FORESIGHT

A GLOSSARY

CSF

Civil Service College Singapore

FORESIGHT: A GLOSSARY

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CONTENTS

INTRODUCTION

Welcome to the Singapore Public Service's futures community!

In the course of your work, you may encounter terms and concepts that may be unfamiliar to you. We have prepared this glossary as a guide to some of the common terms used by our foresight practitioners. Each entry provides a definition and overview of a concept or term, along with resources providing further information.

This glossary is not intended to be comprehensive. Instead, it is a starting point to help you better understand foresight and futures work in Singapore's public sector. To find out more about the concepts, tools or processes defined in this glossary and how they have been used in Singapore, please contact the Centre for Strategic Futures.

This glossary is jointly published by the Centre for Strategic Futures and the Civil Service College, with an inter-agency editorial team comprising (in alphabetical order):

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FOREWORD

> The ability to learn (and change) faster than your competitor may be the only advantage of the future.

Arie de Geus, former head of Shell's Strategic Planning Group

To thrive, Singapore needs every advantage we can muster as a small country in a complex environment. Understanding how the world around us can change gives us the latitude to prepare, to take advantage of the opportunities that may arise, as well as to make contingency plans to mitigate possible threats to our well-being.

As our foresight efforts mature, we are learning to apply a wide range of foresight tools and methods to policy, and have developed a working understanding of how foresight and an appreciation of complexity can help us think about the future better. With the growing futures community in the Government, we now also have better mechanisms to derive whole-of-government insights into complex issues, and translate foresight to strategy.

This foresight glossary is a guide to the concepts and terms commonly used in the Singapore Government foresight space. It is an important effort at ensuring that as a community, we speak the same language, and understand the context in which we use some of these terms. But it is not the last word on these, and I urge you to take this glossary as the start of your own learning journey in foresight, as you explore the workings and applications of various frameworks and methods. It is only then that we can continue to deepen our understanding of foresight, and build upon our existing knowledge.

Ultimately, futures work is about identifying and considering possibilities, and there is no fixed way of approaching it. It is up to agencies to create the flexibility in their policies so that Singapore is able to respond to what is beyond the horizon. I hope that this glossary will help you in this effort of harnessing insights from foresight to guide your agency's work.

I also hope to see contributions from more agencies in future editions of this glossary, as the Singapore Government's foresight expertise grows.

Peter Ho
Senior Advisor, Centre for Strategic Futures and
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A – D

AGENT-BASED MODELLING (ABM)

A **method of simulating complex systems**. It features a number of autonomous "agents" which are each programmed to make decisions according to certain pre-defined rules. The resulting interactions can give rise to emergent patterns that might not have been obvious when considering each of the agents in isolation. Agents can be animate or inanimate, e.g., people, financial institutions, or the environment.

ABM is most useful in situations that involve the interaction of multiple "behavioural" or "human" entities. It helps to simulate the effects of individual actions on a system as a whole. It can help to account for the fact that human individuals behave in ways that are not entirely rational or consistent, and which are subject to cognitive biases.

As with any simulation, the utility of ABM is limited by the granularity and accuracy of its programmed rules. These rules can be improved, e.g., through consultations with experts. As a tool, ABM is most useful in uncovering a range of likely outcomes — including thresholds of risk and boundaries of confidence — rather than predicting specific outcomes with certainty.

Reference

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BACK-CASTING

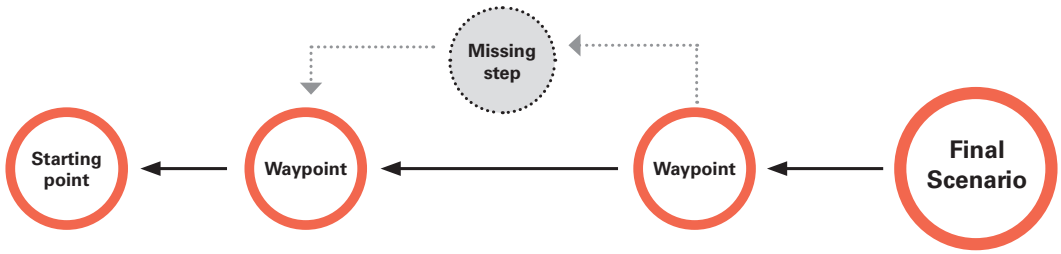
A facilitation method designed to help **translate scenarios to strategies**. It usually begins with a visioning process, where participants are encouraged to describe elements of a future scenario. Working backwards from that future scenario to the present day, back-casting involves fleshing out the steps needed to arrive at the scenario. For example, if in 2015, one were envisioning the future in 2020, discussants would be invited to consider first what the situation in 2020 might look like, and then describe the causal factors that led to the realities in 2020 by moving backwards from 2020 to 2015.

