (Bob) Dickinson (Canada) who initially proposed that we study how to integrate risk management into strategic planning. *May he rest in peace*.

# SAS-093 Membership List


## CHAIR

Dr. Slawomir WESOLKOWSKI
DRDC CORA
CANADA
Email: slawomir.wesolkowski@forces.gc.ca

## CO-CHAIR

Dr. Gunn Alice BIRKEMO
FFI
NORWAY
Email: gunn-alice.birkemo@ffi.no

## MEMBERS

Dr. John DONOHUE
DRDC CORA
CANADA
Email: donohue.jj@forces.gc.ca

Mr. James F. MALTBY
Dstl MoD
UNITED KINGDOM
Email: jfmaltby@dstl.gov.uk

BGen Prof. Dariusz SKORUPKA
Military University of Land Forces
POLAND
Email: dariusz.skorupka@awl.edu.pl

Mr. Francois VAN ZEEBROECK
NATO ACT
UNITED STATES
Email: francois.vanzeebroeck@act.nato.int

# Analysis Support Guide for Risk-Based Strategic Planning

## (STO-TR-SAS-093-Part-I)

# Executive Summary


Eisenhower once noted that "plans are nothing; planning is everything" and according to von Moltke "no plan survives contact with the enemy." This is because every strategic (long term) plan is saturated with risk, defined as the effect of uncertainty on objectives. Indeed, there is considerable interest in both defence and non-defence organisations to include risk management in their strategic planning processes. Theodore Roosevelt once remarked that risk is like fire: it will help you if properly managed, but could destroy you otherwise. Therefore, how can we, as defence analysts, help defence planners identify, evaluate and mitigate those risks to enhance strategic planning processes and make them more robust to uncertainty? In essence, how can we improve current analytical support to planning processes to help create flexible and adaptable plans so that our forces prevail in future conflicts?

We propose integrating risk management practices within strategic defence planning for NATO and member nations, providing a framework for how risk management (as defined in ISO 31000:2009) can be systematically integrated into defence planning processes. This framework helps analysts to apply risk management in support of the various analyses that underpin the strategic planning processes. The framework first outlines the ISO risk management process with specific emphasis on the definition of risk: the effect of uncertainty on (an organisation's) objectives. Next, analytical support to strategic planning is examined from the analyst's point of view since it is the analyst who must ensure that the intellectual effort carried out in support of a planning process and its risk management is valid, verifiable, consistent, and rigorous.

Ideally, risk management would be explicitly built-in and woven into the analytical support to strategic planning in order to capture risks that could result in less robust plans. The framework provides a methodology that applies risk management to the analytical support of strategic planning within NATO nations and NATO itself. We illustrate the framework's use with an example using the United Kingdom's National Risk Assessment. A second report describes various other examples of how risk could be managed including risk management in the NATO Defence Planning Process (NDPP).

Systematically and explicitly integrating risk management within the strategic planning processes should increase robustness to risks, producing more readily adaptable plans. The risk-based framework is intended to be used by defence analysts involved in strategic defence planning at NATO and in NATO nations. It is our hope that this framework will facilitate the systematic integration of risk management practices throughout strategic planning, improving both the processes themselves and the resulting plans.

# Guide d’analyse pour la planification stratégique basée sur le risque

## (STO-TR-SAS-093-Part-I)

# Synthèse

Eisenhower disait que « les plans ne sont rien ; la planification est tout » et d’après von Moltke, « aucun plan ne survit au contact avec l’ennemi. » En effet, tous les plans stratégiques (à long terme) sont saturés de risque, le risque étant l’effet de l’incertitude sur les objectifs. Les organisations, qu’elles travaillent dans le domaine de la défense ou non, s’intéressent de près à l’inclusion de la gestion du risque dans leurs processus de planification stratégique. Theodore Roosevelt a déclaré que le risque était comme le feu : correctement géré, il peut apporter une aide, sinon, il peut détruire. Par conséquent, comment, en tant qu’analystes de la défense, pouvons-nous aider les planificateurs de la défense à identifier, évaluer et atténuer les risques pour faciliter les processus de planification stratégique et les rendre plus résistants à l’incertitude ? Au fond, comment améliorer le soutien analytique actuellement apporté aux processus de planification pour contribuer à la création de plans souples et adaptables, qui permettront à nos forces de prendre le dessus lors des conflits à venir ?

Nous proposons d’intégrer des pratiques de gestion du risque dans la planification stratégique de la défense pour l’OTAN et les pays membres, en fournissant un cadre permettant l’intégration systématique de la gestion du risque (telle que définie dans l’ISO 31000:2009) dans les processus de planification de la défense. Ce cadre aide les analystes à appliquer la gestion du risque pour épauler les diverses analyses qui sous-tendent les processus de planification stratégique. Le cadre décrit en premier lieu le processus ISO de gestion du risque, en insistant particulièrement sur la définition du risque : l’effet de l’incertitude sur les objectifs (d’une organisation). Il examine ensuite le soutien que l’analyste peut apporter à la planification stratégique, puisque c’est l’analyste qui doit veiller à ce que les efforts intellectuels déployés pour faciliter un processus de planification et sa gestion des risques soient valables, vérifiables, cohérents et rigoureux.

Dans l’idéal, la gestion du risque est explicitement intégrée au soutien analytique de la planification stratégique, afin de neutraliser les risques qui fragiliseraient les plans. Le cadre que nous proposons est une méthodologie appliquant la gestion du risque au soutien analytique de la planification stratégique dans les pays de l’OTAN et au sein de l’OTAN elle-même. Nous illustrons l’utilisation de ce cadre par un exemple tiré de « l’évaluation nationale du risque » (NRA) du Royaume-Uni. Un second rapport décrit divers autres exemples de gestion du risque, notamment dans le processus de planification de la défense de l’OTAN (*NDPP – NATO Defence Planning Process*).

L’intégration systématique et explicite de la gestion du risque dans les processus de planification stratégique devrait améliorer la résistance aux risques, en produisant des plans plus facilement adaptables. Le cadre fondé sur le risque est destiné à être utilisé par les analystes de la défense qui participent à la planification stratégique de la défense dans l’OTAN et les pays de l’OTAN. Nous espérons que ce cadre facilitera l’intégration systématique des pratiques de gestion du risque tout au long de la planification stratégique, ce qui améliorera à la fois les processus et les plans qui en résulteront.

# Chapter 1 − INTRODUCTION

*We cannot solve the problems we have created with the same thinking we used in creating them.*

*− A. Einstein*

## 1.1 BACKGROUND

Governments around the world, and by extension their corresponding defence departments, have been engaged in war since the beginning of their existence. Von Clausewitz asserts that "war is the continuation of politics by other means" [16]. Gray expands this idea stating that "defence planning is an extension of politics" [17]. Since safety, and by extension security, is the second basic need for humans after physiological needs (i.e., air, water, food, clothing, shelter, etc.) in Maslow's hierarchy of needs [18], ensuring security (including defence planning for security) becomes an essential government activity. In addition, Gray further argues that strategy, defence planning and uncertainty are all interdependent. In the words of US Army Lieutenant General McMaster [17]: "First, war is political. Second, war is human. […] Third, war is uncertain, precisely because it is political and human."

Each activity in which we engage individually or collectively, every plan we make including strategic plans for defence, is permeated by uncertainties [17]. While many of the uncertainties have little impact on us and are, therefore, irrelevant when we develop plans or make decisions, there are potentially other uncertainties that significantly influence our activities by affecting their outcomes or interfering with our intentions. These are the uncertainties that the Risk-Based Framework for Strategic Planning (RBFSP) developed in this guide[1] addresses: uncertainties that affect defence and national security objectives either positively or negatively or sometimes even both. We will capture positive and negative effects of uncertainties in one term, namely risk. Thus, our definition of risk is that of ISO[2] 31000:2009[3] Risk Management Standard which defines risk as "the effect of uncertainty on objectives" [3, 4].[4]

Because the uncertainties of interest to us can have substantial effects on the objectives and goals that we are trying to achieve in planning and decision making endeavours, it makes sense to manage these effects. The earliest time in which such a management can be conceived, considered and implemented, arguably also the most critical time, is when we plan. If we do so, we are engaged in risk-based planning. The risk-based framework developed in this guide examines risk-based planning specifically in military or defence organisations, both national and multinational ones. This framework was built to help analysts supporting strategic planning to employ risk management practices in the analytical processes and as part of the analytical support. Thus, there are two types of risks that the guide is concerned with: risks affecting the objectives and goals of the actions in a strategic plan and risks inherent to the strategic planning process used [5].

Every organisation, including defence organisations, exists to realise value for its stakeholders.[5] This value can be created, preserved, or eroded by management decisions in all activities from the development of long-

[1] The framework developed in this guide was originally introduced in an earlier paper [5] which was written to allow broad feedback on the initial articulation of the concepts within this report.

[2] ISO is an acronym for International Organization for Standardization.

[3] Our framework has been developed using the ISO 31000:2009 standard. The ISO 31000:2009 standard has recently been updated to ISO 31000:2018 [240]. Our framework is sufficiently flexible that it can use the updated ISO 31000:2018 standard.

[4] The ISO 31000:2009 definition deviates from other definitions found in defence planning documents, such as "the combination of the probability of an event and its consequences" [65] or "uncertainty that can affect the prospects of achieving goals" [64] or "the chance of injury or loss" [63]. Raz and Hillson have previously reviewed various risk definitions [62].

[5] The ISO 31000:2009 definition of stakeholder is "an individual, group of individuals or entity that has an interest in or can affect or be affected by the outcome of a decision or project" [4].

term strategies to day-to-day operations. All of these activities are prone to uncertainties, as are the outcomes of all management decisions. Risk-based planning, then, enables management to take decisions informed by risks that impact on the mission, the key objectives and the reputation of the organisation [5]. It enables decision makers to plan for potential future deviations from an expected or desired outcome. In general, it prepares everyone in the organisation and especially senior executive managers to respond to potential future events that matter and to deal with them effectively.

There are many practical considerations when implementing risk management within an organisation, such as risk ownership (determining who has responsibility for risks and the authority to act on them), risk perception and tolerance (how much risk are decision makers willing to take), risk communication (who needs to, should and wants to know about risks, and how are they best informed), and risk mitigation (how are identified, analysed and evaluated risks managed). Risk-based planning should be markedly improved by the application of sound, evidence-based analysis. Both good analysis practices and close cooperation between analyst and planner are principal contributors to high-quality planning products [5]. Therefore, the key to success is the application of sound principles to a complex endeavour. To help the analyst in his or her support to risk-based strategic planning, this guide provides a systematic reference of useful techniques and suggestions for their application: the RBFSP.[6]

## 1.2 UNKNOWABILITY OF THE FUTURE

The problem of strategic planning in the defence context involves making decisions today that may only have a visible effect in ten to 40 years. With the world continuously changing, the future is inherently unknown and unknowable. Thus, policymakers have no other choice than to make assumptions about the future and to design plans which are robust with respect to the validity of these assumptions. These assumptions are often based on forecasts which extrapolate recent problems into the future. This leads to the situation where plans frequently only address an extension or minor variation of the past [19]. However, given the technological and societal changes happening today, it is unlikely that the future will be similar to the past, making it questionable that extrapolation-based forecasts of the current security environment are an adequate basis for strategic planning. Thus, it may be that much of the effort expended in mitigating possible future events is misdirected because estimates of the future security environment (FSE) are possibly based on very unlikely futures [20].

Defence planning is a strategic, political and a human endeavour. The future is made up of a vast number of interrelated variables that can combine in an unpredictable manner to form many possibilities: a small change in one variable can have as little as no effect or as much as a highly disruptive impact on future events. Combined, this means that our present evaluation of the importance of variables with regard to their effect on the future can only be validated when we have reached the very future that we are trying to model. However, finding abstractions that would allow us to create valid models of the future is impossible. Thus, taking everything into consideration, we do not have the ability to fully comprehend the underlying system that we are trying to manage [21]. When military planners are trying to identify possible strategic FSEs, they are actually trying to anticipate the evolution of a complex adaptive system [22]. The uncertainty that matters the most in any speculation about the future may not be the indeterminism of a known stochastic event or game of chance (i.e., aleatoric uncertainty or statistical uncertainty), but more likely the uncertainty due to a lack of knowledge (i.e., epistemic uncertainty) or a combination of aleatoric and epistemic uncertainty.[7]

Given the nature of epistemic uncertainty and that the loci of control of most factors affecting an organisation are usually outside of that organisation's direct influence, changes affecting an organisation principally occur at the *macro* level rather than at the lower *meso* or *micro* levels, as illustrated in Figure 1-1 (figure reproduced from Bishop, P. and Hines, A. [23]). Alternatively, when changes do occur within the

[6] This framework will be fully described in Chapter 4.

[7] See Chapter 2 (especially Section 2.1.2) for a discussion of different types of uncertainty.

meso or micro levels, it is not possible to determine the causal links of the changes because of the complex interaction between the organisation and its environment. Therefore, there is little ability, even within governments, to know what the future holds let alone to knowingly intervene in a way that is certain to produce the intended outcome. For example, you can go to war in an attempt to achieve a political outcome, but whether that outcome will be achieved cannot be determined and cannot be anticipated in terms of probability.

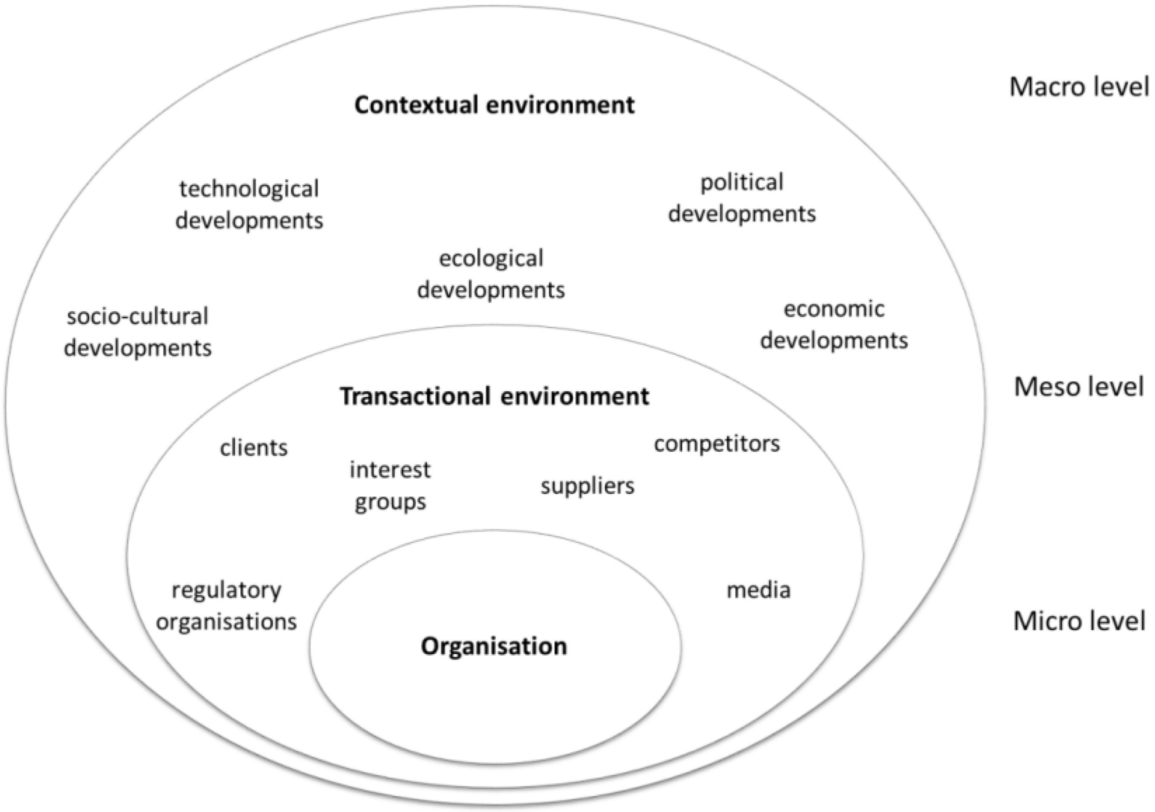



**Figure 1-1: Environmental Levels.**

## 1.3 A WICKED PROBLEM

Defence planning is a complex problem that can be classified in a number of different ways. From the point of view of systems theory, these problems have been classified by a variety of frameworks such as Snowden's Cynefin [24], Emery and Trist's (1963) Causal Texture of Organisational Environments [25], and Gunderson and Holling's Panarchy[8] [26]. Other ways of classifying these problems also exist [27]: *messes* by Ackoff [28], *chaotic* by Snowden [24] and *wicked* by Rittel and Webber [29] and others [30, 31]. These are different terms for problems that are very difficult to solve, because of a changing, incomplete and ambiguous context. They are commonly referred to as wicked problems. Therefore, in this guide, we will use the term *wicked problems* to refer to both the problem type and type of complex system that underpins the strategic planning problem (especially in the defence domain). Wicked problems were originally described by ten characteristics outlined in Table 1-1 [29].

[8] The interrelationships of some these concepts are described in a series of lectures from Raford [235] and Gotts [234].

**Table 1-1: Characteristics of Wicked Problems.**

| | |
|---|---|
| 1) No definite formulation<br><br>"The information needed to understand the problem depends upon one's idea for solving it." In order to define or solve a wicked problem, one has to develop an exhaustive inventory for all the conceivable solutions ahead of time. [29, p. 161] | 2) No clear finish<br><br>"The planner terminates work on a wicked problem, not for reasons inherent in the "logic" of the problem. He stops for considerations that are external to the problem: he runs out of time, or money, or patience. He finally says, 'That's good enough,' or 'This is the best I can do within the limitations of the project,' or 'I like this solution,' etc." [29, p. 162] |
| 3) Each solution is no better or worse than another<br><br>The criteria for judging the validity of a "solution" to a wicked problem are strongly stakeholder dependent. However, the judgments of different stakeholders "… are likely to differ widely to accord with their group or personal interests, their special value-sets, and their ideological predilections." [29, p. 163]. Different stakeholders see different "solutions" as simply better or worse. | 4) Cannot test or pilot solution<br><br>"… any solution, after being implemented, will generate waves of consequences over an extended […] period of time. Moreover, the next day's consequences of the solution may yield utterly undesirable repercussions which outweigh the intended advantages or the advantages accomplished hitherto." [29, p. 163] |
| 5) Every solution is a "one-shot operation"<br><br>"… every implemented solution [to a wicked problem] is consequential. It leaves "traces" that cannot be undone … And every attempt to reverse a decision or correct for the undesired consequences poses yet another set of wicked problems subject to the same dilemmas." [29, p. 163] | 6) Not enumerable i.e., not measurable<br><br>"There are no criteria which enable one to prove that all solutions to a wicked problem have been identified and considered. It may happen that no solution is found… from failing to develop an idea for [a] solution. But normally, in the pursuit of a wicked planning problem, a host of potential solutions arises; and another host is never thought up. It is then a matter of judgment whether one should try to enlarge the available set or not. And it is, of course, a matter of judgment which of these solutions should be pursued and implemented." [29, p. 164] |
| 7) Every problem is essentially unique<br><br>"There are no classes of wicked problems in the sense that the principles of solution can be developed to fit all members of that class. … [P]art of the art of dealing with wicked problems is the art of not knowing too early which type of solution to apply." [29, p. 164] | 8) A symptom of another wicked problem<br><br>"Many internal aspects of a wicked problem can be considered to be symptoms of other internal aspects of the same problem. A good deal of mutual and circular causality is involved, and the problem has many causal levels to consider. Complex judgements are required in order to determine an appropriate level of abstraction needed to move forward in understanding the problem." [30, pp. 4-5] |
| 9) Problem causation can be explained in numerous ways<br><br>"There is no rule or procedure to determine the 'correct' explanation or combination of [explanations for a wicked problem]. The reason is that in dealing with wicked problems there are several more ways of refuting [richer modes of reasoning used in the arguments] a hypothesis than there are permissible in the [e.g., physical] sciences." [29, p. 166] | 10) The planner has no right to be wrong<br><br>In the traditional scientific method, the researcher is allowed to make hypotheses that are later refuted [32]. Indeed, this hypothesis generation is a primary motive force behind traditional scientific development. In this view of science, no one is penalised for making hypotheses that turn out to be wrong. [30, p. 5] "In the world of … wicked problems [however] no such immunity is tolerated. Here the aim is not to find the truth, but to improve some characteristic of the world where people live. Planners [and with them the analysts who support them] are liable for the consequences of the actions they generate," [29, pp. 166-7] which is a concept much closer to Feyerabend's epistemology of science [33]. |

A wicked problem is one where we do not fully understand the problem until a solution has been advanced for it [34]. This is because a wicked problem is "solved" through interventions[9] which inherently change the nature of the problem. Thus, a wicked problem has no clear formulation and no clear finish. These problems are usually ill posed, have many interconnected parts and involve human decision makers, each of whom may have their own agenda. Given that there is no definitive (e.g., optimal) solution, solutions can be constantly adjusted until such a time when there are no more resources to apply to the problem.

Every intervention that is applied reveals new aspects of the problem since each solution is not better or worse than another. Since we cannot objectively determine solution quality, there is no objective way to scientifically validate a solution. One reason for this is that there is usually more than one explanation for the cause of the problem. However, even if not validated or easily measured, solutions can be useful. The solutions are always custom built.

Each solution is a "one-shot operation," meaning that every attempt to solve the problem has consequences; these are termed "crucial decisions" by Shackle [35]. In the case of strategic planning, if a plan calls for a drastic intervention,[10] decision makers cannot undo their use once implemented. The vicious circle of wicked problems is that without trying solutions, one may not fully understand the problem (unlike in simple problems where experiments and randomised controlled trials can be conducted to probe and learn about the situation). However, every solution is usually expensive and its implementation may have lasting, potentially irreversible and unanticipated effects (therefore, solution implementations can be thought of as "crucial decisions" [35]). For example, the Hiroshima and Nagasaki bombs helped precipitate Japan's surrender to the Allies in World War II (as was hoped for), but had many unintended consequences, such as the radioactive contamination of vast areas around the two cities, stillbirths, birth defects and premature deaths for many years to come. Nuclear non-proliferation agreements and sanctions against countries in breach of these agreements are partly a result of the Hiroshima and Nagasaki experiences, and these experiences have changed the way we think about the use of nuclear weapons.

In wicked problems, conflicting interests of stakeholders usually prevent a solution being found, even when each stakeholder's view is logically plausible. Even if stakeholders are rational decision makers (in a "Bounded Rationality" sense of rationality [36]), the way they determine their own success may prevent them from finding a compromise acceptable to all. In addition, each alternative solution has advantages and disadvantages. Thus, creativity becomes central to resolving wicked problems. Human judgement is necessary to determine which actions to take and implement (to make the trade-offs). Finally, both the planner and the analyst supporting the planning are liable for the consequences of planning because the effects of plan execution can be far-reaching and long-lasting. Although wicked problems have no prescribed way to a solution, there are many well-characterised mistakes that should be avoided. The analyst needs to help the planner avoid the obvious and not so obvious (but well understood) pitfalls of decision-making that could reduce the effectiveness of the plan (e.g., the influence of cognitive biases on planning outcomes). This can be achieved by the analyst assisting the planner with appropriate tools and techniques. One of those tools is risk management.

Solutions to wicked problems are called *clumsy solutions* [37]. Clumsy solutions are just-viable solutions: not "true-or-false," instead they are "good-or-bad". Techniques like Robust Decision Making (developed by RAND [19, 38]) provide risk-based approaches to explore the development of clumsy solutions. However, the exploration of clumsy solutions requires the ability to jump backwards and forwards throughout the planning cycle to vary the parameters (e.g., problem scope or prioritisation). The necessity to jump around

[9] An intervention is an approach to problem solving whose intent and outcome are a change of the problem situation. The analyst in support of an intervention is not a passive bystander (whose advice may or may not be taken into account by the decision maker), but an active participant in the implementation of the "solution." It is, therefore, common for analyst and decision maker to collaborate throughout interventionist analysis and for "solutions" to be implemented as they are being developed.

[10] Examples of drastic interventions would be the use of chemical weapons in the Second World War, the dropping of the atomic bombs onto Hiroshima and Nagasaki, and the application of cyber-attack measures in today's warfare.

the planning process means that the planning does not only follow the "think then plan" approach of Mintzberg [39] but rather more of the "do then plan" approach.[11] In conditions of high uncertainty, Mintzberg [39] and Snowden [24] advocate probing and sensing the uncertainty to enable different solutions to be developed and the outcomes to be achieved; when supporting decision making this has been referred to as "deliberation with analysis" [38, p. 16]. When the outcome is achieved, the measure of success may not necessarily be numerically measurable but rather felt, as illustrated by this quote from David Snowden [24]:

> *"Imagine organising a birthday party for a group of young children. Would you agree to a set of learning objectives with their parents in advance of the party? Would those objectives be aligned with the mission statement for education in the society to which you belong? Would you create a project plan for the party with clear milestones associated with empirical measures of achievement? Would you start the party with a motivational video so that the children did not waste time in play not aligned with the learning objectives? Would you use PowerPoint to demonstrate to the children that their pocket money is linked to achievement of the empirical measures at each milestone? Would you conduct an after-action review at the end of the party, update your best practice database and revise standard operating procedures for party management?*
>
> *"No! Instead, like most parents, you would create barriers to prevent certain types of behaviour, you would use attractors (party games, a football, a videotape) to encourage the formation of beneficial largely self-organising identities; you would disrupt negative patterns early, to prevent the party becoming chaotic, or necessitating the draconian imposition of authority. At the end of the party you would know whether it had been a success, but you could not have defined (in other than the most general terms) what that success would look like in advance."*

The risk-based framework for strategic planning that we develop in this guide is intended to help analysts support planners dealing with wicked problems. Since wicked problems are difficult to comprehend, we will use an analogy throughout this guide to aid those readers unfamiliar with the nature of wicked problems. The analogy to be used is that of painting. Painting is similar, in our view, to a wicked problem. Akin to a wicked problem, defining what is required is difficult because it is a human endeavour. There is no perfect answer and many outcomes are equally good, but success is difficult to measure. To create a painting requires a lot of preparation, gathering the materials and skills, together with deciding on what type of painting is to be done. The ideas and purpose for the outcome of the painting are not always clear, and often require exploration to discover what works since artists often produce many preliminary sketches or preparatory studies. Another important criterion is the level of expertise of the painter which varies with the accumulation of experience, skill and knowledge: Todd and Gigerenzer describe the relationship between expertise and the accumulation of experience, skill and knowledge [40]. Therefore, if an apprentice is not yet adept at painting, a tutor can aid them in using the appropriate techniques to improve their painting. If an apprentice is an expert in one area, providing awareness of other more appropriate methods can improve overall performance: Dicks' et al. describe how technique selection is usually made by familiarity of the technique rather than its appropriateness to address the problem [41]. At various points in this guide, we will refer to this analogy order to aid the reader's understanding of the processes used in the RBFSP.

## 1.4 TERMS OF REFERENCE

This study was carried-out in the context of the NATO Science and Technology Organization's (STO) System Analysis and Studies Panel Task Group 093 (SAS-093). It is dedicated to Risk-Based Strategic Planning in the defence and national security context for which it aims to develop a framework. The Terms of Reference (ToR) for the NATO SAS-093 Task Group constitute the official mandate on which this study is based [42]. The following paragraphs summarise the contents of the ToR (see Annex B).

[11] There are tools like Parmenides Eidos [232] and RAND's Assumption-Based Planning [237] that provide a more systematic way to conduct non-linear planning, including the explorative variation of the different parameters. Both tools may aid in using the RBFSP in practice.

### 1.4.1 Justification for the Study

There are three key drivers that provide the impetus for the study. First, the security environment is becoming more complex and uncertain for NATO member countries. One should, therefore, expect significant benefits from improvements in the integration of risk-based planning throughout the various planning stages. This activity would allow member nations to share methodology in a systematic and formal manner. It would enable NATO (and member nations) to develop a joint framework for the integration of risk-based planning into its processes.

Second, risk management implementation in defence organisations has significant challenges. The primary challenge is the size and complexity of the organisation in which risk management has not yet been linked fully to the force development cycle, strategic planning, and day-to-day defence planning and management processes. This study should provide a framework that is flexible to be applied to different strategic planning contexts and scalable in its scope of application.

Third, there is a need for devising a common defence-oriented lexicon. The existing international standards ISO 31000:2009 (Risk management − Principles and guidelines) [3] and ISO 31010 (Risk management – Risk assessment techniques) [43], as well as ISO Guide 73 (Risk management – Vocabulary) [4] are suggested as a starting point for devising a NATO lexicon for risk terminology.

### 1.4.2 Study Objectives

The main study objective was to develop a risk-based framework that would facilitate an analyst's support to strategic defence planning of NATO and individual NATO countries. The specific goals of the task group's activity and the topics to be covered included the adaptation of the ISO standard on risk management to the defence context, sharing risk management and decision making methods and tools that can contribute to the main objective, jointly developing subjective/contextual/soft systems methods for risk assessment (to help integrate the qualitative with the quantitative), and applying the risk-based framework to a NATO or a member nation's case study.

## 1.5 NATO DEFENCE PLANNING

In this section, we introduce the NATO Defence Planning Process[12] (NDPP) as an example of strategic planning. The NDPP is also described in more depth in a companion document to this guide [44].

### 1.5.1 NATO's Values as an Organisation

NATO is a politico-military alliance of 29 Nations. The NATO website states that "since its founding in 1949, the transatlantic Alliance's flexibility, embedded in its original Treaty, has allowed it to suit the different requirements of different times. In the 1950s, the Alliance was a purely defensive organisation. In the 1960s, NATO became a political instrument for détente. In the 1990s, the Alliance was a tool for the stabilisation of Eastern Europe and Central Asia through the incorporation of new Partners and Allies. Now NATO has a new mission: extending peace through the strategic projection of security" [45]. Hence, the Alliance has periodically had to redefine its values and the related objectives. These adjustments, agreed to by heads of state, were expressed in a succession of strategic documents.[13]

[12] As of Oct 2016, the Defence Policy and Planning Committee (Reinforced) has agreed on a document called "The NATO Defence Planning Process (NDPP)" [239] to supersede the "Outline Model for a NATO Defence Planning Process" [238] and several of the other documents on the basis of which the present description of the NDPP has been developed. While some of the changes introduced are quite significant in terms of the process definition, it is assessed that they do not compromise in any significant manner the essence of the ideas discussed here.

[13] Major such documents include: Alliance's Strategic Concept (1991, 1999 and 2010), Declaration of Alliance Security (2009), and the Wales Declaration on the Transatlantic Bond (2014).

Currently, the Alliance's Strategic Concept 2010 forms the very basis for NATO's Strategic Defence Planning effort. Without entering into the details of this important document, the following text highlights the few, and quite simple, underlying principles that drive it: "NATO is committed to protecting its members through political and military means. It also encourages consultation and cooperation with non-NATO countries in a wide range of security related areas such as defence reform and peacekeeping. Through its discussions and partnerships, NATO contributes to preventing conflicts within and beyond the frontiers of its member countries. It promotes democratic values and is committed to the peaceful resolution of disputes. If diplomatic efforts fail, it has the military capacity needed to undertake crisis-management and peacekeeping operations alone or in cooperation with other countries and international organisations. NATO also has a third dimension which consists of activities in the area of civil emergency planning, helping Allies and Partners to cope with disasters, as well as to promote cooperation in the field of science and the environment" [46].

### 1.5.2 The NATO Defence Planning Process

The NDPP has been defined by the member nations as a way for those nations to harmonise defence planning with those of NATO to identify, develop and deliver a fair share of the overall forces and capabilities needed for the Alliance to be able to undertake its full range of missions. Given our definition of risk, we will consider as risks to the NDPP the effects of all uncertainties that may affect the objectives of the NDPP (see the NDPP case study in the companion document to this guide for the full list of objectives [44]).

As prescribed by the Nations, the NATO Defence Planning Process consists of five main functions or steps conducted over a period of four years as shown in Figure 1-2 [47, p. 13]. These steps are generally sequential and cyclical in nature, although the frequency of the individual functional activities may vary and the function of facilitating implementation is a continuous activity.

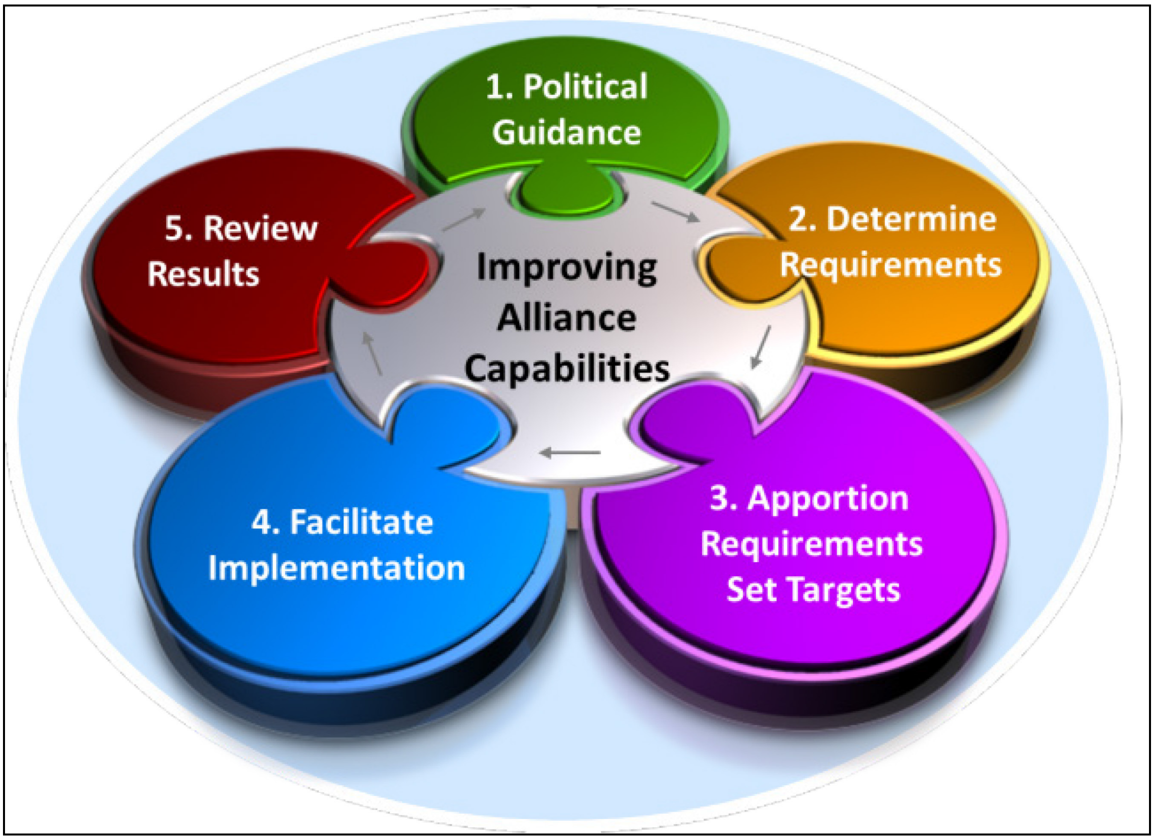



**Figure 1-2: The Five Steps of the NATO Defence Planning Process.**

The first step establishes the *Political Guidance*. "NATO political guidance translates guidance from higher strategic policy documents, such as the Strategic Concept, in sufficient detail to direct the defence planning efforts of the planning domains in order to determine the capabilities required. Political guidance aims at defining the number, scale and nature of the operations the Alliance should be able to conduct in the future (commonly referred to as NATO's Level of Ambition). It also defines the qualitative capability requirements to support this ambition. By doing so, it steers capability development efforts within the Allies and NATO. It defines associated priorities and timelines for use by the planners" [48]. Requirements are determined in the second step, *Determine Requirements*. A comprehensive and detailed analysis is conducted to identify the capabilities required to achieve the level of ambition and to steer capability development efforts of Allies and within NATO.

In the third step, *Apportion Requirements Set Targets*, "target setting apportions the Minimum Capability Requirements to the Allies (either individually or as part of an agreed multinational undertaking) and NATO entities in the form of target packages. The apportionment process aims to apply the principles of fair burden-sharing and reasonable challenge" [48]. Step 4, *Facilitate Implementation*, "assists national measures, facilitates multinational initiatives and directs NATO efforts to satisfy agreed targets and priorities in a coherent and timely manner. Unlike other steps in the process, this step − or function − is continuous in nature" [48]. The last step, *Review Results*, seeks to examine the degree to which the aims and objectives set out in the NATO political guidance and the associated targets have been met. It also seeks to assess the ability of NATO to meet its ambitions, and to offer feedback and direction for the defence planning process and its associated activities for the next cycle and/or any necessary mid-term and out-of-cycle actions.

The NDPP aims to be an all-inclusive (holistic) process: it addresses capabilities covering all 14 Planning Domains[14] and, while it does this, it aims at covering these capabilities over the full planning-horizon spectrum. In addition, the NDPP embraces not only the planning aspects of NATO's capabilities, but it starts as early as possible with the setting of strategic objectives (in the political guidance) and it extends as far as to include the implementation of the plan and a review of the planning process, which feeds into the next planning cycle. Of course, this is consistent with the NDPP's objectives and, therefore, only a process that embraces the full cycle of Capability Development would be able to affect all objectives.

All these considerations converge to generate a body of stakeholders that is not only very numerous but that, more importantly, is extremely heterogeneous and even fractured, in terms of interests, organisational and national belonging, professional perspectives, cultural heritage, and educational backgrounds, to name only a few. In addition, the process itself is multi-faceted. Although the NDPP process may arguably not be extraordinarily complicated, it is definitely complex. Some may actually call it a wicked problem since it meets many, if not all, of the criteria set out in Section 1.3. This complexity is a major factor when it comes to managing risks. We will use the framework developed in this guide to address risk management in the NDPP and other national planning processes.

## 1.6 STUDY APPROACH AND STRUCTURE OF THE DOCUMENT

The Guide is organised in the following way. The current chapter provided an overview of the problem being addressed. The second chapter introduces the ISO 31000:2009 Risk Management Standard and risk-based thinking, thus articulating what "risk-based" in the construct of "risk-based strategic planning" means. Chapter 3 outlines a generic model for analytical support to strategic planning in the defence context. Chapter 4 describes the Risk-Based Framework for Strategic Planning. The fifth chapter explains how to apply the framework and presents a case study of the UK's National Risk Assessment. Chapter 6 concludes the main portion of the Guide. References are included in Chapter 7. Annex A lists all the activities and

[14] The 14 planning domains are: air and missile defence; aviation planning; armaments; civil emergency planning; consultation, command and control; cyber-defence; force planning; intelligence; logistics; medical; nuclear deterrence; resources; science and technology; and standardisation and interoperability.

techniques related to the risk-based framework. Several ideas presented in this guide have already been previously published [5].

A companion report contains several descriptions of how the RBFSP could be used or could have been used to aid planning processes within a number of nations' strategic planning cycles. This Guide is purposefully written for public release while the case studies in the companion document have been classified as NATO Unclassified to enable the discussion of the NDPP [44].

# Chapter 2 − RISK MANAGEMENT

*Never was anything great achieved without danger.*

*− Niccolò Machiavelli*

## 2.1 INTRODUCTION

At any single point in time, it is impossible to know the outcome of a future activity or plan with absolute certainty. Given that each activity an organisation engages in, including strategic planning, is permeated by uncertainties and the impact of these uncertainties can be significant, organisations need to systematically manage the effect of those uncertainties on their activities. Risk management is an approach that combines a framework, a set of principles, and a process that when put together help to *manage risks* systematically. Risk management refers to the methodology or architecture; managing risks refers to the application of the methodology [3]. Risk management should help an organisation to make decisions under uncertainty by providing a comprehensive system to identify, analyse, evaluate, treat, monitor and communicate risks.

Risk-based planning is a process that integrates risk management and strategic planning. We have built a framework to help analysts who support strategic planning to employ standardised, consistent risk management practices. Before we describe the Risk-Based Framework for Strategic Planning, we first outline its two main components or axes: risk management and analytical support to strategic planning. In this chapter, we discuss the importance of risk management and the process we choose to follow. Although risk management is discussed in a generic manner, we also discuss some specific challenges for defence organisations.