Back-casting is useful in engaging groups that are more focused on tangible outcomes, since it provides an opportunity to translate scenarios to operational or concrete strategies. Back-casting can also help to stress-test vision statements, i.e., back-casting from a preferred future can help groups determine the feasibility of certain strategic thrusts and shed light on potential tensions and trade-offs en-route to that preferred future.

The following diagrams on page 8 illustrate some other applications of back-casting:

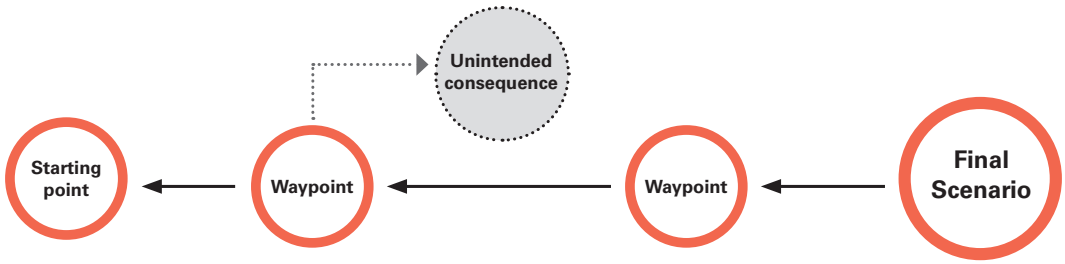
MISSING STEPS

can be uncovered if we question the cause-effect relationships in our back-casted narrative. These missing steps could be crucial milestones to help validate the emergence of the scenario.



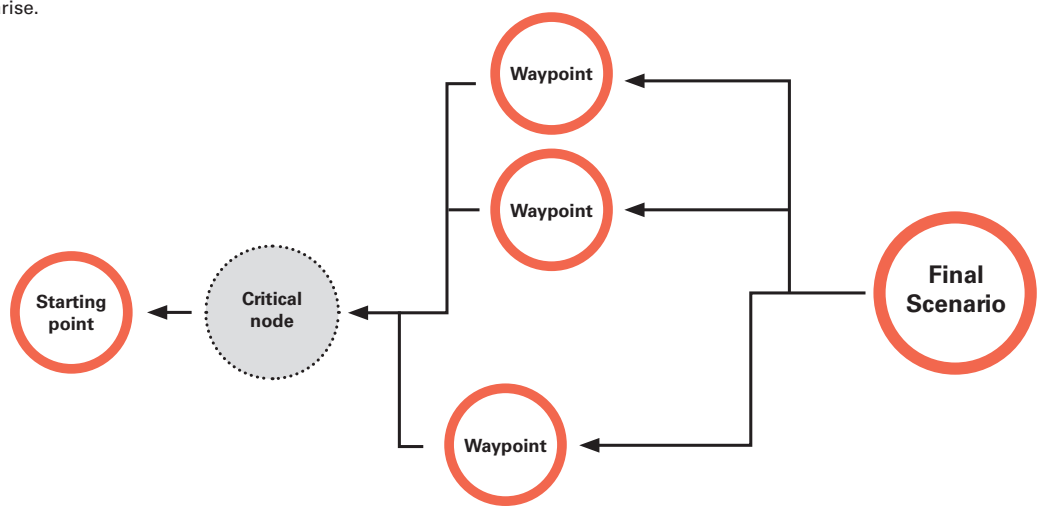
UNINTENDED CONSEQUENCES

may not be immediately obvious if we are too focused on a singular narrative or trajectory. They are nevertheless important to uncover, as they may impede progress towards the scenario.



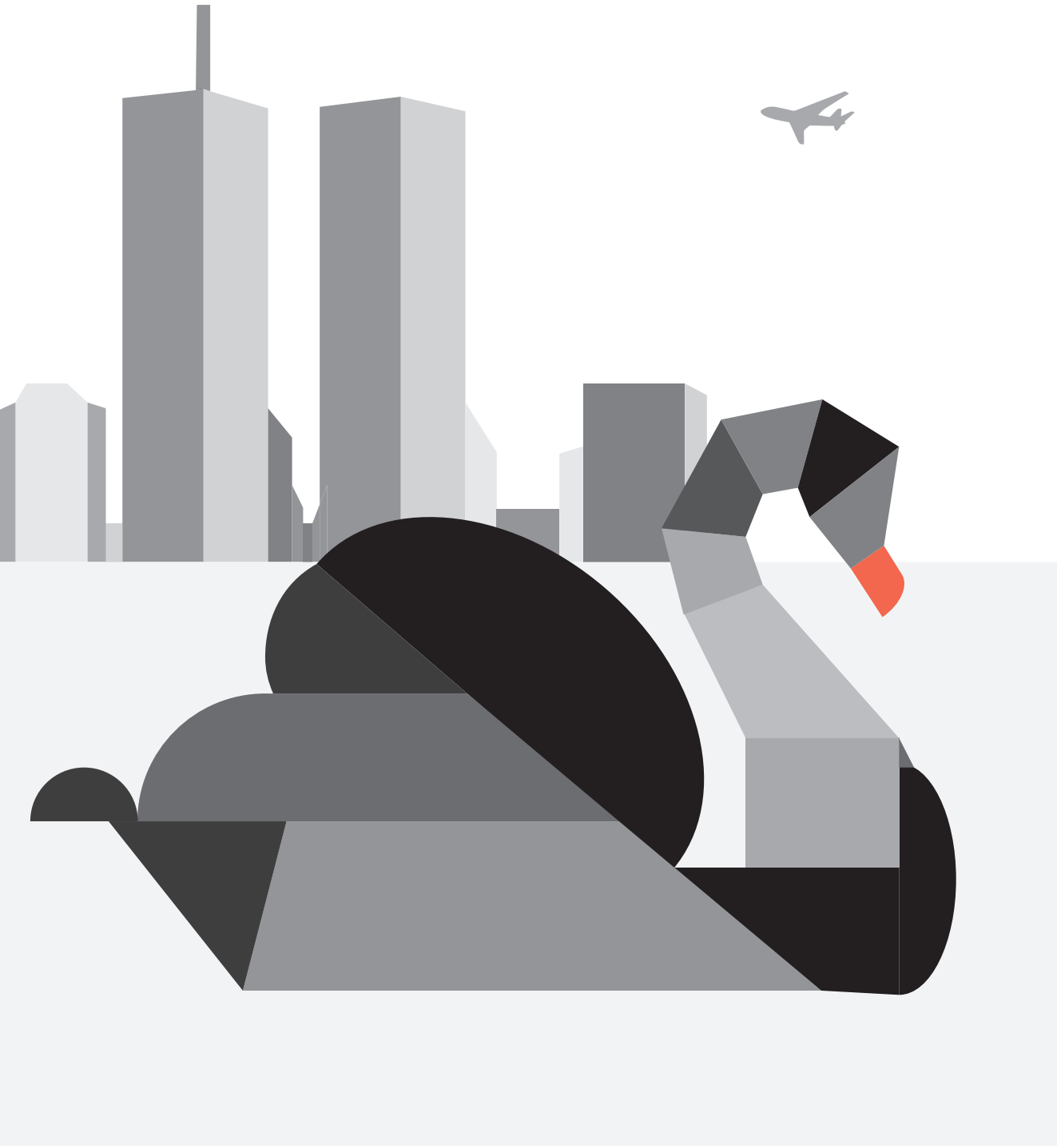
CRITICAL NODES

have an impact on multiple trajectories. If they are not reached, the scenario in question may not arise.



Integrated back-casting is a methodology developed by the National Security Research Centre that applies back-casting to generate pathway maps of the feared or undesired outcomes from a set of pre-defined driving forces. As the *integrated back-casting* process approaches the starting point, pre-defined driving forces are linked to causal nodes that reflect current reality. This gives each pathway map a sense of how current developments line up with the driving forces that are believed to shape the future.