The chapter is outlined as follows. First, the subjectivity of risk management is addressed. Next, we discuss which standard should be used as part of the RBFSP. Third, we briefly present ISO 31000:2009, our choice for risk management standard, and several important definitions in this standard. Next, the ISO 31000:2009 principles and framework of risk management are described in sections four and five, respectively. The sixth section describes the risk management process steps which will be used in the RBFSP (see Chapter 4). A summary section concludes the chapter.

## 2.2 RISK MANAGEMENT IS A SUBJECTIVE PROCESS

Risk management is a process that centres on human perceptions of risk. Often, risk management is assumed to be objective and rational but it is in fact highly subjective [49]. The very nature of human decision making involves perception, intuition, and personal judgement all of which are subject to (what are commonly described as) cognitive biases, logical fallacies and paradoxes of choice (see Text Box 1). Under the conditions people face every day, they are generally skilled in the use of intuition and judgements [50]. However, under the conditions of defence planning and wicked problems, these everyday skills can be problematic and the skills needed are less well developed [40, 51].

**Text Box 1: Human Thinking Errors and Perspectives.**

There are several well-understood short-cuts (heuristics) in human thinking: cognitive biases, fallacies and paradoxes of choice. In addition, there are several other issues that may impact human decision making capacity: flaws, conditions, and perspectives (or perceptions). For example, the experience, knowledge and mental models that an individual has accumulated over time provides their personal perspective; moreover, the environmental conditions, both physiological (e.g., being too hot or hungry), sociological (e.g., another individual's behaviour), and organisational can affect how decisions are made [52].

Cognitive heuristics are commonly described as being faults in judgement that arise from errors of memory, social attribution, perceptual distortion and illogical interpretation [53]. There are numerous, specific biases that describe the differing effects on the choices humans make [54]. These heuristics and biases, however, make humans very well adapted for functioning under everyday conditions where a purely objective and logical machine is less fluid and economical [50]. Therefore, human decision making struggles to be purely objective and logical, like a machine, because this demands large computational power which is beyond the capacity of the human brain. This cognitive limit is known as *Bounded Rationality* [36]. This bounded rationality in human decision making creates logical fallacies which are commonly described as being errors in logical argumentation such as circular arguments, generalisations and rationalisation, and include misconceptions which influence logical thought processes [55]. Fallacies make purely rational decision making impossible. A number of fallacies have been characterised and described [55]. Paradoxes of choice, popularised by American psychologist Barry Schwartz [56], suggest that the presence of too many choices creates information overload and decision paralysis. When faced with too many options or high levels of uncertainty, the decision maker chooses based upon personal preferences as opposed to a logical analysis of the data. Thus, in terms of the Normative Decision Theory, decisions become irrational.

These three concepts have been described mainly by behavioural economists conducting experiments in laboratory settings. Their assertion is that the human brain is flawed. However, naturalistic decision making criticises these findings given the unnatural (laboratory) experiment settings. They attribute observed errors to other factors [50]: a lack of skill; an unfamiliarity or failure to identify the difference in the conditions faced; or circumstances from which it is difficult to learn because of lack feedback, or a combination of these. This contrast in viewpoints has been studied and suggests that there are some conditions humans struggle to attain the skill to deal with, or are beyond human capacity [57].

The perspective that is taken when looking at risks makes a difference. An example of this is the introduction of the mandatory wearing of seat-belts legislation for drivers (in the UK). The introduction of the legislation resulted in the reduction of fatal crashes of drivers. However, it also resulted in an increase in the relative proportion of pedestrians and cyclists injured after the law was introduced [58]. This difference in perspective is characterised in the "Dance of the Risk Thermostat," which describes a systems view of the uncertainty (and thus risk) and demonstrates some of the characteristics of wicked problems. For example, two characteristics – a symptom of another wicked problem and problem causation can be explained in numerous ways – can help us understand that when we intervene to treat a risk this can result in other risks elsewhere in the organisation. This concept is known as risk homeostasis.

These factors make risk management a subjective process for which humans struggle to develop the level of skill required to make good judgements, especially when confronting a wicked problem. However, this should in no way undermine the significant value of a standardised risk management process to defence organisations. On the contrary, organisations should make use of formal risk management processes and standards in order to provide a framework which can be used to manage risk systematically. Since people tend not to apply these skills on a daily basis and lack adequate feedback when they do need them, these skills are uncommon. The ability to perform under these unusual situations can be learnt and the use of systematic and transparent processes can improve both the performance of organisations and the skills of individuals and teams within those organisations [51] (see also the Good Judgement Project [59]).

Therefore, we need to be aware of the subjectivity of risk and how it can significantly affect the outcomes in order to better manage risks. Many modern risk management methods attempt to minimise the subjectivity (on occasions being ignorant of it) of the process; however, no matter how sophisticated these methods are, there will always be residual subjectivity. One way to manage the subjectivity of risk management is to use a risk management standard.

## 2.3 WHICH STANDARD SHOULD BE USED?

Many different risk management standards have been developed. Most of these standards use their own definitions of risk and uncertainty. The question naturally arises, which standard should be used for a given planning situation? Given the large variety of application domains, the definition of the term "risk" has been debated at length [60]. One of the principal differentiators between standards is the definition of risk used. A commonly accepted definition of risk is "the possibility that something bad or unpleasant (such as an injury or a loss) will happen" [61]. Raz and Hillson provide a review of risk definitions used in numerous standards [62]. For example, the 2002 Canadian Risk Management standard gives a negatively-slanted definition, "the chance of injury or loss" [63] while the 2000 British Project Management standard provides a more neutral, neither positive nor negative, definition [64]: "uncertainty that can affect the prospects of achieving goals." On the other hand, the ISO 31000:2009 provides a much broader definition of risk, "the effect of uncertainty on objectives" [3]. This definition further extends the UK-developed 2002 Risk Management Standard definition of risk [65], "the combination of the probability of an event and its consequences… can range from the positive to the negative," by focusing on effects of uncertainties rather than trying to define risk as "the combination of the probability of an event and its consequences." It is also a more succinct version of the AS/NZS 4360:2004 definition[1] [66], "the chance of something happening that will have an impact upon objectives." Thus, the ISO 31000:2009 standard clearly defines risk as being either a negative or a positive effect and not just a negative effect. Furthermore, risk is no longer defined in mathematical or probabilistic terms as has been the accepted norm in various standards [65] and risk research[2] [67].

For the purpose of building a risk-based framework for strategic planning that is applicable to NATO nations and NATO itself, we felt it was important to choose a widely accepted[3] standard with a broad definition of risk. The ISO 31000:2009 standard meets these criteria and was thus selected as the basis of the risk management for the risk-based framework on strategic planning. ISO 31000:2009 also unites within one framework several important aspects of risk management:

1) It allows risk to have either positive or negative connotations, making this an important tool not only to mitigate negative effects of uncertainty on an organisation's objectives but also to seize the opportunities, the positive effects of uncertainty, an important aspect of strategic planning.

2) It allows risk to have a broad non-mathematical definition which links the effects of uncertainties and an organisation's objectives.

[1] The ISO 31000:2009 standard is based on the AS/NZS 4360:2004 [66], a standard originally developed by Australia and New Zealand in 1995 and subsequently revised in 1999 and 2004.

[2] This is not surprising since the fields where risk is seriously considered such as banking and insurance, usually both uncertainties and impacts on objectives can be readily quantified [236].

[3] The standard was developed by the ISO which is a worldwide federation of national standards organisations from over 160 countries.

3) It provides an easy-to-use risk management process which can be adapted to each user's need and different planning situations.

Although we have chosen to illustrate our framework with the ISO 31000:2009 risk management standard, analysts are not constrained to use ISO 31000:2009. Analysts may choose any risk management standard to follow as long as they apply the standard consistently in their risk management. There are many considerations for a defence organisation when choosing a framework for risk management, including organisation-wide acceptance, government-wide acceptance, NATO acceptance, international acceptance, NATO interoperability, and ease of implementation.

## 2.4 ISO 31000:2009 TERMINOLOGY

Many key terms and concepts are defined in the ISO 31000:2009 standard. One purpose for providing definitions of concepts and terms is to standardise the risk management language. We will use the ISO 31000:2009 terminology [3, 4] throughout this guide and augment it when necessary. This section defines the principal terminology associated with risk management. Additional terms related to risk management are defined where they first appear in this chapter.

Risk is defined by ISO 31000:2009 as the "the effect of uncertainty on objectives." The ISO 31000:2009 definition of risk shifts away from an uncertainty focus to an "effect of uncertainty" focus. Each term in this succinct definition is important and has significant implications for how risk management should be conducted. The word "effect" is defined in the guide as "a deviation from the expected" which can be either positive or negative or both (i.e., the effect can be positive with respect to one objective and negative with respect to another). Uncertainty is defined as "the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood." In other words, it is the state of being not exactly (or definitely) known or sure [15]. There are different types of uncertainty depending on whether the source of uncertainty was inherent variability in the environment, lack of knowledge or misrepresentation due to language use (see Text Box 2 for additional details). The word "objective" is not clearly defined in ISO 31000:2009. Therefore, similarly to earlier work [5], we will also refer to an "objective" as "an end towards which efforts are directed" [8] and we will consider the "end" to be a general direction rather than an actual end state or goal.

To understand better the risk definition, consider the following example of an international traveller interested in exploring particular well-known tourist sites in a country. The uncertainty related to being safe in a foreign country may not lead to a risk, unless it interferes with a traveller. This is because the occurrence of an unsafe event or alternatively a chance encounter with an old friend (uncertainty) may affect the safety of the traveller in the foreign country (effect) and, thus, may impact upon the realisation of the traveller's intent to visit all the well-known sites in the country she is visiting (objectives). In this case the effects can be negative (e.g., not visiting many sites due to being robbed) or positive in nature (e.g., meeting a friend who joins the traveller on part of the trip and increases safety). Another example discusses how the effects of an unfavourable change in exchange rate might force a traveller to cut the trip short whereas a favourable exchange might lead to trip extension or better lodging and eating options [5].

An interesting consequence of risk being either positive or negative is that the psychological judgement of negative risk and positive risk is not the same [68]. For example, Prospect Theory shows that people make decisions based on the potential value of losses and gains rather than the final outcome. In addition, the value attributed to losses differs from that attributed to gains [69]. Other studies show that exposure to risk can change how we value risk over time (e.g., see Harris *et al.* [70]) and that often these changes in the risk valuations are compensated for by changing other risk valuations to balance the overall risk [58]. Therefore, the reality of risk is not as arbitrary as described in ISO 31000:2009 which should be factored into the analysis used to support planning. Thus, the risk of encountering an unsafe event (e.g., getting robbed by strangers) is often perceived to be much greater than the chance of encountering a safe event (meeting a friend). Finally, risks need to be characterised and expressed. The ISO 31000:2009 [3] notes that risk is "often characterised by reference to potential *events* and *consequences*, or a combination of these." In addition, risk is "often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated *likelihood* of occurrence." The ISO 31000:2009 standard defines the highlighted terms as follows.

**Text Box 2: Likelihood, Uncertainty and Their Measurement.**

The reader should carefully consider the meaning of words such as "likelihood," "probability" and "possibility." These words are often used in a similar way; however, they may refer to different types of uncertainty. *Likelihood* is defined by ISO 31000:2009 as the "chance of something happening" and can be "defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically" [3]. Similarly within the RBFSP, we consider likelihood as the chance of an event occurring that can affect planning objectives. To determine likelihood, the RBFSP includes a range of methods needed to evaluate likelihood, probability, and possibility and more novel ideas like regret [38], using both quantitative and qualitative evaluation techniques.

We divide uncertainty into three different types [5]: aleatoric, linguistic, and epistemic. We need to differentiate between these different types of uncertainty since how we evaluate uncertainty and thus risk (given that risk is the effect of uncertainty on objectives) is dependent on the uncertainty type. Therefore, risks should help us connect "what [ends] might be" with "what [the end] must be" [5] thus ensuring that "the future may be surprisingly different from what we expect" [71].

Aleatoric (or statistical) uncertainty is representative of the variability that is inherent in systems due to random variation [1] such as the lack of certainty that an event will occur (*unknown knowns*). This type of uncertainty is usually measured using *probabilities* obtained, for example, by observing a set of regularly (even if rarely) occurring events and calculating their statistics. Each time we make an observation of an event, there is some uncertainty in both the event occurrence and the values we are measuring contributing to the observed variability. In simple terms, we can then compute the average and standard deviation of the observations to provide a sense of whether those events might occur again.

Linguistic uncertainty refers to the imprecise use, or the ambiguous expression, of language. This misrepresentation, accidental or deliberate, might generate misunderstandings [5]. Measuring linguistic uncertainty may be difficult; however, it can be minimised, for example, through the iterative reassessment of likelihoods and consequences via facilitated discussions [7].

Epistemic uncertainty refers to incomplete knowledge about some aspect of the system being observed or the environment within which the system is being observed [5]. Black swans [6] (*unknown unknowns*) are an example of epistemic uncertainty (i.e., Europeans discovered black swans when first visiting the Australian continent). Since epistemic uncertainty is about our lack of knowledge, we cannot usually use traditional statistics (i.e., probabilities) to describe this uncertainty since there is no sample to observe. For example, Europeans could not have asked what the probability could have been that they will discover black swans in the future since they did not know of the existence of black swans. However, they could have asked themselves if black swans were *possible*[4] [72].

[4] The possibility of any event is always 1 or 0 (i.e., yes or no). When rolling a dice, the possibility of number 2 is 1, whereas the possibility of number 7 is 0. However, the probability of obtaining number 2 is 1/6.

In possibility theory, one evaluates to what extent an event is consistent with the knowledge we have. This knowledge helps us distinguish between what we find plausible and implausible, what we expect and what surprises us, what we consider the normal course of things and what we consider an abnormal course. Possibility theory can help to describe aspects of epistemic and linguistic uncertainty when some knowledge of the possible states of an event exists (*known unknowns*). However, only using possibility theory might not be enough and subjective probabilities based on expert opinion might be necessary even though they may just be educated guesses.

Epistemic uncertainty precludes the construction of probability distribution functions, when one takes a very "hard" statistical position. In such cases, the best that one can say is that certain events are "possible," but nothing further about their likelihoods (relative or otherwise). For the vast majority of defence planning problems epistemic uncertainty will exist; therefore, if we adopt a dogmatic interpretation, many things will be "possible," and nothing will be "probable" or "improbable." In those cases, our analyses may have little utility for stakeholders (especially decision makers). Thus the key to informing decision making under epistemic uncertainty is (a) to explain the lack of information, (b) to state a reasonable assumption necessary to make progress, and (c) to proceed with the analysis on the basis of that assumption. In a real-world Chemical, Biological and Radiological (CBR) example, this meant making educated guesses of the relative likelihoods of potential CBR events [73]. This approach explicitly assumed that the collective aggregation of a diverse collection of belief distributions corresponds (when normalised) to probability density functions for the relative likelihoods of possible CBR events, avoiding analysts becoming paralysed by epistemic uncertainty. Others have built (Bayesian) statistical models for dealing with some aspects of epistemic uncertainty [1] or applied one of the approaches in the growing area of robustness [38]. Thus, this represents the judgements of the people best placed to inform decisions, according to conventional wisdom and common practice. These assessments of the likelihoods of potential events are useful in aiding decision making for budget allocations.

Recent research from the Good Judgement Project [59], however, demonstrates that likelihood estimates obtained by consulting traditional subject matter experts [74] and aggregating those diverse expert opinions does not necessarily work well. Generally, there is little or no understanding of how good these estimates really are [51]. However, it has been shown that there are skilled individuals (not generally traditional experts) who possess the (rare) skill to make these assessments well consistently and that teams can be formed that will outperform individuals [51]. It has also been shown that teams can learn to become skilled [51].

Finally, risk can also be viewed from a deterministic perspective, akin to Laplace's Clockwork Universe model, where more data and information will help reduce negative impacts of risk. However, within a complex system small changes can have a big effect, large changes can have little effect and variables can combine. Shackle's "tipping points" and "crucial decisions" [35] illustrate how systemic changes that cannot be reversed contradict the idea that systems can be wound back like in a clockwork universe. Therefore, using a deterministic view of the world will definitely not capture all of the epistemic uncertainties.

An *event* is an "occurrence or change of a particular set of circumstances" [3]. In addition, an event can be single or several occurrences (or not occurrences) with one or more causes. A *consequence* is an "outcome of an event affecting objectives" [4], which means it may create deviations from "the desired end" towards which efforts are directed. The ISO 31000:2009 standard adds that a "near miss" or "close call" event would be an event without consequences. Finally, *likelihood* is defined as the "chance of something happening" [4] with the clarification that likelihood can be "defined, measured or determined objectively or subjectively, qualitatively or quantitatively, and described using general terms or mathematically" [4] (see Text Box 2 for a discussion of various ways to measure likelihood and uncertainty). Since there is no direct translation of the word “likelihood” in some languages; the word “probability” is often substituted. However, the word “probability” is often narrowly interpreted in English as a mathematical term. Therefore, given that there are over ten different national languages within NATO, along with the ISO 31000:2009 standard, we recommend that the word “likelihood” be broadly interpreted in languages that do not have a direct translation of this word, as the term “probability.” As an alternative, the term “possibility” could be used although one needs to keep in mind that there are differences between “probability” and “possibility” in the English language and the same is true in some other languages such as French (see Text Box 2 for a discussion on probability and possibility). Finally, although the term likelihood is clearly defined in this guide, likelihood is more generally understood and used as an equivalent to probability; this should be kept in mind when using the RBFSP with wider audiences.

## 2.5 PRINCIPLES OF RISK MANAGEMENT

The development and sustainment of a successful risk management program includes the following core elements: defining risk management principles, designing a risk management framework, developing a risk management process and associated tools, as well as the continuous review and improvement of this program. A risk management framework is a high level structure which defines an organisation’s approach to and treatment of risk. It includes the design, implementation, review and improvement of risk management processes and tools. In this guide, the RBFSP uses the steps in the risk management process in combination with the steps used by analysts in supporting strategic planning (described in Chapter 4) to develop the RBFSP’s structure. An associated toolbox of methods (described in Annex A) is then linked to this structure. A risk management plan is the document that defines an organisation’s approach to and management of risks. A plan also defines the resources, procedures and tools to be used in managing risk. For example, the UK’s National Risk Assessment is a risk management plan. Chapter 5 describes how the RBFSP compares to the UK’s National Risk Assessment.

For an effective risk management program to operate, it should be based upon a set of principles that are agreed upon across all levels of an organisation. ISO 31000:2009 outlines eleven principles that both are agreed as the international standard, and also lay the foundation for a comprehensive, responsive program that delivers value, and improves planning, decision making and outcomes [3]. *Risk management creates and protects value* within an organisation by minimising the negative effects of risk and maximising the positive effects of risk on objectives, projects and the organisation itself. *Risk management must be integral to all organisational processes* to ensure a uniform, consistent and objective treatment of risk throughout the organisation. *Risk management is a key component in decision making* which can have significant impact on objectives, projects and organisations at various levels. *Risk management focuses on the effects of uncertainty* from both internal and external sources ensuring a comprehensive identification of, planning for and responses to risk (e.g., by explicitly addressing the nature of uncertainty) from the project level to the enterprise level.

*Risk management is systematic and structured* resulting in consistent and comparable results by following accepted processes such as the ISO 31000:2009 standard. This should enable more efficient decision making processes in an organisation. *Risk management is based on the best available information, is timely, is transparent and inclusive, is dynamic, iterative and responsive to change and is tailored.* Thus, risk management is transparent and responsive to change which results in timely, relevant risk planning that utilises the latest and best information. *Risk management takes human and cultural factors into account* thus recognising the subjectivity inherent in addressing risk. *Risk management facilitates continual improvement of the organisation* thus ensuring that an organisation is always using best practices when managing risk.

These principles provide a systematic, transparent and credible manner of managing any form of risk within any context and provide a guide to an organisation with respect to the risk management a risk-based management framework should be able to achieve.

## 2.6 BUILDING A RISK MANAGEMENT FRAMEWORK

The ISO 31000:2009 standard provides a framework to help organisations design and build effective risk management programs. It is based on the principles defined in Section 2.5 and incorporates the risk management mandate, the risk management processes and tools, as well as the flow of information related to the management of risk in an organisation. Each organisation must tailor the framework to its specific goals and practices. This framework is designed to help an organisation integrate risk management into its planning processes, such as the analytical support to strategic planning processes within NATO and member nations. The components of a generic framework for managing risk are shown in Figure 2-1 (based on a similar figure in ISO 31000:2009 [3]) and are explained in more detail in the sections that follow. This framework for creating, implementing and monitoring a risk management process can be carried out in conjunction with (perhaps even as part of) the analytical support to the strategic planning process. This will be discussed in more detail in Chapter 3. The actual risk management process used to manage risks is described in Section 2.7.

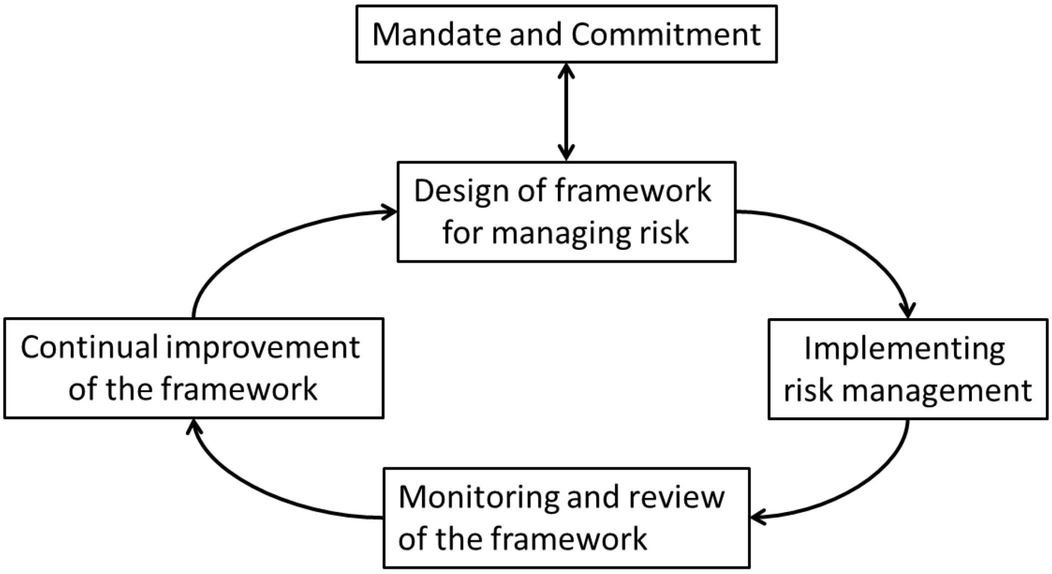



**Figure 2-1: The Components of a Generic Risk Management Framework.**

### 2.6.1 Mandate and Commitment

The introduction of risk management into an organisation requires a clear mandate, leadership and commitment from senior management. It is the role of senior management to communicate the goals and benefits of a risk management program and obtain buy-in for the program at all levels of the organisation. Leadership must promote a culture of risk management within the organisation in order to sustain buy-in and participation. It must clearly define risk policies and ensure that risk management processes align with those policies. It is essential that metrics be established to measure risk management outcomes in as objective a manner as is possible. Finally, the mandate must address accountability and establish a quality assurance system to monitor compliance and enable continuous improvement of the risk management framework, processes and tools.

### 2.6.2 Framework Design

The design of the risk management framework requires several parts: understanding the organisation's context, risk management policy, communication, accountability, and resources. Before creating a risk management framework, it is important to understand the *internal and external contexts of the organisation*. Context can be defined as the environment within which the organisation must achieve its objectives. Understanding the political, social, legal, technological and economic environment in which an organisation operates is critical (discussed in detail in Section 1.2). Awareness of trends and drivers of change is also vital. Another consideration is incorporating the objectives of the organisation and the adoption of industry standards or guidelines into the risk management framework. In addition, it is essential to know the regulatory constraints within which the organisation operates. An understanding of all these factors will help create a solid, tailored foundation on which to define organisational risk management policy and build the risk management framework.

One very important aspect to understand before designing any framework or program is the organisation's tolerance for risk. Risk tolerance essentially defines how much risk and organisation is willing to accept in order to achieve its objectives. This is defined uniquely by different types of organisations. For instance, insurance companies have well-defined risk tolerances[5] based upon actuarial statistics and profits, and banks have well-defined parameters for loaning money. The selection of who gets insurance coverage and at what cost, or who gets a loan are based on these defined tolerances. Multiple factors will influence an organisation's risk tolerance and it is essential that these are well articulated and incorporated into the development of risk management policies. Organisations may well have very different tolerances for different types of risk or for risks at different levels of the organisation.

The way in which individual stakeholders (including decision makers) perceive risk is very subjective and thus their tolerance for risk and the manner in which they deal with risk can vary significantly. This is why it is essential for an organisation to reach consensus on what types of risk an organisation will manage and how it will respond to those risks. All of this information needs to be captured in a risk management plan and considered when designing a risk management framework.

Once the organisational context has been considered, a *risk management policy* is created by management that should clearly articulate the rationale and benefits of the risk management program. It should also define the link between the risk management policy, risk tolerance and organisational objectives, and in the case of strategic planning, the link between risk management policy, doctrine and planning objectives. The roles and responsibilities for planning, implementing, executing and reviewing the risk management program should be made clear. A risk management policy should also define the metrics to be used for measuring the performance of the risk management program. It should provide for and define the mechanism for review and improvement of the program.

The framework should define how the organisation will *communicate risks* to internal and external stakeholders. This would include clearly communicating the organisation's expectations regarding risk management, as well as a process to consult with internal and external stakeholders on a regular basis. It is essential to get the right information to the right people in a timely manner. The plan also needs to define a reporting mechanism to allow for tracking the effectiveness of the risk management program.

To implement and sustain an effective risk management program, it is important to identify roles and responsibilities within the organisation. Certain individuals will be responsible for designing the framework. Others will be responsible for its implementation. Each risk will have a risk owner who is the person or entity with the accountability and authority for managing the risk and any associated risk treatments. Some large organisations have risk management specialists each having specific areas of expertise. For instance, in military planning, areas of expertise may include logistics, intelligence, combat capabilities, operational medicine, etc. In smaller organisations, the role of risk owner often falls to project managers. Although specialists might design and champion risk management in their organisations, it is critical for everyone in the organisation to embrace risk management and help to implement it. When implementing risk

[5] ISO Guide 73 defines risk tolerance as "the organization's or stakeholder's readiness to bear the risk after risk treatment in order to achieve its objectives" [4].

management for analytical support for strategic planning, all analysts and planners should embrace the use of risk management.

An effective risk management program requires adequate resources to function optimally. This includes people, well defined processes, appropriate tools and training. As well, it is vital to document all processes and procedures and to perform continuous quality assessments of the program. It is the role of senior management to ensure there are sufficient resources to implement and sustain a risk management program.

### 2.6.3 Implementation Plan

Once the framework is designed, it needs to be implemented. The organisation now needs to specify how the risk management policy will be implemented which includes determining how the risk management program should be introduced to and embedded within the structure of the organisation. This includes defining the strategy and timing for introducing the risk management program into the organisation. The implementation plan ensures that decision making and planning (including the definition of objectives) are performed within the context of the risk management program.

The plan will define the risk management processes and tools to be used and ensures that people are adequately trained in those risk management processes and tools. The risk management process suggested by ISO 31000:2009 is an example of risk management implementation.

### 2.6.4 Monitoring Performance and Continuous Improvement

Examining the effectiveness of the risk management program on a continual basis using an agreed upon set of metrics is essential to the on-going improvement of the program and ensures that best practices are used. The metrics used for evaluation will permit an organisation to update or modify its risk management framework, risk management processes and tools and risk management policies in a responsive, timely manner. In addition to internally driven continuous improvement, organisations may require independent, third-party audits of their risk management program.

This step in the risk management program is akin to lessons identified and lessons learnt processes that will be discussed as part of the analytical support to strategic planning. Those steps help to identify how to improve existing processes, including risk management, for the next planning cycles (see Chapter 3).

## 2.7 ISO 31000:2009 RISK MANAGEMENT PROCESS

A comprehensive risk management process should be an integral part of a risk management program. It is the process whereby organisations like NATO and defence departments worldwide methodically address the risks attached to all their activities including the analytical support to strategic planning. A successful risk management process should be proportionate to the level of risk in the organisation, aligned with other corporate activities, comprehensive and flexible by being responsive to changing circumstances. The goal of risk management is to achieve maximum value for an organisation by increasing the likelihood of success and reducing the probability of failure and the level of uncertainty associated with planning and achieving objectives. The risk management process is created based upon the risk management framework designed by and for the organisation. The elements of the risk management process suggested by ISO 31000:2009 are depicted in Figure 2-2 [3]. The thick arrows show the linear flow of the process whereas the thin arrows indicate that communication, consultation, monitoring and review need to take place within the main five steps of the process. Each component of the process elaborated upon is based on the ISO 31000:2009 standard [3]. Defence organisations are free to use this framework as is or to modify it to better suit their needs as outlined in Section 2.6.

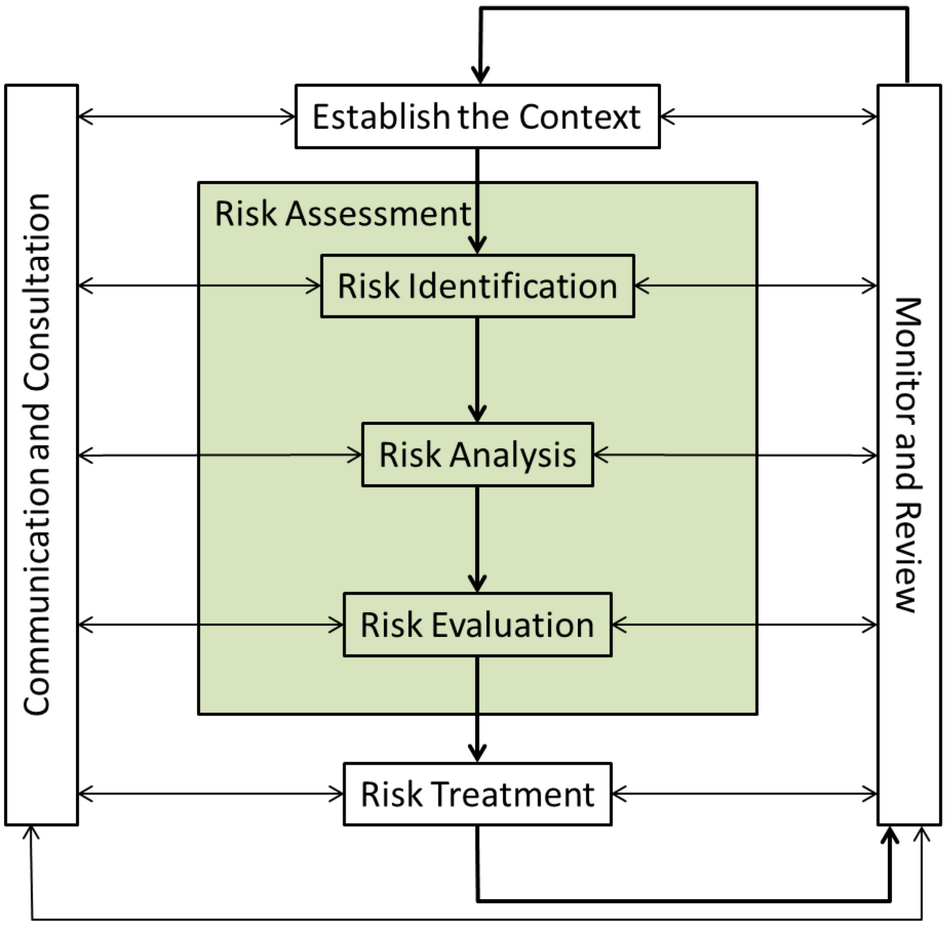



**Figure 2-2: ISO 31000:2009 Generic Risk Management Process.**

### 2.7.1 Communication and Consultation

*Communication and consultation* with internal and external stakeholders is a continuous process in risk management. It ensures that all interested and affected stakeholders are informed and can decide how to manage risks. A risk management process should clearly identify the process for communicating with stakeholders and how to document such communications. Communication should ensure appropriate information flow and decision making traceability which should include clear stakeholder identity and objectives [5]. It is best practice to develop an actual communications plan that is approved by all principal stakeholders. Finally, clear and concise communication of analyses is essential to ensuring that the planner understands and accepts them. Various communication formats and methodologies are available [75].

### 2.7.2 Establishing the Context

*Establishing the context* is a critical first step in the risk management process because the factors related to the organisational context need to be well-defined in order to appropriately determine the risk criteria for a given organisation. Risk criteria are the terms of reference against which the significance of a risk is evaluated and would include response thresholds. In addition, the external and internal contexts need to be established [5, 76]. The external context includes the cultural, political, legal, regulatory, financial, technological, economic, natural and competitive environments within which an objective must be met [3]. The internal context includes the policies, objectives, and the strategies of the organisation plus the standards and governance structures, roles and accountabilities within the organisation.

All of these factors influence the way in which risks will be defined and treated. For instance, they will impact the risk management objectives, the roles and responsibilities for risk management (e.g., stakeholder identification and description), the definition of risk management processes, tools and effectiveness metrics. Understanding the context basically lays the foundation for applying the risk management process.

### 2.7.3 Risk Assessment

*Risk assessment* is the collective process encompassing the identification of risk (determining risk sources, events and their causes and their potential consequences), the analysis of risk (the basis for risk evaluation and decisions about risk treatment) and the evaluation of risk (comparing the results of risk analysis against risk criteria). These three processes are explained in greater detail in the next three sections and the reader is referred to the ISO 31010 standard on "Risk management − Risk assessment techniques" for an extensive treatment of the subject including processes and tools [43].

#### 2.7.3.1 Risk Identification

The purpose of *risk identification* is to create a list of potential risks, and their causes (i.e., risk sources). This list needs to include any uncertainty that could affect meeting specific objectives and interrelationships between different risks and between risks and objectives. This process can occur as early as deciding whether or not to pursue an objective. If it is decided to pursue an objective, the process must form an integral part of planning to meet that objective (e.g., it may be known that an objective is strongly associated with certain risks). Importantly, risk identification is a continuous process that looks for new risks during the pursuit of an objective.

Each organisation will develop methods of risk identification that are tailored to its operations. Specific processes and tools can be used to enhance the identification and ensure capture of risk information from all stakeholders. For best results in risk management, it is essential that risks be identified early and continuously. Typical questions to be considered when identifying risks are [3]: what is the risk, how might it occur, what is the source of a risk, what and or who does it impact, when might it occur, what is its impact, how does the risk relate to other risks, and will one risk trigger the occurrence of other risks.

The process for identifying risks should be collaborative and inclusive. It should involve key stakeholders, subject matter experts and project team members. In the process of identifying risks, it is important to acknowledge that each person has their own perception or view of risk [77] (see Section 2.2 on the subjectivity of risk). The risk identification process must examine both current and historical data. Some well-known methodologies include brainstorming [78], the use of checklists [79] or the use of structured approaches such as the Delphi technique [80, 81] or the HAZOP method[6] [82, 83, 84]. Therefore, the iteration of risk identification and use of participatory groups helps to identify risks and ensure that they are actually risks rather than perceptions of risks, e.g., road safety can be increased by safety measures such as using seatbelts and cycle helmets [58].

#### 2.7.3.2 Risk Analysis

*Risk analysis* is the process used to define the nature of a given risk in detail. It includes information such as the source of the risk, whether the risk has a positive or a negative impact on meeting objectives, what the impact will be and the consequences should the risk occur. Risk analysis should also examine risk interdependence and risk flow (risks likely to cause or exacerbate other risks). Figure 2-3 illustrates one possible interpretation of risk flow for several components of a defence organisation (similar to Adam's [58] "Dance of the Risk Thermostats," discussed in Text Box 1). The arrows indicate a possible flow of risks from one organisational component to another and the thickness of an arrow indicates the possible

[6] Carrying out a threat or hazard assessment could be an auxiliary process for informing likelihood considerations during the risk identification and risk analysis phases [5, 227].

magnitude of this risk. Risk analysis should also consider the interrelationships between the corresponding objectives [5] since objectives are seldom independent of each other.

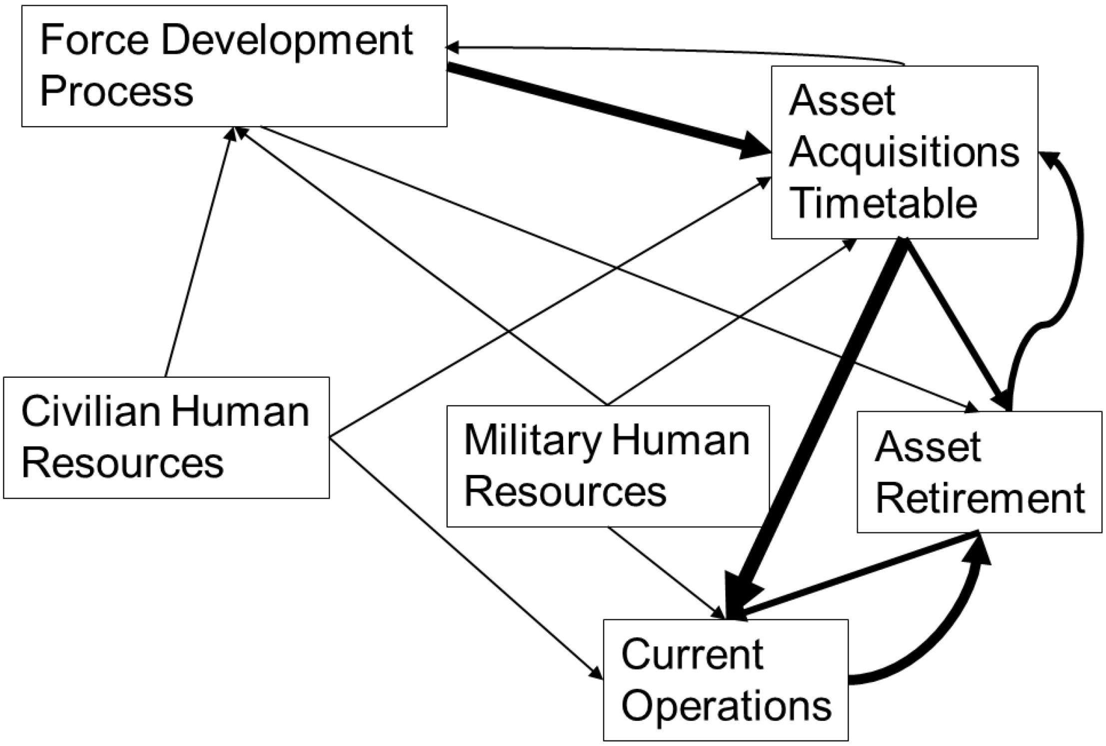



**Figure 2-3: Illustration of Potential Risk Flow Between Different Organisational Structures.**

The risk analysis process uses a variety of methods that are selected based upon the level of accuracy required [85]. These methods range from simple qualitative descriptions to very sophisticated quantitative estimates based on mathematical algorithms. It is important that the type of uncertainty being faced is understood to ensure that the appropriate techniques are used.

Likelihood can be expressed using simple, terms such as “high,” “medium” or “low.” More detail can be achieved using a more granular scale (e.g., 1 – 10 with one being low probability and 10 being high). Probability density functions can also be used to determine likelihood leading to more sophisticated, quantitative treatments such as Monte Carlo simulation [86, 87] some which may require extensive parameter settings and large data inputs. However, in many real-world problems such as strategic planning, it may only be possible to obtain qualitative data from subject matter experts because the main uncertainties we are dealing with are epistemic and linguistic, and not aleatoric (e.g., how can one estimate the probability of another 9/11-like event in the future from available data?) In those cases, it may be very difficult to be accurate since the true likelihood is unknown; however, if a diverse group of appropriately skilled subject matter experts agrees, the estimated likelihood may be precise (even if not accurate). In wicked problems, many of these estimates are very difficult to make; however, with planning cycles, the underlying assumptions can be tested and adjusted while the estimates can be improved (e.g., using robust approaches [19, 38]).