A Master Pathway Map (MPM) is derived from integrating all the pathway maps into a single map, which then forms the basis of a monitoring framework. By monitoring current developments with reference to the MPM, critical challenges can be anticipated, and appropriate intervention points for further policy research and action can be identified.



BLACK SWAN

A rare, large-impact, hard-to-predict and discontinuous event beyond the realm of normal expectations. Taking reference from how people believed that all swans were white up to the discovery of black swans in Australia, "Black Swans" illustrate the fragility of human knowledge, and the weakness of a purely empirical approach to preparing for the future.

The discovery of the Internet and the September 11 attacks, both of which have had a paradigm-shifting impact on the status quo, are commonly cited examples of Black Swans.

As the world becomes more complex and volatile, our tendency to be surprised by Black Swans will increase, because it will become progressively harder to pick up weak signals and identify outliers ahead of time. The human tendency is also to look for explanations for Black Swans after they have occurred; while comforting in the short term, this tendency to seek coherence in hindsight might blind us to future threats.

The concept of the Black Swan has inspired many variants, some of which are captured below:

GREY SWAN

Inventor of term
Nassim Nicholas Taleb

Definition
Similar to a Black Swan, except that the event is **predictable to a certain degree**, i.e., some warning signs are observable.

Examples
Extreme weather events, e.g., earthquakes.

DIRTY-WHITE SWAN

Inventor of term
Scott Ryrie

Definition
Unlike a Black Swan, the event is only surprising because **cognitive biases** (**e.g., wilful blindness**) blind observers to it.

Examples
Brisbane floods: Mayor of Queensland's flood-devastated Lockyer Valley neglected evacuation plans

RED SWAN

Inventor of term
Gordon Woo

Definition
Unlike a Black Swan, the event is a **red herring** and is not actually impactful.

Examples
Y2K bug
Mad cow disease

DRAGON KING

Inventor of term
Didier Sornette et al.

Definition
Unlike a Black Swan, which appears to come out of nowhere, dragon kings are large extreme events which exhibit different characteristics from similar smaller-scale events. This is due to the emergent properties of complex systems.

Examples
Financial bubbles

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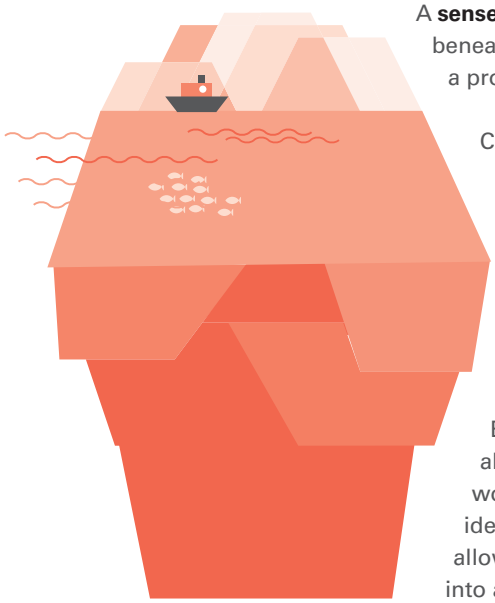
CAUSAL LAYERED ANALYSIS (CLA)



A **sense-making tool** designed to help uncover the underlying issues beneath observable events and trends. It is commonly described as a process of uncovering the story beneath the tip of the iceberg.

CLA begins with identifying an obvious and superficial phenomenon (*litany*), analysing the cause of the phenomenon (*systemic perspective*) and then unravelling the deeper ideological assumptions (*worldview*). These assumptions can help uncover the unconscious emotive aspects of the issue (*myth/metaphor*). Through this process, CLA expands the issue from the short to the long term and from reality to the imaginative or emotive dimension.

Employing CLA in a facilitated discussion can help reveal alternative interpretations of an issue arising from different worldviews or myths held by people. CLA can also help to identify tensions between these different perspectives, and allow for discussions on alternative realities or futures that take into account different stakeholders' views.