Impact can also be expressed using qualitative scales. Often the values of likelihood and impact are multiplied to yield a risk score. The risk score assigns a single value to a risk which can be used to rank and prioritise a list of risks. Given that the scales used to express likelihood and impact are not the same, or that they are not independent variables, multiplying those two values does not necessarily make sense [88, 89].

The methods chosen to express likelihood and impact should reflect the nature and complexity of the objective. A complex objective with significant outcomes and multiple risks may require an in-depth analysis. Some other techniques are emerging to make estimations differently and begin to address the common misuse of consequence of likelihood,[7] e.g., the use of regret from Regret Theory [38, 52, 90].

Even with extensive quantification, the outcomes of the analysis are only estimates. This is due to the fact that the very nature of risk analysis has different degrees of uncertainty associated with the analysis process and the data collected during that process. Data fidelity or accuracy should be considered and accounted for by verifying or weighting data from different sources and by applying different analysis techniques (e.g., two very different techniques yielding a similar result add confidence to selecting courses of action). It is also influenced by how an individual perceives risk and the consequences of risk occurrence. In other words, the very process of risk analysis has inherent risk. However, even with inherent risk, this structured process is usually useful.

#### 2.7.3.3 Risk Evaluation

*Risk evaluation* compares the outputs of risk analysis against the risk criteria previously devised in establishing the context phase. It attempts to define the significance or level of a risk and if the risk requires treatment. It is an overall risk ranking that informs decisions related to risk management in the context of an organisation’s risk tolerance and its fiscal, legal, regulatory and capability constraints. One outcome of this step is to ask for further analysis. Another is to not treat the risk at the present time, but track its status as the planning progresses.

An important aspect of risk evaluation should be the aggregation of individual risks. How risk aggregation should be done (especially when there is interdependence of risks and objectives) is a significant challenge.

### 2.7.4 Risk Treatment

When a risk is deemed to require treatment, the organisation must examine the options available and select the appropriate primary treatment or risk response to be applied. The options may include avoiding the risk by deciding not to pursue an objective; accepting the risk to pursue an objective; mitigating the risk to reduce the potential negative impact; modifying the risk to increase the potential positive impact; and transferring the risk to or sharing the risk with another entity.

Selecting a risk response is a decision with potentially significant consequences and often involves a balancing of costs, priorities and benefits to the organisation and stakeholders. Sometimes more than one response is required and these should be prioritised for maximum effect. Interestingly, implementation of a risk response can introduce uncertainty and this must be considered and weighed when selecting options. It is also possible for a risk response to be only partially effective leaving residual risk to be analysed and dealt with.

The selection of a risk response requires more than just the data generated in previous steps, it requires intuition based on current circumstances, an historical perspective using lessons learnt and a strategic view of the organisation’s overall goals and objectives. It is not science, but rather a subjective choice made with the information at hand and knowledge of how much risk an organisation will accept.

The risks that remain after treatment are called *residual* risks. These risks, just like any other identified risk, should be regularly monitored and reviewed (see Figure 2-2). Just like any risk, these residual risks may also undergo treatment if required and possible. Risk treatment may need to be applied in a cyclical manner by selecting options: implementing controls and assessing their effectiveness until risks (or iteratively residual risks) are acceptable [5] (see also iteration of risk identification in Section 2.7.3.1). This is particularly

[7] Some of these alternative risk estimation methods will be discussed in Chapter 5.

pertinent in wicked problems, where clumsy solutions are imperfect and may create risks themselves (see the concept of "Risk Homeostasis" introduced in Text Box 1). Ignoring residual risk may cause unintended consequences [91].

When treating risks, the interdependencies between risks and objectives should be considered. Sometimes the re-design of strategic planning process (and the analytical support to it) or the risk management process itself may be necessary in order to improve on the planning processes (see the risk management process design discussion in Section 2.6). Risk management should provide a framework to aid the analyst in better understanding risks and how risk aggregates, enabling analysts to provide a variety of risk treatment options that are acceptable to stakeholders. One of the questions that this issue raises is which techniques should be used and how should they be combined to address risks effectively.

### 2.7.5 Monitor and Review

For a risk management program to be effective and evolve within a dynamic organisation, it must be monitored as to its effectiveness. Effectiveness metrics are defined in the risk management framework. The frequency of and process for monitoring the program are defined in the risk management plan or as part of a larger organisational quality assurance program. Omissions or deficiencies should be identified and addressed in a timely manner in order to optimise program results. All aspect of the program should be monitored and reviewed including the risk management framework, the risk management plan, the processes themselves and the tools used in those processes.

### 2.7.6 Risk Recording

The risk register is a living document updated during all the phases of the risk management process. It allows for tracking a risk from the time it is first identified to the time it ceases to be a risk. It also allows the addition of new risks that are identified during a project. Importantly, the risk register serves as a repository of information from which lessons learnt may be derived.

All aspects of a risk management program should be traceable which requires records to be kept. These records provide the baseline for continuous improvement initiatives. Records such as risk registers, risk response outcomes, risks that occurred but were not identified in risk assessment activities, lessons learnt from projects and recommendations for future risk decisions need to be actively created and easily accessible to risk planners and decision makers.

The precise content of a risk register will depend on the types of data an organisation deems important to track. Thus, the risk register is a tailored tool for each organisation or group within an organisation.

## 2.8 SUMMARY

Risk-based planning attempts to anticipate future uncertainties and create plans to manage their effects. We have adopted the ISO 31000:2009 risk management process for our risk-based framework because it is flexible and has been widely accepted by most national standard organisations in the world. By adopting this standard for military or defence organisations, and specifically for strategic planning, we attempt to provide one way for nations to make their risk management processes systematic. Our framework was built to help analysts supporting strategic planning to employ risk management practices. Ultimately, defence organisations should choose the framework that they are most familiar with. However, they should be mindful that in a multi-national alliance standardised vocabulary is essential for common understanding. We believe the ISO 31000:2009 standard provides this vital foundation.

Given that the second component of RBFSP is the analytical support to strategic planning, we will now discuss what it entails.

# Chapter 3 − ANALYTICAL SUPPORT TO STRATEGIC PLANNING

*Plans are nothing; planning is everything.*

*− Eisenhower*

## 3.1 INTRODUCTION

In this chapter, we describe the generic activities carried out by analysts in supporting planners and other stakeholders involved in the defence and national security strategic planning processes. Together with the risk management process outlined in Chapter 2, the planning support activities form the scaffold of the Risk-Based Framework for Strategic Planning which is described in detail in Chapters 4 and 5. The RBFSP is designed to assist in the employment of risk management principles, processes and practices, as well as associated evidence-based methods: when undertaking strategic planning, when creating a strategic plan, and when implementing a strategic plan.

The RBFSP has been developed by analysts for analysts (see Text Box 3 for a discussion of the distinction between analysts and planners). Therefore, it does not provide guidance on *what* to include in a strategic plan (future trends, emerging technologies, enduring geopolitical forces, etc.) but on *how* to think about and undertake risk-based strategic planning in a systematic way [5]. Risk-based planning should help the analyst to apply *risk thinking*[1] to analytical support to strategic planning and reinforce the use of the *scientific method* in analytical investigations [92]. The framework is not intended to conduct strategic planning, and indeed cannot prescribe how NATO or member states carry out their planning. Stated differently, the RBFSP is a decision support system that aims to provide support to existing planning processes.

**Text Box 3: Analysts and Planners.**

| |
|---|
| We make a distinction between analysts and planners. Analysts are defined to be decision-support specialists who support planners and their efforts throughout all phases of the strategic planning process by employing scientifically sound methods. Analysts are usually operational research scientists, operational analysts, defence analysts, etc. On the other hand, planners are people who conduct and implement the strategic planning process. Planners have ownership of the strategic planning process and are ultimately accountable for its products. Planners are often military personnel but can also be civilian stakeholders within a nation's Ministry of Defence. For many nations, the analyst and the planner may be the same person or a group of people doing the work of both the analyst and the planner. In larger nations, there may be many planners and many analysts working on various parts of a strategic plan or working on many different plans in parallel (e.g., different services may have different strategic plans). |

## 3.2 WHAT IS STRATEGIC PLANNING?

Strategic planning[2] is defined as follows [9, p. 3] "a process that investigates possible future operating environments and develops a force structure development plan[3] to best adapt the defence organisation to

[1] The concept of risk thinking was introduced earlier [5, 92] and has many similarities to other concepts such as risk-based thinking [11], risk conscious culture [12] or risk management mindset [13]. Risk thinking is defined as a "philosophical stance and analytical perspective" that encourages the analyst to think about risk with respect to all aspects of the analytical process.

[2] Our notion of strategic planning is the same as that of long term defence planning [9] and similar to defence planning [17].

[3] A force structure development plan describes the required changes in the total force structure (capabilities and supporting manpower, equipment, infrastructure, etc.) for all the years in the planning period [9].

those environments given a host of constraints – including financial ones." The planning horizon for strategic planning is usually ten to forty years (sometimes even longer) and is based on the defence domain. The conduct of strategic planning allows a defence organisation the opportunity to reflect on various future horizons, to think about possible strategies for the organisation to anticipate and respond to future events (e.g., via studies of the future security environment). Different approaches to planning have been described [9]: top-down planning, resource-constrained planning, capability-based planning, scenario-based planning and threat-based planning.

It is widely accepted that strategic planning is a wicked problem where the planner has to take into account a diverse variety of factors[4] (e.g., security challenges, the political environment, resource constraints, the economic situation, current force structure, force structure development, technology development, various local and national considerations, and divergent views among stakeholders). Given that any one of these factors, let alone their possible combinations, can bring about a significant amount of uncertainty, there is an obvious need to take risk into account when carrying out strategic planning. As for wicked problems, there is no one good strategic plan solution.

Therefore, for strategic planning to be useful, it needs to provide several important outcomes [5]: planning boundaries, a strategic plan and an implementation of the plan. First, the planning boundaries [9], or boundary judgements [5, 93] should characterise the planning scope; in other words, what is to be included and what is to be excluded from the planning process.[5] Second, the strategic plan that is produced should describe how to best adapt a nation's current or future/planned force structure explicitly based on planning objectives and their trade-offs. As part of the plan, analysis should outline what the effect of the different uncertainties could be on the planning objectives. Third, a plan, including a timeline, to carry out the implementation of the strategic plan should be specified. Finally, the risks in obtaining these strategic planning outcomes should be managed using a risk management process.

There are important common elements to most defence strategic planning efforts that address the realities of government or defence departments such as [5]: involving a diverse set of stakeholders, being methodical, and being adaptable. All strategic planning processes involve more than one stakeholder usually representing different views of the problem scope; this challenge is especially relevant for the NATO Defence Planning Process which involves almost thirty countries. These planning processes are usually methodical (or systematic) in order to obtain traceability throughout the planning process, including the strategic planning outcomes. This is necessary in order for the results to be accepted (i.e., be considered credible) and, therefore, giving decision makers confidence to be accountable for their decisions based on those results.[6] The planning processes also should be *adaptable* in order to allow defence departments to adjust to changes in a nation's economy, political landscape, future security environment, as well as technological advances and changes to defence department structures.

## 3.3 MAIN ANALYTICAL ACTIVITIES SUPPORTING PLANNING

### 3.3.1 Structure of Generic Strategic Planning Process

Although strategic planning processes are usually nonlinear in their application, they are described very much in a linear fashion (see Text Box 4). As described in the previous section, a linear application of a

[4] A practical example describing the variety of problems when undertaking strategic planning under deep uncertainty is presented in Chapter 3 of a natural gas industry study [201].

[5] Some stakeholders may assign different planning boundaries to a problem. One of these stakeholder's might dominate the direction taken in solving the planning situation, thereby, *marginalising* the interests of the other stakeholders [5, 92]. This concept can also be referred to as *contested* planning scope.

[6] How one conducts strategic planning may also be observer-dependent; i.e., dependent on the institutional position of the observer (planner or analyst) with respect to the planning process. Thus, strategic planning can be conducted at multiple levels, ranging from the fleet or project level all the way up to the enterprise level.

generic planning process usually consists of three components [5]: planning instance set up, planning itself (i.e., plan creation), and plan implementation (or plan execution). There are several key activities that comprise these components.

**Text Box 4: Planning is Nonlinear.**

It is recognised that the way the planning process is described in this chapter may give the impression that planning is linear. In reality, however, planning is not linear. It is usually iterative; planners and analysts alike jump mentally back and forth through the various steps of the planning process. From the analyst's perspective, feedback and feedforward loops are needed to implement critically reflective practices. From the planner's perspective, jumping back and forth accounts for different individuals being mentally at different stages of the planning process at any given time [39, 94].

Describing planning as a process comprising five steps is merely a simplification made to provide a structure that can be adapted to any planning process. It allows for the methodological support (theory and techniques) to be mapped to core activities. Analysts supporting strategic planning can then pick the most appropriate methods and techniques from those activities and map them to the processes used in his or her organisation/nation.

From the analyst's point of view, there are specific activities that need to take place during the planning phases [5]. The set up phase is comprised of activities geared towards scoping the planning problem, identifying those who have a stake in the planning process and outcomes, and eliciting interests that need to be taken into account. The actual plan development or creation phase consists of evaluating objectives in the context of organisational strengths and weaknesses, analysing contexts with respect to opportunities and threats, and supporting the planner in determining (and committing to) a course of action. In the implementation step, the decided actions are executed and monitored for desired and undesired effects against the set objectives and identified stakeholder interests, and the course of actions is adjusted depending on the feedback received.

Given that strategic planning processes that we are concerned with are cyclical or periodic, two additional activities should be added to the three main planning steps. Before setting up the planning instance step, it is necessary for the analyst to *prepare to plan*. This step involves revisiting previous planning endeavours to extract their strengths and weaknesses, improving tools and techniques applied in previous efforts, anticipating and filling data gaps, undertaking an initial analysis of the human and technical complexities that characterise the planning context, and identifying enablers and possible constraints that may affect the planning instance set up, plan creation and plan execution (or implementation) steps, including policy, resources and the analyst's past experiences with decision-support tools. In planning processes that are recurrent, lessons learnt are usually captured (e.g., the Review Results step in the NATO Defence Planning Process [44]). While review, quality assurance and monitoring occur throughout all the steps of the planning process their importance warrants defining an explicit *lessons learnt* activity that aids the analyst in capturing, analysing and exploiting learning from the analytical support to planning. A common experience is that lessons are often identified but not learnt [94]. Therefore, although the analyst is not necessarily deeply involved in each of the planner's activities, he or she needs to be aware of everything that is of concern to the planner [5]. The analyst needs to be interested in the whole planning process because it provides the purpose and the context of what he or she is supporting.

Combining the three steps of linear planning with those that account for the often cyclical or periodical nature of defence and national security strategic planning, there are five main planning activities that structure the analyst's support to the planner [5]:

1) Prepare the Planning Process;

2) Set up the Planning Instance;
3) Create the Plan;
4) Execute the Plan; and
5) Learn Lessons.

Figure 3-1(a) provides a generic pictorial overview of how the planner and analyst interact in supporting the strategic planning process while part (b) shows the same interaction with the main five planning activities. Existing defence strategic planning processes can be seen as being made up of three generic steps: *Set up the Planning Instance*, *Create the Plan* and *Execute the Plan* (black part of Figure 3-1(b)). The extended analytical support process can, then, be thought of as wrapping around the planning process (blue part of Figure 3-1(a)) and comprising the five steps. In the following subsections, we describe the analyst's involvement in these five steps in more detail.

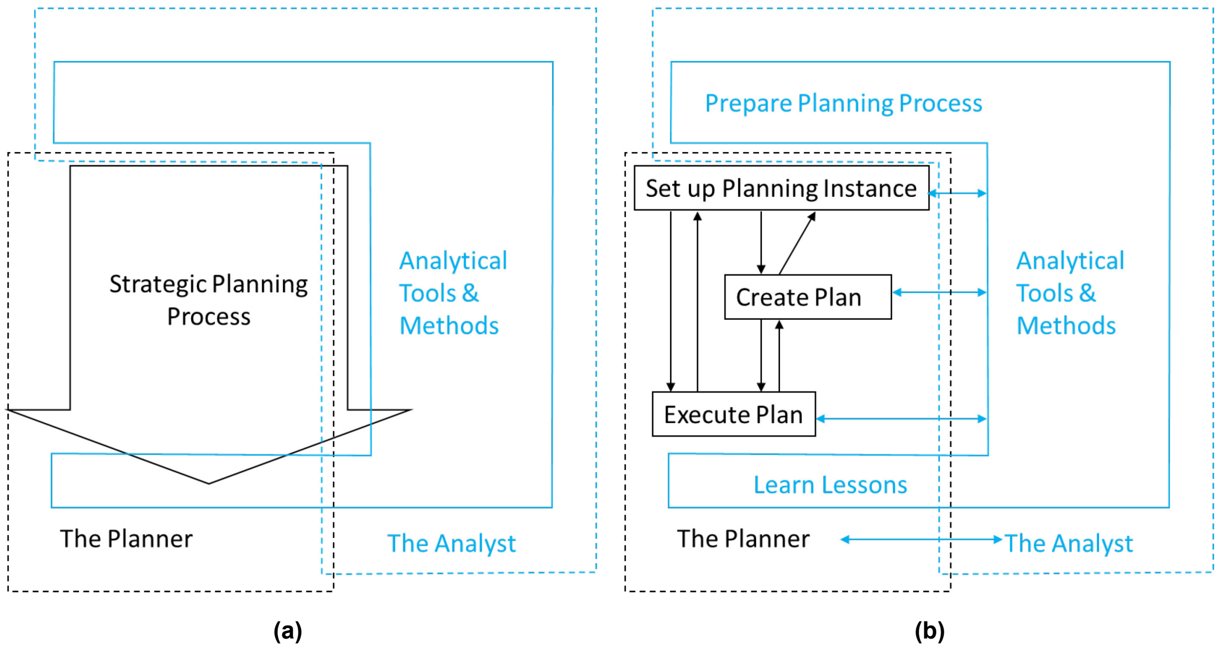



**Figure 3-1: Outline of the RBFSP (Blue) Performed by the Analyst Supporting an Existing Strategic Planning Process (Black) Performed by the Planner.**

### 3.3.2 Prepare the Planning Process

An often unacknowledged step in the planning process of a defence department is that of preparing for and, if necessary, preparing the strategic planning process itself. When preparing the planning process, the analyst helps structure the planning problem and makes a preliminary assessment of which analytical approaches to take. Therefore, the analyst should consider investing effort in the following areas [5]: establishing generic constraints, classifying the problem context, anticipating problem sets, reviewing lessons learnt, and taking inventory of extant toolsets and data.

When establishing generic constraints that affect the planning and associated decision support efforts the analyst may acquaint herself with her nation's (or more specifically the local organisation's) strategic planning policies, strategic planning decision making bodies (such as boards, committees, councils), timeframes and time horizons as well as the knowledge domain (national security, land, air, maritime, capability, force structure, etc.) associated with the strategic planning problem. This will be helpful later in the identification of methods for the characterisation of risk management's internal environment during the

*Set up the Planning Instance* step. The analyst may also wish to evaluate past strategic planning efforts in order to understand other constraints (such as security classifications of knowledge repositories) that may impose practical limitations on which data sources and analysis tools might be available throughout the planning process.

There is also a need to anticipate the problem sets that will require analytical support. During the *Prepare the Planning Process* step, high-level information requirements can start to be determined for the entire planning process. In some situations (e.g., when the planning context is reasonably well understood or when the planning process is strongly constrained), it may be possible to build prototypes or even working models that can be used to support the planning process. This might include identifying data sources, and developing data collection strategies [95]. In some cases, there might be an opportunity to pilot test multiple approaches to determine their strengths and weaknesses and which one to adopt in and/or adapt to the particular planning instance. Of course, changes in techniques can occur in later stages of the planning process as more information becomes available, planning objectives become clearer, stakeholder views converge (or, at least, divergences are set aside), and modelling and simulation approaches firm up.

As already described, reviewing lessons captured in past strategic planning cycles is a useful exercise for the analyst especially when setting up critically reflective support to strategic planning that has validation, verification and sensitivity analyses in mind from the very start of the planning process. Analysis of past strategic planning support efforts may unearth inconsistencies in previous analysis assumptions and/or point towards issues regarding the appropriation (or lack thereof) of past planning outputs by the various stakeholder groups, some of whom may be involved again in the new strategic planning cycle.

Taking inventory of extant decision support tools, consulting the record of lessons learnt and the risk register to assess strengths and weaknesses of these methods, evaluating the problem situation context in which these tools have been applied in the past, and making possible adjustments and improvements to the set of tools (e.g., remove bugs in computational models) are also useful areas to explore in the *Prepare the Planning Process* step. Incomplete data sets used in the past may be enhanced and analysis tools and methods added, removed or exchanged (e.g., introducing a strategic planning support tool used in a different organisation or nation).

Finally, if this is the first cycle in a new strategic planning process (and this cycle has not started yet), as part of preparing the planning, the design of the strategic planning and the risk management processes could be carried out. In this guide, we implicitly assume that both of these processes have been designed. The strategic planning process may also have been applied for several cycles without the explicit inclusion of a risk management process for the analyst. Some guidelines on designing a risk management process are provided in Section 2.6; however, the design of strategic planning processes is beyond the scope of this guide [96, 97].

### 3.3.3 Set Up the Planning Instance

When setting up the planning instance (e.g., akin to the Political Guidance step in the NATO Defence Planning Process), the analyst first works with the planner. Taking the considerations made in the previous step (*Prepare the Planning Process*) to define the evidence-based analysis required to support the planning effort. Using the consideration made in the previous step − such as lessons from previous planning cycles, the use of and testing of different models and techniques and the high level information requirements − helps the planner identify appropriate representatives of the various stakeholders in the strategic planning process and its outputs.

Next, the analyst should elicit the initial planning boundaries [9] (also referred to as boundary judgements [5]) from the stakeholders to identify areas that each of them considers relevant [5, 92]. By analysing the differing perspectives of stakeholders and what they feel is important, it makes explicit the possible friction points (e.g., marginalisation [5, 92]) and avoids “big problems” being uncovered later on and creating issues that are difficult to correct in later planning stages. The analyst also needs to explore the domain of interest. In doing so, the analyst needs to include assessing various dimensions that may affect the strategic planning situation, estimating the degree of their impact on the planning process, and how much they differ from the stakeholders' views of the world, and integrating the results of these analyses. This in itself can cause problems later on because there is a tendency for conservatism (see Section 1.2) and a need to reconcile the potential difference between what is possible and the planning boundaries considered by the stakeholders. However, if the stakeholders are of a rich enough diversity, the comparison of the wider domain with the boundary judgements can be a useful critical exercise itself.

One critical aspect of the analyst's contribution is deciding on the analytical approaches to be used throughout the strategic planning process: which we tend not to be very good at [41]. Developing a plan as to what kinds of analyses are to be conducted and when supports the selection of methods, techniques and data that are appropriate throughout the planning process, and may require the development and/or customisation of techniques and data collection methods [95]. This is where the consideration of lessons from previous planning cycles can be very useful. Lessons from previous cycles can assist in choosing, eliminating and understand gaps in the techniques to be used: this is where the structure of the RBFSP technique mapping in Annex A can be of particular assistance.

Finally, the analyst should begin to collect the required data. This may include accessing existing databases, converting extant data sources for use in techniques as planned, and running practice data sets on techniques to make stakeholders acquainted with the analysis techniques and their outputs and to gain an understanding of how sensitive analysis outputs are to the assumptions made. These activities both test the techniques before they are used and familiarise stakeholders with the analysis techniques and their outputs.

### 3.3.4 Create the Plan

When creating the strategic plan, the analyst should implement the agreed upon analytical approach which could consist of one or more techniques.[7] The first step in any approach should be an examination of the planning objectives in order to determine their priority [5]. Some of these objectives will already be known from the previous step. There may, however, be factors that have affected and altered these objectives. Supporting the analysis to determine the precedence of one objective with respect to another would be important since some objectives might be in conflict[8] [98], e.g., economic objectives versus operational capability objectives. The support of the prioritisation of objectives could be done for example by using trade-off techniques to develop various courses of action and analyse their impact on achieving planning objectives. Using modelling and simulation tools can be very helpful in these situations. In addition, conflict resolution workshops (or similar participatory activities such as wargaming) could be convened to examine the importance of various objectives to all the stakeholders.

Once objectives and their importance have been agreed upon (or the highest possible level of agreement has been obtained) and confirmed, the analyst can make use of various techniques to study the effect of uncertainties on those objectives (individually and jointly) in order to develop alternative courses of action [5]: futures studies techniques (to examine the breadth of possible futures within the considered time horizons), scenario planning and similar exploratory techniques (to examine how differences in planning options may affect planning objectives) and robustness techniques to elicit the minimax course of action (robust to all possibilities rather than those selected, preferred or more likely [19]).

[7] As is demonstrated in Chapters 4 and 5, the RBFSP will help the analyst in the systematic, risk-focused application of analytical support to strategic planning.

[8] Consider a simple illustration of using the classic parameters for tank design. Tank design is a compromise between firepower, manoeuvrability, and protection. You cannot have a highly manoeuvrable tank with great protection: protection levels are compromised by firepower, and firepower is compromised by manoeuvrability. Another illustration closer to the strategic planning domain would be as follows: a country requires surveillance aircraft with higher terrain coverage resulting in higher costs since more aircraft would be required. Since one cannot have high surveillance coverage at low cost, the objectives of surveillance coverage and aircraft cost are in conflict.

Once alternative courses of action have been developed, the analyst can support the planner in the selection of one or more alternatives by carrying out modelling of the considered scenarios [5]. Sensitivity analyses would be a way to test the robustness of the various courses of action. Depending on the level of the organisation at which the planning was done (from single fleet or project to the enterprise level) different levels of modelling detail would be required and possible (the larger the system being modelled, the more data is usually required, and this data is not always obtainable [19]). More important still would be to understand the level of detail necessary at the various levels of the organisation in order to obtain relevant data, and produce relevant analysis. The developed courses of action also need to be prioritised in order to select a preferred and alternate one (other options that could be triggered by certain events).

Finally, the analyst should help facilitate the communication of the plan to those who have responsibilities and roles during its execution and implementation, and to other stakeholders and parties who have an interest in, or are affected by, plan execution and implementation. The analyst can provide a structured process for investigating the risk aspects of the planning process and for communicating those aspects across the various stages of the strategic planning process and to future iterations of the process (through lessons learnt).

### 3.3.5 Execute the Plan

When supporting the execution and implementation of a strategic plan, the analyst is attempting to help monitor and adjust the analysis to suit the realised conditions and situation. The analytical support to strategic planning should include supporting the identification of Key Performance Indicators (KPIs) and establishing the means to measure or evaluate them. As well, in collaboration with the planner, the analyst needs to develop measures of success and failure for the outcomes of plan implementation.

Together the analyst and planner need to facilitate the establishment of reporting mechanisms and other processes needed to execute the strategic plan, identify ways to handle contingencies that arise, support reviews of, and updates to, the plan. They also both need to facilitate the execution of continuous quality improvement processes, and establish mechanisms by which compliance with various external (and internally imposed) requirements can be demonstrated.

Finally, the analyst should examine the need to develop and implement techniques for analysing changes in (and the dynamics of) external contextual factors (e.g., security environment, national economic situation), the composition of stakeholders, and the mix of objectives [5]. For example, if the need to improve analysis of possible changes in the external economic environment was important, it might require the development of (internally or via contracting) or purchase of (from central banks) macroeconomic forecasting tools. Another possibility would be to examine the assumptions in future security environment analysis in order to capture what changes may happen in the future (i.e., known unknowns).

### 3.3.6 Learn Lessons

Unlike projects (which typically have a well-defined beginning and end), strategic defence planning is never complete, as the plan is regularly updated. Defence plans are regularly updated, often cyclically, sometimes irregularly on-demand, or even both. Some parts are often updated, and assessed (or just reported) periodically, like in the NDPP for example.

Whereas the first four steps usually build on each other, lessons are identified and learnt throughout the whole process. Learning is understood to behave like an appreciative system – an ongoing recursive loop where the flux of events generates appreciation and appreciation contributes to the flux – as first described by Vicker’s in 1965 [99]. We have made it an explicit final step to both emphasise the importance for the learning to occur, but also to provide a formal step to consolidate the appreciation that has occurred through the planning process and invoke *active learning* (see Text Box 5).

**Text Box 5: Lessons Learnt or Lessons Identified?**

Much of the literature about learning lessons arises from the Disaster and Emergency Response domains, which are in many respects similar to Defence and Security Challenges [102]. Within the Disaster and Emergency Response domains, during the 2000s, a shift occurred whereby the phrase *lessons learnt* was replaced by *lessons identified* because it was recognised that lessons were merely identified and were so rarely learnt [102, 103]. By making the identification of lessons explicit, it was hoped that the lessons would then be learnt from those identified lessons. However, if processes such as the UK NRA are examined, there appears to have been more hope than careful consideration of how people learn in implementing a process for dealing with lessons. Kahneman clearly describes how, even when presented with clear evidence, people do not change their behaviour [52]. This lack of change, even though it is clearly observed, occurs because we learn more from doing (active) than from observing (passive). But learning from doing is difficult to implement and it is not fully understood why it works [104].

A simple model of learning is [103, p. 13]:

*Identify the lesson → Recognise the causal process → Devise a new operational process → Practice the new process → Embed/Institutionalise and sustain the new process*.

Because learning by doing is often difficult, people tend to rely on a process of learning by passive absorption (*Identify the lesson → Recognise the causal process*). This means that people tend to be good at carrying out the first two steps of the simple learning model (*Identify the lesson → Recognise the causal process*) and less proficient at carrying out the third step (*Devise a new operational process*). People are, however, very poor at the fourth and fifth steps (*Practice the new process → Embed/Institutionalise and sustain the new process*). For a response situation to a disaster or an emergency (i.e., a rare event), the learning process is illustrated in the flow diagram in Figure 3-2 (figure based on Carley & Harrald [105, p. 105]).

When the problem is a *wicked problem*, additional challenges are presented because active learning is most easily achieved during day-to-day activities such as learning on the job [104]. Examining the principles of wicked problems (see Section 1.3) shows why learning is more difficult [29]: “each solution is no better or worse than another”, one “cannot test or pilot a solution”, and “every solution is a one-shot operation.”

The tendency to rely on identifying errors is problematic [104]. Recognising errors may work in simple circumstances; however, recognising errors disguises the actual mechanism of learning and where there are a multitude of potential errors or hidden errors. This strategy may be of little use when dealing with wicked problems [102]. Furthermore, research shows that there is a far greater neurological response to stimulus of successful outcomes [104] which, together with the learning literature and the simple model shown earlier, demonstrates that the best way to truly learn is to successfully do something [104]. This is also far more efficient because there are far fewer successful options (and you only need to find one) than the multitude of possible errors. For example, if one burns a hand on a hot pan, one does not learn not to touch the pan ever again (because of the continuing need to cook), but one learns how not to burn one’s hand on a hot pan, a subtle but important difference. The simplest demonstration of this phenomenon in a complex problem situation (i.e., a wicked problem) is seen in the evolution of species, where the most successful (fittest) individuals get to pass on their genes [106].

Given this need for learning by doing, and a need for planning in defence, there are two important aspects to be drawn from this. First, the analyst needs to iterate through the defence planning cycle so that experience can be developed to deal with the wicked problems within planning through doing (conscious and unconscious competence [107]). The RBFSP is designed to aid the analyst in the learning. Secondly, the framing of learning needs to be changed to unlock the learning potential in defence planning.

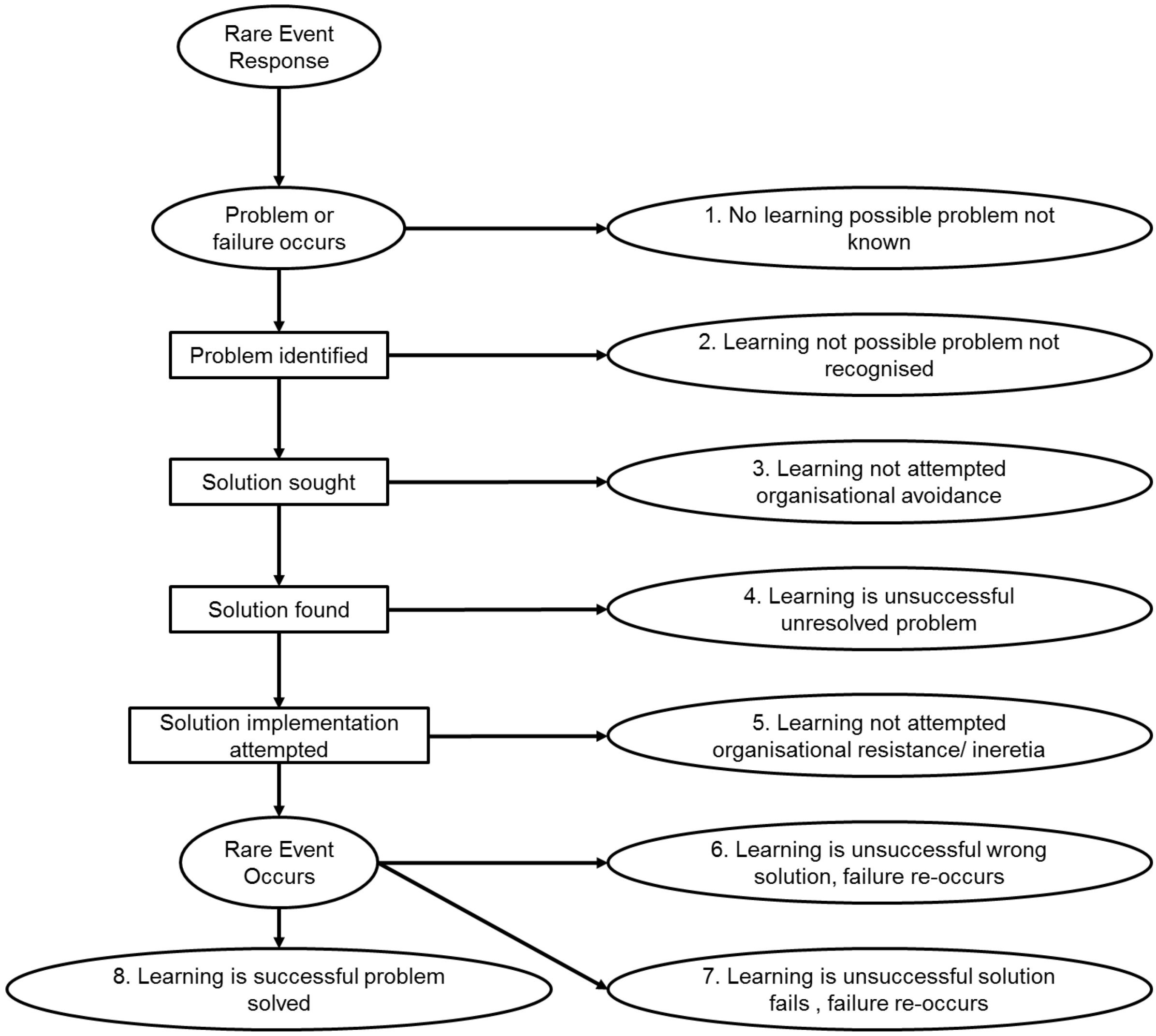



**Figure 3-2: An Example of Organisational Learning from Rare Events.**

This learning step, besides consolidating and learning the lessons from the planning instance that is underway, links to the *Prepare the Planning Process* step of the next planning cycle, supporting the notion that strategic planning and analytical support to it are iterative, circular and continuous processes. Lessons can, therefore, be identified from the planning iteration coming to an end and they can be evaluated such that the next iteration is improved. There are a number of important considerations for the analyst in this *Learn Lessons* step that cannot be achieved easily without a formal step in the process [5]. First, the analyst should be able to critically evaluate the assessments within the entire planning process and take a more holistic view of the interrelationships between all the elements involved – a systems thinking perspective [5]. Part of this critical assessment is in considering if there is enough diversity in the perspectives being applied to the problem (see Text Box 1 in Chapter 2) and, therefore, if there is a need for improving the diversity of stakeholders or the use of participatory approaches [5, 27].

To enable the critical assessment requires the analyst to "show the workings" of the assessments within the planning process in a transparent way making explicit the assumptions, considerations, constraints and decisions made throughout the process [5]. When managing risk, the purpose of a risk register is usually to record all these aspects of identified risks; however, there are no explicit assumptions or constraints register for analytical support activities.

This register of assumptions and other considerations provides two very useful functions for both learning and planning. First, it allows the analyst to develop adaptable plans that are robust to changes in assumptions using techniques such as Dynamic Adaptive Policy Pathways [100, 101]. Second, it allows longitudinal studies to be conducted to help learn and understand what works because as with most defence planning there is not enough detailed recording and explicit detail of the assumptions to look back over a long period of time to see what planning approaches worked well and which ones did not.

The learn lessons step, therefore, is inextricably linked to the next planning process. The lessons identified from this planning iteration need to be actively learnt by changing the way that the planning is conducted in the next iteration (if needed). Therefore, if something is seen not to work properly in one cycle of the planning process then this should be changed in the next cycle (something often not easy to do), and the evolution of planning development should be recorded (e.g., in the risk register) to aid in the subsequent refinement of the planning process and the analytical support to carry it out.

## 3.4 ANALYTICAL SUPPORT TO RISK-BASED STRATEGIC PLANNING

Analytical support to strategic planning is the systematic application of analytical techniques by the analyst to support strategic planning activities. These activities start with the preparation of the planning process and the set-up of a planning instance where the analyst needs to re-examine past planning cycles and to prepare for the current cycle by examining the planning scope. The next step is the creation of the plan which involves the prioritisation of objectives, analysing different courses of action achieving those objectives under uncertainty and choosing the ones preferred by the stakeholders (but especially decision makers). The implementation of the devised plan requires analytical support in order to monitor its progress. The cycle culminates in the analyst recording lessons and hopefully learning from them for the next cycle. The key to successful analytical support is its systemic application in the planning context. Those notional steps should not necessarily be carried out in a linear fashion (see Text Box 4 on planning being nonlinear).

Defence planning is also a pragmatic endeavour. Therefore, when conducting risk-based strategic planning, a balance needs to be carefully achieved between both resources and effort, and the accuracy of the modelling and resulting estimates. There is a tendency either to invest too much effort in precision or to simplify the analysis by making many assumptions to generate quick results (e.g., doing 20% of the work to obtain the 80% of the solution). However, it is our hope that the RBFSP can aid in balancing these factors. The framework should allow the user to make any number of assumptions and quickly iterate through early planning cycles to refine models and ultimately risk estimates. These planning iterations can help reduce some of the uncertainties informing the estimates and, therefore, ultimately increase the precision of the models. However, in order to ensure also some accuracy, different models need to be used just like a set of diverse stakeholder or subject matter expert views can provide more accurate analyses. The framework's structure, therefore, should aid in this by providing a consistent structure through the planning cycles, allowing the linking of different techniques and allowing longitudinal (long-term) learning of which techniques work best.

There are many uncertainties that plague the analytical support to every strategic planning process. It is crucial that those uncertainties be examined in a structured and systematic fashion to understand their effect on planning objectives. The effect of those uncertainties then needs to be mitigated or the opportunities generated by those uncertainties should be seized. The Risk-Based Framework for Strategic Planning, combining a risk management process with a process for analytical support to strategic planning, presents one way for analysts to support planners systematically and in a scientifically rigorous way. The analytical support steps previously outlined are again illustrated in Figure 3-3, but now with the emphasis that the analytical support should be carried out not only with traditional tools but also with risk-based tools and a risk aware mind-set (i.e., applying risk thinking). Therefore, the risk-based framework for strategic planning is a framework for the systematic and structured application of techniques that support the planner in his or her work.