Level	Description	Key Question	Examples
Litany	Headlines Problems Issues	What am I experiencing right now?	Enrichment classes for young children
Systemic	Social, economic, cultural, political, historical factors	What caused this?	Academic qualifications are valued
Worldview	Narratives that support the litany and system	What intellectual justifications can I make to explain this?	Everything is a competition
Myth/ Metaphor	Deep stories and collective archetypes	What deep convictions do I have about how society should function?	"There is no free lunch"; "Dog-eat-dog world"

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COGNITIVE BIAS

Psychological tendencies that result in systematic errors in the way human beings receive, process, retain or recall information, or make inferences, judgements and predictions.

Many cognitive biases result from the heuristics or mental shortcuts that human beings unconsciously use to process information. These heuristics are generally useful in making simple daily decisions. In more complex situations, however, they can lead to an overestimation or underestimation of actual odds.

It is especially important for decision-makers in government to be aware of some cognitive biases:

	Definition	Example
Recency effect/ availability heuristic	The tendency to assess the probability of events by the ease with which examples come to mind.	The risk of a terrorist attack on the US was underrated prior to the events of September 11 and overrated soon after those events.
Confirmation bias	The tendency to look for or interpret information in a way that confirms one's preconceptions.	Intelligence information was interpreted in the run-up to the 2003 Iraq War to support policymakers' conviction that Iraq had weapons of mass destruction.
Groupthink	The tendency to believe something because many others do so, e.g., in hierarchical organisations that emphasise conflict avoidance and harmony.	In the lead up to the Challenger space shuttle disaster in 1986, individual engineers had identified risks, but downplayed them to avoid coming into conflict with NASA management.
Hyperbolic discounting	The tendency to underestimate future costs and benefits relative to immediate ones, or to overestimate the costs of immediate actions relative to their future benefits.	Most of us do not put aside enough money for retirement healthcare as we tend to overestimate the immediate costs and underestimate the future costs of healthcare, as well as the future benefits of taking out insurance today.
Status quo bias	The tendency to stick to the "default setting" or the option that is consistent with past precedent.	In the early 1990s, citizens in New Jersey and Pennsylvania were offered two options for their car insurance: an expensive option giving them full right to sue, and a cheaper option with restricted rights to sue. In New Jersey, the cheaper option was the default and most citizens selected it. Only a minority chose this cheaper option in Pennsylvania, where the more expensive option was the default.

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COGNITIVE DISSONANCE

The psychological discomfort a person feels at the discrepancy between his existing beliefs and new information or views he is confronted with that contradict those beliefs. Since it is difficult to hold two opposing ideas in one's mind at the same time, individuals tend to reduce their cognitive dissonance by denying or devaluing the new information or views that they are confronted with, or by rationalising their own views. They may cast doubt on the credibility of the source of such new information or views, or dismiss them as insufficient grounds to disprove their preconceived ideas. They may also subtly adjust their own position to reduce the dissonance between that and incoming information.

In the policy context, decision-makers could devalue inconvenient truths about ground sentiments by insisting that they constitute the views of a vocal minority and may not reflect those of the silent majority. The futurist therefore has to make a convincing case for new information or views that contradict decision-makers' preconceptions. It is vital that organisations consider an issue from multiple angles, and not just the most comfortable or preferred perspective, in order to ensure that their strategies are more resilient.

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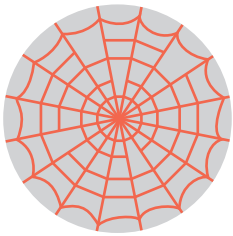

COMPLEXITY

A phenomenon involving multiple components in a dense network of interactions or relationships, where cause-effect relationships are not clear, stable or predictably repeatable.

Complex systems are often self-organising; they exhibit new patterns and behaviours that cannot be predicted beforehand or by examining the component parts of the system, but which can only be discerned and understood after the fact and usually cannot be replicated. The occurrence of these new patterns and behaviours is known as emergence.

Complex systems are also characterised by non-linearity, i.e., where changes are random and/or discontinuous, and do not follow a gradual and orderly pattern. As a result, cause-effect relations between the various components are difficult to establish in a complex system (See *Cynefin Framework*).

The increasing complexity of the operating environment for government has been associated with large-scale disruptions in recent times, such as the SARS outbreak (2003) and global financial crisis (2008-2009).

One key lesson for policymakers arising from complexity is that the past is not a good predictor of the future. While it is possible to retrospectively discern patterns between events and trends in a complex system, it is unwise for policymakers to base their plans entirely on extrapolations from history. Even

though interactions in a complex system might make logical sense in hindsight, there is no certainty that the sequence of interactions leading up to a particular outcome has been fully understood, or can be replicated in the future.