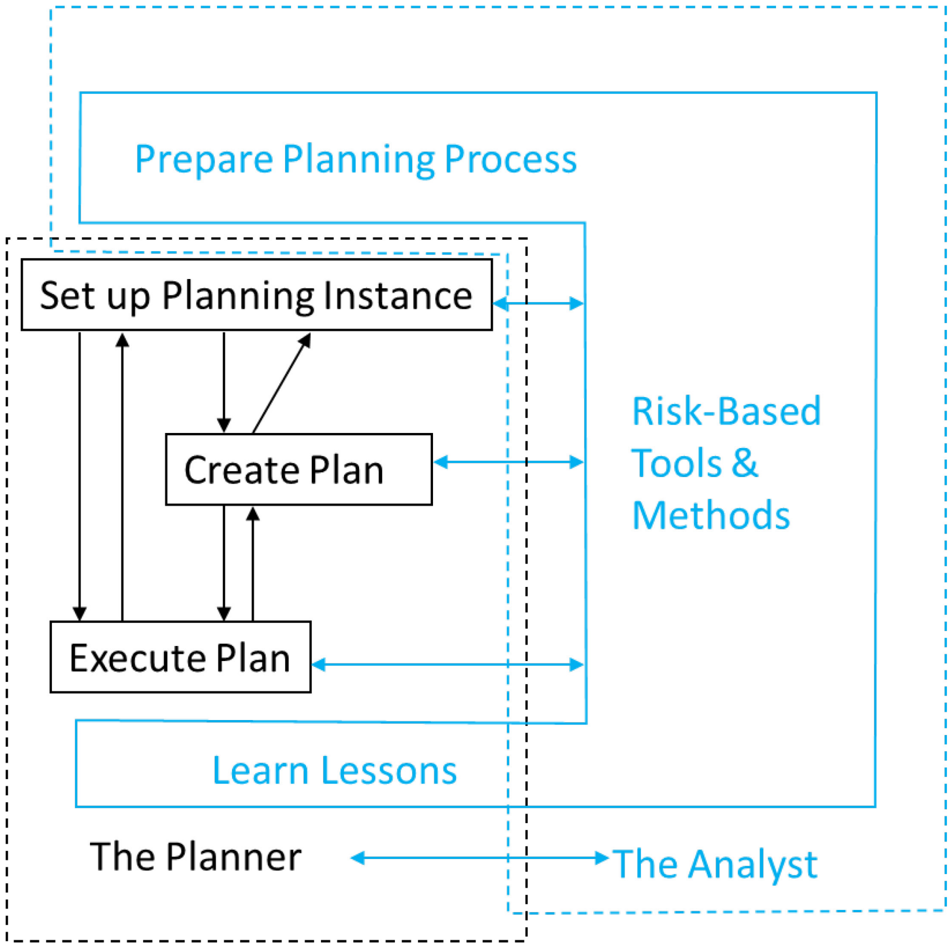



**Figure 3-3: Outline of How the Analyst Supports the Planner in a Strategic Planning Process by Applying Risk-Based Tools and Techniques.**

# Chapter 4 – RISK-BASED FRAMEWORK FOR STRATEGIC PLANNING

*Risk is like fire, if [managed] it will help you; if not [managed] it will rise up and destroy you.*

*− Theodore Roosevelt*

## 4.1 INTRODUCTION

This chapter builds upon the principles of risk management and risk thinking (described in Chapter 2) and how they can be used to support the five steps of analytical support to strategic planning (described in Chapter 3). In this chapter, we describe how by aligning these two constructs a framework[1] to aid analysts in thinking systematically about risk in strategic planning can be developed in the defence context.

To develop the Risk-Based Framework for Strategic Planning, we need to make an explicit distinction between two broad risk types: risks arising from uncertainties affecting the objectives of the selected planning process and risks arising from the uncertainties affecting the objectives of the planning process itself. This distinction is important as both types of uncertainties could affect, for example, the achievement of the strategic planning objectives, but the techniques for dealing with those effects could well be different. For example, if a risk to the achievement of strategic objectives is caused by an uncertainty due to the planning method selected, the selection of a different method could help in mitigating this risk. Therefore, the analyst can add valuable support to the planner by helping him or her understand the various types of uncertainty and complexity that affect planning objectives and by applying appropriate analytical techniques to the planning problem.

Research shows that people have a tendency to draw upon information that is familiar when making judgements [108, 109] (see Text Box 5 in Chapter 3). This skill is a strength and efficient when applied to problem situations that have common patterns, including normal planning cycles, or those that require fast and frugal decision making, e.g., in dangerous situations [57]. It is, however, not the correct skill to use when there is either something new about a problem situation that needs to be understood or the problem dynamics present complex or irregular patterns. Given that strategic planning problems show both recurring and irregular patterns, it is important to enhance an analyst's understanding of what techniques exist and provide him or her with access to a selection of options [41]. Therefore, the Risk-Based Framework for Strategic Planning is designed to assist the analyst in the choice of appropriate techniques to suit the risk management phase in each planning step [5]. This chapter describes the types of activities that need to occur in each intersection of a matrix that is the product of the five phases in a planning cycle (see Chapter 3) and the seven risk management phases (see Chapter 2). Each matrix intersection is mapped to relevant techniques that an analyst can use to raise the planner's risk awareness and to inject good risk management practice into the strategic planning process. Thus, by explicitly linking the risk management process to the planning process, increasing both the analyst's and the planner's risk awareness, and hopefully leading to an improved strategic planning process.

Ideally, risk management would be highly integrated into the strategic planning process by both the analyst and the planner. However, given the paucity of explicit risk management in most strategic planning processes (for examples see companion report [44]) and especially in the analytical support to planning, the RBFSP focuses on linking standard risk management processes with generic strategic planning processes from the analyst's viewpoint. Our aim in developing the framework is to support the management of risk for

[1] The framework developed in this chapter was originally introduced in an earlier paper [5]. Chapters 4 and 5 elaborate further on how this framework could be used.

strategic planning by offering to the analyst an organised collection of risk management techniques[2] considered to be suitable and useful for strategic planning and analytical support for it. While the framework focuses on the defence context, the techniques identified may be applicable to other areas of enterprise risk management and other large complex planning processes. The framework itself is designed to be a starting point to which techniques can be added to and feedback from users can aid in further development and refinement.

## 4.2 FRAMEWORK STRUCTURE

The RBFSP is best conceived of as an overlay to an extant strategic planning approach. It aims to provide an annotated toolbox that can be used by analysts supporting the planner in the development and implementation of a nation's (or NATO's) defence plan. The toolbox is complemented by guidelines for where the techniques can be used. These guidelines are presented in Chapter 5.

Grimaldi *et al.* [110] categorise techniques that capture the effects of uncertainty on project management objectives. Specifically, their framework classifies techniques based on purpose and project management context. Our framework follows a similar form to that of Grimaldi *et al*. but differs substantially in a number of areas. First, we use the full set of ISO 31000:2009 [4] risk management phases whereas Grimaldi *et al.'s* framework omits two phases we consider vital: establishing the context and communications/consultations [110]. Second, we focus on strategic planning processes specifically for the defence context, which are wicked and not as well structured as the three project management steps that are of concern in Grimaldi *et al.* [110, 111]. Third, important risks relating to elements of the planning project such as schedule, and resource adequacy are not explicitly considered in the RBFSP given that they have been comprehensively covered elsewhere in the literature [110, 111, 112, 113, 114, 115]. However, similar elements also affect the implementation of the plan (e.g., schedule of implementation and resources required for the implementation). These considerations, when applied to the implementation of the plan are great sources of risk (e.g., the NDPP case study refers to these as Category 3 Risks [44]).

A pictorial overview of the RBFSP structure is presented in Figure 4-1. The strategic planning process that will be followed is depicted at the top as it provides the backdrop against which the RBFSP will be used. Immediately beneath this layer is the *matrix* (Level A, discussed in Section 4.3), which represents the intersection between the strategic planning process steps and the application of risk management. Level B represents specific risk management *activities* (see Sections 4.3.1 to 4.3.7), which can be carried out using specific techniques (Level C), represented by the blue circles in Figure 4-1. Each activity may be carried out using any of a variety of techniques. We provide a categorisation of techniques in Chapter 5 and Annex A, which will help in selecting appropriate techniques to be applied in activities of the *matrix*.

The RBFSP is organised in such a way that once analysts decide in which *matrix* intersection or cell they are operating (the red layer representing the intersection between the strategic planning process and the risk management approach), they can quickly identify the corresponding activities and the set of techniques that are relevant for supporting the *activities*. Below the activity level in the RBFSP (Level B), there are descriptions and references to techniques (described in Annex A) and, where available, examples of where they have been used and recommendations as to how they could be used in other strategic planning processes (see Chapter 5 and Annex A).

[2] In this chapter, the term "techniques" will be used consistently to designate risk management practices, i.e., operational means to put risk management into practice. The literature also frequently talks about "tools" and "methods" somewhat interchangeably.

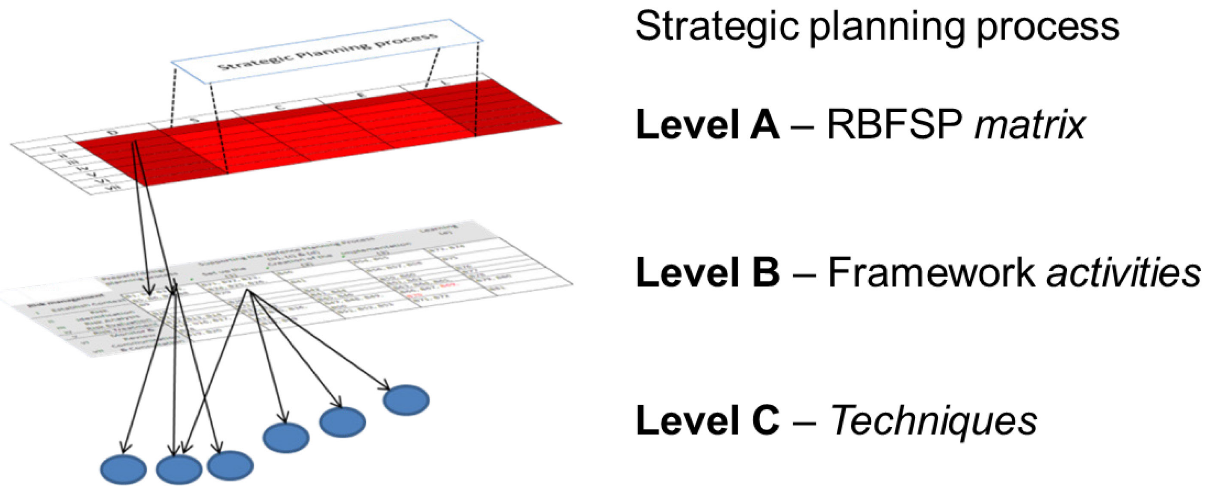



**Figure 4-1: An Illustration of the Structure of the Risk-Based Framework for Strategic Planning.**

## 4.3 THE RBFSP MATRIX AND RISK MANAGEMENT ACTIVITIES IN STRATEGIC PLANNING

When first using the RBFSP in support of a planning process, the high-level risk management process should be investigated and determined[3] (e.g., choosing ISO 31000:2009 like we suggest in this guide or a different standard to carry out risk management, deciding whether to use capability-based planning, etc.). This section provides the high-level aspects of the risk management, providing the direction for how the RBFSP processes are set up. Of course, the selection of analytical activities will be refined as the planning progresses. Tools and techniques can be selected throughout the later planning steps as more information becomes available such as clarification of the planning objectives, converging stakeholder views (or, at least, divergences are set aside), and application of analytical methods.[4]

Although strategic planning and risk management processes are usually described as linear progressions, they are often not followed in a linear way, especially in wicked problems like defence planning [30, 94]. For example, if the planning progresses to a point where it is realised that the plan's aim cannot be reached or the aim does not agree with broader constraints (e.g., political goals), then the planning activity might jump back, reset parameters and re-run through the subsequent steps. There are typically various layers of process that build on each other, and the specific characteristics of the whole only emerge in later stages of the planning process. Analysts and planners are, therefore, expected to jump backwards and forwards as they plan, support planning, set objectives, identify, assess and manage risks, generate evidence for decision making, make decisions, and so on. Following a linear approach would create risks [41] since, for example, a risk could be identified in the *Set up the Planning Instance* step, but there might not be enough information or understanding to analyse or treat it until the *Execute the Plan* step. This is explained in more detail in Chapter 5. Although this type of mental jumping backwards and forwards through a linear process by users is recognised in research [94], it is not necessarily recognised within defence strategic planning processes. This makes it difficult for the analyst to communicate their thinking clearly. Therefore, one of the functions of the RBFSP is to aid the users in communicating their non-linear progress through the planning process.

[3] For guidelines on how to design a risk management framework please see Section 2.6.

[4] Strategic planning can be conducted at multiple levels, ranging from the fleet or project level all the way up to the enterprise level. Risks encountered at lower levels (e.g., capability delivery risk) may feed into higher level risks (e.g., risk of not closing a capability gap). Similarly, enterprise-level risks (e.g., workforce cutbacks due to lower budget) may influence project level activities (e.g., higher risk of not completing an asset acquisition to augment a fleet).

To allow for the non-linear execution of the RBFSP, we define an RBFSP *matrix* (Level A in Figure 4-1) each cell of which defines activities (Level B in Figure 4-1) to which techniques in support of risk management and strategic planning can be applied (Level C in Figure 4-1). In combination with the categorisation of techniques, this approach provides the analyst guidance as to how to support planning and risk management efforts (i.e., a menu of options), rather than prescribe a specific procedural way of carrying out this support (e.g., a particular three-course meal choice).

In the RBFSP *matrix* (see Table 4-1), we introduce a numbering system to aid in identifying the matrix cells with the numeral referring to the risk management phase and the latter referring to the strategic planning step. As the risk management process is prepared, the analyst could decide not only on the type of risk management activities required but also (in some limited circumstances) on the techniques needed especially if those techniques were used in previous planning iterations. Some of those techniques might need implementation plans as well. In the remainder of this section, we describe, row by row, the risk management activities that one would expect to perform in the 35 matrix cells. These activities will be described in the context of ISO 31000:2009. Given a different risk definition and risk management process, these activities may be different.

**Table 4-1: The RBFSP *Matrix* is the Product of Risk Management Phases (Matrix Rows) and Strategic Planning Steps (Matrix Columns).**

| Risk Management Process | Planning Activities | | | | |
|---|---|---|---|---|---|
| | Prepare Planning Process (P) | Support the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set Up Planning Instance (S) | Create the Plan (C) | Execute the Plan (E) | |
| 1. Communication and Consultation | 1P | 1S | 1C | 1E | 1L |
| 2. Establish Context | 2P | 2S | 2C | 2E | 2L |
| 3. Risk Identification | 3P | 3S | 3C | 3E | 3L |
| 4. Risk Analysis | 4P | 4S | 4C | 4E | 4L |
| 5. Risk Evaluation | 5P | 5S | 5C | 5E | 5L |
| 6. Risk Treatment | 6P | 6S | 6C | 6E | 6L |
| 7. Monitor and Review | 7P | 7S | 7C | 7E | 7L |

Revisiting the analogy to painting a picture from Chapter 1, if one watches an artist composing a painting, the general outline of the finished product is developed first, for example a sketch. The sketch, to the uninitiated eye, doesn't necessarily resemble a meaningful picture let alone what the finished product is supposed to look like. However, it is, in reality, the critical base for the finished product. This stage represents the initial attempt to outline the risk management approach(es), but there is typically insufficient detail available as to what exactly needs to be risk-managed to define explicitly the techniques that will be used. As the risk management process becomes better defined, more is added to the picture.

### 4.3.1 Communication and Consultation Activities

Communication and consultation is the first and overarching set of activities which requires the planner (supported by the analyst) to decide on the communications strategy that will be employed before, during and after the risk management and strategic planning processes are executed. This can and should include a broad variety of activities ranging from setting the stakeholder engagement strategy (in 1S and possibly also in 1P) that, from the analyst's perspective, will determine how and when stakeholder input will be solicited, from whom it will be solicited, how it will be incorporated into the risk management and strategic planning processes, how and when these processes will be explained and to whom. Various communication formats and methodologies are available [75].

In order to support the risk management in the strategic planning process, it might be possible to set up a risk knowledge architecture [92] in early stages of the planning process – the earlier the better (preferably as early as in 1P). This architecture would support the gathering of all the information useful for risk management in the five strategic planning steps. The risk knowledge that will inform the strategic planning process should include an idea of what the broad information flow should be to obtain it. This information flow would begin with determining data requirements and outputs for the various risk management activities (1P and 1S). However, specific data requirements might not be known until those activities are started and the techniques have been chosen (1S through to 1E).

The risk knowledge architecture contains various risk information artefacts, including the risk register. It would support the tracing and monitoring of risks, as discussed in Section 4.3.7 and depicted in Figure 4-2. This risk knowledge flow tracks how each risk moves "down" and "right" within the framework matrix (see also the Canadian investment plan case study in the companion report for an illustration [44]). Thus, risks can be identified in the planning process, but do not necessarily need to be analysed/treated at the step where they are identified (analysis/treatment might occur later in the planning process as information and knowledge become available to enable these actions). Once the risk management process for a planning step is designed and the planning progresses through this step, the application of the techniques begins and generates knowledge for the risk knowledge architecture. This is still not the completed end-product. The final product begins to become clear and represents an articulated and mapped risk knowledge architecture by the application of the RBFSP once the planning process has gone through all its steps and risk management has been applied throughout. The risk knowledge architecture would also play an important role when the analyst reflects on the strengths and weaknesses of his or her support to the risk management and strategic planning processes for the purpose of ongoing improvement and learning (1L). Like the painter who starts to fill in the details of his painting, the application of the various techniques will fill in the knowledge architecture, which will ultimately provide all the available detail as to the risk picture of the plan being developed.

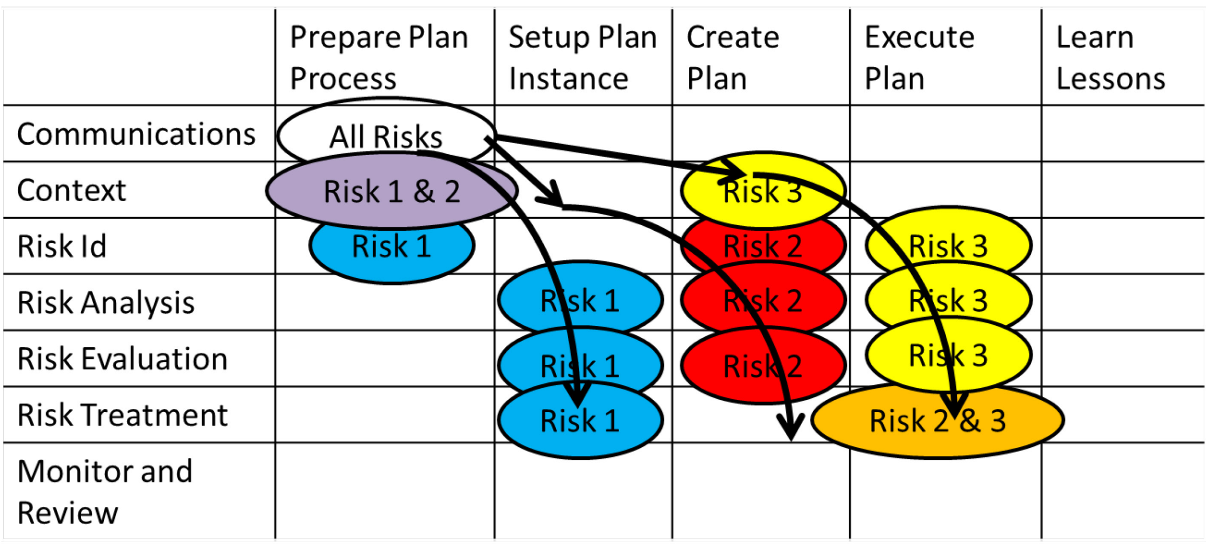



**Figure 4-2: An Illustration of How the Artefacts of the Risk Knowledge Architecture Support the Risk Knowledge Flow and thus the Monitoring of Risks Throughout the Risk Management and Strategic Planning Processes.**

As mentioned in Section 2.4.1, one of the keys to a successful communications strategy is to ensure that communications remain open so that information quality and decision transparency can be maintained. How decision makers differ in risk perceptions may be an important issue to identify and document (1S), and, if possible, analysed for its impact on planning objectives (1S, 1C and 1E). Different perceptions may be a reflection of differences in preferences or differences in risk tolerance, both of which are sources of risk to the achievement of successful strategic planning outcomes and thus need to be managed. Similarly, a possible divergence of interests and values amongst stakeholders is an important risk source to identify, analyse, understand and communicate (and hence enter into the risk communication plan). This risk would need to be addressed by employing analysis methods that are able to manage divergence of views (e.g., being able to keep track of differing worldviews, are robust to variations in views in terms of outputs produced, can visualise divergence) and emphasise participation of those with diverse views in the analysis approach (1S, 1C and 1E).

The overall approach established in RBFSP matrix cells 1P and 1S would be operationalised and carried out through cells 1C, 1E, and 1L. In 1L, learning aspects of the communications activities of the risk management process are transmitted across the strategic planning activities and to other activities of the risk management process.

### 4.3.2 Activities to Establish the Risk Context

As described in Section 2.4.2, there are three core activities in the Establishing the Context phase of risk management: establishing the external context, establishing the internal context and establishing the risk management context. To establish the external context, techniques need to be applied that elicit those constraints and factors in the political, economic, financial, social, cultural, legal, regulatory, physical, national, international, local and global environments that are relevant to the planning problem [92]. One would expect for much of this analysis to occur in 2P and 2S. However, given that planning objectives may not be fully formed in these early planning steps and given that external factors and constraints may change or may be discovered later (in 2C and/or 2E), techniques need to be applied that, throughout the whole process, support introspection, normative selectivity, and empirical selectivity [92]. Introspection refers to reflection on one's approach to planning and use of risk management. By normative selectivity, we understand the development of judgements about what ought to be the end state or outcome. Empirical selectivity would be defined as observations about what is actually the current state or trend. There is a whole range of techniques in operations research and management science that facilitate in a systematic way the analyst's and the planner's introspection, normative and empirical selectivity [27] (see Chapter 5 for a categorisation). By and large, these techniques also support learning (2L).

For example, the analyst can examine the broad definition of the strategic planning problem class (e.g., investment planning, capability planning, national security planning) and then select broadly a set of techniques based on the problem type (as early as in 2S and usually in 2C). If particular techniques are not available or cannot be developed given external constraints (time, human resources) then the search begins for alternatives (including developing approximations of the technique needed, e.g., through combinations of known methods). Part of this activity includes examining the types of data that can be obtained (i.e., data availability should inform technique selection) and the avenues for how assumptions made throughout the planning process can be validated (i.e., ability to provide evidence should equally determine the choice of techniques).

Given that the type of strategic planning is identified at the beginning of a new planning cycle, reviewing lessons captured from past cycles, especially in relation to validation, verification and sensitivity analysis and with regard to inconsistencies in analysis assumptions is an important activity to understand the planning process' risk context. It is important to evaluate whether and how these lessons may apply to the strategic planning activity that lies ahead and what assumptions about the internal and external environments will need to be adjusted. The review of past cycles should also help to identify, at a later stage, what risks may be posed by the analytical techniques used. At the same time, one could make an inventory of techniques (with their risks) that have been used in past planning cycles and potentially scan the research literature (whether public or defence) to determine if new techniques had been devised.

Stakeholders should be identified and analysed as they contribute to both the external and internal contexts. With respect to risk management, it is important to elicit stakeholders' objectives and their "stake" (interest, concern, investment) in the planning problem [5]. This is a key activity in 2S that should be ongoing throughout the whole planning process (e.g., in 2C and 2E) because often stakeholder compositions change, representatives rotate, new interest groups join and/or individuals vary their inputs and views over time. Stakeholder analysis and interventionist techniques offer means by which the analyst can deal with this human complexity throughout all planning steps [92]. They also allow for gauging of the stakeholders' risk tolerance which is important for understanding the internal context, but also for determining appropriate risk criteria.

Those risk criteria need to be developed, i.e., the criteria against which risks will be evaluated, including thresholds. The criteria are closely linked to the strategic planning objectives and are affected by the interests and risk tolerances of the stakeholders. Therefore, it may make sense to establish risk criteria concurrently with the examination of the internal context. Since the nature of the criteria may be operational, technical, financial, or environmental, various modelling and simulation activities may be conducted in concert with qualitative research (e.g., workshop activities). Defining risk criteria should provide clear guidance about how each effect, consequence, likelihood and level of risk will be determined, and should establish the levels of risk acceptability and tolerability. Usually, this information is produced early in the process (2S or even 2P), but sometimes adjustments need to be made later (2C and 2E).

The establishment of the internal context is an activity that is usually not emphasised in defence strategic planning as it is often assumed that the defence organisation, i.e., its structure, values, culture and policies, are well understood. However, what is often not as well established (or is not made explicit) is the *complete* set of objectives that the strategic plan is expected to achieve. Given the difficulties surrounding the elicitation and compilation of objectives, this requires the application of qualitative research techniques especially in the early stages of planning [5, 116] (in 2S or even 2P if the stakeholder space is reasonably well understood in the *Prepare the Planning Process* step). In addition, it is wrong to assume that the internal stakeholders form a homogeneous group who agree on all objectives and priorities. Thus, participative approaches need to be applied that help identify commonalities and possible differences, and support the management of divergent views throughout the entire strategic planning process (2P through to 2E) thus helping to reduce risks due to epistemic and linguistic uncertainties increasing the analyses' accuracy.

The understanding of both the external and internal contexts can be complemented by modelling and simulation activities. These involve development or refinement of (internal and external) models (2P and 2S), data collection planning (2P) [95], data collection (2S through to 2E) [95], simulation (2C) and analysis of models and simulation (2C and 2E). Threat, criticality and vulnerability models may be established for use throughout the whole risk management process.

The analyst also needs to examine how risk should be understood in the context of the whole planning process by taking a holistic view of the planning steps in 2P, 2S and 2C. This will help to devise appropriate techniques at the various stages of analysis. In a cyclic strategic planning process, previous risk treatment activities can be reviewed and evaluated for their applicability to the new planning situation (2P and 2L). Since there are many different approaches to risk, how risk needs to be understood and included in the planning preparation is a critical part of these activities.[5] At 2C, the analyst needs to understand what the plan objectives are so that performance models, scenario simulations and other techniques can be employed

[5] In this guide, we have adopted the ISO 31000:2009 risk management standard; however, this is not necessarily true for other planning processes. If one adopts a different risk management process or standard, then care has to be taken when adapting the framework developed in this guide to a given planning process.

effectively and efficiently. At 2E, on the other hand, the elicited objectives may be used to define measures to evaluate successful plan implementation.

One of the issues that analysts (and planners) need to recognise is that although the context typically becomes more refined as planning progresses, the full context may never be known until the results of the planning are actually tested in practice (i.e., during force employment). Even then, the full context may not be known since the types of conflict that a country would decide to engage in depend very much on political decisions. As a consequence, analysts should keep in mind that most of the time a strategic planning process will need to be carried out based on incomplete or estimated data. Thus, analysts should aim to mitigate time spent on establishing the context by gathering “good enough” information to manage risks but not more [92].

Finally, it should also be recognised that in some planning processes such as the UK National Risk Assessment case study (see Chapter 5), the Polish case study (see companion report [44]) and the NDPP case study [44], there are predefined criteria that constrain how the context is understood and, therefore, constrains how the risks are identified (see Section 4.3.3), analysed (see Section 4.3.4) and evaluated (see Section 4.3.5).

### 4.3.3 Risk Identification Activities

During risk identification the analyst can consider in some detail how risk information is to be collected (3P), including the nature of the information (qualitative or quantitative) and the methods for gathering and storage (3P and 3S) [5]. The underlying assumptions of these decisions need to be recorded and assessed for their contribution to the overall risk management process (3S, 3C and 3E). This will produce a list of relevant information sources that will inform all stages of the risk management and strategic planning processes, the means by which these information sources will be accessed, and a consideration of how risks to the overall outcomes can be recognised (including from the national/government perspective, the public/citizen’s perspective, military and SME judgement).

Risk identification aims to establish “what unexpected ends might happen,” whether positive or negative, in terms of the five “W” questions: what with (how), why, where, when (for how long) and who might be involved. Similarly to the questions posed in Section 2.4.2.1, risk identifications would look at [5]:

- What effects might be experienced?
- What uncertainty sources might be involved?
- How might these consequences happen?
- What consequences might generate these effects?
- How likely are these consequences to happen?
- Over what period of time?

Answering these questions requires the application of a whole range of techniques that generate breadth of knowledge such as creative thinking approaches, parallel thinking approaches and other group elicitation techniques [92]. Especially in the early stages of planning (3P and 3S), qualitative risk identification approaches dominate and may be informed by the analysis activities that are applied to establishing and understanding the risk context (e.g., in 2P, 2S; see previous section). Problem structuring techniques, such as morphological analysis or Strengths Weaknesses Opportunities and Threats (SWOT) analysis, may help to set the scene for risk identification and can support the systematic generation of a list of risk events that is as comprehensive as possible.

The more is known about the planning situation and its contexts, the more value quantitative techniques, such as scenario-based modelling and simulation (see 035 and 036 in Table A-6 in Annex A), can add. Quantitative techniques may be particularly useful when trying to identify risks in intricate causal networks or in relation to technologically complicated or complex defence capabilities. An example would be the identification of cyber vulnerabilities in a future networked Command, Control, Communications, Computers and Intelligence (C4I) capability.

Special attention needs to be paid to risks that are inherent in extant models and theoretical frameworks. Many of the cyclic strategic planning processes re-use planning methods and tools. Because of this re-use strategic planning process-specific risk identification techniques can be applied. For example, in the capability shortfalls activity within the NDPP, risks in capability gaps may be identified. Other capability-based planning processes such as Canada's also have capability gap assessments.[6] It is important to determine how accurate those analysed capability gaps actually are. Each capability gap assessment technique has inherent uncertainties including those relating to interpretation and model definitions of what a capability is. For example, if capability is incompletely defined, then counting systems contributing to a particular capability would be an inaccurate way of assessing capability coverage and would give rise to a considerable risk (namely, that the capability gap is assessed erroneously). Risk registers and lessons learnt are good sources to support the identification of inherent risks (3L), but it may be worthwhile to dedicate special efforts to identify and understand risks that arise from the "established way of thinking" about the planning problem [5] (including the use of previously established theoretical, modelling and simulation frameworks).

During risk identification the analyst may want to gain an understanding of how risk events are related to each other. Stakeholders and other subject matter experts can be consulted to understand risk relationships. This can be done via soft systems and qualitative research methods that help elicit subject matter expert opinions. In addition, while it is often hard to prove causality between risk events, it may be possible to establish interdependencies, e.g., through the application of wargaming tools (supporting especially 3C and 3E), or to identify possible correlations, e.g. by creating Markov trees, or setting up statistical models (in 3S for later use in 4C, 4E, 5C and 5E). Interdependencies and correlations are means by which risk drivers may be found. Risk drivers play an important part in the activities that establish the planner's risk mitigation approach.

### 4.3.4 Risk Analysis Activities

Establishing the approach of how risks are to be analysed within the context of planning objectives occurs in 4P and 4S. Once risks have been identified, it is important to understand how the consequences of each risk (i.e., the actual impact of the uncertainty on the desired outcomes of the strategic planning process) might affect the strategic planning outcomes. Application of such generic techniques as SWOT, red teaming and risk analytics support the linking of risk consequences to the strategic planning objectives. For risk analysis, the analyst typically engages subject matter experts (especially in 4S) or runs models and simulations (in 4S, 4C and 4E) to understand the nature of a risk and to assign a consequence value to it. Here the analyst may draw from the analyses of internal and external contexts (2P, 2S, 2C and 2E) in order to add the detail necessary to appreciate the risk consequences and their interdependencies.

Referring back to the established risk contexts is also important when analysing risk likelihoods because subjective probabilities, frequency counts, or other likelihood assessments depend strongly on prior knowledge of the assessor(s) and the conditions that surround risk events. Care needs to be taken how a risk is presented to experts as it is known that subjective likelihood analysis is affected by the way an event is framed (especially its consequences) [69]. Good qualitative research design is required to minimise the risk of likelihood overestimation or underestimation. Disbanding subjective likelihood assessments for

[6] Another related example can be found in a Canadian case study [44], where the Visual Investment Plan Optimization and Revision (VIPOR) tool is presented as a risk-identification technique [117, 221]. VIPOR is a data-visualisation technique that aids the senior management of Canada's Department of National Defence (DND) to develop a range of investment portfolios, each of which can be tailored to achieve particular desired outcomes (e.g., best value for money, maximum spending within a timeframe, etc.). The visualisation aspect helps these senior decision-makers to identify and correct potential risks to the strategic investment plan of DND by portraying various aspects of the portfolios that may not have been accessible using previously available techniques.

quantitative likelihood assessments, such as probabilistic modelling and statistical analyses, is not necessarily a solution to this problem because many risk events are impossible to represent in quantitative models (see Text Box 2 on Likelihood, Uncertainty and Their Measurement).

Specific risks may require the application of a specific risk analysis technique or set of techniques, especially when risk events are causally networked or involve processes of high technical complexity [5]. Then, special modelling efforts are required, e.g., to develop physical representations of capability (such as sensor models that determine the probability of detection as a function of environmental factors), or to assign likelihood and consequence values to a risk. It is critical to note that, although contrary to good analytical practice, this step may be dictated by policy, and the analyst's means of supporting it may be constrained by policy.

As the planning process progresses (4C and 4E), newly identified risks will need to be analysed and studied in relation to previously identified risks. The models that were established in the Risk Identification step may support the analysis of interdependencies and correlations amongst risks and hence play an important role in later likelihood and consequence assessments. Model assumptions will need to be monitored and it may be beneficial to consult records of previous lessons (4L).

### 4.3.5 Risk Evaluation Activities

In 5P and 5S the initial decisions are made as to how analysed risks are to be evaluated and prioritised against the established risk criteria [5]: which risks are acceptable, which ones need the development of risk mitigation actions, what are the different options, which of these might be appropriate to follow, and how does the interplay of multiple risks amplify or dampen *overall* risk? It is crucial that a well-established (and agreed-to) process for evaluating and prioritising the risks is decided upon and supported by appropriate analysis techniques, especially those models and simulations that have been established to understand the internal and external contexts and the interdependencies of risks (5S, 5C and 5E). Isolating major risk drivers (i.e., sources of high or multiple interrelated risks) or risk "bottlenecks" can be supported by model-based systems engineering techniques, scenario-based analyses, or other modelling and simulation activities. If a risk can affect (e.g., increase) several other risks, this risk should be probably evaluated as an important risk that needs to be treated.

An important consideration in the establishment of risk criteria (and hence the evaluation of risk) is the risk tolerance of the planner and other stakeholders. The analyst may be required to apply techniques that support decision makers in helping them to understand their own attitudes to risk and the attitudes of others with an interest in the planning products [92] (however, in practice this may be very difficult to carry out). Such techniques may play out various scenarios (to illustrate the effect of the choices that reflect different risk attitudes), allude to alternative ways of framing the planning problem (and hence point constructively towards alternatives in the solution space of strategic action plans), and/or look at identifying decision paths that are insensitive to variations in risk tolerance (to allow for adjustments in risk attitude at a later stage with as little a disruption to the planning outcomes as possible).

This is a critical phase, as the number of identified risks may quickly outpace the analysts' (and planners') capacity to manage them. The number of risks could paralyse the analyst and could negatively affect the delivery of analysis to the planner at best delaying important advice and at worst not delivering any advice making the analysis irrelevant.

### 4.3.6 Risk Treatment Activities

Risk treatment is about establishing courses of action and making decisions around the management of evaluated risks. The initial identification of how risks should be treated is determined at intersection 6P.[7]

[7] Treatment actions for risks with negative outcomes can be broadly categorised as follows: avoid, reduce (likelihood and/or impact), transfer or share, and retain or accept. For risks with positive outcomes those action categories would be create/maintain, increase (likelihood and/or gain), share, and retain.

At this stage, mitigation strategies that have been used in other circumstances can be considered and evaluated for their applicability in the current planning problem, noting the context dependence of risks and associated risk mitigations [5]. The analyst may draw from lessons learnt in other but similar strategic planning exercises (including those performed in other nations) so as to create a list of possible actions that may be pursued by the planner and/or other stakeholders.

In 6S, the analyst can support the planner to gain an understanding of what types of action are within the areas of responsibility and authority of the planner and other stakeholders. Depending on the degree of human complexity it may be required to apply participative approaches that help all parties involved gain confidence in the applied risk management techniques and appreciate the identified, analysed and evaluated risks. Participation in the analysis will likely increase the stakeholders' willingness to take action and contribute adequately to the creation of the plan (6C) and its implementation (6E). The analyst should be concerned with ensuring that the techniques used are well understood by the planner(s) and that they will provide rigorous results (even if qualitative) ensuring that the basis of the plan remains valid.

For example, one of the NDPP activities concerns National/Multi-national or NATO execution such as the apportionment of targets across NATO nations. This apportionment is a risk treatment of identified capability gaps. It is carried out using a variety of techniques and needs to be agreed to by nations. The techniques are to produce targets that align with national policies as much as possible. The less alignment there is, the less the (NATO) Nations might be willing to deliver on NATO's request and therefore the higher the risk that a particular capability target might not be reached. Participative and systems intervention approaches thus may help NATO mitigate the risk of misalignment between NATO's and the Nations' targets.

Throughout 6S, 6C and 6E risks, causal networks, and risk drivers may need to be visualised (e.g., via interactive visualisation tools like VIPOR [117]). Models may need to be developed that allow the analyst and the planner to study the effect of various alternative remediation actions on planning outcomes [19]. Scenarios and vignettes may be used to represent external (and even internal) contexts to play out possible, wanted or undesirable futures. Red teaming, SWOT or trade-off analyses may be applied to understand the risk remediation actions' strengths, weaknesses, effectiveness and interdependencies. The analyst may offer support to activities that prioritise risk treatment choices, such as multi-objective optimisation or Multi-Criteria Decision Analysis (MCDA).

The analyst also needs to determine the strategy that will be used to select (where applicable) from among a group of options for treating a particular risk. This strategy may include trade-off options and modifying specific techniques. However, if a planning process needs to be adjusted to mitigate risks, it would most likely not be modified until the next process cycle. The corresponding risks would have to be accepted. Moreover, it is also important for the analyst to avoid having to modify techniques since any delay in analysis would make the results applicable only to the next planning cycle (if at all). Thus, the initial risk management process design including choice of techniques is critical to the analyst's success in helping treat risks.

Finally, it is important to remember that the treatment of risks is dependent on where one sits within the strategic planning process. For example, when designing the planning process at 3P, risks to the overall planning process need to be treated in such a way that they do not impact the entire planning process that follows, and thus they may need to be identified, evaluated and tracked differently than a risk that arises, for example, later in the strategic planning process (e.g., during the *Execute the Plan* step at 3E), where the impact of the risk is likely more localised and easier to handle; this does not necessarily mean these risks would be less important.

### 4.3.7 Risk Monitor and Review Activities

The strategy for risk monitoring and reviewing is determined in 7P. Analysts should consider how to achieve coherence in risk management throughout the planning process [5]. This can include setting the strategy for monitoring and reviewing risks that arise during the analytical support to strategic planning and the risk management processes, and setting the strategy for monitoring and reviewing the strategic planning and risk management processes themselves (and the risks they generate).

With the support of the analyst, the planner needs to monitor the changes to the external, internal and risk management contexts as well as other factors that may affect the risk management of the strategic planning (7S), the plan (7C) and its execution (7E). For example, if there are changes to how risks are identified, it may be realised that certain types of risks were omitted and, therefore, not analysed, evaluated and treated. Although it is not possible to predict the future through the application of analysis tools, it is possible to develop a risk management process that is flexible and can be adapted to changing circumstances, while at the same time being robust [38].

The risk knowledge architecture described in Section 4.3.1 supports the tracing and monitoring of risks through artefacts such as the risk register that records risks, likelihood, consequences, treatment, responsibilities, and timeframes for actions. It allows for a systematic way of reflecting on changes throughout the strategic planning and risk management processes (7S, 7C and 7E), and of learning, especially when discrepancies between expected and actual outcomes occur (7L).

The work of preparing the risk management approach and the related risk architecture is not complete when the actual strategic planning begins. Indeed, there is a strong need for ongoing monitoring of the risk management process itself as the strategic planning process progresses. Tweaks and possibly even wholesale adjustments to the risk architecture or the analytical support to planning may be in order (e.g., if mistakes are made in the application of scientifically appropriate methods), dependent on the outputs developed in and the risks identified during the planning process. There is a shift when the planning process begins, from the risk management of risks *to* the successful completion of the planning process to the risk management of risks that arise *from* the strategic planning process.

It is also important not to overlook the learning aspects of the RBFSP, which can be viewed as a combination of both the *Monitor and Review* and the *Communication and Consultation* phases. The lessons learnt, in addition to the risks identified and mitigation decisions made, in the planning of the strategic planning process need to be carried forward throughout the entire strategic planning process to inform decisions made later in the process.

## 4.4 RISK MANAGEMENT IMPLEMENTATION IN THE PLANNING PROCESS

Once the risk management activities for the *Prepare the Planning Process* step have been decided, the analyst can proceed to applying the grand design systematically. At the applied level, the RBFSP is concerned with assessing and mitigating risks that are inherent within the planning instance itself. Risk examples would include selecting the wrong capability gaps to close or choosing a less-than-ideal portfolio of capabilities to meet unknowable future threats. At the abstract level, there needs to be recognition that the specific planning approach selected (e.g., capability-based planning, in the Canadian case) has risks associated with it that may or may not play out (or emerge in an identified/identifiable manner) in the actual strategic planning instance.

The abstract level of risk management seems to be missing in the Canadian investment plan case study [44], as evidenced by the absence of indicators in the 1P cell of the RBFSP matrix. Similarly, it also seems to be missing from the Canadian capability-based planning case [44]. This suggests that, when planning is started in all earnest, there might be sometimes a narrow view (by both the planner and the analyst) of what approaches and techniques to apply to the strategic planning problem. Recognition that there is a super-ordinate level of risk inherent in the planning approach adopted is important to consider, however, as it impacts whether the results of the planning are outputs that can be defended or that are useful. The analyst might never know if he or she does not check for risks arising from the planning process itself. Recording what was done in previous planning cycles can help avoid this type of error.

One of the main outputs of the risk management process is the risk knowledge flow wherein the path of risk knowledge movement through the framework intersections is highlighted to portray the various phases of risk management as they are activated: establishing context, identification, analysis, evaluation, treatment, monitoring and communication. Thus, risks can be identified in the planning process, but do not necessarily need to be analysed or treated at the planning step where they are identified.

While we strongly advocate for a systematic and coherent approach to incorporating risk management into the strategic planning process, we are equally adamant that the manner in which this incorporation is executed will need to be bespoke; traceable but likely not repeatable (i.e., from a scientific point of view) given the idiosyncrasies in most if not all strategic planning processes and the nature of wicked problems. This means that the *recommendations* provided in this chapter and Chapter 5 are meant to provide guidance only but are not to be read as prescriptions. We are identifying best practices but do not demand compliance with our viewpoint.

## 4.5 CONCLUSION

In this chapter, we have presented and described the Risk-Based Framework for Strategic Planning, and explained the underlying logic and recommended means of risk management application to the five generic steps of strategic planning. The RBFSP *matrix* was introduced which supports the formulation of activities that the analyst may conduct in support of strategic planning and risk management. Classifications and details of techniques used to execute the activities are described in more detail in Chapter 5. Practical applications to real strategic planning instantiations are discussed in the case studies presented in the companion report [44].

# Chapter 5 − USING THE FRAMEWORK

*No plan survives contact with the enemy.*

*− von Moltke*

## 5.1 INTRODUCTION

This chapter describes how the framework enables the use of a techniques catalogue (see Annex A) in supporting strategic defence planning. It builds upon Chapter 4 by providing further guidance on using the framework. This chapter describes to analysts how the framework can be applied to provide analysis support to planners in a way that increases risk-thinking.

This chapter illustrates the application of the framework by using tangible examples from the case studies and the authors' experiences. The chapter starts by describing how to apply the framework within any given strategic planning process. It then describes how the structure of the framework allows an analyst to navigate through and draw upon the different techniques of the framework to support the planner in making the planning process more risk-based. Next, a more detailed description of using the framework, akin to a walkthrough of the different steps, is provided with the UK's National Security Risk Assessment process used as an illustration.

## 5.2 APPLYING THE FRAMEWORK TO A SPECIFIC STRATEGIC PLANNING PROCESS

The framework is designed to be used at a conceptual level with each intersection and the activities within it posing questions for consideration. To aid in building a risk management process from the ground up, more detailed information on the techniques is contained within Annex A. However, it is important to recognise and reiterate that the principal intention of developing the RBFSP is to provide a structure that helps analysts to systematically support planners in incorporating risk management into their planning process.

Therefore, the framework's structure is designed to assist analysts in supporting a planning process. For example, considering multiple alternatives has been shown to enhance planning [41], and the framework's design helps analysts to consider multiple alternatives. The framework's design leads the user to systematically examine multiple alternatives at each decision point and more clearly judge the advantages and disadvantages of proceeding along any one path. This structure should improve the analysis and, thus, the thinking behind the planning itself (i.e., decision support).

By systematically integrating risk management within a strategic planning process through the framework, this chapter, as per the painting analogy (introduced in Chapter 1 and revisited in Chapter 4), provides a painting-by-numbers approach to risk-based planning. The authors recognise that this systematic and almost mechanistic approach (painting-by-numbers) appears to contradict the advocacy for holistic approaches to risk management. The earlier criticism (see Chapter 2) referred to the use of functional approaches to risk management. On the other hand, the framework outlines a systematic approach where decision support is traceable and shows the work of the analyst, thereby being helpful in both reducing the analyst's liability to some of the cognitive biases identified in Chapter 2 (such as the Availability Heuristic [69]) and also to allow others to scrutinise the assumptions [51]. Therefore, the first iterations through the RBFSP could follow this (more mechanical) approach, and the iterations thereafter increase in fluency as an understanding of the assumptions and assessments is generated. Section 5.4 describes the application of the RBFSP in a linear way (i.e., during the first iteration); it also touches on how the framework can be used in an iterative manner (i.e., navigating through the intersections multiple times during the same planning instance) and identifies specific points where this is particularly valuable.

The RBFSP can be applied to many strategic planning processes (previously described in Section 4.3). This application process begins by fitting the actual strategic planning process to the generic strategic planning process described in Chapter 3. This activity includes relating the Support to the Strategic Planning Process steps (as set out in RBFSP matrix shown in Table 4-1) to the actual strategic planning process steps being used.

Next, one can relate each of the planning activities in the given process to the *activities* in the Framework. For example, once the user identifies what parts of the actual planning process relate to the *Set up the Planning Instance* step (given identifier "S") by looking at the related *framework activities* (matrix intersections 1S to 7S detailed in Annex A), the reader assesses which of the *framework activities* relate to the *actual* planning activities. For example, the communication of how the risks in the plan are governed and communicated would be related to the Communication and Consultation phase in the Risk Management Process (given identifier "1") and would therefore correspond to intersection 1S in the framework (see illustrative example shown in Table 5-1) with the *actual activity* related (or mapped) to *framework activity* B21.

**Table 5-1: An Illustration Relating Actual Planning Activities to Framework Intersections for the *Set Up the Planning Instance* Step.**

| Activity Reference (a) | Relationship to Framework (b) | Activity (c) | Description (d) |
|---|---|---|---|
| B21 | 1S | Identify guidelines for risk communication and governance | Devise the guidelines of how the risks within the plan will be governed and communicated. |
| B22 | 1S | Initiate engagement and consultation with the selected stakeholders | Initiate engagement and consultation with the selected stakeholders, as well as decision makers in order to establish their engagement first in the planning process, and second (to some extent) in the analysis process supporting the strategic planning. |
| B23 | 2S | Identify the objectives of the planning instance | Identify all objectives of the planning instance, whether explicit or implicit, that will inform the entire planning process and risk management; e.g., what is the plan to achieve? |
| B24 | 2S | Identify the risk tolerance | Identify the risk tolerance of the decision makers; e.g., Will the decision maker accept 100 possible casualties? |
| B25 | 2S | Identify the specific scope and context | Identify the specific scope and context for the planning instance (e.g., planning time horizon, plan duration, geography, operation posture types). |
| B26 | 2S | Assess the planning context | Assess the context of the specific planning instance; that is, analyse the context of the planning instance to provide the internal and external contexts to stakeholders (i.e., what the initial conditions are and sphere of influence for the planning instance?). |

Due to variations in defence planning and the use of a simplified generic planning process in building the framework, some interpretation is required in applying the framework to the given planning process. Therefore, the analyst should avoid getting stuck determining how to relate the generic activities to their planning process because it will quickly become apparent if it is wrong. The intention in applying the actual process to the framework is to determine the relevant techniques for the appropriate step of the *actual* planning process. For example, some *framework activities* may not exist (or not have been made explicit) in the actual planning process, or vice versa. In addition, there might be parts of the actual planning process that do not exist or would not fit in *framework activities.* To re-iterate, the aim of this guide is to provide the analyst with a roadmap of how their analysis support to planning could inject risk thinking into their nation's planning process.

The framework's function is to enable the analyst in his or her support to strategic planning, as well as a subset of techniques to aid the analyst. Once related *framework activities* have been identified for the actual planning activities, the link to appropriate techniques can be made. This will be outlined in Section 5.3 and explained in detail in Section 5.4.

## 5.3 LINKING THE FRAMEWORK TO THE TECHNIQUES

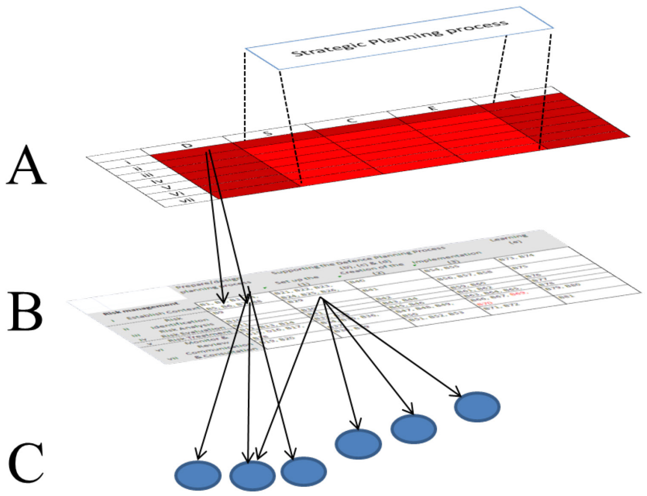
The framework provides a structure for the identification of appropriate techniques to help the analyst support the management of risk in a strategic planning process. Once the RBFSP matrix is applied to the chosen planning process, Levels B and C of the Framework can be used (see Figure 4-1); i.e., finding the appropriate activities (Level B) and the specific techniques (Level C). At present, the framework has a set of techniques that are largely understood to be useful and appropriate for defence planning; however, this group of techniques is not exhaustive.

Some activities, therefore, may not have specific techniques mapped to them because appropriate techniques have yet to be identified for these specific activities (i.e., there is a gap in analytical capability), or the appropriate techniques are not specific to that activity (i.e., they require a more general application across the framework and it would not make sense if they were linked to a specific activity).

Conversely, there are also some activities that have many techniques mapped to them. Therefore, techniques have been classified into various categories to help select the most appropriate technique for activities at a given intersection between the strategic planning process used and its risk management (Level A). Techniques have been categorised into a hierarchical structure from broad categories of soft or hard operations research, to high level tool groupings (e.g., Multi-Criteria Decision Analysis), to risk and non-risk specific tools and techniques (see Section 5.4.2 for details). This categorisation should help the analyst not only in selecting techniques for a specific planning activity but also in the development of comprehensive risk management thinking for the given planning process being supported. For example, when there are two similar techniques it may be more appropriate to select a technique for an activity, because (a) it can more easily link to another technique that needs to be applied beforehand or afterwards, or (b) when the analyst looks at the broader planning context they may see that one technique helps to combine the use of quantitative and qualitative data streams in a more coherent way.

## 5.4 FRAMEWORK NAVIGATION AND MAPPING

Once the framework is applied to the planning process, the analyst can identify how the RBFSP *matrix intersections* (illustrated as Level A in Figure 5-1) and *activities* (Level B in Figure 5-1) apply to the planning process that he or she is supporting. He or she can then draw upon the techniques which enable the activities to occur (illustrated as Level C in Figure 5-1 and detailed in Annex A). Thus, within the context of planning activities, the framework "signposts" what intersections occur where (with regards to a given planning process), what activities they enable, how the activities can be performed or supported by appropriate analysis techniques, what these techniques are, and how to select the most appropriate technique for an activity. The structure provided by the RBFSP assists the analyst in developing a holistic understanding of how risk management can enhance the given strategic planning process and the analysis support he or she provides to it.




| Framework | Mapping |
|---|---|
| Strategic planning process | Nation specific process<br>e.g. UK NRA |
| Level A – The RBFSP matrix: intersection of strategic planning and risk management processes | Level A – Examples of intersections as specified in Table 3 |
| Level B – RBFSP activities: the tasks that can occur within each of the matrix cells | Level B – Examples of activities as specified in Table 4 and Table 5. |
| Level C – RBFSP techniques: the methods, tool and approaches that provide analytical support to risk management and strategic planning | Level C – Examples of techniques as shown in Table 6 |

**Figure 5-1: Descriptions of the Different Levels in the Framework and Examples to Illustrate How These Levels Map to the Tables in Chapter 5.**

Therefore, the important parts of the framework include: understanding how the RBFSP matrix fits to the specific planning process, understanding how to relate the framework contents to the relevant parts of the planning process, and providing assistance in selecting appropriate techniques to carry out planning activities. In the next section, we explain how to relate the framework contents to the relevant part of the planning by the mapping and technique categorisation.

### 5.4.1 Mapping: Navigating to the Relevant Techniques

The RBFSP lists a large number of techniques that an analyst could use to support strategic planning and to introduce risk thinking. Each technique has been mapped to at least one planning activity in the framework to indicate when in the planning process they can be applied most appropriately. This mapping provides an aid to select techniques systematically.

In applying the framework to a specific planning process, the analyst can navigate to appropriate activities and, then, to specific techniques. As the analyst navigates into the framework hierarchy, each of the maps (described in the following paragraphs and illustrated in Figure 5-1) provides an increasing level of detail about the manner in which elements within the framework (e.g., the planning *activities* at Level B) correspond to each other and their place within the framework (see further details in Annex A).

In the RBFSP, planning *activities* (Level B) are mapped onto the *matrix* (Level A). Overall, the RBFSP has identified 77 activities that may be performed during analysis support to risk-based strategic planning. They are labelled by the letter B (as of Level B in the framework) followed by a serial number and described in Annex A, Section A.3. Table 5-2 shows the full mapping of the 80 activities (Level B) onto the *matrix* (Level A).

**Table 5-2: Level B Mapping Showing the Activities Within Each RBFSP Matrix Intersection.**

| **Risk management process** | **Planning activities** | | | | |
|---|---|---|---|---|---|
| | Prepare planning process (P) | Support the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set up planning instance (S) | Create the plan (C) | Execute the plan (E) | |
| 1. Communication & Consultation | B1, B2 | B21, B22 | B39, B40 | B52, B53 | B69 |
| 2. Establish Context | B3, B4, B5, B6, B7, B8, B9, B10 | B23, B24, B25, B26, B27, B28, B29 | B41 | B54, B55 | B70, B71 |
| 3. Risk Identification | B11 | B30 | B42 | B56, B57, | B72 |
| 4. Risk Analysis | B12 | B31 | B43 | B58, B59 | B73 |
| 5. Risk Evaluation | B13 | B32 | B44, B45 | B60, B61 | B74 |
| 6. Risk Treatment | B14, B15, B16 | B33, B33 | B46, B47 | B62, B63, B64 | B75 |
| 7. Monitor & Review | B17, B18, B19, B20 | B35, B36, B37, B38 | B48, B49, B50, B51 | B65, B66, B67, B68 | B76, B77 |

All the *techniques* (Level C) are mapped onto the activities where they can be applied, and by extension to the corresponding framework matrix cell. For an illustration see Table 5-3 which shows the techniques applicable to matrix cell 2P (Level A), and their relationship to specific planning activities (B3, B4, B5, etc.). Technique references are three numerical values (e.g., 070) and the supported activity is shown in brackets. For example, to indicate that reference number technique 070 can be used to support planning activity B6, we would write 070 (B6).

**Table 5-3: Level C Mapping Showing the *Techniques* Applicable Within *Intersection* P2 (Level A) and How these *Techniques* are Related to Specific Planning *Activities* (Level B).**

| | **Prepare planning process (P)** |
|---|---|
| **2. Establish Context** | 002, 004, 007 (B9), 009 (B5 – B9), 010, 018, 020, 027, 032, 041, 043, 045, 047, 050 (B5, B7, B8, B9), 055, 065, 066, 070 (B6), 072, 073, 074, 079 (B5 – B10), 081 (B3 – B10) |

### 5.4.2 Categorisation for Technique Appropriateness and Selection

Grimaldi *et al*. [110] recognised that there are many aspects to consider when determining what techniques were appropriate in constructing their risk management framework. They categorised techniques based on various characteristics including application domains in order to aid in the use of these techniques for various risk management activities. Therefore, it is important to characterise a technique's scope and range of use in the RBFSP so that the technique's appropriateness can be assessed; otherwise, inappropriate techniques, i.e., techniques that are not fit for purpose, might be used in the implementation of risk management practices within defence strategic planning.

Grimaldi *et al.* [110] propose three categories: *the phase of the risk management process, the phase of the life cycle of a project, and the corporate maturity towards risk.* ISO 31000:2009 techniques are characterised by four categories: *complexity of the problem, the nature and degree of uncertainty, resources required in terms of time and level of expertise, data needs or cost,* and *whether the method can provide a quantitative output.* How the different categorisation compare with the RBFSP categorisation is described next and summarised in Table 5-4.

**Table 5-4: A Comparison of RBFSP Categories with Other Approaches to Categorisation.**

| Categorisation | RBFSP | ISO 31000:2009 [3] | Grimaldi *et al.* [110] | Remarks |
|---|---|---|---|---|
| **i.** | *Uncertainty type* | *Nature and degree of uncertainty* | | Uncertainty is a key component of the RBFSP |
| **ii.** | *Overarching technique category* | | | |
| **iii.** | *Technique specialism* | | | |
| **iv.** | | *Complexity of the problem* | | The RBFSP already characterises Defence Planning as being a Wicked Problem |
| **v.** | | | *Phase of the risk management process* | This is captured already in how the technique is mapped to activities in the RBFSP |
| **vi.** | | | *Phase of the life cycle of a project* | This is not applicable because defence planning is not a project |
| **vii.** | | | *Corporate maturity towards risk* | This is not applicable |
| **viii.** | | *Resources required in terms of time and level of expertise* | | Useful but too detailed and resource intensive |
| **ix.** | | *Data needs or cost* | | Useful but too detailed and resource intensive |
| **x.** | | *Whether the method can provide a quantitative output* | | Useful, but was captured within the Overarching Techniques category |

Grimaldi *et al.*'s categories were designed to examine project risk. Therefore, since in this guide we are primarily interested in risks specific to strategic planning and not project planning, their categories were deemed not to be appropriate for RBFSP. For example, although, *the phase of the life cycle of a project* is inappropriate for defence strategic planning, this is analogous to the steps in a generic strategic planning process. However, since both the strategic planning steps and phases in the *risk management process* are components of the RBFSP, there is no need to include them as categories.

The ISO 31000:2009 categories were more appropriate for RBFSP, with *the nature and degree of uncertainty*, being directly applicable since uncertainty is the basis of our definition of risk (discussed in Chapter 2). However, since the strategic planning problem is already characterised as being a *wicked problem*, the category *complexity of the problem* was judged not to be useful. The other categories (i.e., *resources required in terms of time and level of expertise, data needs or cost,* and *whether the method can provide a quantitative output*) although potentially useful, were judged to be too granular for deciding what technique to use.[1]

[1] Developing an assessment of the resources and costs for a large number of different techniques was not feasible for this work.

In addition to the *uncertainty type* directly adopted from ISO 31000:2009, two additional categories were developed: *Overarching technique* and *Technique specialism*. The *Overarching technique* category (largely adopted from ISO 31000:2009) allows the user to see how techniques are similar and complimentary in their application. The *Techniques specialism* category also allows the analyst to look at techniques with a similar application but which might not typically be applied in that part of the framework; thus, enabling the user to identify alternative applications or alternate techniques to apply [41]. The categorisation system used in the RBFSP is shown in Table 5-5.

**Table 5-5: The Categorisation Used to Describe the Techniques Within the RBFSP.**

| Category | Categorisation Attributes | Notes |
|---|---|---|
| Uncertainty Type | Systemic<br>Cognitive<br>Systemic and Cognitive | See Chapter 2 for details |
| Overarching Technique Category | Business information systems (e.g., GIS)<br>Business Tools<br>Clustering/Classification<br>Forecasting<br>Heuristics<br>Modelling<br>Network Theory<br>Operations Research<br>Economic Analysis<br>Legal Analysis<br>Psychology<br>Qualitative Research<br>Reductionism<br>Systems Thinking | Based on ISO 31010 [43] |
| Technique Specialism | Cause-Effect Analysis<br>Classification<br>Clustering<br>Critical Systems Thinking<br>Decision Support Tools<br>Gap Analysis<br>Management Sciences<br>Multi-Methodology<br>Performance Analysis<br>Planning<br>Qualitative Data Collection from Groups<br>Qualitative Data Collection from Individuals<br>Simulations<br>Soft OR/Problem Structuring<br>Synthesising/Ranking/Outranking<br>Trade-off Analysis<br>Trend Analysis<br>Visualisation<br>Wargames | |

Each category has a number of subcategory levels to help delineate between different techniques in order to select an appropriate one or eliminate inappropriate ones. Categorisation should help the analyst apply appropriate techniques to the given planning activity and avoid selecting inappropriate techniques. Categorisation will hopefully lead analysts to discover new (to them) techniques that may be more appropriate, thus, providing improved results, because practitioners tend to rely on familiar and not necessarily appropriate techniques [41]. This categorisation may also provide guidance on more appropriate uses of a technique, as well as provide transparency in the assumptions for its use and its limitations [110]. The categorisation has not been comprehensively tested; therefore, framework users are encouraged to adapt and develop the RBFSP further to suit their needs.

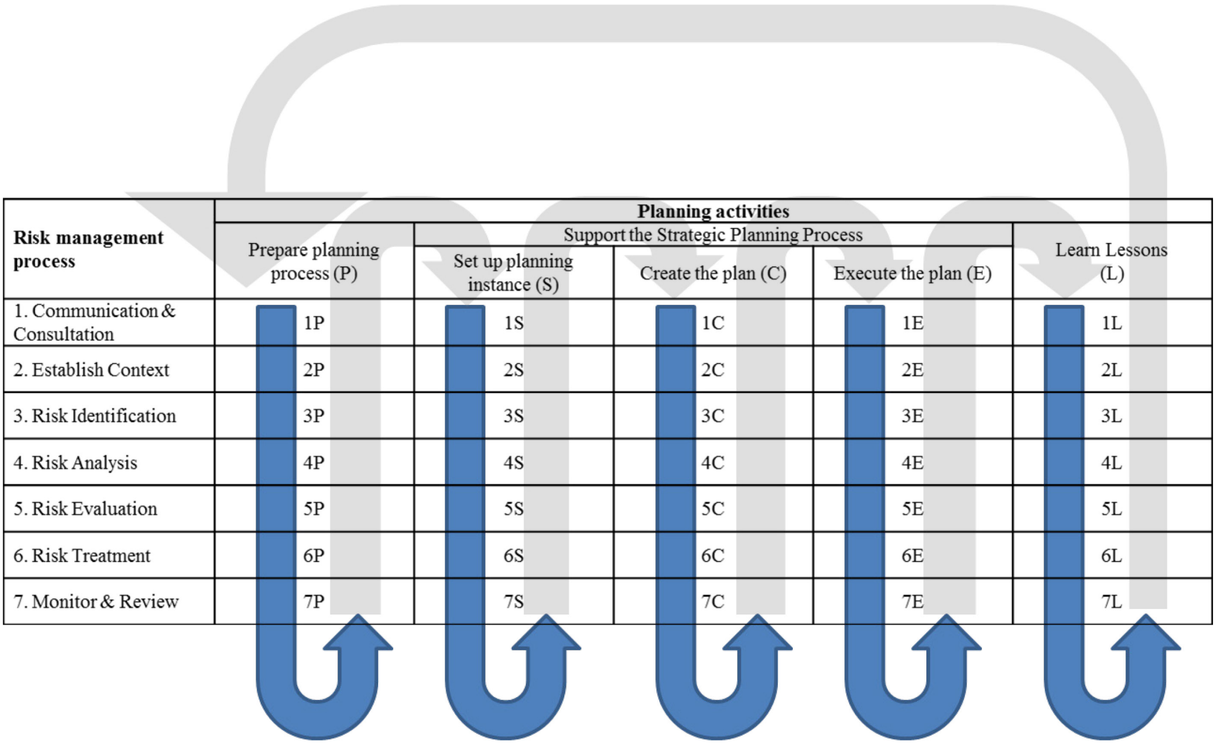
### 5.4.3 Technique Descriptions

Annex A provides a summary of the details for each of the tools and techniques (including strengths and weaknesses), as well as their categorisation.

## 5.5 USING THE FRAMEWORK

This Guide illustrates how the framework "could" be used rather than how it "should" be used. This section describes how to use the framework structure to navigate to and draw upon the different techniques in a systematic and coordinated fashion. Chapter 4 describes the framework's use from a risk perspective of an analyst supporting the planning. However, the framework can be understood from a number of perspectives and applied in a variety of ways.

In this section, we provide some practical guidance to the analyst in supporting planning. We navigate through the matrix of the framework column by column and describe the conceptual application of risk to each of the planning steps (see Figure 5-2 where the blue arrows illustrate the general path taken through the framework and the grey lines illustrate how the blue lines link together).



| Risk management process | Planning activities | | | | |
|---|---|---|---|---|---|
| | Prepare planning process (P) | Support the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set up planning instance (S) | Create the plan (C) | Execute the plan (E) | |
| 1. Communication & Consultation | 1P | 1S | 1C | 1E | 1L |
| 2. Establish Context | 2P | 2S | 2C | 2E | 2L |
| 3. Risk Identification | 3P | 3S | 3C | 3E | 3L |
| 4. Risk Analysis | 4P | 4S | 4C | 4E | 4L |
| 5. Risk Evaluation | 5P | 5S | 5C | 5E | 5L |
| 6. Risk Treatment | 6P | 6S | 6C | 6E | 6L |
| 7. Monitor & Review | 7P | 7S | 7C | 7E | 7L |

**Figure 5-2: The Application of the RBFSP to Each Planning Step.**

### 5.5.1 Prepare the Planning Process

At the beginning of the *Prepare the Planning Process* step, it is assumed the framework has been *superimposed* on the actual planning process (as described in Section 5.2) and the relationship between the framework and actual planning process is understood (Level A in Figure 5-1).

In the *Prepare the Planning Process* step, one should consider how to set the initial conditions for the planning and instil risk thinking in the analyst and the planner. The emphasis is largely on exploring the ways in which the planning context can be understood, anticipating limits to problem scope (i.e., where the planning boundaries might lie). The activities related to this step are (unsurprisingly) more prominent in the intersections of the matrix concerned with *Establishing the Context* and the *Monitoring and Reviewing* phases of risk management (see Figure 5-3). This is because at this stage, the framework is about both understanding the span of the problem space (e.g., planning boundaries) and learning from what has occurred in previous planning cycles (i.e., when the current planning is not the first iteration of the planning cycle). Therefore, there is an emphasis on the *Monitoring and Review* activities to learn from previous planning cycles, as well as setting up the learning for this planning cycle. Finally, one of the key roles of the analyst is to carry out risk thinking and analytical groundwork to prepare to support the planner; e.g., considering what analyses might be required and anticipating what information, data, models and techniques may be required during the planning process.

| **Risk management process** | **Planning activities** | | | | |
|---|---|---|---|---|---|
| | | Support the Strategic Planning Process | | | |
| | Prepare planning process (P) | Set up planning instance (S) | Create the plan (C) | Execute the plan (E) | Learn Lessons (L) |
| 1. Communication & Consultation | 1P | 1S | 1C | 1E | 1L |
| 2. Establish Context | 2P | 2S | 2C | 2E | 2L |
| 3. Risk Identification | 3P | 3S | 3C | 3E | 3L |
| 4. Risk Analysis | 4P | 4S | 4C | 4E | 4L |
| 5. Risk Evaluation | 5P | 5S | 5C | 5E | 5L |
| 6. Risk Treatment | 6P | 6S | 6C | 6E | 6L |
| 7. Monitor & Review | 7P | 7S | 7C | 7E | 7L |

| **Risk management process** | **Planning activities** | | | | |
|---|---|---|---|---|---|
| | | Support the Strategic Planning Process | | | |
| | Prepare planning process (P) | Set up planning instance (S) | Create the plan (C) | Execute the plan (E) | Learn Lessons (L) |
| 1. Communication & Consultation | B1, B2 | B21, B22 | B39, B40 | B52, B53 | B69 |
| 2. Establish Context | B3, B4, B5, B6, B7, B8, B9, B10 | B23, B24, B25, B26, B27, B28, B29 | B41 | B54, B55 | B70, B71 |
| 3. Risk Identification | B11 | B30 | B42 | B56, B57, | B72 |
| 4. Risk Analysis | B12 | B31 | B43 | B58, B59 | B73 |
| 5. Risk Evaluation | B13 | B32 | B44, B45 | B60, B61 | B74 |
| 6. Risk Treatment | B14, B15, B16 | B33, B33 | B46, B47 | B62, B63, B64 | B75 |
| 7. Monitor & Review | B17, B18, B19, B20 | B35, B36, B37, B38 | B48, B49, B50, B51 | B65, B66, B67, B68 | B76, B77 |

**Figure 5-3: Predominant Activities in Preparing the Planning Process.**

The first part of this step is thus about consulting with appropriate stakeholders to establish a shared picture for the planning context, mapping out the stakeholder space and any potential vested interests. Therefore, when we look at the *activities* in *intersections* 1P, 2P and 7P, this can be done either sequentially (one at a time) or holistically[2] (at the same time). The analyst needs to identify what worked well and what has not worked well, from previous planning cycles, by reviewing previous lessons (i.e., the activities in intersections 1P/2P that draw from intersections 1L/2L/7L).[3] The analyst should then look to the *activities* in *intersections* 1P and 2P to identify and define the parameters for establishing the broad planning context so that appropriate *techniques* can be selected. For example, questions that could be asked might include: "What type of stakeholders should be involved in the planning?", "What analysis activities should be carried out?", "In what order might the activities be carried out, and what techniques might be appropriate?", "How can this analysis be delivered and what resources (e.g., data, people, and time) does the analyst need?"[4]

By beginning to identify the strengths and weaknesses of each different approach to planning, defining the constraints (both explicit and implicit), and capturing the assumptions, the risks arising from each of approaches planning can begin to be identified by the analyst. These should be recorded in a risk register (see Section 2.4.6) for processing at a later stage (at intersections 4C/5C and 4E/5E of the matrix), but how the recording and management of this information by the analyst is established should be considered in *intersection* 7P. In addition, the way in which the success of the process is measured should also be considered and initially defined in *intersection* 7P.

The *Prepare the Planning Process* step helps the analyst consider what has been done in previous cycles, estimate of the degree of technical complexity, anticipate the problem sets that will require analytical support, think through what might be needed for the planning and what analysis they might need to provide to support the planner in the next three planning steps. By following activities B1 to B20, the analyst has thus structured their thoughts about how they might support the planner, what they might need and anticipate what actions they might need to take in preparation for the planning. The activities that should take place include: taking an inventory of extant decision support tools (B13 to B16), consulting the record of lessons learnt and the risk register to assess strengths and weaknesses of these methods (B10), evaluating the problem situation context in which these techniques have been applied in the past (B9 and B10), and making possible adjustments and improvements to the set of techniques (B11 to B13).

Now, the *Prepare the Planning Process* step is considered in more detail, looking specifically at the *activities* and *techniques* in the framework. First, there are three main components to consider: who might need to be consulted and involved, and how might they be engaged with (*intersection* 1P), what has worked before (parts of *intersection* 2P such as activity B10), and what might need to be instigated in this planning instance and its context (*intersection* 2P). The questions asked do not necessarily need to be answered in this order or sequentially, but this sequence will be used here to ease the presentation.

Beginning with *intersection* 1P (using Annex A, Section A.4), the *activities* can be identified as: Identify the guidelines for the plan's communication (B1) and Identify the guidelines of stakeholder engagement and consultation (B2). Using Annex A, Section A.6, the relevant technique(s) for 1P and its activities (numbered with B's) can be identified. Examples are the Large Group Interaction Methods (043), Stakeholder Analysis (070) and Stakeholder Involvement (071). These activities, therefore, anticipate what might need to be done and the technique(s) provide the method, tool or family of tools that can help (where appropriate) in

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[2] This also applies for the general use of the RBFSP.

[3] This is also intimately linked to intersections 1L, 2L and 7L and the lessons learnt from previous planning; hence, the emphasis in this guide about the iterative and non-linear nature of strategic planning in the defence context.

[4] The emphasis in the *Prepare the Planning Process* step is thus on who *should* be involved and what *might* be used; thus, it is hypothetical and explorative in nature in order to help the analyst consider the different options rather than jumping to early solutions.

accomplishing those activities: providing assistance in structuring the relevant considerations; i.e., using techniques such as the soft systems approaches.

At 2P, the next intersection, the activities should include: identify the broad characteristics of the risks (B3), Identify the risk policy (B4), identify/analyse broad assumptions (B5), Identify stakeholders (B6), identify/analyse objectives of the planning process (B7), identify the breadth of scope (B8), assess the defence and security context (B9), and enact lessons from previous planning cycles (B10). The techniques[5] could be: Change-Analysis (014), Benchmarking (008), Policy Analysis (056), Large Group Interaction Methods (043), and Quality Framework (058). Thinking about those techniques enables the analyst to begin to anticipate what data and other resources they may need at later stages for each of these techniques.

At this stage, the non-linearity of the RBFSP begins to become apparent because in order to consider what *might be* the characteristics of risk you need to have some understanding of the types of risks being considered, which are covered in later planning support steps C and S. But this set of activities only requires a cursory identification and assessment of the risks and does not require a complete analysis to be performed. Therefore, it is possible to jump around the framework and not follow it linearly, in the same way that project planning is commonly implemented especially when the planning is not in its very first cycle.

*Activity* B10 provides the link between the lessons identified in previous planning cycles (see Column L in Figure 5-3), so that these lessons are enacted rather than passively observed or ignored. This is an important step because it helps the analyst to consolidate learning from the planning process that just occurred. Unfortunately, often in practice identified lessons are infrequently acted upon and their collection is often an afterthought (see Text Box 5 in Chapter 4). *Activity* B6 links to and builds upon activities in 1P in understanding the stakeholders' anticipated needs, e.g., when deciding the type of the planning to be used, the current framework suggests using techniques such as Stakeholder Analysis (070) and Stakeholder Involvement (071). At the same time, activities B7 to B9 begin to define the context and purpose of the plan using techniques such as Large Group Interaction Methods (043).

The techniques used in the first planning step (i.e., Column P in Figure 5-3) support risk management activities (i.e., B1 to B20), but these techniques often aid in the consideration of techniques to be used at later stages; therefore, many of the activities need to refer to the techniques in other parts of the framework to assist in the considerations made in this part (i.e., activities B1 to B20). For example, the Identify the broad characteristics of the risks (B3) and Identify the risk policy (B4) have implication for, but are not independent of, the techniques that are to be used in the actual risk management phases: Risk Identification (3C), Risk Analysis (4C), Risk Evaluation (5C) and Risk Treatment (6C). When the decisions about which techniques to use are made in *intersections* 3S, 4S, 5S and 6S (see Figure 5-4), these decisions draw upon the considerations made in the activities in *intersections* 3P, 4P, 5P and 6P: Identify the guidelines for finding, recognising and recording risks (B11), Identify the guidelines for how risks are characterised and analysed (B12), Identify the guidelines for comparing and prioritising risks (B13), Identify the guidelines for how to treat risks (B14), Identify risk trade-off strategies (B15), and Identify the planning processes that can be used (B16). And these activities use techniques such as Change-Analysis (014), Risk Categorisation Approaches (062), Cause and Effect Diagram, Fishbone, and Ishikawa Diagram (013), Scenario Development (065) and Modern Portfolio Theory (048) to aid with understanding the risk type and the ability to ascertain cause and effect. Qualitative risk identification approaches dominate and may be informed by the analysis activities that are applied to establishing and understanding the risk context. This planning step thus helps in defining both the explicit and implicit constraints and assumptions being made, and identifying risks derived from the planning process.

[5] The list of techniques in the framework is by no means exhaustive and should be considered a starting point to develop a larger catalogue of techniques for the user to refer to over time.

| Risk management process | Planning activities | | | | |
|---|---|---|---|---|---|
| | Prepare planning process (P) | Support the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set up planning instance (S) | Create the plan (C) | Execute the plan (E) | |
| 1. Communication & Consultation | B1, B2 | B21, B22 | B39, B40 | B52, B53 | B69 |
| 2. Establish Context | B3, B4, B5, B6, B7, B8, B9, B10 | B23, B24, B25, B26, B27, B28, B29 | B41 | B54, B55 | B70, B71 |
| 3. Risk Identification | B11 | B30 | B42 | B56, B57, | B72 |
| 4. Risk Analysis | B12 | B31 | B43 | B58, B59 | B73 |
| 5. Risk Evaluation | B13 | B32 | B44, B45 | B60, B61 | B74 |
| 6. Risk Treatment | B14, B15, B16 | B33, B33 | B46, B47 | B62, B63, B64 | B75 |
| 7. Monitor & Review | B17, B18, B19, B20 | B35, B36, B37, B38 | B48, B49, B50, B51 | B65, B66, B67, B68 | B76, B77 |

**Figure 5-4: How the Activities in the Earlier Stages of the Planning Process Consider and Inform the Selection of the Risk Assessment Techniques in the Later Stages of Planning Like the Creation of the Plan.**

Then, once these considerations have been made, how the identified risks are monitored, reviewed and learnt from should be considered through activities in *intersection* 7P: Identify the guidelines for monitoring and reviewing of risks (B17), Identify the guidelines for monitoring and reviewing the planning process (B18), Identify how learning lessons should be carried out (B19), and Identify guidelines for providing traceability and knowledge management (B20). In addition, the way in which the success of the process is measured is also considered and begins to be defined in Activity B20.

To continue the painting analogy, these preparations (i.e., *Prepare the Planning Process* step) are akin to getting the composition of the painting right. A painting method for this purpose is the use of the "Golden Triangle" which was used by the Greeks for developing composition, and based on the mathematical "Balance of Symmetry" [118] (which we see in natural phenomena such as leaves, animals and non-living things [119, pp. 48-84). This is not painting-by-numbers but is about using aids to form a structured way to organise and deliver what the painter (or in our case the analyst) needs to do, which is the intent of applying the framework. At this stage, the painter also considers what the purpose of the painting is and the meaning that he wants to convey (in a strategic sense). Essentially, the painter determines how they are going to reach their goal and how they will know when they have done so. These considerations of purpose and success are rarely made explicit in art, and equally in strategic planning [17].

### 5.5.2 Set Up the Planning Instance

The second stage in the framework involves the analyst working more intimately with the planner. After considering the approach to the analysis in the previous step, the parameters and context (e.g., planning boundaries) are explored and initially defined, and decisions are made on the type (i.e., parameters that will help the categorisation) of approach and techniques to use in this phase of RBFSP. This means that having a clearer (although not necessarily definitive) understanding of the planning boundaries, for example, the analyst can think about what type of data will need to be generated.