ASPECTS OF COMPLEXITY

SOCIAL COMPLEXITY

refers to the extent of consensus that may exist among a group working on a solution based on different assumptions, values, rationales, and objectives. There is an inverse relation between consensus and social complexity: where there is low consensus among stakeholders, social complexity is high. In such circumstances, imposing top-down solutions is likely to fail, since those involved in implementing the solution may have different or even competing interests. Social complexity is often manifested in wicked problems such as climate change.

EMERGENCE

(also known as generative complexity or aggregation) refers to the phenomenon where the interactions within the system and with the environment create new outcomes in an unpredictable manner. For instance, economies exhibit emergent phenomena: an economic system as a whole shows distinctive characteristics that cannot be extrapolated from the traits of individuals or firms in the economy interacting with one another.

COMPLEX ADAPTIVE SYSTEMS

specifically have the capacity to learn from experience and adapt to new scenarios. They are able to self-organise in order to adapt to changes, and develop strategies which in retrospect are coherent. For instance, societies are complex adaptive systems, with norms and practices that constantly evolve in response to the interactions and experiences of their constituent members.

DYNAMIC COMPLEXITY

refers to situations where causality is subtle and effects over time are unclear. For example, the relationship between demographic change and the challenges it poses to a city is difficult to fully characterise. There may be additional factors that have not been identified, such as technological changes or workforce policies.

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CRISIS MANAGEMENT

The process by which an organisation deals with a major event that threatens to harm the organisation, its stakeholders, or the general public. The study of crisis management originated with the large scale industrial and environmental disasters of the 1980s.

Three elements are common to a crisis: (i) a threat to the organisation, (ii) the element of surprise, and (iii) a short decision time. In a crisis, it is extremely important for decisions to be made quickly, sometimes in the absence of complete information.

At the national level, the Singapore Government has in place a crisis management system designed to prepare for and respond to a wide variety of hazards, including terrorist attacks, major accidents and other home front crises that could affect Singapore.

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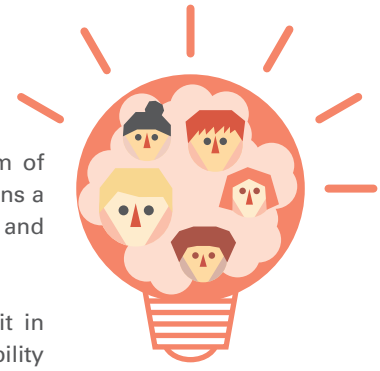
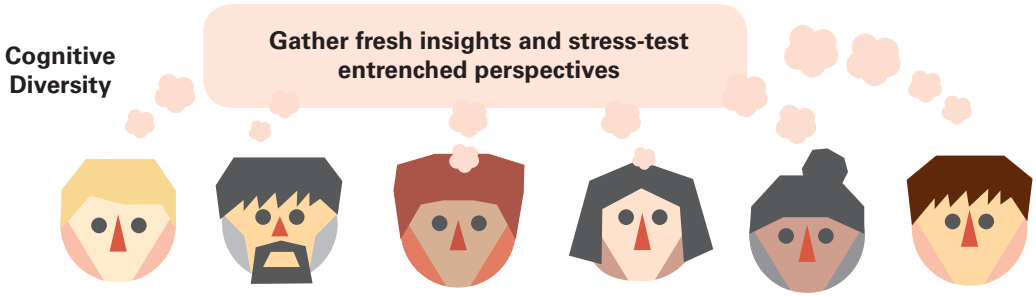


CROWD-SOURCING

The process of **canvassing for views and ideas** across a broad spectrum of people, drawing upon the idea of cognitive diversity, where a group contains a variety of ways of thinking. This can help to overcome the cognitive biases and blind spots of any particular individual or team.

Crowd-sourcing is particularly important for the work of a foresight unit in government. Institutionalised practices and norms of analysis can limit the ability to pick up weak signals or reveal the "unknown unknowns" that lie just beyond the horizon. Deliberately canvassing views from individuals and organisations perceived to be peripheral or "fringe" to the work of government is one way to gather fresh insights and stress-test entrenched perspectives.