The activities in the *Prepare the Planning Process* step (principally at intersections 1P, 2P and 7P) set up stakeholder consultation (i.e., considering who would be appropriate to consult initially, narrowing down the group to a logical initial subset of stakeholders). In the current planning step, the stakeholders are engaged and participate in defining the scope of the problem (e.g., the Boundary Judgements) at *intersections* 1S and 2S. In addition, the implied underlying context, in terms of constraints and opportunities, is made explicit. From this problem bounding activity (scope or planning boundaries), the possibilities of "what might be" can be explored and can be used in generating the future context(s) (B26).

Having defined the extent of the context enables an understanding of how insights (information) can be drawn from the different possibilities (scenarios) of "what might be" and whether further scenarios might need to be generated to provide sufficient coverage of the possibilities. In addition, throughout this planning step, what works well and what did not work in previous planning cycles is drawn upon. For example, in *activity* B29 the user is enacting the lesson, but equally *activity* B36 sets up the process to ensure that future lessons are not lost, either. With the lessons from previous planning iterations in mind, users then look to the activities in 3S, 4S, 5S and 6S to define the approach and identify the appropriate analytical options and techniques; i.e., how to collect and generate the data required for these analyses and decide what the analytical approach for trade-offs (e.g. Maximin or Minimax) will be (see Figure 5-4).

The activities at intersection 1S are as follows: Identify guidelines for risk communication and governance (B21), and Initiate engagement and consultation with the selected stakeholders (B22). These activities draw upon techniques such as Large Group Interaction Methods (043), and more specifically the Strategic Assessment Model (072) and similar Soft Systems Methodologies (073 and 074), to work with the stakeholder participants to define the Boundary Judgements making explicit constraints and opportunities. The possible activities at *intersection* 2S would be as follows: Identify the objectives of the planning instance (B23), Identify the risk tolerance (B24), Identify the specific scope and context (B25), and Identify assumptions (B27). These activities also include Identifying who the specific stakeholders are (B28).

Intersection 2S is a critical part of the framework since at this intersection is where much of the engagement and participatory analysis, that is vital to addressing *wicked problems*, is initiated. The use of the categorisation hierarchy can be seen here. For example, Large Group Interaction Methods (043) is a general technique category of more specific techniques that can aid in deciding how to communicate the plan and who should be consulted. Other techniques are more specific (e.g., Strategic Assessment Model (072)). Therefore, the more general categories can help steer the user to an appropriate group of techniques from which a more specific and contextually appropriate technique can then be selected.

Within the problem boundaries, the planning context is defined using activities like B26 (Assess the planning context), drawing on a group of techniques for Scenario Development (065) such as Intuitive Logics. This activity provides the context for how best to glean insights from the range of possible future security environments that have been generated. The user then looks to the activities in 3S, 4S, 5S and 6S to identify the appropriate possible analytical techniques, how to collect and generate the data required for these and the trade-off strategy for. These activities include: select the approach to risk identification (B30), select the risk analysis approach (B31), select the risk comparison approach (B32), select the risk treatment and mitigation approach (B33), and select the type of planning process to be used (B34). These activities draw upon techniques such as HAZOP (040), Cause and Effect, Fishbone, Ishikawa Diagram (013) and Risk Categorisation Approaches (062).

Additionally, the *activities* in *intersection* 7S (e.g., select the process for capturing and integrating new risks (B35), identify the guidelines for monitoring and reviewing the planning process (B36), identify how lessons will be learnt from the planning process (B37), and select the guidelines for traceability and knowledge management (B38)) set up the activities that enable the planning cycle to iterate effectively. This means that the performance of the plan during its implementation can be assessed and the information collected as new risks or issues arise, providing a way to recognise these risks and respond appropriately. For example, this may require the establishment of modelling and simulation tools, wargaming tools (083), SWOT analysis (075), Red Teaming activities (060) or Subject Matter Expert Surveys (078). The aim of those activities would be to ensure that the plan's performance can be understood (or measured) so that learning can occur.

Continuing the painting analogy, the *Set up the Planning Instance* step is about preparing for *actually* painting the picture. For example, setting down the sketch of what you are going to paint and starting the crude picture outlines providing the umber (shading tonal layers used in oil painting also known as underpainting). As with the use of umber in oil painting, the *Set up the Planning Instance* step is not clearly defined because there are contradictory and antagonistic judgements from the variety of stakeholder views; however, the bulk of the analysis (where there is agreement) begins to form an outline.

### 5.5.3 Create the Plan

The third stage in using the framework is about the analyst supporting the planner in creating the plan. In this step the framework emphasis shifts. Previously, the framework has been aiding the analyst in supporting the planner in thinking about the planning. In this step, the analyst is aiding the planner in applying that thinking, analysis and participants' views into the development of the plan itself. The impact comes from the support that the analyst provided (with the planner) in setting up the techniques to be used in the previous planning steps (P and S). By the current step (C), the analytical approaches to be used have most likely been decided, although they can still be revised. This circling back to earlier activities in the planning process creates one of the many possible feedback loops in a planning instance. From within the boundaries of judgement, the stakeholders define the objectives of the plan and the dimensions of uncertainty from the context of the plan. New risks are identified, and risks identified from earlier steps are also examined.

The starting point for the *Create the Plan* step would be intersection 2C[6] which means principally just drawing on the information generated in the previous column of the RBFSP *matrix*; i.e., the planning context generated (more generally) in *intersection* 2S and (specifically) in *activity* B26.

The bulk of the framework's contribution to creating the plan is in the risk thinking being fed into the risk assessment process (identification, analysis, evaluation and treatment) and the application of the techniques identified in earlier intersections. For example, given the combination of lessons identified in previous planning iterations (e.g., in activity B10), a change in risk policy and the trade-off strategy could lead to the use of a different set of techniques for risk identification being decided upon, which otherwise may not have been considered without following a systematic approach such as the RBFSP. Changing one or more previously identified techniques has an effect throughout the other parts of the risk assessment process. The implications of any change needs to be thought through in a systematic way, for example using a framework like RBFSP.

When dealing with wicked problems with high levels of complexity and uncertainty, a linear planning approach does not tend to yield successful results. Therefore, at this stage, techniques such as Robust Decision Making (063) [19, 38], designed to deal with wicked problems, can be used; they have iterative cycles, and tend to use other methods to assess risk (e.g., regret), and are used as exploratory tools to help decision makers generate more insight, rather than definitive answers. These techniques typically use a variety of other different techniques within them (such as SWOT analysis (075), Simulation (024), Wargaming (083), and Bayesian statistical modelling (007)). They tend to use scenarios, modelling or simulations to aid the decision makers in exploring the problem space to discover the variety of clumsy solutions available. This is especially useful for risk identification (*intersection* 3C) in complex capability evaluations (e.g., multiple inter-connected capabilities).

The framework enables the link between *Create the Plan* and *Execute the Plan* steps. At this time, the analyst should communicate the results of the analysis [75] to the planner (*intersection* 1C) to help the planner decide how to gauge the performance of the plan during implementation. The framework's monitoring and evaluation activities in *intersection* 7C (e.g., Select the process for capturing and integrating new risks (B35), Identify the guidelines for monitoring and reviewing the planning process (B36), Identify how lessons will be learnt from the planning process (B37), and Select the guidelines for traceability and knowledge management (B38)) set the conditions for this link. Therefore, iterating is important in order to

[6] 1C and the communication intersection come first in the matrix but do not actually occur until later: a plan that does not yet exist cannot be communicated. This is another example that highlights that although the Framework is depicted in a linear fashion, it is not meant to be used in such a way.

explore different assumptions and trade-offs to work towards the development of *clumsy solutions* (to a wicked problem) [37].

Continuing the painting analogy, the *Create the Plan* step is about actually painting the picture, the different stages of it and the realisation that some parts may not be painted as planned. Thus, there is a better chance to obtain a coherent picture if one is methodical and systematic and having the ability to go back and rework earlier parts that can be seen not to be correct in the context of everything else.

### 5.5.4 Execute the Plan

The *Execute the Plan* step's principal purpose is to ensure that the plan meets its intended purposes:[7]

1) Meet the plan's intended objective; and
2) Execute the plan as intended.

Monitoring the first purpose requires Measures of Effectiveness (MoEs) while monitoring the second requires the definition of Measures of Performance (MoPs). Criteria (set earlier at intersections 7D, 7S and 7C) enable monitoring and reviewing the plan (or, *in extremis*, identifying where the plan is failing) to provide dynamic adjustments and contingencies for the missed objectives (i.e., either planning objectives or milestones), new data acquired or where risks are perceived differently. This step is dynamic and reactive. When responding in a timely manner is essential, a rapid cycle (e.g., OODA loop[8] [120]) should be carried out through the activities in intersections 3C to 6C if the developed contingencies are insufficient.

This planning step's success is often dependant on the reliability of a previously established monitoring regime which allows for the consideration of contingencies. Therefore, in the first iteration of planning, there will be a lack of information and feedback to respond to (however, in defence departments of NATO nations this is not an issue since some form of strategic planning is part of the regular ministerial activities). Thus, this planning step also provides the majority of the information for the learning step.

This learning step is essential when employing clumsy solutions because by their very nature the clumsy solutions are incomplete and imperfect. Therefore, they require adaptation to the environmental conditions with the help of techniques such as the Dynamic Adaptive Policy Pathways approaches (001) [100, 101, 121]. The use of Wargaming (083) and related techniques helps generate feedback on the plan because implementation only occurs in situations where the plan is needed and needs to be successful (e.g., for conflicts or emergencies).

One must not forget that the ability to carry out these activities is not possible without communicating the plan's purpose and how its success is to be monitored and reviewed continually. Hence, the activities in intersection 1L (e.g., Communicate the success of plan's delivery (B52), and Communicate plan's success (B53)) to articulate not just the plan, but also an understanding of the planning context and its risks (as part of the *Monitoring and Review* phase) is important. Therefore, since these planning context risks need to be especially monitored and reviewed, the analyst ensures that the plan can respond and adapt to any changes in conditions (due to changes in the internal or external environment). This is supported by having Key Performance Indicators (KPIs), which incorporate both MoEs and MoPs, and having the ability to visualise (and thus monitor) the information through visualisation tools.

In the painting analogy, this is the showing of the painting. The painter may redo portions of the painting after receiving feedback or looking at it from different points of view. The painter may also reinterpret what the painting means.

[7] The NDPP case study discusses the risks related to both intended purposes [44].

[8] The Observe Orientate Decide Act (OODA) loop is decision action cycle that was first described by Col. Boyd [120].

### 5.5.5 Learn Lessons

In the *Learn Lessons* step, the analyst takes the collected information of identified lessons and translates it into learning. This can be simple (e.g., do not do that again in these circumstances), or more complicated (e.g., developing a new way for part of the planning to be carried out and understanding why the failure occurred). However, since the solution (e.g., responding to the lesson) may be unknown (since strategic planning is a wicked problem and causation is difficult to ascertain), something different from what was tried needs to be attempted. Under these conditions, it is important that the analyst be systematic in making any changes because people have a tendency to do the same thing again even when they know it is wrong [52] especially, when no other solution has been devised or the reasons for the lesson's (errors') occurrences are unclear (i.e., there is a lack of a clear causal link[9]).

In risk terms, the context of the lessons is known. That is, they have arisen from the planning process addressing a defined set of objectives or have been identified throughout the planning process. The lessons can then be assessed and prioritised in terms of how they have affected the objectives of the plan. Then, this prioritised set of lessons provides the focus of what to learn (in order of importance if resources are constrained) before the next planning instance. Mitigating the risk of planning failure (or more likely failure in part of the planning process) would be how to learn to plan or carry out planning activities differently. This activity is followed by implementation of the learning step.

This step has distinct activities (e.g., Communicate and share the lessons learnt (B69), Review the planning (if context has changed) (B70), Identify how to learn (B71), Identify lessons and observations (B72), Assess the importance of each of the lessons (B73), Identify what can be learnt from the planning process (B74), Learn from lessons identified (B75), Record the lessons (B76), and Implement lessons (B77)). Examples of techniques employed in these activities are: critical reflective practices, systems thinking, participative approaches, recording of assumptions and constraints, and the evaluation of the sensitivity of planning products.

Within the painting analogy, the *Learn Lessons* step is about reflecting on the painting process and the finished picture. Collating the mistakes identified throughout the painting experience and then deciding what can be done to rectify those mistakes when painting the next picture (or to improve the current masterpiece); e.g., the need for a different set of brushes, the need to spend more time getting the composition correct, or the need to learn or practice a new painting technique. This step links directly into the next planning preparation step because it is during planning preparation that those lessons to rectify the identified mistakes need to be enacted. In addition, these lessons may also be about addressing problems identified further into the planning process (i.e., in *Set up the Planning Instance* or *Create the Plan* steps).

## 5.6 APPLYING THE RBFSP: THE UK NATIONAL RISK ASSESSMENT

To demonstrate the use of the framework, the UK National Risk Assessment (NRA) has been selected as an example because it follows the ISO 31000:2009 approach and is similar to the Polish case study [44]. Most importantly, however, it has recently been scrutinised by a panel of academic experts in the Blackett Review [122] and different aspects were examined by various British Parliamentary House of Commons Select Committees.[10] Following these critiques, the NRA has been improved in response to the recommendations; however, some of the recommendations are taking longer to address[11] or have not yet

[9] This relates to the probing and sensing into uncertainty, discussed in the Introduction (Chapter 1). In wicked problems, the unsuccessful application of a (clumsy) solution can be observed, but understanding why it does not work (i.e., the causal link) is often very difficult to ascertain. Therefore, rather than systematically learning from solution application there is a tendency to ignore the lesson identified (even if those lessons are general in nature).

[10] These were the House of Commons Select Committee reports from the Science and Technology Committee [228, 230, 231, 233] and Public Administration Committee [229].

[11] Some of these are simply because the scientific knowledge to resolve the identified problems is not available, and these problems persist within all risk management activities.

been fully implemented in the publicly available material (at the time of writing). This section will use the NRA and recommendations from the Blackett review to help highlight how the framework can be used.

The NRA began in 2005 and is a classified assessment of the risks facing the UK. The process uses historical data, scientific data and expert judgement to analyse the risks. The process has three broad steps: identification of risks, assessment of risks and comparison of risks (see Figure 5-5). The National Risk Register (NRR) is the public version of the NRA, which contains a high level overview of the risks to the UK, as well as giving advice on how businesses, communities and individuals can better prepare for emergencies [123]. Although not publically available, the process and mechanics for the NRA are largely the same as those described in the advice given to businesses, communities and individuals on how they can better prepare for emergencies in the UK's Emergency Preparedness report [124]. In addition, the NRA provides the basis from which the UK plans for emergencies [125]. Like strategic planning in defence, responding to emergencies has been recognised as being a wicked problem [126, 127].

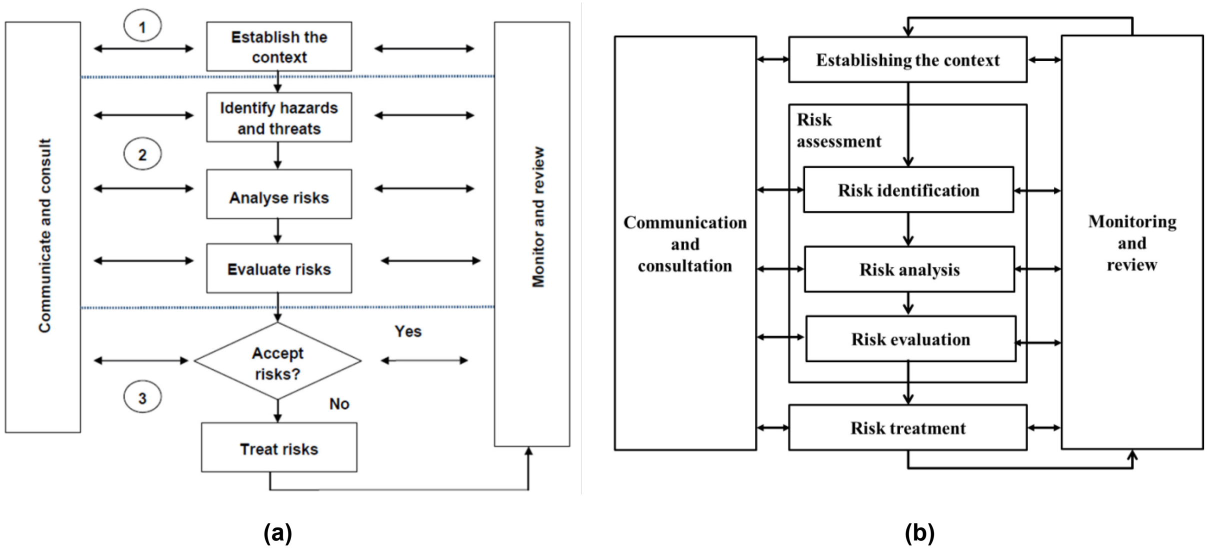



**Figure 5-5: UK NRA Risk Process (a) Alongside Figure 2-2 from Chapter 2 which Describes the ISO 31000:2009 Process (b).**

Section 5.6.1 first describes how the NRA relates to the RBFSP. Then, in Section 5.6.2, the RBFSP will be applied to the NRA following the format outlined in Section 5.5.

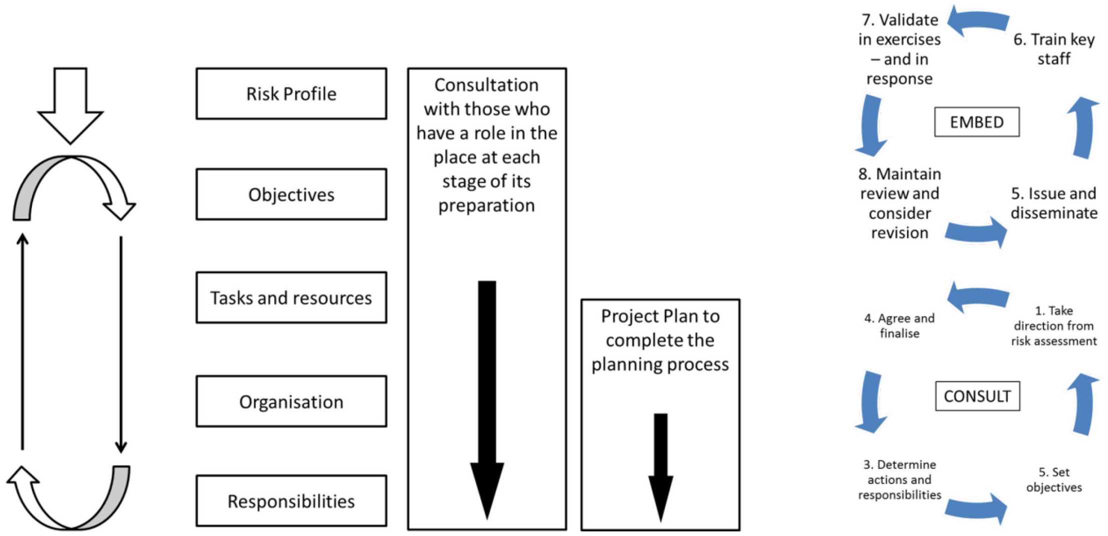
### 5.6.1 Where the UK NRA Does and Does Not Relate to the RBFSP

Just like the RBFSP, the NRA follows the ISO risk management process (see Figure 5-5). However, the NRA focuses on the UK's emergency response, where an emergency is defined as: "*an event or situation which threatens serious damage to human welfare in a place in the UK, the environment of a place in the UK, or war or terrorism which threatens serious damage to the security of the UK*" [124]. Therefore, the NRA defines the *risk* as: "the probability of an emergency occurring" and it measures risk as *likelihood versus impact* [128, p. 13]. Thus, it differs from the ISO 31000:2009 risk definition, the effect of uncertainty on objectives, which is used in the RBFSP. However, the NRA does measure risk in a similar way to the method described in Section 2.7.2 (illustrated in Figure 2-1). It could be said that although in the UK NRA risk is defined as "the probability of an emergency occurring," it could be redefined – preserving its original meaning – as being: "*the uncertainty of the UK being able to operate safely in the short-term,* [12] *beyond*

[12] The National Security Risk Assessment (NSRA) looks at risks beyond the short-term and events that are beyond the Civil Response. Therefore; anything beyond the short-term and that is a Military Task (beyond assisting with the civil response) is out of scope of the NRA.

*everyday disruptions (e.g., crime), but not beyond the UK's influence*." Hence, risk would be the uncertainty on the specific objective of "*the UK being able to operate safely in the short-term*." Thus, the notion of risk in the NRA could be said to align with that of the framework closely.

However, the NRA planning process has five steps (see Figure 5-6) which differs in structure from the RBFSP in the way they are structured. For example, the five steps, namely Risk Profile, Objectives, Task and resources, Organisation, and Responsibilities, do not directly match the five steps in the framework's generic planning process. The NRA's design and guidance (Emergency Preparedness) is prescriptive and its implementation is strictly defined. This NRA approach, therefore, provides one specific approach to one type of uncertainty whereas the RBFSP seeks to enable the analyst to vary the approach applied, to suit the uncertainty being addressed (as advocated in the Blackett Report's recommendations [122]).




(a) (b)

**Figure 5-6: The UK's 5 Step Emergency Planning Process (a) and the Cycle of Emergency Planning from the UK (b).**

In the NRA, there is an additional emphasis in the documentation for both monitoring and reviewing risk, and learning activities as is emphasised in the RBFSP. The lessons identified and lesson learning direction within the NRA's and the cycle of emergency planning, that supports the UK's emergency planning process, could be considered similar to the *Prepare the Planning Process* and the *Learn Lessons* steps, in their support to the strategic planning process used in the RBFSP. This similarity can be particularly seen in the Embed functions of the Emergency Planning Cycle as shown in Figure 5-6 (figures reproduced from the Revised Emergency Preparedness report [125]). For example, steps 5 to 8 of the Embed cycle (top-right of Figure 5-6) are similar to the *Learn Lessons* step because they are used to actively learn from what has occurred. In addition, the link from step 8 to step 5 is similar to the *Prepare the Planning Process* step because in step 8 the learning from step 7 is considered and integrated into future planning within step 5.

The UK NRA's steps are similar to the phases in Poland's Security Strategy Cycle [44]. Table 5-6 shows a comparison between the Polish Security Strategy Cycle and the UK emergency planning cycle in relation to the generic strategic planning process as defined in the RBFSP (see Chapter 3). A number of clear similarities can be seen.

The NRA is also similar to the NDPP[13] in that it tries to span the different planning levels (Strategic, Operational and Tactical), but concentrates on "generic plans." When the NRA refers to "generic plans,"

[13] The NDPP is briefly described in Chapter 1 and in more detail in the NDPP case study [44].

these are intended to be plans that function with a wide range of possible scenarios in the same way that defence planning in general and the NDPP specifically do, because these defence plans have an equivalent function: in being useful for many possible conflicts while "generic plans" are useful for different national emergencies. Namely, the NDPP provides a centralised planning process to guide the Alliance's member nations in an equivalent way that the UK Cabinet Office provides direction to the Government's Departments and the Emergency Responders.

The NRA's design and guidance (Emergency Preparedness) is prescriptive and its implementation is strictly defined. This NRA approach, therefore, provides one approach to one type of uncertainty; the RBFSP seeks to enable the analyst to vary the approach applied, to suit the uncertainty being addressed (as advocated in the Blackett Report's recommendations [122]). Although, as mentioned earlier, the lessons identified and lesson learning direction (within the NRAs Emergency Preparedness) is similar to the *Prepare the Planning Process* and the *Learn Lessons* steps (in the RBFSP), therefore, aiding in the iteration and evolution of planning.

**Table 5-6: Comparison of Poland's Security Strategy Cycle and the UK Emergency Planning Cycle Against the Generic Strategic Planning Process Used in the RBFSP.**

| **Steps of the Generic Strategic Planning Framework** | Prepare the Planning Process | Supporting the Defence Planning Process | | | | Learn Lessons |
|---|---|---|---|---|---|---|
| | | Set Up the Planning Instance | | Create the Plan | Implement/ Execute the Plan | |
| **Phases of the Poland's Security Strategy Cycle** | | Strategic Self-Identification | The Security Environment | Operational Strategy | Preparatory Strategy | |
| **Phases of UK Emergency Planning Cycle** | Emergency Preparedness | Risk Profile | Objectives | Task and Resources<br>Organisation<br>Responsibilities | Testing and Exercising | Lessons Identified and Lesson Learning |

## 5.6.2 How the UK NRA Relates to the RBFSP

Having described and illustrated the similarities (and differences) in structure and philosophy (see Table 5-6), the next sections will describe how the use of analysis the NRA and the RBFSP are similar and how they differ.

### 5.6.2.1 Framework Application

The RBFSP is designed to be malleable in order to meet a range of different analysts' purposes and work with existing planning processes; therefore, the RBFSP should fit a variety of planning processes (as described in Sections 4.2 and 5.2). This contrasts with the NRA which is much more prescriptive, even though it has similar ambitions in terms of breadth of application.

### 5.6.2.2 Prepare the Planning Process

The Emergency Preparedness guidance provides the majority of the functions described in the *Prepare the Planning Process* step setting the initial conditions for the planning and instilling risk thinking in the analyst. The NRA, in many ways, does this too; however, rather than using an approach that is directed by the user, the NRA does so by prescribing[14] the approach through the Emergency Preparedness guidance [128]. This approach forces the users to identify lessons and conduct monitoring and review throughout the process. Also, the NRA clearly *communicates* and engages (e.g., *consults*) the appropriate stakeholders in the process, through the guidance provided; i.e., the function of intersection 1P. Thus, the Emergency Preparedness guidance provides the majority of the functions described in the *Prepare the Planning Process* of the RBFSP. In this case, the *Prepare the Planning Process* step would serve limited additional help; illustrating that the RBFSP is only there to provide assistance when it does not already exist in supporting the planning process being used.

The NRA makes explicit many of the constraints and assumptions made, as intersection 2P does, but does not explicitly identify risks derived from the planning process itself. The approaches and techniques to be used later in the process are prepared and defined in the guidance, as also occurs in intersections 3P to 6P. Similarly to the functions in *intersection* 7P and *activity B20*, the NRA (in its set up mode; i.e., *Prepare the Planning Process*) looks to learn from previous planning cycles and establish the monitoring and review activities and structures. However, the prescriptive nature of the NRA process does constrain some of the scope for dynamism and evolution of the NRA process, as it iterates through planning processes, because it can require the guidance to be rewritten or other large structural and bureaucratic changes to be made (e.g., much of the guidance was amended in response to the Blackett Review recommendations [122]). This defined structure does have the advantage of being clearer about the way that the NRA articulates the function of the analytical requirement in support of the whole planning process and has legislation to assure its implementation.

#### 5.6.2.3 Set Up the Planning Instance

Next, the "Risk profile" and "Objectives" planning steps are generally similar to the *Set up the Planning Instance* step, but with some exceptions. The aim of the "Risk profile" planning step is to "define the situations or scenarios … [for] all the possible circumstances" [125, p. 445] while the aim of the "Objectives" planning step translates these scenarios and understanding of the situation into a series of objectives [125, p. 455]. These planning steps are equivalent to *intersections* 1S and 2S, where stakeholders are engaged and participate in defining the scope of the problem (i.e., the boundary judgements) and the possibilities of "what might be" is explored to generate the future context(s).

The other intersections (3S, 4S, 5S, 6S and 7S) and the associated activities of the framework are covered in the Emergency Planning Guidance and are the decision steps of the steps explored in *Prepare the Planning Process* step that the guidance has already considered and decided upon (i.e., the Guidance has been published).

A recommendation from the Blackett Review to improve the NRA that is relevant to this step was to make "greater use of external experts to inform risk assumptions, judgements and analyses"[15] [122, p. 12]. This recommendation supports the framework's activities to establish a diverse stakeholder group (the techniques included in Annex A should aid in this) and leads to more appropriate planning boundaries.

An important difference between the NRA and the RBFSP is that the "Risk profile" (from the NRA) draws upon the "treatment of risks" (the final step of risk assessment in the ISO 31000:2009 risk management process) in the *Set up the Planning Instance* step. Therefore, the NRA does its risk assessment as a precursor to the planning to draw out planning assumptions and scenarios, which means that the NRA does not neatly

[14] Prescription is not meant here to be a negative thing, because it is recognised that for the NRA it is necessary. Unlike defence planning, Emergency Preparedness is guidance to aid emergency responders in conforming to legislation (the Civil Contingencies Act).

[15] This is supported by recent research that demonstrates the need to use the *appropriate* expertise and panel configuration when using expert judgement [125, p. 245], and that *appropriate* expertise is not necessarily a reflection of academic prowess: the traditional view of expertise [51, 74]).

fit into the RBFSP. However, given that the RBFSP is not a linear process (which is also the case for the NRA guidance), its components can be adapted for purpose-built processes like the UK's NRA. However, Nations need not necessarily *adopt* the RBFSP in supporting their internal planning processes but should be able to (at the very least) *adapt* it to their internal analytical process to create their own risk-based process. Therefore, where the Nations' planning processes do not neatly fit, the RBFSP can cope with disjunctions in its structure to aid in the creation of a risk-aware process.

#### 5.6.2.4 Create the Strategic Plan

In the *Create the Plan* step, the NRA activities that provide the risk analysis are very similar (see Figure 2-1 and Figure 5-5); however, they occur at different places in the NRA and the RBFSP processes (i.e., in the NRA, this step has already occurred prior to the *Create the Plan* step in the RBFSP, during the Risk Profile step). However, their use is similar and they are considered in a similar way to the relevant RBFSP intersections and activities (i.e., 3C, 4C, 5C and 6C). The relevant planning steps from the NRA ("Task and resources," "Organisation" and "Responsibilities") can be considered to overlap with the activities of intersections 6C and 7C.

In comparing the NRA risk assessment approach to the how risk assessment is defined in Chapter 2 (e.g., 3C, 4C, 5C and 6C in the RBFSP), the NRA uses a similar approach to the ISO 31000:2009 risk management process. Although the NRA describes risk in terms of likelihood and impact, it does not make explicit the definition of risk as being the effect of uncertainty on objectives. However, it does describe how emergency planning is "concerned more with consequences than with causes" which is similar to ISO 31000:2009. The NRA has well-defined criteria and scales for assessing likelihood and impact of risks [128, pp. 57-59 and 63-64]; therefore, the NRA could provide a useful template for others to consider in setting criteria for assessing likelihood and impact of risks in strategic planning in the defence context.[16]

NRA's purpose means that only negative aspects of risk are considered. The Blackett review also recommends that the risk assessment is supplemented with other approaches [129] (e.g., The Italian Flag, The Renn Approach and The Cochrane Framework) to improve the likelihood and impact assessments [122, p. 8]. There is also a recommendation to avoid, where possible, the use of deterministic (e.g., only using a few scenario points) evaluations of risk and to use more "probabilistic-based analysis" [122, p. 13]. The difficulties in judgement (see Section 2.2), especially when used by policy makers and politicians, can make the use of heat-maps and probability less useful. This is because, although the probability may not be defined in a normative way (based on a defined probability distribution like the Gaussian or understood in terms of optimum expected utility), it is still interpreted as such, resulting in decisions being made on an incorrect understanding of the information being conveyed [122, p. 40].

At intersection 6C, where risk treatment strategies are developed, the activities are developing the risk treatment options (B46) and Identifying the balance point (sweet-spot) between the different options (B47); therefore, it provides analytical direction for the plan's development and the capabilities required. The required capabilities are considered in the NRA's planning step of "Task and resources" which links to the NRA via the UK Capability Programme[17] (this is the way in which the emergency planning process assures it has the capability to respond to emergencies). Generally in strategic planning for the defence context, there is a great deal of effort invested in the analysis of the options and trade-off strategies. The NRA's planning step of "Task and resources" has limited guidance in how to do this[18] and may benefit from greater use of the analytical tools defence planning uses.

[16] There are arguments in the scientific literature against the use of risk matrices [88].

[17] The UK Capabilities Programme has been developed by central government to address the most serious disruptive challenges requiring support from central government. It leads to some capabilities being developed at the local level in support of UK-wide resilience planning, but these are a matter of current government policy and are not a specific requirement of the Act [125, pp. 32-33 (Box 5.6)].

[18] Defence analysts could aid UK Emergency Planning activities relevant "Task and resources."

At intersection 7C, where the monitoring and review occur, there is a close match with the planning steps of "Organisation" and "Responsibilities." In this NRA planning step, the organisational structures and responsibilities (i.e., the infrastructure) for the continuous monitoring and review of the performance to respond to changes are defined.

#### 5.6.2.5 Execute the Plan

The principal purpose of the analytical support to *Execute Plan* step is to ensure the plan meets its intended purpose through two functions: communicating the plan (1E), and monitoring and providing the ability to adjust to changes (2E to 5E and 7E).

In this respect, the NRA provides similar functions to the RBFSP activities. Once an Emergency Plan is produced there is a requirement for this plan to be published and training to be provided on the plan (i.e., how to use it); ensuring effective communication; and, new capabilities are fed into the UK Capabilities Programme when they are identified. In addition, there is a series of activities to "maintain and embed the plan," as well as running exercises designed to "test the plan."

#### 5.6.2.6 Learn Lessons

Like the RBFSP, the *Learn Lessons* step of the NRA not only has specific analytical activities to identify and record the learning, but also aims to ensure that these activities encourage active learning. For example, there are specific activities on both "Lessons identified and lessons learning" and "Plan maintenance procedures and revision" [125, pp. 62-66]. Moreover, there is an emphasis on the link between this step and the initiation and delivery of the next planning cycle. Therefore, there is a great deal of coherence between the two approaches.

#### 5.6.2.7 Summary

The UK NRA's approach and philosophy to risk-based planning compares favourably to the RBFSP and in many ways they align. Although the RBFSP generally superimposes onto the NRA process, this comparison does highlight some interesting points (and associated analysis requirements) that are more widely applicable.

The planning preparation step is present in both approaches and is useful in setting up the planning analysis. This preparatory step and the learning step are key in enabling the effective systematic iteration of the analysis that supports the planning cycle. This is also enhanced by the monitoring and review, activities that both approaches contain.

The RBFSP and NRA have quite different purposes and applications. Therefore, there are some distinct differences. For example, the NRA only looks at external risks and not risks inherent within the process itself; it only looks at negative risk; and the interaction between the risk analysis steps differs between the NRA and the RBFSP.

The NRA provides some useful insights in its definition and criteria for measuring likelihood and impact. The recommendations from the Blackett Review have helpful considerations for using the RBFSP, many of which are already included. For example, it is important to use supplementary approaches to inform the risk assessments, and use logical calculus to aid in the judgement of risks.

## 5.7 CONCLUSION

In this chapter, we have presented and described how one can use the RBFSP. A case study was also presented to provide implementation guidance showing in more detail how the framework can (and, in our view, could) be applied. Several limited applications to real strategic planning processes are discussed in a companion report [44] while a categorised toolbox of analytical activities and techniques that support the RBFSP is presented in Annex A.

# Chapter 6 − CONCLUSIONS

*By seeking and blundering we learn.*

*− Goethe*

The Risk-Based Framework for Strategic Planning was developed with the aim to provide NATO and its member nations with a way to integrate risk management systematically and explicitly into the analytical support provided to strategic planning. The resulting framework uses the ISO 31000:2009 standard as the basis to describe the risk management processes. RBFSP provides a way for risk management to be integrated systematically into strategic planning processes to provide a way to verify that the analytical outputs are sound or at the very least to sensitise the analyst (and thus the planner) to the inherent risks in any given analytical product. This is because each technique used by the analyst to assist the planner carries some degree of risk with it, whether known to the analyst or not.

Through this guide (including the UK NRA case study) and companion case study report [44], we have illustrated how various nations think about risk and integrate risk management into their strategic planning processes. The six case studies, including one on the NATO Defence Planning Process, provide a window into this practice. It is recognised that not everyone has adopted ISO's view that risks are the effects of uncertainty on objectives. There is still much debate in the scientific community about the use of this risk definition [60]. However, the use of the ISO 31000:2009 standard as the basis for the RBFSP should not detract the analyst from the main purpose of this guide, which is to sensitise and encourage analysts to use risk thinking in their analytical work. The analyst needs to be conscious that her work has an effect on the strategic planning products and, therefore, she has a responsibility to ensure that these products are as sound as possible.

The analyst's role in learning is to help improve both the current instance of the strategic planning process (and the analytical support to it), and the overall strategic planning and risk management processes that are conducted to ensure "improved" future results. In practice, this may mean that the Monitor and Review phase may need to be split into two different risk management phases: one to support the current process (Monitor) and one to provide "Lessons Identified" that can inform future risk management instances (Review). Although there may be some learning during the monitoring of the risk management process, there should be a lot of learning from the iteration of the defence planning process, with the formal (explicit) review of the risk management process and of the planning process providing a transparent audit of how the analysis and planning has been conducted. This may be a key difference between strategic planning and project planning or management, and should be investigated in the future.

In addition, how to integrate risk management at operational and tactical levels of decision making should be investigated in more detail. For strategic planning in the defence context, we may have the luxury of having time to study issues carefully; however, this luxury likely does not exist at the operational and tactical levels. Understanding how to integrate systematically risk management at those levels, without affecting time critical decision making processes, would certainly be challenging since those planning levels are just as wicked problems as strategic planning is especially in the defence context.

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# Annex A – TECHNIQUES

Annex A catalogues a large number of techniques, appropriate to different parts of risk-based strategic planning. In this annex, we provide details of the components that make up the framework and the understanding of how the techniques relate to the various levels and parts of the framework. This set of techniques is not an exhaustive list; as such it should be adapted and augmented by the user (the analyst). Our intention was to develop a dynamic database of techniques to enable this work to be improved and easily exploited by analysts. The building of a complete and dynamic database is left as a future endeavour.

## A.1 RISK-BASED STRATEGIC PLANNING FRAMEWORK

Table A-1 (originally presented in Table 4-1 on page 4-4) shows how the risk management process, in our case ISO 31000:2009, and generic planning activities intersect to form the Risk-Based Strategic Planning Framework (described in Chapter 4), and shows the reference system used within this Annex to refer to each intersection.

**Table A-1: The RBFSP *Matrix* is the Product of Risk Management Phases (Matrix Rows) and Strategic Planning Steps (Matrix Columns).**

| Risk Management Process | Planning Activities | | | | |
|---|---|---|---|---|---|
| | Prepare Planning Process (P) | Support the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set Up Planning Instance (S) | Create the Plan (C) | Execute the Plan (E) | |
| 1. Communication and Consultation | 1P | 1S | 1C | 1E | 1L |
| 2. Establish Context | 2P | 2S | 2C | 2E | 2L |
| 3. Risk Identification | 3P | 3S | 3C | 3E | 3L |
| 4. Risk Analysis | 4P | 4S | 4C | 4E | 4L |
| 5. Risk Evaluation | 5P | 5S | 5C | 5E | 5L |
| 6. Risk Treatment | 6P | 6S | 6C | 6E | 6L |
| 7. Monitor and Review | 7P | 7S | 7C | 7E | 7L |

## A.2 RISK-BASED STRATEGIC PLANNING FRAMEWORK – INTERSECTION DESCRIPTIONS

This section of the report presents high level descriptions (see Table A-2) of the framework intersections outlined in Table 4-1 and Table A-1. A brief description of the activity(ies) at each stage of the Risk Management Process (left-hand column of Table A-2) across each of the five stages of the Analytic Support to Strategic Planning Process (top row of Table A-2) is offered in the intersection.