Properly applied, crowd-sourcing can be a powerful content-generation tool. However, indiscriminate crowd-sourcing, as is sometimes the case with social media, can result in the spread of misinformation or panic, especially when individuals blindly reinforce each other's assumptions in an information cascade.

An example of crowd-sourcing in foresight is FutureCoast (www.futurecoast.org). This is a collaborative storytelling game where members of the public are invited to imagine what life would be like in a world affected by climate change. They contribute stories through voicemails, which other participants can then access and build on.

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CROSS-CUTTING ISSUES

Issues that, in the context of government, do not fall neatly within the purview of a single agency. To consider and address such issues, a Whole-Of-Government (WOG) approach is necessary.

See *Whole-Of-Government (WOG)*

CYNEFIN FRAMEWORK

A **sense-making and decision-making tool** to help decision-makers analyse and evaluate issues, determine their significance, and take appropriate follow-up action. The framework classifies issues into four types — simple, complicated, complex and chaotic — with each type requiring distinct responses.

COMPLEX

Probe → Sense → Respond

Because complex contexts are in constant flux, cause-effect relationships cannot be determined *ex ante*. This is the realm of "unknown unknowns", where we understand why things happen only in retrospect.

Problem-solving in a complex space thus requires a degree of experimentation and a tolerance for failure.

COMPLICATED

Sense → **Analyse** → Respond

Complicated contexts, unlike simple ones, may contain multiple right answers. Though clear cause-effect relationships exist, not everyone can see them.

This is the realm of "known unknowns", where the understanding of the situation is unevenly distributed, and where expert knowledge may be required.

DISORDER

CHAOTIC

Act → Sense → Respond

In a chaotic context, searching for the "right answers" is pointless.

This is the realm of "unknowables", where cause-effect relationships have been so destabilised that they have no discernible pattern. The only sensible response is to act first, move out of the chaotic space, and establish order.

SIMPLE

Sense → **Categorise** → Respond

Simple contexts are characterised by stability and clear cause-effect relationships that are easily discernible.

This is the realm of "known knowns", where problems are readily resolved through best practices and standard operating procedures.

The Cynefin Framework includes two additional concepts:

- A region of "disorder" that lies outside these four quadrants, where the categorisation of the issue is unknown.

- A "cliff" between the simple and chaotic quadrants, which serves as a reminder that issues that seem simple can quickly become chaotic if we are not alert to early warning signs. This cliff serves as a reminder that complacency and blind adherence to standard operating procedures can tip an organisation into crisis.

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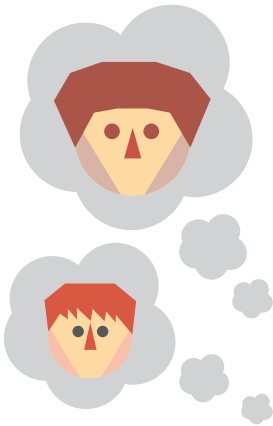
DELPHI METHOD

A **method of crowd-sourcing inputs** that involves two or more rounds of consultations with a group of experts. After each round, a facilitator circulates an anonymised summary of the group's responses to the previous round's questions. The members of the group then respond to the new set of information, revising their previous answers, if necessary. The underlying philosophy here is that, over time, the group will converge towards the "correct" answer, or at least arrive at a working consensus on the issues discussed.

The Delphi Method is most useful as a tool to facilitate discussions within a group that cannot readily meet face-to-face or has not yet built the level of rapport and familiarity required for an uninhibited discussion. It also helps to create a safe space for individuals to share their views that may run counter to expectations of their professional roles.



DESIGN THINKING

An approach to problem-solving that takes the end-user's experience as the starting point in developing the solution. Instead of focusing only on the purely rational parameters of a given situation, design thinking recognises that there is bound to be some messiness and unpredictability in the way situations develop and the way people respond to those situations.

Design thinking methodologies support problem-solving by helping to foster a more accurate and nuanced understanding of different groups of stakeholders or end-users. Some examples of these approaches include ethnographic-based research, interactive and immersive workshop formats and rapid prototyping.