**Table A-2: High Level Description of Each RBFSP Matrix Intersection.**

| Risk Management Process | Planning Activities | | | | |
|---|---|---|---|---|---|
| | Prepare the Planning Process (P) | Support the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set Up Planning Instance (S) | Create the Plan (C) | Execute the Plan (E) | |
| **1. Communication and Consultation** | Decide the strategy of how the stakeholders could be engaged and consulted. | Initiate engagement with stakeholders, describing how the governance and communication of risks within the plan are to be shared. | Communicate and share the plan. | Communicate how and why execution differed from the most current plan. | Communicate and share the lessons identified. |
| **2. Establish Context** | Establishing the broad risk context during the preparation of the planning process. | Define specific assumptions about what the plan is supposed to do especially in relation to risk. | Produce (write) the plan's context(s) (e.g., in NDPP they establish the future security environment). | Verify that all assumptions/ context still hold (huge context changes may require jumping back to an earlier part of the process). | Identify how/what we need to learn from a changed context – should we set the context for risk management differently – adjust how we approach risk management. |
| **3. Risk Identification** | Set the strategy for how risks are found, recognised and recorded (e.g., what sources of information can be drawn upon, internal only, external, public consultation or specific publications?). | Confirmation of the approach to risk identification and adjustment to the specific planning instance; e.g., UK NRA develops risks from policy experts, then subject matter experts and then consultation with the practitioners (see Chapter 5). | Identify the risks – risk conscious planning. | Identify the potential changes in the validity of assumptions (no plan survives first contact with the enemy), no longer potential changes, but actual changes in elements of risk to be addressed; also conclusions, not just assumptions. Assessing impacts of "correct" conclusions, changing the way risk events are identified. | Identify what we learnt from the risk identification and management process (what did we learn about our expected risks?). Identify systematic process results. |

| Risk Management Process | Planning Activities | | | | |
|---|---|---|---|---|---|
| | Prepare the Planning Process (P) | Support the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set Up Planning Instance (S) | Create the Plan (C) | Execute the Plan (E) | |
| **4. Risk Analysis** | Set the strategy for how risks are characterised and analysed (e.g., see NDPP case study [44]). Policy may dictate. | Confirmation of the approach to how risks are analysed and adjusted to the specific planning instance. Determine metrics to be used for each risk event identified. | Analyse the risks by applying planned risk metrics to each identified risk event. Characterising the risks identified. | Analyse new/unforeseen risks and changes in existing risks. Need to monitor previously identified risks (already identified and newly defined risks). Review metrics for unchanged, changed and new risk events. Recognise and make needed changes to risk metric values. | Identify how we might re-design analysis to better analyse risks – were there other risks that were never identified? |
| **5. Risk Evaluation** | Set the strategy for how risks are compared and prioritised. | Confirmation of the approach to how risks are compared and prioritised and adjustment to the specific planning instance (e.g., severity, likelihood, etc.). | Prioritise the risks. Develop possible mitigation strategies. | Reprioritise risks as necessary. Adjust mitigations as necessary. | Identify/investigate how risk evaluation should be re-designed. How might we have better evaluated risks and developed mitigations? |
| **6. Risk Treatment** | Set the strategy for how to deal with risks (e.g., selecting the planning process such as Capability-Based Planning, NDPP, etc. followed by selecting techniques old and new [44]). | Select planning process to be used (if not already selected) and select the appropriate subset of approaches to treat/mitigate risks. | Develop the option(s) for how to treat/mitigate the risks and select option(s) to implement. | Set the strategy for how to deal with risks (e.g., selecting the planning process such as Capability-Based Planning, NDPP, etc. followed by selecting techniques old and new [44]). | Select planning process to be used (if not already selected) and select the appropriate subset of approaches to treat/mitigate risks. |
| **7. Monitor and Review** | Set the strategy for how the planning process could be monitored and reviewed and how to monitor and review risks. | Set the strategy for monitoring the progression of the plan and how to captured, integrate and learn transparently, throughout the process of planning and implementation of the plan. | Review the plan against the risk in order to implement. | Understand how and why what was executed differed from the original plan if it has. | Identify the lessons from the risks found in the planning process – checking against previously learnt lessons; also, assess utility of completed monitoring and review processes. |

## A.3 RBFSP ACTIVITIES (LEVEL B) DESCRIPTIONS

In this section, we present an annotated list of activities that can be used in support of the activities presented in Table A-2. In Table A-3, we provide a brief description of the activity and its proposed relationship to the RBFSP as presented in Table 4-1 and Table A-1. We remind the reader that this list is not meant to be exhaustive in that many other activities may be useful to support the RBFSP. This table is meant to serve as a starting point for analysts to identify activities that others have found useful for various purposes, not the final authority as to what should be done.

**Table A-3: Activities Within Each RBFSP Matrix Intersection.**

| Activity Reference | Activity | Description | Relationship to Framework |
|---|---|---|---|
| B1 | Identify the guidelines for the plan's communication | Identify the means for how the plan should be communicated. | 1P |
| B2 | Identify the guidelines of stakeholder engagement and consultation | Identify how the stakeholders should be engaged and consulted. | 1P |
| B3 | Identify the broad characteristics of the risks | This activity is about identifying the risk characteristics in relation to the objectives for the planning, including an understanding of the associated uncertainties and what is going to be measured (quantitatively or qualitatively). | 2P |
| B4 | Identify the risk policy | This activity is about identifying the organisation's policy or strategy towards risk. Is the organisation willing to take risks? e.g., high casualty levels versus a "precautionary" stance (i.e., having a very low tolerance for casualties). | 2P |
| B5 | Identify/analyse broad assumptions | Identifying the assumptions to provide clarity about what is initially assumed about the planning process. This record should not be the same at the end of the framework as it would be at the beginning because new assumptions will have been made and discovered throughout the planning process. | 2P |
| B6 | Identify stakeholders | Identify the range and type of stakeholders that are going to be invited to participate in the planning. This activity should explicitly include the identification of all decision makers, all of which are also stakeholders. For example, will it include public consultations, or is it limited to a specific set of interested external or purely internal stakeholders? This can be either defined by the information classification or a definer of the level of information classification. | 2P |
| B7 | Identify/analyse objectives of the planning process | Determine the objectives of the planning process. Is the objective of the planning to plan for interventions in which military force will be used, to plan the required force structure, to plan what science and technologies are to be adopted in the future, or to plan the levels of readiness required for forces? | 2P |

| Activity Reference | Activity | Description | Relationship to Framework |
|---|---|---|---|
| B8 | Identify the breadth of scope | This is about defining the broad scope of planning (e.g., the planning timeframe, whole of department versus airlift fleet, starting from scratch versus evolving current structure). | 2P |
| B9 | Assess the defence and security context | Assess the defence and security context which represents the bounds within which the planning will be done (could include short, medium and long future security environment analysis). | 2P |
| B10 | Enact lessons from previous planning cycles | Review and integrate the lessons from previous planning cycles. | 2P |
| B11 | Identify the guidelines for finding, recognising and recording risks | Setting the guidelines to identify risks in a systematic manner, enabling the systematic identification of risks through, for example, surveys and a risk register. Some questions that might be asked could be: what sources of information can be drawn upon, are they only internal, or external, and do they draw upon public consultation or specific publications? | 3P |
| B12 | Identify the guidelines for how risks are characterised and analysed | Since there are many different types of risks (see Chapter 2), it is valuable to understand and decide how to categorise the expected risks. e.g., in London, UK, the Thames Barrier surge (risk was identified but is not well understood). Many experts struggle to understand how risks are characterised and analysed. | 4P |
| B13 | Identify the guidelines for comparing and prioritising risks | Identify the appropriate tools and techniques needed to prioritise risks in a rational and systematic way. | 5P |
| B14 | Identify the guidelines for how to treat risks | Guidelines must be established to treat risks (i.e., take action based on the assessment of risks). This provides clarity and transparency. For example, what type of risk is: to be tolerated, treated to prevent crisis, treated through corrective controls, treated through directive controls, treated through detective controls, transferred, terminated and how are opportunities to be exploited? | 6P |
| B15 | Identify risk trade-off strategies | Selecting the risk trade-off strategies (depending on the number of identified risks) helps determine which risks to treat and in what order. For example, what are we trading off? When should we trade-off cost versus risk or select the cheapest option, the most robust option, or one optimised for the expected context? | 6P |
| B16 | Identify the planning processes that can be used | Examine the potential planning processes that can be used; e.g., Capability-Based Planning, Scenario-Based Planning, etc. | 6P |
| B17 | Identify the guidelines for monitoring and reviewing risks | Identify the strategy for how risks that are captured and integrated across the planning process will be monitored and reviewed. | 7P |

| Activity Reference | Activity | Description | Relationship to Framework |
|---|---|---|---|
| B18 | Identify the guidelines for monitoring and reviewing the planning process | Identify the guidelines for how the planning process will be monitored and reviewed. | 7P |
| B19 | Identify how learning lessons should be carried out | Determine how lessons learnt from the planning process and plan implementation will be identified, recorded and acted upon. For example, will there be a lessons register and who will maintain it? | 7P |
| B20 | Identify guidelines for providing traceability and knowledge management | Identify the guidelines to provide traceability and knowledge management throughout the risk management process. For example, ensure clear traceability and the logic between initial assumptions, risk assessment and risk treatment within the planning process. | 7P |
| B21 | Identify guidelines for risk communication and governance | Devise the guidelines of how the risks within the plan will be governed and communicated. | 1S |
| B22 | Initiate engagement and consultation with the selected stakeholders | Initiate engagement and consultation with the selected stakeholders, as well as decision makers in order to establish their engagement first in the planning process, and second (to some extent) in the analysis process supporting the strategic planning. | 1S |
| B23 | Identify the objectives of the planning instance | Identify all objectives of the planning instance, whether explicit or implicit, that will inform the entire planning process and risk management; e.g., what is the plan to achieve? | 2S |
| B24 | Identify the risk tolerance | Identify the risk tolerance of the decision makers; e.g., Will the decision maker accept 100 possible casualties? | 2S |
| B25 | Identify the specific scope and context | Identify the specific scope and context for the planning instance (e.g., planning time horizon, plan duration, geography, operation posture types). | 2S |
| B26 | Assess the planning context | Assess the context of the specific planning instance; that is, analyse the context of the planning instance to provide the internal and external contexts to stakeholders (i.e., what the initial conditions are and sphere of influence for the planning instance?). | 2S |
| B27 | Identify assumptions for the planning instance | Identify assumptions for the specific planning instance being examined. For example, Canada will have a force of up to a given number of military personnel to carry out the strategic plan under consideration. | 2S |
| B28 | Identify specific stakeholders | Identify specific stakeholders from the initial group of stakeholders. This activity also includes narrowing down the list of decision makers to the critical ones for this planning instance. | 2S |

| Activity Reference | Activity | Description | Relationship to Framework |
|---|---|---|---|
| B29 | Adapting the lessons from previous planning cycles | Examine, adapt and implement the lessons from previous planning cycles (where appropriate). These could be previous cycles of the same planning process or other relevant (related) planning processes. | 2S |
| B30 | Select the approach to risk identification | Based on an analysis of available techniques, select and confirm the risk identification approach. Adjust the technique(s) to the specific planning instance, e.g., UK NRA could develop risks from policy experts, then Subject Matter Experts and then from consultation with practitioners. | 3S |
| B31 | Select the risk analysis approach | Based on an analysis of available techniques, select and confirm the approach to how risks are analysed and adjusted for the specific planning instance. | 4S |
| B32 | Select the risk comparison approach | Based on an analysis of available techniques, select and confirm the approach to how risks are compared and prioritised. Adapt the techniques to the specific planning instance. | 5S |
| B33 | Select the risk treatment and mitigation approach | Based on an analysis of available techniques, select and confirm the approach to how risks are treated and mitigation is to be applied, providing adjustment to the specific planning instance. | 6S |
| B34 | Select the type of planning process | Based on an analysis of available and relevant planning processes, select the planning process to be used, e.g., Capability-Based Planning, Scenario Planning, etc. This activity would only be needed if the planning process has not been prescribed by national policy. | 6S |
| B35 | Select the process for capturing and integrating new risks | Based on an analysis of available processes for capturing and integrating new risks, select and confirm how new risks will be captured and integrated across the planning process, and how they could be monitored and reviewed. | 7S |
| B36 | Identify the guidelines for monitoring and reviewing the planning process | Guidelines for how the planning process could be monitored and reviewed are identified. This activity decides how some of the data in the risk management process will be collected and how it may be analysed (i.e., different techniques might be examined). | 7S |
| B37 | Identify how lessons will be learnt from the planning process | Based on an analysis of available and relevant techniques, select how lessons from the planning (specifically create and implement the plan steps) will be identified and learnt. This activity is about analysing the identified lessons (B35), and creating the first part of the feedback loop that leads to specific revisions of the planning process (but also the risk management process). | 7S |
| B38 | Select the guidelines for traceability and knowledge management | Select and confirm the guidelines to provide traceability and knowledge management throughout the strategic planning process. One of the ways risk can be mitigated within strategic planning is to ensure that all decisions taken during the planning are traceable. | 7S |

| Activity Reference | Activity | Description | Relationship to Framework |
|---|---|---|---|
| B39 | Finalise the plans analysis and check coherency | The plan is checked for analytical coherency and completeness prior to finalising and documenting the appropriate reports. For example, the finalised plan should have been checked to ensure traceability, analytical rigour, assumptions and an associated risk register with all the risks that were identified before and during plan creation. | 1C |
| B40 | Sharing of plan | The plan is shared with all relevant stakeholders to elicit feedback. This can take on different forms: written reports or briefings, or it can take the form of more active approaches such as simulations, wargame demonstrations and rehearsals too. | 1C |
| B41 | Assess and develop the planning context(s) | Produce (write) the plan's context(s), e.g., in NDPP the future security environment is analysed. For example, this activity makes use of national military strategy documents (e.g., Strategic Defence and Security Review of the United Kingdom, and national defence and security policy documents (e.g., Canada First Defence Strategy, White Papers). | 2C |
| B42 | Identify the risks | Risk identification refers to the systematic and comprehensive process of determining the potential risk sources, risk causes, risk triggers, areas of impact, events and chains of events, consequences, their interdependencies, their relationships with the objectives including the effects, and how all these might be perceived by stakeholders. | 3C |
| B43 | Analyse the risks | Develop an understanding of each risk's relevance to the organisation's objectives leading to an estimate of the level of risk within the established context. Examine the interrelationships between risks, and interrelationships between risks and objectives. | 4C |
| B44 | Compare the risks against the risk criteria | Comparing the identified and analysed risks against the risk criteria, as part of risk evaluation. | 5C |
| B45 | Prioritise the risks | Risk evaluation also concerns prioritising the identified and analysed risks – likely a trade-off between different criteria or between the differing risks – balancing the risk thermostat, to generate an initial priority ordering for the treatment. | 5C |
| B46 | Develop risk treatment options | Risk treatment options concern implementing risk controls in order to retain or modify risks. These options can include updating existing controls or introducing new ones. The most common options change the risk (e.g., either the likelihood, or the consequences, or both); other options include risk avoidance, risk exploitation, risk source removal, risk sharing or risk retention. | 6C |
| B47 | Identify the balance point (sweet-spot) between the different options | During plan creation, a critical activity concerns identifying acceptable trade-offs between the various risk treatment options by some predefined criteria (examined in intersection 6P), and selecting the option to implement. | 6C |

| Activity Reference | Activity | Description | Relationship to Framework |
|---|---|---|---|
| B47 (cont'd) | | This trade-off activity strikes a balance between derived benefits from the risk treatment and the cost and effort of implementation. It should consider the viewpoints of the stakeholders (especially decision makers) and the potential of new risks that can be brought about by the treatment itself. | |
| B48 | Implement risk tracking | The process of risk management is documented to ensure traceability of all activities, and to track all risks over the course of the planning process. A risk register should be maintained; containing the information gathered throughout the entire risk management process about all identified risks. | 7C |
| B49 | Identify deviations in the risk | Risk criteria should enable an organisation to detect emerging risks and ensure that controls are effective and efficient in design and operation. Monitoring and review should provide an ongoing assessment of progress in implementing the treatment plan and of the performance of the entire process of managing risks. An important risk monitoring activity concerns identifying at what point (i.e., threshold point) we need to reassess the risks under consideration. | 7C |
| B50 | Test the plan | The analyst could be involved in some form of testing the created plan. This testing can take on different forms such as red teaming, or providing a challenge function (e.g., in terms of analysis-based review using tools like simulation). Testing the plan helps ensure that the analysis that went into the planning process meets an acceptable level of scientific rigour. This activity is very closely linked with activity B51. | 7C |
| B51 | Internal review of plan | The plan should be internally reviewed by the analysts supporting the military planners to ensure traceability and analytical rigour. This review can be as simple as reviewing the various reports and analytical results that support the planning process or more complicated involving a suite of tools (e.g., simulation) to test the plan. This activity is very closely linked with activity B50. | 7C |
| B52 | Communicate the success of plan's delivery | Develop and deliver communication tools to let stakeholders and decision makers know that the plan has been delivered as expected. Communication should address how well the implementation fits or adheres to the planned path. | 1E |
| B53 | Communicate plan's success | Develop and deliver communication tools that let stakeholders and clients know the extent to which the plan has met the objectives originally set as measured by the original evaluation/assessment tools included in the plan. | 1E |
| B54 | Identify any change in the context | In this activity, the analyst must examine and determine if the context has changed; e.g., the scope, assumptions, etc. This activity is linked to activities in intersection 7C and with activity B55. | 2E |
| B55 | Verify all assumptions | The analyst must verify that all assumptions made in the plan still hold and are respected, and that risks have, therefore, not changed. This activity is closely linked to B54. | 2E |

| Activity Reference | Activity | Description | Relationship to Framework |
|---|---|---|---|
| B56 | Identify new risks | Based on the revised context and plan implementation, emergent risks need to be identified in a similar fashion to risk identification carried out in activity B42. | 3E |
| B57 | Identify changes to existing risks | Based on the revised context and plan implementation, the analyst needs to identify how existing (i.e., previously identified) risks have changed as the plan has been implemented and risks have or have not been realised. | 3E |
| B58 | Analyse new risks | Based on the revised context and plan implementation, the analyst needs to analyse the new (unforeseen) risks. The same techniques apply as to activity B42. | 4E |
| B59 | Analyse changes to existing risks | Based on the revised context and plan implementation, the analyst needs to analyse changes to existing risks (i.e., did the consequence, likelihood or impact severity change because of new information obtained when implementing the plan). | 4E |
| B60 | Compare new and changed risks | Based on the revised context and plan implementation, the analyst compares the new and changed risks against the risk criteria developed earlier in the risk management process. This activity is similar to activity B43. | 5E |
| B61 | Reprioritise the updated risks | Based on the revised context and plan implementation, the analyst needs to reprioritise the updated list of risks as necessary. | 5E |
| B62 | Generate treatments for updated risks | Based on the revised context and plan implementation, the analyst needs to devise treatments for new and changed risks. | 6E |
| B63 | Treat the updated risks | Based on the revised context and plan implementation, the analyst (with the support of the planner) needs to treat the updated risks. | 6E |
| B64 | Apply alternative treatment options | Based on having encountered new or changed risks, the analyst potentially needs to apply alternate treatment options such as contingency plans. | 6E |
| B65 | Record and understand how risk context changes affected the planning | In this activity, the analyst needs to consider and record how changes in the risk context affected the planning (e.g., scope, assumptions). If the risk context changed, then identify and record where those changes occurred and how the plan is affected (i.e., identifying the initial assumptions made, and what changes were made as a result – the re-analysed, re-evaluated and re-treated risks). | 7E |
| B66 | Verify and record the validity of changes in assumptions | Assess how all assumptions have changed from earlier stages (i.e. what still holds true and what does not), and identify and record the necessary corrections made to the planning for those that changed. | 7E |
| B67 | Track the risks | Track the risks using the risk register against the previously developed metrics (B35 and B46), for deviations. | 7E |
| B68 | Flag deviations | Assess and evaluate the tracked risks against the criteria developed earlier and flag deviations (return to (B67)). | 7E |

| Activity Reference | Activity | Description | Relationship to Framework |
| --- | --- | --- | --- |
| B68 (cont'd) | | If there are deviations (either reducing or increasing the risk), then risks need to be re-examined and their future impact re-assessed. | |
| B69 | Communicate (share) the lessons learnt | Communicate/share the lessons learnt and advertise the existence of and means of access to the lessons library. Ensure the stakeholders and clients have access to the lessons learnt and the assessment of the impact of the lessons learnt (activities B76-78) to ensure that any future decisions are well-informed. | 1L |
| B70 | Review the planning | If the original context has changed, assess the impact of these changes on the planning objectives and on the techniques to determine whether the plan is still appropriate given the new context. | 2L |
| B71 | Identify how to learn | Assess the planning process and resultant plan to identify areas of learning that could be useful for future iterations of the current planning process or that may have higher-order (more general) learning utility in other planning exercises. | 2L |
| B72 | Identify lessons and observations | Assess and evaluate the completed planning process to identify what went well and what went poorly and try to discern why things went well/poorly. These are the lessons/observations we want to record for future use. | 3L |
| B73 | Assess the importance of each lesson | Compare the different lessons and understand comparative importance of each of the lessons. Areas of interest to this analysis could include: return on investment, impact on outcomes, impact on cost of planning, impact on implementation of the plan, impact on broader acceptance of the plan, etc. | 4L |
| B74 | Identify what can be learnt from the planning process | Taking a more abstract view of the process and the identified lessons (e.g., activities B74-76), assess what general lessons the analyst can learn from the lessons identified and how they might be useful to future planning instances. | 5L |
| B75 | Learn from lessons identified | Assess how we can learn from the identified lessons. The analyst needs to think about how to integrate the lessons from this planning process instance in the next instance. | 6L |
| B76 | Record the lessons | Record best practices. The analyst should develop a "lessons library" that will be available to future instantiations of this and other planning processes. This record should be keyword indexed and reviewed by other planners, analysts, Other Government Departments, and potentially planners/analysts in partner countries. | 7L |
| B77 | Implement lessons | Identify methods to implement and develop processes for implementing the key lessons (where practical) and record this information in the "lessons library." | 7L |

## A.4 RBFSP ACTIVITIES (LEVEL B) MAPPED ONTO THE FRAMEWORK

In this section of the report, we present a mapping (shown in Table A-4) of the activities presented in Table A-3 to the intersections of the RBFSP presented in Table A-2. Again, this is not meant to be carved in stone; rather, it is meant to facilitate the use of the techniques by analysts in support of strategic planning processes.

**Table A-4: Activities Within Each RBFSP Matrix Intersection.**

| Risk Management Process | Planning Activities | | | | |
|---|---|---|---|---|---|
| | Prepare the Planning Process (P) | Support the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set Up Planning Instance (S) | Create the Plan (C) | Execute the Plan (E) | |
| **1. Communication and Consultation** | B1, B2 | B21, B22 | B39, B40 | B52, B53 | B69 |
| **2. Establish Context** | B3, B4, B5, B6, B7, B8, B9, B10 | B23, B24, B25, B26, B27, B28, B29 | B41 | B54, B55 | B70, B71 |
| **3. Risk identification** | B11 | B30 | B42 | B56, B57 | B72 |
| **4. Risk Analysis** | B12 | B31 | B43 | B58, B59 | B73 |
| **5. Risk Evaluation** | B13 | B32 | B44, B45 | B60, B61 | B74 |
| **6. Risk Treatment** | B14, B15, B16 | B33, B33 | B46, B47 | B62, B63, B64 | B75 |
| **7. Monitor and Review** | B17, B18, B19, B20 | B35, B36, B37, B38 | B48, B49, B50, B51 | B65, B66, B67, B68 | B76, B77 |

## A.5 RBFSP TECHNIQUES (LEVEL C) DESCRIPTIONS

This Annex presents a list of techniques that can be used in support of the activities detailed in Table A-2, Table A-3 and Table A-4. The techniques have been categorised by several attributes that are selected to help analysts decide appropriate techniques to support their particular planning instance. The categorisation attributes are presented in Table A-5, while the list of techniques and references are presented in Table A-6.

**Table A-5: Categorisation Key.**

| Category | Categorisation Attributes | Notes |
|---|---|---|
| **Uncertainty Type** | • Systemic (Aleatoric)<br>• Cognitive (Epistemic or Linguistic)<br>• Systemic and Cognitive | See Chapter 2 for details |
| **Overarching Technique Category** | • Business information systems (e.g., GIS)<br>• Business Tools<br>• Clustering/Classification<br>• Analysis models and data forecasting; e.g., Holt Winters, Exponential smoothing<br>• Heuristics<br>• Models used to identify the most suitable or optimal variable meeting assessment criteria<br>• Network Theory<br>• Operations Research | Based on ISO 31010 [43] |

| Category | Categorisation Attributes | Notes |
|---|---|---|
| **Overarching Technique Category (cont'd)** | • Other such as Economic / Legal Analysis<br>• Psychology<br>• Qualitative Research<br>• Reductionism<br>• Systems Thinking<br>• Wargames and Simulations | |
| **Techniques Specialism** | • Cause-Effect Analysis<br>• Classification<br>• Clustering<br>• Critical Systems Thinking<br>• Decision Support Tools<br>• Gap Analysis<br>• Management Sciences<br>• Multi-Methodology<br>• Performance Analysis<br>• Planning<br>• Qualitative Data Collection from Groups<br>• Qualitative Data Collection from Individuals<br>• Risk Management<br>• Simulations<br>• Soft OR/Problem Structuring<br>• Synthesising/Ranking/Outranking<br>• Trade-off Analysis<br>• Trend Analysis<br>• Visualisation<br>• Wargames | |

The techniques listed in Table A-6 are not meant to be exhaustive, but rather suggestive of techniques that the analyst may find useful at various intersections of the RBFSP. There are many additional techniques sources that can be used; for example, the ISO 31010 Risk Management − Risk assessment techniques [43], the NATO's Human Environment Analysis Reasoning Tool (HEART) [130] and the NRC-CNRC Risk Assessment and Communication Literature Survey [75].

**Table A-6: Sampling of Techniques Referenced in RBFSP.**

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 01. | Adaptive Pathways | The Adaptive Pathways technique provides information about pathways that link hazards, impacts, vulnerabilities, and management actions. This provides a more adaptive approach to implementing plans – like the approach advocated by von Moltke. | Cognitive | Business Tools | Risk Management | [121] |
| 02. | Affinity Charting | Affinity diagrams or charts are a form of Thematic Analysis (see separate entry in this Table), providing a systematic means to group or cluster and structure qualitative data and come up with a consensus view on a subject. Alternatively they can be used simply as an aid to stimulate debate. | Systemic | Clustering/ Classification | Visualisation | [131, 132] |
| 03. | Analytical Hierarchy Process | AHP is based on the assumption that when faced with a complex decision the natural human reaction is to cluster the decision elements according to their common characteristics. It is especially suitable for complex decisions which involve the comparison of decision elements which are difficult to quantify. | Cognitive | Qualitative Research | Synthesising/ Ranking/ Outranking | [133] |
| 04. | Architecture Framework Analysis | Architecture Framework Analysis uses or develops architectures to help consider the aspects of a certain business, domain or area. They provide a structured checklist used to explore and analyse the theme appropriately and systematically. For example, in the UK MoD, the operations can be understood using TEPIDOIL(I) and within NATO using DOTMLPFI (Doctrine, Organisation, Training, Materiel, Leadership and education, Personnel, Facilities, and Interoperability). | Systemic | Clustering/ Classification | Classification | [241] |
| 05. | ASSIMPLER | ASSIMPLER is a Framework is an enterprise architecture framework, based on the work of Mandar Vanarse at Wipro in 2002, and can be applied to business services or processes. | Systemic | Clustering/ Classification | Clustering | [134, p. 156] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| **05.** | ASSIMPLER (cont'd) | ASSIMPLER is an acronym for Availability, Scalability, Security, Interoperability, Maintainability, Performance, Low cost of ownership, Extendibility and Reliability. | | | | |
| **06.** | Balance of Investment | Balance of Investment (BoI) is an Operational Analysis technique which is a type of Trade-off analysis, except the key focus in BoI is on the resultant cost (optimisation). | Systemic | Operations Research / Optimisation | Performance Analysis | [135] |
| **07.** | Bayesian statistics and Bayes Nets | Bayesian statistics is a branch of statistics in which the evidence about the true state of the world is expressed in terms of 'degrees of belief' called Bayesian probabilities.<br>A Bayesian network, or Bayes network, is a probabilistic graphical model for displaying Bayes analysis. | Systemic | Operations Research / Statistics | Cause-Effect Analysis | [136] |
| **08.** | Benchmarking | This 10-step structured process is a way of looking outside a process or organisation to identify, analyse, and adopt the best practices in the industry or function. | Cognitive | Business Tools | Performance Analysis | [137] |
| **09.** | Boundary Critique / Critical Systems Heuristics (CSH) | CSH is a framework for reflective practice based on practical philosophy and systems thinking. | Systemic | Systems Thinking | Critical Systems Thinking | [138] |
| **010.** | Brainstorming | The term "brainstorming" is often used very loosely to mean any type of group discussion. However true brainstorming involves particular techniques to try to ensure that people's imagination is triggered by the thoughts and statements of others in the group. It is used by teams and departments when: determining possible causes and/or solutions to problems; planning out the steps of a project; and deciding which problem (or opportunity) to work on. Brainstorming involves stimulating and encouraging free-flowing conversation amongst a group of knowledgeable people to identify potential failure modes and associated hazards, risks, criteria for decisions and/or options for treatment. | Cognitive | Qualitative Research | Qualitative Data Collection from Groups | [140] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 010. | Brainstorming (cont'd) | Effective facilitation is important in this technique and includes stimulation of the discussion at kick-off, periodic prompting of the group into other relevant areas and capture of the issues arising from the discussion (which is usually quite lively). Some have criticised the technique [139]. | | | | |
| 011. | Capability-Based Planning | Capability-Based Planning "involves a functional analysis of expected future operations. The future operations themselves do not enter the evaluations. The outcome of such planning is not concrete weapons systems and manning levels, but a description of the tasks force structure units should be able to perform expressed in capability terms. Once the capability inventory is defined, the most cost-effective and efficient physical force unit options to implement these capabilities are derived" [9]. | Systemic/ Cognitive | Operations Research / Planning Type | Soft OR/ Problem Structuring | [9, 97, 141, 142] |
| 012. | CapDiM | The Capability Discussion Matrix (CapDiM) tool was developed in Canada to support strategic senior level decision-making by providing a readily accessible two-dimensional plot of variables of interest to decision makers that allows scalable comparisons across multiple ratings respecting initially set conditions (i.e., no individual rating can out-do a group rating, etc.). | Systemic/ Cognitive | Operations Research / Multi-Criteria Decision Analysis | Soft OR/ Problem Structuring | [143, 144] |
| 013. | Cause and Effect Diagram or Cause Consequence Analysis (CCA) | This approach can help determine which risks have the most potential impact, where cause and effect can be determined.<br>It can also identify where effects can have a number of contributory factors, which may be grouped into different categories. These contributory factors are often identified through brainstorming techniques and can be displayed in a tree structure or fishbone diagram. This visualisation can be helpful in allowing others to understand the thinking behind the risk identification. | Systemic | Operations Research | Cause-Effect Analysis | [110, 145] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 014. | Change Analysis | Change Analysis is used to systematically investigate possible risks and to identify the appropriate risk management strategies and measures in changing situations. | Systemic | Operations Research | Risk Management | [146, 147] |
| 015. | Checklists | A technique that develops a detailed aide-memoire for the identification of potential risks by the listing of typical uncertainties which need to be considered. They can be developed from historical information and knowledge that have been accumulated from previous similar projects; or refer to a previously developed list, codes or standards. This technique is used for the collection of quantitative or qualitative repetitive data. | Systemic | Qualitative Research | Qualitative Data Collection from Individuals | [79] |
| 016. | Computational Red Teaming | An architecture representing the integration of computational intelligence techniques and multi-agent systems for understanding competition. | Systemic | Operations Research | Simulation | [148, 149] |
| 017. | Conflict Analysis | Conflict analysis assists in the identification of components of a system that have conflicting interests. Related techniques include the matrix method shown in the Importance / Performance Matrix (042), Force field analysis (034) and matrices (045). | Systemic | Operations Research | Cause-Effect Analysis | [150] |
| 018. | Consensus Building Methods | Tools to help build consensus among planners and decision makers (and maybe analysts) such as Canada's MARCUS. | Cognitive | Qualitative Research | Qualitative Data Collection from Individuals | [151, 152] |
| 019. | Critical Path Analysis or Method (CPA or CPM) | CPA or CPM is a network map of a project, tracing the essential components of work from a departure point to the final completion objective. | Systemic | Business Tools | Management | [153] |
| 020. | Data Collection via Workshop | Holding structured workshops with subject matter experts to collect data. The workshop setting provides an opportunity for the subject matter experts to interact and debate various parameters of interest to the planning process. | Cognitive | Qualitative Research | Qualitative Data Collection from Groups | [154] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 021. | Data Confidence Assessment | An example of a Data Confidence Assessment technique is the Italian Flag. The Italian Flag method is a simple evidence-based tool for eliciting information about a planning process where we lack knowledge/evidence. Knowing what we do not know can be very helpful in planning. This follows from the assertion that strategic surprises arise from a lack of knowledge or the inability to perceive the consequences of what is known. | Cognitive | Clustering/ Classification | Visualisation | [129] |
| 022. | Decision Tree | A decision tree represents decision alternatives and outcomes in a sequential manner which takes account of uncertain outcomes. It is similar to an event tree in that it starts from an initiating event or an initial decision and models different pathways and outcomes as a result of events that may occur and different decisions that may be made. Usually structured using a tree diagram that describes a situation and the implications of each of the available choices and possible scenarios. It can incorporate the cost of each available choice, the probabilities of each possible scenario, and the rewards of each logical path. The decision tree can be used as a model simply to explain the complexity inherent in planning, prediction and strategic thought. | Cognitive | Operations Research | Decision Support Tools | [155] |
| 023. | Delphi Method | The Delphi method is used to elicit information and judgements from participants to facilitate problem solving, planning, and aiding decision-making. A facilitator uses a questionnaire to solicit ideas about the important project risk sand the experts participate anonymously. | Systemic | Qualitative Research | Qualitative Data Collection from Individuals | [80, 81] |
| 024. | Discrete Event Simulation | A Discrete Event Simulation (DES) is a model developed to simulate military operations at a high degree of fidelity (i.e., many real-world rules for engaging in tasks or missions can be devised). DES is an extremely computer- and data-intensive methodology. | Systemic | Wargames and Simulations | Simulations | [156, 157, 158]. |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 025. | Drama Theory | Drama theory is a problem structuring method of operations research. It is based on game theory and adapts the use of games to complex organisational situations, accounting for emotional responses that can provoke irrational reactions and lead the players to redefine the rules of the game. In drama theory, emotions trigger rationalisations that create changes in the game, and so change follows change until either all conflicts are resolved or action becomes necessary. The game as redefined is then played. | Cognitive | Operations Research | Soft OR/ Problem Structuring | [159, 160] |
| 026. | Environmental Risk Assessment | Environmental Risk Assessment examines risks due to contamination of the environment using quantitative methods. The risk assessment methods can incorporate political, social and economic considerations when determining remediation solutions. | Systemic | Operations Research | Cause-Effect Analysis | [161] |
| 027. | Evolutionary Reconfiguration Processes | This process involves the identification of changes in technology, practices, regulation, industrial networks (supply, production, and distribution), infrastructure, and symbolic meaning or culture; and how this they can be structured and captured. | Cognitive | Operations Research | Cause-Effect Analysis | [162] |
| 028. | Failure Mode Effect Analysis | Failure Mode and Effects Analysis (FMEA) is a methodology for evaluating a system, design, process or service for possible ways that it can fail. | Systemic | Operations Research | Cause-Effect Analysis | [163] |
| 029. | Fault Tree Analysis | Fault tree analysis is a technique for performing a safety evaluation of complex systems. It starts from a particular event, and identifies all the possible event sequences giving rise to it. These sequences can be displayed graphically in a logical tree diagram. Once the fault tree has been developed, the ways of reducing or eliminating potential causes / sources are considered. | Systemic | Operations Research | Cause-Effect Analysis | [164] |
| 030. | Finite Capacity Scheduling | Finite capacity scheduling is a process analysis method that takes capacity into account from the very outset. The schedule is based on the capacity available; e.g., discrete event simulation. | Systemic | Business Tools | Performance Analysis | [165, 166] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| **(a)** | (b) | (c) | **(d)** | **(e)** | **(f)** | **(g)** |
| **031.** | Flexibility Framework | The flexibility framework allows managers to delineate each of the types of flexibility with which they may be concerned, in an unambiguous manner, so that more fruitful discussions can take place and more focused action plans be developed. | Systemic | Operations Research | Soft OR/ Problem Structuring | [167] |
| **032.** | Flow Charts | Pictures, symbols or text coupled with lines or arrows showing direction of flow. Enables modelling of processes, identification of problems/opportunities and decision points, etc. Used to develop a common understanding of a process by those involved. | Systemic | Clustering/ Classification | Visualisation | [168] |
| **033.** | FN (Frequency Number) Curves | FN curves are a graphical representation of the probability of events causing a specified level of harm to a specified population. Most often they refer to the frequency of a given number of casualties occurring. FN curves show the cumulative frequency (F) at which N or more members of the population will be affected. High values of N that may occur with a high frequency (F) are of significant interest because they may be socially and politically unacceptable. | Systemic | Clustering/ Classification | Visualisation | [169] |
| **034.** | Force Field Analysis | Force field analysis is a diagnostic technique for identifying, analysing and organising psychological, social, and other forces maintaining a current condition and planning change to improve the situation. Widely used in change management, they can also be used to help understand most change processes in organisations. | Systemic | Operations Research | Cause-Effect Analysis | [170, 171] |
| **035.** | Force Structure Computation | Force structure computation models are used to determine the optimal number of each asset type that should be acquired in order to fulfil a given set of scenario requirements or demands; whereas, fleet mix models, for example, usually use considered asset specifications, required scenarios to be carried out by those assets, and the conditions under which the assets should operate. | Systemic | Operations Research | Optimisation | [157, 172] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 035. | Force Structure Computation (cont'd) | Force structure computation models also tend to be low fidelity approaches, utilising approximation methods or surrogate models to the problem so as to be computationally efficient to produce optimal force structure solutions within an optimisation framework. The models output one or more force structures which can then be evaluated using simulation models with more complex rules in order to assess the force structures' validity before the results are presented to a decision maker. | | | | |
| 036. | Force Structure Evaluation | Force structure evaluation models are typically focused on the performance assessment of a particular combination of assets, often modelling to a moderate or high degree of fidelity (i.e., how closely the model represents the rules used in the processes that are modelled) the asset specifications, required military missions to be carried out by those assets, and the conditions under which the assets should operate. The primary outputs are detailed risk assessments associated with scenarios that cannot be completed by the force structure and the capability deficiencies of the force structure. | Systemic | Operations Research | Simulation and Optimisation | [157, 172] |
| 037. | Functional Analysis | A decision making approach where a problem is broken down into its component functions (accounting, marketing, manufacturing, etc.). These functions are further divided into sub-functions and sub-sub-functions until the functional level suitable for solving the problem is reached. | Systemic | Reductionism | Trade-Off Analysis | [173] |
| 038. | Game Theory | The study of competition between human actors, generally at the strategic level. | Cognitive | Reductionism | Trade-Off Analysis | [174, 175] |
| 039. | Hazard Analysis and Critical Control Points (HACCP) | Hazard analysis and critical control point (HACCP) provides a structure for identifying hazards and putting controls in place at all relevant parts of a process to protect against the hazards and to maintain the quality, reliability and safety of a product. HACCP aims to ensure that risks are minimised. | Systemic | Qualitative Research | Cause-Effect Analysis | [176] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 039. | Hazard Analysis and Critical Control Points (HACCP) (cont'd) | It is a systematic, proactive, and preventive system for assuring product quality, reliability and safety of processes by measuring and monitoring specific characteristics of a process that are required to be within defined limits. | | | | |
| 040. | Hazard and Operability Studies (HAZOP) | HAZOP is a hazard identification technique that uses a structured and systematic team review of a system or process to identify possible deviations from normal operations and their causes and consequences. It uses a standard list of guidewords (e.g., "more," "less," "no") combined with process conditions to systematically consider all the possible deviations from the normal conditions. For each deviation, possible causes and consequences are identified as well as whether additional safeguards should be recommended. A general process of risk identification to define possible deviations from the expected or intended performance. It uses a guideword based system. The criticalities of the deviations are also assessed. | Systemic | Qualitative Research | Cause-Effect Analysis | [82, 83, 84] |
| 041. | Historical (Case Study) Analysis | A method that seeks to make sense of the past through the disciplined and systematic analysis of the 'traces' it leaves behind. Such traces may be of many different kinds, ranging from everyday ephemera, artefacts and visual images, to old buildings, archaeological sites or entire landscapes. The most widely used historical traces, however, are written documents, whether of public or private origin. Historical analysis is commonly used in social research as an introductory strategy for establishing a context or background against which a substantive contemporary study may be set. | Cognitive | Qualitative Research | Cause-Effect Analysis | [177] |
| 042. | Importance / Performance Matrix | A crucial stage in the formulation of operations strategy is the derivation of a ranked (or rated) list of competitive factors such as quality, flexibility, cost, etc. | Systemic/ Cognitive | Qualitative Research | Synthesising/ Ranking/ Outranking | [178] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 042. | Importance / Performance Matrix (cont'd) | This list is used either to infer an appropriate set of strategic operations decisions or, in conjunction with an independently derived list of the organisation's performance to prioritise each of the competitive factors. | | | | |
| 043. | Large Group Interaction Methods | Large Group Interaction Methods are techniques used to structure the way groups interactions (e.g., workshops) are designed to elicit desired qualitative information. Includes techniques such as: Real-Time Strategic Change, Search Conferences, Future Searches, Strategic Options Development and Analysis (SODA), Strategic Choice, Technology of Participation, and Open Space Technology. | Cognitive | Qualitative Research | Qualitative Data Collection from Groups | [27] |
| 044. | Likelihood and Impact Analysis | This technique uses (multi-disciplinary) subject matter expert judgement to establish as objectively as possible an assessment of likelihood and impact for identified risks, in circumstances where accurate information does not exist or is impossible to obtain economically, or inputs to conventional assessments (e.g., by committee or face to face) are so subjective that they risk drowning out individuals' critical judgements. An example of a tool for this is the Delphi method, although it should be used to capture the distribution of results too, not just the consensus or mode. A Chemical Biological Radiological example was discussed in Chapter 2 [73]. | Cognitive | Qualitative Research | Qualitative Data Collection from Groups | [179] |
| 045. | Matrices | Matrices can be used in numerous ways to record, organise, manipulate and visualise information. See specifically the: 2 x 2 matrix, Importance /Performance matrix, From/To chart, Criteria Rating form, Analytical Hierarchy Process, two-by-two (2 x 2) matrix, Importance /Performance matrix, From/To chart, Criteria Rating form, Analytical Hierarchy Process. For example, the 2 x 2 matrix is a useful tool for initial sorting of qualitative data. | Cognitive | Clustering/ Classification | Visualisation | [180] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| **(a)** | (b) | (c) | **(d)** | **(e)** | **(f)** | **(g)** |
| **045.** | Matrices (cont'd) | Generally, the 2 x 2 matrix is a useful tool for categorising things that can be reduced to two simple variables, especially when quantitative information is unavailable and qualitative judgements must be made. It enables a rapid clustering (or separating) of information into four categories. It is particularly useful with groups as a way of visibly plotting out a common understanding or agreement of a subject. | | | | |
| **046.** | Metagame Analysis | Metagame Analysis provides a frame through which problems can be viewed as strategic games that pit participants against each other in trying to achieve their objectives using various options given to them. Post-game meta-analysis of decision points and choices provides strategies and outcome insights. | Systemic/ Cognitive | Heuristics | Multi-Methodology | [181] |
| **047.** | Mind and Concept Mapping | These are a form of displaying stakeholder views and structured information in a format (qualitative map) for learning and knowledge. Concept maps, mind maps, conceptual diagrams, and visual metaphors are grouped together under this heading. | Cognitive | Clustering/ Classification | Visualisation | [182] |
| **048.** | Modern Portfolio Theory | Portfolio Optimisation models, like the Pierson-Markowitz model, are multi-objective (Pareto-based) models used for portfolio analysis. A common approach is to optimise for both expected profits from a portfolio of investments and the level of risk (usually the variance in the expected return) in those investments. A critique of modern portfolio theory is offered by Taleb [6]. | Systemic | Operations Research / Portfolio Optimisation | Simulation | [183] |
| **049.** | Monte Carlo | A type of mathematical simulation that randomly and continuously generates values for uncertain variables to simulate the performance of a stochastic model. | Systemic | Wargames and Simulations | Simulations | [86] |
| **050.** | Morphological Analysis | General Morphological analysis (GMA) is a method for structuring and investigating the total set of relationships contained in multi-dimensional, non-quantifiable, problem complexes. | Cognitive | Operations Research | Soft OR/ Problem Structuring | [30, 184] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 050. | Morphological Analysis (cont'd) | It was originally developed by Fritz Zwicky, the Swiss astrophysicist and aerospace scientist based at the California Institute of Technology. | | | | |
| 051. | Multi-Criteria Decision Analysis | MCDA is a decision analysis and support tool employed to mathematically evaluate options through the use of a range of specific criteria and weights. | Cognitive | Operations Research / Multi-Criteria Decision Analysis (MCDA) | Synthesising/ Ranking/ Outranking | [185, 186, 187] |
| 052. | Nominal Group Techniques | Similar to Brainstorming but is structured by allowing individuals to brainstorm on their own first, present (without interruption) to group, and then discuss. | Cognitive | Qualitative Research | Qualitative Data Collection from Groups | [188] |
| 053. | Outranking Methods | Outranking methods (e.g., ELECTRE) are a component of MCDA. These methods are used to compare criteria in MCDA. They can be used to discard some unacceptable alternatives to the problem, early on after which another MCDA method can select the best one. This method helps reduce the set of alternatives for use in the second iteration, saving much time. | Systemic | Operations Research / Multi-Criteria Decision Analysis (MCDA). | Synthesising/ Ranking/ Outranking | [189] |
| 054. | Performance Metrics and Indicators | Performance metrics and indicators are used to assess organisational performance against standard or benchmarks and can be either internally or externally referenced, depending on the usage. | Systemic | Operations Research | Performance Analysis | [190] |
| 055. | PESTLE | PESTLE Analysis is a type of Thematic Framework enabling structured thinking or thematic Analysis Political, environmental, social, technological, legal and economic factors. | Systemic/ Cognitive | Clustering/ Classification | Classification | [191] |
| 056. | Policy Analysis | A typical form of the economic analysis of Law. | Cognitive | Other: Economic/ Legal Analysis | Soft OR/ Problem Structuring | [192] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| **(a)** | (b) | (c) | **(d)** | **(e)** | **(f)** | **(g)** |
| **057.** | Programme Evaluation and Review Technique (PERT) | PERT is very similar to CPM (Critical Path Method) except that every activity in a PERT network also has a variance associated with its completion time. | Systemic | Business Tools | Management | [115, 193] |
| **058.** | Quality Framework | Quality Framework consists of eight critical dimensions or categories of quality that can serve as a framework for strategic analysis: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. | Cognitive | Operations Research | Soft OR/ Problem Structuring | [194] |
| **059.** | Quality Function Deployment | Quality Function Deployment is a method used to identify critical customer attributes and to create a specific link between customer attributes and design parameters. Matrices are used to organise information to help marketers and design engineers answer three primary questions: What attributes are critical to our customers? What design parameters are important in driving those customer attributes? What should the design parameter targets be for the new design? | Systemic/ Cognitive | Operations Research | Soft OR/ Problem Structuring | [195] |
| **060.** | Red Teaming | A red team is a team formed with the objective of subjecting an organisation's plans, programmes, ideas and assumptions to rigorous analysis and challenge. It performs a challenge function, probing the "blue team" solution for weaknesses or vulnerabilities. | Cognitive | Operations Research | Wargames | [196] |
| **061.** | Risk Analysis Tools | These tools aid the identification and assessment of risk.<br>ISO 31000:2009 provides a selection of risk assessment techniques. | Cognitive | Business Tools | Risk Management | [43, 197] |
| **062.** | Risk Categorisation Approaches | Risks are not all the same in nature; therefore, it can be valuable to categorise them into differing types. For example, if a risk is not identified and characterised as "normal," it requires expert knowledge; e.g., Thames Barrier surge; or the risk could be if a risk is identified but not well understood; or most (including experts) struggle to understand the risk. | Systemic | Operations Research | Risk Management | [89, 198, 199, 200] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 063. | Robustness Analysis | Robustness analysis provides an approach to the structuring of problem situations in which uncertainty is high, and where decisions can or must be staged sequentially. The specific focus of robustness analysis is on how the distinction between decisions and plans can be exploited to maintain flexibility. | Cognitive | Operations Research | Decision Support Tools | [19, 38, 100, 101, 121, 201] |
| 064. | Root Cause Analysis | Root Cause Analysis addresses a single loss that has occurred. This loss is thoroughly analysed in order to understand contributory causes and how the system or process can be improved to avoid such future losses. The analysis shall consider what controls were in place at the time the loss occurred and how controls might be improved. | Systemic/ Cognitive | Operations Research | Cause-Effect Analysis | [202] |
| 065. | Scenario Development | Process of generating scenarios that deal with real world problems and the exploration of wider issues to identify capability gaps. | Cognitive | Operations Research | Soft OR/ Problem Structuring | [203] |
| 066. | Scenario Techniques – Intuitive Logics | Intuitive Logics is a scenario planning approach that uses (usually) the two drivers of highest uncertainty to develop a set of plausible futures/events. It enables subject matter experts to describe a chain of causation events corresponding to different sets of future outcomes. It is claimed that the key advantage of Intuitive Logics over forecasting is how it enables the stakeholders' consideration of challenging futures because it is based on event plausibility rather than event probability or event projection. | Cognitive | Operations Research | Soft OR/ Problem Structuring | [204, 205, 206, 207] |
| 067. | Sensitivity Analysis | Sensitivity Analysis helps to determine which risks have the most potential impact on a project. Sensitivity analysis is useful in consideration of the consequences of using faulty data in, say, forecasting costs/cash flows. It involves speculation on alternative scenarios and estimating the accuracy of data, e.g., Optimistic estimate – Pessimistic estimate – most likely estimate. | Systemic | Operations Research | Statistics | [208] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| **(a)** | (b) | (c) | **(d)** | **(e)** | **(f)** | **(g)** |
| **068.** | Sneak Circuit Analysis | A methodology for identifying design errors. A sneak condition is a latent hardware, software, or integrated condition that may cause an unwanted event to occur or may inhibit a desired event and is not caused by component failure. These conditions are characterised by their random nature and ability to escape detection during the most rigorous of standardised system tests. Sneak conditions can cause improper operation, loss of system availability, program delays, or even death or injury to personnel. | Systemic | Systems Thinking | Cause-Effect Analysis | [209] |
| **069.** | Social Network Analysis (SNA) | SNA is the methodical analysis of social networks. Social network analysis views social relationships in terms of network theory. | Systemic | Network Theory | Soft OR/ Problem Structuring | [210] |
| **070.** | Stakeholder Analysis | Stakeholder Analysis (SA) is a methodology used to facilitate institutional and policy reform processes by accounting for and often incorporating the needs of those who have a 'stake' or an interest in the reforms under consideration. With information on stakeholders, their interests, and their capacity to oppose reform, reform advocates can choose how to best accommodate them, thus assuring policies adopted are politically realistic and sustainable. Stakeholder Analysis originated from the business sciences. It has evolved into a field that now incorporates economics, political science, game and decision theory, and environmental sciences. Current models of SA apply a variety of tools on both qualitative and quantitative data. Stakeholder Management is an important discipline that successful people use to win support from others. It helps them ensure that their projects succeed where others fail. | Systemic | Operations Research | Soft OR/ Problem Structuring | [211] |
| **071.** | Stakeholder Involvement | Stakeholder Involvement is the process for recording how stakeholders contribute to the planning process being conducted. This usually uses a Stakeholder Involvement Record, which records the stakeholders that are involved, and how they are involved i.e., their influence and the assistance that they provide. | Systemic | Operations Research | Soft OR/ Problem Structuring | [27, 212] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| **(a)** | (b) | (c) | **(d)** | **(e)** | **(f)** | **(g)** |
| **072.** | Strategic Assessment Model | The Strategic Assessment Model decomposes a strategic problem into clearly defined components in which all alternatives, factors, weights, and probabilities are depicted. Next, objective information and subjective judgements of experts are integrated by utilising several methods of problem structuring and information processing. | Cognitive | Operations Research | Soft OR/ Problem Structuring | [27] |
| **073.** | Strategic Assumptions Surfacing and Testing | Strategic Assumptions Surfacing and Testing is a process which reveals the underlying assumptions of a policy or plan and helps create a map for exploring them. | Cognitive | Operations Research | Soft OR/ Problem Structuring | [27] |
| **074.** | Strategic Choice Approach | The Strategic Choice Approach is used in face to face workshops of a decision making group. Strategic choice is viewed as an ongoing process in which the planned management of uncertainty plays a crucial role. | Cognitive | Operations Research | Soft OR/ Problem Structuring | [27] |
| **075.** | Strengths, Weaknesses, Opportunities, and Threats (SWOT) | SWOT analysis provides a good framework for reviewing strategies, positions and business directions of a company or an idea. | Cognitive | Clustering/ Classification | Clustering | [213, 214] |
| **076.** | Stress Testing | Stress testing can be used to identify how robust a defence structure is in order to handle various types of scenarios, including wild card scenarios that span the space of potential (known and unknown) challenges. | Systemic | Wargames and Simulations | Simulations | [215] |
| **077.** | Structured Interviews | It can be difficult to obtain accurate stakeholder information. Some data may be available publicly (e.g., via Janes); however, it may be necessary to carry out one's own set of interviews. A structured interview (also known as a standardised interview or a researcher-administered survey) is a commonly used survey methodology. This method tries to ensure that each interview is conducted exactly the same way in all cases (using the same questions and in the same order). | Systemic | Qualitative Research | Qualitative Data Collection from Individuals | [95, 216, 217, 218] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 077. | Structured Interviews (cont'd) | One of the reasons for doing this is to permit the analyst to easily aggregate responses for comparison purposes. Interviews could be analysed using the Framework Method [216]. | | | | |
| 078. | Subject Matter Expert Surveys | Structured questionnaire to obtain input from subject matter experts or to assess public consensus on particular planning situations. | Systemic/ Cognitive | Qualitative Research | Qualitative Data Collection from Individuals | |
| 079. | Thematic Analysis | Thematic analysis is the grouping or clustering of qualitative data using some form of themed structure. It aids in the identification of patterns and trends, and the development of a consensus view on a subject. It can also be used simply as an aid to stimulate debate. | Systemic | Clustering/ Classification | Classification | [219, 220] |
| 080. | Trade-off Models | The conventional trade-off model states that unless there is some slack in the system, improving any one of the four basic manufacturing capabilities - Quality, Dependability, Speed and Cost - must necessarily be at the expense of one or more of the other three. The picture often used is of a balance or a see-saw. There is an alternative to disturbing the balance and that is to raise the fulcrum or balance point, thus (in the example above) simultaneously reducing cost and increasing speed. In this example, the fulcrum would be either Quality or Dependability. The Sand Cone model, which is related to trade-off models, suggests that although in the short term it is possible to trade off capabilities one against the other, there is actually a hierarchy amongst the four capabilities. There are similar trade-offs necessary in defence planning. | Cognitive | Systems Thinking | Critical Systems Thinking | [117, 157, 172, 221] |
| 081. | Trend Analysis | An aspect of technical analysis that tries to predict the future movement of events or qualities based on past data. Trend analysis is based on the idea that what has happened in the past gives analysts an idea of what is likely to happen in the future. | Cognitive | Qualitative Research | Qualitative Data Collection from Groups | [222] |

| Ref. | Technique Name | Description | Uncertainty Type | Overarching Technique Category | Techniques Specialism | Source (Ref. #) |
|---|---|---|---|---|---|---|
| (a) | (b) | (c) | (d) | (e) | (f) | (g) |
| 081. | Trend Analysis (cont'd) | Trend analysis means looking at how a potential driver of change has developed over time, and how it is likely to develop in the future. Rational analysis of development patterns provides a far more reliable basis for speculation and prediction than reliance on mere intuition. Several trends can be combined to picture a possible future for the sector of interest, such as schooling. Trend analysis does not predict what the future will look like; it becomes a powerful tool for strategic planning by creating plausible, detailed pictures of what the future might look like, and provides a basis for testing the viability of various scenarios. | | | | |
| 082. | Using Near Miss Data | This is about the collection of data about near-misses rather than just crises. The data for crises is rare and sporadic, whereas the data for near misses is much richer but usually ignored. Collecting near-miss data can provide a great reduction in the uncertainty. | Systemic | Operations Research | Performance Analysis | [223, 224, 225] |
| 083. | Wargaming | A scenario based interactive event. It is a type of simulation game, generally about tactical combat. | Cognitive | Wargames and Simulations | Wargames | [226] |

## A.6 RBFSP TECHNIQUES (LEVEL C) MAPPED ONTO THE FRAMEWORK

This section of the report presents, in Table A-7, a mapping of the techniques to the RBFSP (as displayed in Table 4-1 and Table A-1). This table shows an example of techniques to use at each intersection of the Risk Management Process steps with the Analytical Support to Strategic Planning steps. This listing is not meant to be exhaustive, but rather suggestive of techniques that the analyst may find useful at various intersections of the RBFSP.

**Table A-7: Mapping Techniques to the Framework.**

| Risk Management Process | Planning Activities | | | | |
|---|---|---|---|---|---|
| | Prepare the Planning Process (P) | Supporting the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set Up Planning Instance (S) | Create the Plan (C) | Execute the Plan (E) | |
| **1. Communication and Consultation** | 002, 004, 009, 032, 037, 045, 047, 055, 065, 066, 070, 071, 072, 073, 074, 079, ( B1, B2 ) | 043, 059, 070, 071, 072, 073, 074 ( B21, B22 ) | 012, 059, 065, 066 ( B39, B40 ) | 054, 057, 059 ( B52, B53 ) | 014, 054, 060, 083 ( B69 ) |
| **2. Establish Context** | 002, 004, 007, 008, 009, 010, 014, 018, 020, 027, 032, 037, 041, 043, 045, 047, 050, 051, 052, 053, 055, 056, 058, 065, 066, 070, 071, 072, 073, 074, 075, 077, 078, 079, 081 ( B3, B4, B5, B6, B7, B8, B9, B10 ) | 009, 010, 018, 020, 022, 026, 027, 028, 029, 037, 041, 043, 050, 051, 052, 053, 055, 056, 059, 061, 065, 066, 069, 070, 071, 072, 073, 074, 075, 081 ( B23, B24, B25, B26, B27, B28, B29 ) | 002, 004, 005, 009, 010, 012, 018, 020, 022, 027, 029, 032, 043, 045, 047, 050, 052, 055, 056, 061, 064, 065, 066, 070, 072, 073, 074, 079, 081 ( B41 ) | 001, 002, 004, 006, 009, 011, 018, 032, 045, 047, 055, 061, 070, 072, 073, 074, 079 ( B54, B55 ) | 001, 002, 004, 032, 045, 047, 054, 055, 072, 073, 074, 075, 079, 082 ( B70, B71 ) |
| **3. Risk identification** | 002, 004, 010, 013, 014, 015, 017, 018, 019, 020, 022, 032, 041, 045, 047, 050, 052, 055, 065, 066, 072, 073, 074, 075, 079 ( B11 ) | 010, 013, 014, 015, 017, 018, 019, 020, 022, 026, 028, 029, 037, 043, 050, 052, 060, 061, 069, 072, 073, 074, 075, 077, 078, 082 ( B30 ) | 002, 004, 005, 007, 010, 012, 013, 014, 015, 017, 018, 019, 020, 021, 022, 024, 029, 030, 032, 035, 036, 038, 039, 040, 043, 045, 047, 048, 050, 051, 052, 054, 055, 057, 060, 061, 062, 063, 064, 068, 072, 073, 074, 078, 079, 080, 083 ( B42 ) | 001, 007, 011, 013, 014, 015, 016, 017, 019, 022, 024, 029, 030, 036, 040, 054, 057, 060, 061, 063, 078, 079, 080, 083 ( B56, B57 ) | 013, 014, 015, 017, 054, 082 ( B72 ) |

| Risk Management Process | Planning Activities | | | | |
|---|---|---|---|---|---|
| | Prepare the Planning Process (P) | Supporting the Strategic Planning Process | | | Learn Lessons (L) |
| | | Set Up Planning Instance (S) | Create the Plan (C) | Execute the Plan (E) | |
| **4. Risk Analysis** | 010, 014, 015, 017, 018, 020, 052, 060, 061, 062, 075<br>( B12 ) | 003, 007, 010, 013, 014, 017, 018, 020, 022, 029, 039, 040, 043, 052, 060, 061, 062, 064, 067, 075, 076, 077, 078<br>( B31 ) | 003, 007, 010, 011, 012, 013, 014, 017, 018, 020, 021, 022, 023, 024, 029, 030, 035, 036, 038, 039, 043, 044, 048, 050, 051, 052, 054, 057, 060, 062, 063, 064, 067, 076, 078, 080, 083<br>( B43 ) | 007, 014, 016, 017, 024, 030, 036, 054, 057, 060, 062, 063, 067, 076<br>( B58, B59 ) | 002, 004, 014, 017, 032, 045, 047, 055, 058, 062, 072, 073, 074, 075, 079, 082<br>( B73 ) |
| **5. Risk Evaluation** | 010, 014, 015, 017, 018, 020, 052, 075<br>( B13 ) | 003, 010, 014, 017, 018, 020, 021, 022, 029, 033, 034, 039, 040, 043, 051, 052, 053, 061, 067, 075, 076<br>( B32 ) | 001, 002, 003, 004, 005,007, 010, 011, 012, 014, 017, 018, 020, 021, 022, 023, 024, 029, 030, 032, 033, 034, 035, 036, 038, 039,043, 044, 045, 047, 048, 049,051, 052, 053, 054, 055, 057,060, 061, 062, 063, 064, 067, 072, 073, 074, 075, 076, 078, 079, 080, 083<br>( B44, B45 ) | 005, 006, 007, 014, 016, 017, 021, 024, 030, 033, 036, 054, 057, 060, 061, 063, 067, 075, 076<br>( B60, B61 ) | 002, 004, 008, 014, 017, 032, 045, 047, 055, 072, 073, 074, 075, 079, 082<br>(B74) |
| **6. Risk Treatment** | 002, 004, 008, 012, 015, 024, 032, 037, 042, 045, 047, 055, 071, 072, 073, 074, 075, 079, 080,<br>( B14, B15, B16 ) | 003, 006, 030, 031, 034, 039, 040, 042, 051, 053, 055, 080<br>( B33, B34 ) | 001, 003, 006, 011, 021, 024, 025, 030, 031, 033, 034, 036, 038, 048, 049, 051, 053, 054, 057, 60, 063, 064, 078, 080, 083<br>( B46, B47 ) | 001, 005, 025, 038, 060, 063, 075, 080<br>( B62, B63, B64 ) | 082<br>( B75 ) |
| **7. Monitor and Review** | 002, 004, 032, 037, 042, 047, 054, 072, 073, 074, 075, 079<br>( B17, B18, B19, B20 ) | 015, 016, 021, 024, 034, 036, 042, 046, 048, 049, 058, 060, 075, 077, 078, 083<br>( B35, B36, B37, B38 ) | 001, 049, 054, 058<br>( B48, B49, B50, B51 ) | 001, 014, 054, 057, 060, 076, 083<br>( B65, B66, B67, B68 ) | 054, 058, 082<br>( B76, B77 ) |

## A.7 RBFSP TECHNIQUES GUIDE'S (LEVEL C) MAPPING OF TECHNIQUES TO RBFSP ACTIVITIES

Figure A-1 presents a visualisation of the mapping of the techniques to the RBFSP (as displayed in Table A-7). Additionally, it more clearly shows the relationship between techniques that perform similar functions within the RBFSP Activities. This table, therefore, helps identify the groups of techniques that support RBFSP activities and where an individual technique is most appropriately applied (as assessed by the authors). This listing is not meant to be exhaustive, but rather suggestive of what techniques (and groups of techniques) could be used by the analyst at various parts of the RBFSP.

**Figure A-1: RBFSP Techniques (Level C) Mapping to RBFSP Activities.**

## A.8 RBFSP TECHNIQUES GUIDE'S (LEVEL C) MAPPING OF INTER-TECHNIQUE RELATIONSHIPS

Figure A-2 presents a visualisation that maps the inter-relationships between the different techniques in the RBFSP (listed in Table A-6). The figure is designed to assist in identifying techniques that perform in similar or related way. The relationships identified were based on the authors' assessment and is not meant to be exhaustive, but rather suggestive of how techniques relate to each other.

| Technique Name | ID | 001–083 | ID | Technique Name |
|---|---|---|---|---|
| Adaptive Pathways | 001 | [illegible] | 001 | Adaptive Pathways |
| Affinity Charting | 002 | [illegible] | 002 | Affinity Charting |
| Analytical Hierarchy Process | 003 | [illegible] | 003 | Analytical Hierarchy Process |
| Architecture Framework Analysis | 004 | [illegible] | 004 | Architecture Framework Analysis |
| ASSIMPLER | 005 | [illegible] | 005 | ASSIMPLER |
| Balance of Investment | 006 | [illegible] | 006 | balance of investment |
| Bayesian statistics and Bayes Nets | 007 | [illegible] | 007 | Bayesian statistics and Bayes Nets |
| Benchmarking | 008 | [illegible] | 008 | Benchmarking |
| Boundary Critique / Critical Systems Heuristics (CSH) | 009 | [illegible] | 009 | Boundary Critique / Critical Systems Heuristics (CSH) |
| Brainstorming | 010 | [illegible] | 010 | Brainstorming |
| Capability-Based Planning | 011 | [illegible] | 011 | capability based planning |
| Cap dim, decision tool | 012 | [illegible] | 012 | Cap dim, decision tool |
| Cause Consequence Analysis (CCA) | 013 | [illegible] | 013 | Cause and effect diagram or Cause Consequence Analysis (CCA) |
| Change Analysis (ChA) | 014 | [illegible] | 014 | Change Analysis (ChA) |
| Check-lists | 015 | [illegible] | 015 | Check-lists |
| Computational Red Teaming | 016 | [illegible] | 016 | Computational Red Teaming |
| Conflict Analysis | 017 | [illegible] | 017 | Conflict Analysis |
| Consensus Building Methods | 018 | [illegible] | 018 | Consensus Building Methods |
| Critical Path Analysis (CPA, CPM) | 019 | [illegible] | 019 | Critical Path Analysis (CPA, CPM) |
| Data collection via workshop | 020 | [illegible] | 020 | Data collection via workshop |
| Data Confidence Assessment (e.g. Italian Flag) | 021 | [illegible] | 021 | Data Confidence Assessment (e.g. Italian Flag) |
| Decision tree | 022 | [illegible] | 022 | Decision tree |
| Delphi method | 023 | [illegible] | 023 | Delphi method |
| Discrete Event Simulation | 024 | [illegible] | 024 | Discrete Event Simulation |
| Drama Theory | 025 | [illegible] | 025 | Drama Theory |
| Environmental risk assessment | 026 | [illegible] | 026 | Environmental risk assessment |
| Evolutionary reconfiguration processes | 027 | [illegible] | 027 | Evolutionary reconfiguration processes |
| Failure mode effect analysis | 028 | [illegible] | 028 | Failure mode effect analysis |
| Fault tree analysis | 029 | [illegible] | 029 | Fault tree analysis |
| Finite Capacity Scheduling | 030 | [illegible] | 030 | Finite Capacity Scheduling |
| Flexibility Framework | 031 | [illegible] | 031 | Flexibility Framework |
| Flow Charts | 032 | [illegible] | 032 | Flow Charts |
| FN curves | 033 | [illegible] | 033 | FN curves |
| Force Field Analysis | 034 | [illegible] | 034 | Force Field Analysis |
| Force Structure Computation | 035 | [illegible] | 035 | Force Structure Computation |
| Force Structure Evaluation | 036 | [illegible] | 036 | Force Structure Evaluation |
| Functional Analysis | 037 | [illegible] | 037 | Functional Analysis |
| Game Theory | 038 | [illegible] | 038 | Game Theory |
| Hazard Analysis and Critical Control Points (HACCP) | 039 | [illegible] | 039 | Hazard Analysis and Critical Control Points (HACCP) |
| Hazard and operability studies (HAZOP) | 040 | [illegible] | 040 | Hazard and operability studies (HAZOP) |
| Historical (case study) analysis | 041 | [illegible] | 041 | Historical (case study) analysis |
| Importance / Performance Matrix | 042 | [illegible] | 042 | Importance / Performance Matrix |
| Large Group Interaction Methods | 043 | [illegible] | 043 | Large Group Interaction Methods |
| Likelihood and impact analysis | 044 | [illegible] | 044 | Likelihood and impact analysis |
| Matrices | 045 | [illegible] | 045 | Matrices |
| Metagame Analysis | 046 | [illegible] | 046 | Metagame Analysis |
| Mind and Concept Mapping | 047 | [illegible] | 047 | Mind and Concept Mapping |
| Modern Portfolio Theory | 048 | [illegible] | 048 | Modern Portfolio Theory |
| Monte Carlo | 049 | [illegible] | 049 | Monte Carlo |
| Morphological analysis | 050 | [illegible] | 050 | Morphological analysis |
| Multi Criteria Decision Analysis and Support (MCDA) | 051 | [illegible] | 051 | Multi Criteria Decision Analysis and Support (MCDA) |
| Nominal Group Techniques | 052 | [illegible] | 052 | Nominal Group Techniques |
| Outranking methods | 053 | [illegible] | 053 | Outranking methods |
| Performance Metrics and Indicators | 054 | [illegible] | 054 | Performance Metrics and Indicators |
| PESTLE | 055 | [illegible] | 055 | PESTLE |
| Policy Analysis | 056 | [illegible] | 056 | Policy Analysis |
| Programme Evaluation and Review Technique (PERT) | 057 | [illegible] | 057 | Programme Evaluation and Review Technique (PERT) |
| Quality Framework | 058 | [illegible] | 058 | Quality Framework |
| Quality Function Deployment (QFD) | 059 | [illegible] | 059 | Quality Function Deployment (QFD) |
| red teaming | 060 | [illegible] | 060 | red teaming |
| Risk Analysis Tools | 061 | [illegible] | 061 | Risk Analysis Tools |
| Risk Categorization Approaches | 062 | [illegible] | 062 | Risk Categorization Approaches |
| Robust analysis | 063 | [illegible] | 063 | Robust analysis |
| Root cause analysis | 064 | [illegible] | 064 | Root cause analysis |
| Scenario Development | 065 | [illegible] | 065 | Scenario Development |
| Scenario techniques - Intuitive Logics | 066 | [illegible] | 066 | Scenario techniques - Intuitive Logics |
| Sensitivity analysis | 067 | [illegible] | 067 | Sensitivity analysis |
| Sneak circuit analysis | 068 | [illegible] | 068 | Sneak circuit analysis |
| Social Network Analysis (SNA) | 069 | [illegible] | 069 | Social Network Analysis (SNA) |
| stakeholder analysis | 070 | [illegible] | 070 | stakeholder analysis |
| Stakeholders involvement | 071 | [illegible] | 071 | Stakeholders involvement |
| Strategic Assessment Model | 072 | [illegible] | 072 | Strategic Assessment Model |
| Strategic Assumptions Surfacing and Testing | 073 | [illegible] | 073 | Strategic Assumptions Surfacing and Testing |
| Strategic Choice Approach | 074 | [illegible] | 074 | Strategic Choice Approach |
| Strengths,Weaknesses, Opportunities, and Threats (SWOT) | 075 | [illegible] | 075 | Strengths,Weaknesses, Opportunities, and Threats (SWOT) |
| Stress testing | 076 | [illegible] | 076 | Stress testing |
| Structured interviews | 077 | [illegible] | 077 | Structured interviews |
| Subject Matter Expert Surveys | 078 | [illegible] | 078 | Subject Matter Expert Surveys |
| Thematic analysis | 079 | [illegible] | 079 | Thematic analysis |
| Trade-off models Analysis | 080 | [illegible] | 080 | Trade-off models Analysis |
| Trends analysis | 081 | [illegible] | 081 | Trends analysis |
| Using near-miss data | 082 | [illegible] | 082 | using near-miss data |
| Wargaming | 083 | [illegible] | 083 | Wargaming |

**Figure A-2: RBFSP Techniques Inter-Technique Relationship Guide.**

# Annex B – TERMS OF REFERENCE

## I. ORIGIN

### A. Background

Risk refers to the effect of uncertainty on objectives. It is commonly expressed as the likelihood and impact of an event with the potential to affect the achievement of an organisation's objectives; however, there are variations in the definition, interpretation and perception of risk especially in defence. Risk-based planning may allow us then to take into account the variations (both negative and positive) from an expected outcome in future plans. In general, it supports value creation by enabling especially highest level managers (but really all levels) to deal effectively with potential future events, and to respond to them. Thus, risk is integral to everything humans do and specifically when planning future actions. There are many ways of categorising risk but the key is to distinguish inputs from outcomes at various levels.

Risk-based planning is required for defence purposes due to the increased complexity of the security environment, global pace of change, growing transparency and accountability (results in external pressures for assured results), continuous institutional change, and interdependence of capabilities, nations and organisations. From this complexity many risks emerge that have a multifaceted nature (e.g., perception, communication, impact). Thus, a portfolio view[1] is needed given that all risks put together are more than just the sum of all the individual risks. In defence departments, risk analysis could be integrated more explicitly and systematically at every stage of the defence planning process to ensure the capability development remains in context.

Risk-based planning should enable risk-informed management decisions regarding the mission, key objectives and the reputation of an organisation. It should also integrate risks from across functional areas to indicate the degree of uncertainty associated with key departmental objectives. Risk-based planning should be something that everyone is involved in, not just the risk factory. It should be process light, helping focus management attention on key issues.

Within the context of strategic or long-term planning, Enterprise Risk Management[2] (ERM) is an existing framework for risk management, which typically involves identifying particular events or circumstances relevant to the organisation's objectives (risks and opportunities), assessing them in terms of likelihood and magnitude of impact, determining a response strategy, and monitoring progress. ERM-based methodologies could be used initially to assess its utility to risk-based planning in the defence context.

There are many practical considerations when trying to implement risk management within organisational processes such as risk ownership (knowing who has authority to act and manage), risk perception (especially risk tolerance of decision-makers), risk communications (important with respect to processes), and risk mitigation strategies (related to the concept of a learning organisation). However, the key to success is simple application of sound principles to a complex endeavour.

Thus, risk-based planning should be a key enabler to decision-making, should be integrated across domains at all levels of an organisation and must become an integral part of doing business.

[1] The guide does not develop a portfolio view of risk. Each nation is free to use techniques within risk management to develop a portfolio view of the risks affecting their strategic planning processes.

[2] The focus of the guide is the integration of risk management processes within a given strategic planning process. Therefore, since the guide does not specifically look at enterprise risk, the guide will not focus on ERM.

### B. Justification (Relevance for NATO)

The security environment is becoming more complex and uncertain for NATO member countries. There is a need to improve the integration of risk-based planning throughout the various planning stages. This activity would allow member nations to share methodology in a systematic and formal manner. It would enable NATO (and member nations) to develop a joint framework for the integration of risk-based planning into its processes.

## II. OBJECTIVES

1) The area of research to be undertaken and the scope of the activity:

   Development of a risk-based framework for strategic or long term defence planning of NATO, providing a format for individual NATO countries to integrate with.

2) The specific goals of the task group's activity and the topics to be covered:
   a) Adapting ISO standards on risk management to the defence context;
   b) Sharing risk management and decision making methods that can contribute to objective[3] (e.g., in Canada CapDiM and, MARCUS; in Norway J-DARTS);
   c) Developing jointly subjective/contextual/soft methods for risk assessment (to help integrate the qualitative with the quantitative);
   d) Developing a risk-based framework for strategic or long term defence planning of NATO, providing a format for individual NATO countries to integrate with;
   e) Applying the risk-based framework to a NATO or a member nation case study; and
   f) Organising a specialist conference on risk-based planning in September 2011, in part to review the team's approach.

## III. RESOURCES

### A. Membership

Chair: Dr. Slawomir WESOLKOWSKI, Canada

Vice-Chair: Dr. Gunn Alice BIRKEMO, Norway

Lead Nation: Canada

Nations and Bodies really participating: NATO Allied Command Transformation, Australia, Canada, Norway, Poland, Portugal, United Kingdom

### B. National and/or NATO Resources Needed

Expertise: Scientists should be working in long-term/strategic planning and quantitative risk management areas specifically for defence purposes. In addition, technical expertise in the following areas would be useful: risk assessments, statistics, operations research and analysis, optimisation, fuzzy logic and any other relevant fields. Experience in the following qualitative domains would be helpful:[4] risk management, strategic analysis, systems thinking, and psychology.

[3] For example, Canada has decision support models called CapDiM and MARCUS, and Norway has a model called J-DARTS; other nations may have equivalents that could be understood and shared.

[4] This list should also include management science.

Task group manpower requirements:

- 1 month/person/year;
- 2 meetings/year in person; and
- 2 virtual meetings/year and more as needed.

Contributing nations should be prepared to offer case study data on risk management.

Also, a venue for the peer review conference (Specialists' Meeting format) is needed.

### C. STO/CSO Resources Needed

C&E funding and possibly TER and keynote speaker funding for the peer review conference.

Publication support and use of the NATO Collaboration Support Office meeting facilities once per year.

## IV. SECURITY CLASSIFICATION LEVEL

The security level will be NATO RESTRICTED.[5]

## V. PARTICIPATION BY PARTNER NATIONS

Sweden, Switzerland and Austria invited.

See Membership.

## VI. LIAISON

Seeking involvement of the International Monetary Fund/World Bank due to their extensive experience in risk-based approaches in finance.

[5] To allow broad circulation of ideas the security level was modified to unclassified, public release, for the main guide and NATO UNCLASSIFIED for the case study companion report [44].

## REPORT DOCUMENTATION PAGE

| 1. Recipient's Reference | 2. Originator's References | 3. Further Reference | 4. Security Classification of Document |
|---|---|---|---|
| | STO- TR-SAS-093-Part-I<br>AC/323(SAS-093)TP/774 | ISBN<br>978-92-837-2102-4 | PUBLIC RELEASE |

| | |
|---|---|
| **5. Originator** | Science and Technology Organization<br>North Atlantic Treaty Organization<br>BP 25, F-92201 Neuilly-sur-Seine Cedex, France |
| **6. Title** | Analysis Support Guide for Risk-Based Strategic Planning |
| **7. Presented at/Sponsored by** | Designing the Risk-Based Framework for Strategic Planning to support NATO and national defence planning processes. |

| **8. Author(s)/Editor(s)** | **9. Date** |
|---|---|
| Multiple | March 2018 |

| **10. Author's/Editor's Address** | **11. Pages** |
|---|---|
| Multiple | 156 |

| | |
|---|---|
| **12. Distribution Statement** | There are no restrictions on the distribution of this document. Information about the availability of this and other STO unclassified publications is given on the back cover. |

**13. Keywords/Descriptors**

| | | |
|---|---|---|
| Analytical support | NATO Defence Planning Process | Risk-based planning |
| Analytical support to strategic planning | NATO outline model | Risk management |
| Case studies | Objectives | Strategic planning |
| Defence planning | Risk | UK National Risk Assessment |
| Long term defence planning | Risk analysis | Uncertainty |

**14. Abstract**

Every strategic (long term) plan is saturated with risk, defined as the effect of uncertainty on objectives. How can we, as defence analysts, improve current analytical support to planning processes to help create flexible and adaptable plans so that our forces prevail in future conflicts? We propose integrating risk management practices within strategic defence planning for NATO and member nations, providing a framework for how risk management (as defined in ISO 31000:2009) can be systematically integrated into defence planning processes.

The framework provides a methodology that applies risk management to the analytical support of strategic planning. We illustrate the framework's use with an example using the United Kingdom's National Risk Assessment. A second report describes various other examples of how risk could be managed including risk management in the NATO Defence Planning Process. Systematically and explicitly integrating risk management within the strategic planning processes should increase robustness to risks, producing more readily adaptable plans. The framework is intended for defence analysts involved in strategic defence planning at NATO and in NATO nations. We hope that this framework will facilitate the systematic integration of risk management practices throughout strategic planning, improving both the processes themselves and the resulting plans.

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**GRECE (Correspondant)**
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ISBN 978-92-837-2102-4