Design thinking is particularly useful in complex or uncertain environments, where constantly evolving circumstances make it difficult to define problems precisely. Instead of focusing on pinning down all the parameters of a problem before embarking on a solution, design thinking advocates a more iterative approach, allowing the facts of a problem to be uncovered progressively, with prototype solutions that can be continually improved.

In the context of governance, design thinking can help policymakers (i) better understand issues which concern the public and (ii) craft policies and programmes that connect better with members of the public and respond to their needs more meaningfully.

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DRIVERS / DRIVING FORCES

Significant trends, observable in the present, which are expected to continue to affect the future, e.g., the rise of China.

A distinction is typically made between driving forces that are "predetermined" and those that are "critical uncertainties".

- "Predetermined" driving forces are likely to remain stable and predictable. For example, because demographics take a long time to shift, China's ageing population is likely to be a predetermined element across multiple possible development trajectories.

- "Critical uncertainties" are driving forces for which a range of plausible future trajectories exists. For example, as China gradually opens its doors to trade with other countries, its own growth trajectory will increasingly be subject to the uncertainty and volatility of the international economy. This uncertainty prevents us from saying definitively that China's economic growth will follow any one trajectory.

In the context of Singapore's national scenarios, driving forces represent the "top issues" that cut across multiple scenarios. Driving forces are compiled through multiple rounds of interviews with key stakeholders, to ensure that the scenarios as a whole address the key concerns of each group. The insights from these interviews are then clustered together into broadly-defined driving forces, which contain both predetermined elements and critical uncertainties.

Further Reading

1. Peter Schwartz, *The Art of the Long View: Paths to Strategic Insight for Yourself and Your Company* (New York: Random House LLC, 1996).

E – M

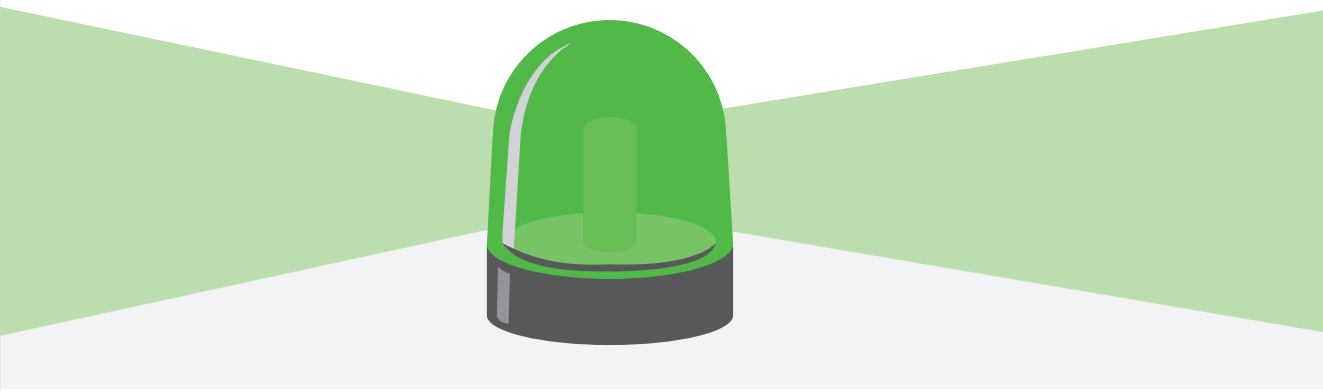
EARLY WARNING SYSTEM

A system established to track indicators identified as warning signs that possible future trends or events are imminent. A good early warning system should:

- Be easily tracked on a regular basis;
- Give sufficient advance warning so that action can be taken before the time-window expires for making use of the opportunity or addressing the threat.

The Risk Assessment and Horizon Scanning (RAHS) Programme Office has developed the *Issues-to-Indicators Process*. The process aims to examine emerging issues by developing future scenarios, to draw out implications and indicators for monitoring.

See *Signposts*



EMERGENCE

See *Complexity*

EMERGING STRATEGIC ISSUES (ESIs)

Issues that could pose **institutional surprises** and are **plausible**. They have implications that have not yet been fully accounted for, and there is sufficient evidence that they may occur in future. They are "strategic" as the **consequences they generate cut across multiple domains of public policy.**

ESIs can arise for several reasons. They can:

- **Develop as the result of an acceleration of existing phenomena.**
  A recent example is the phenomenon that Chris Anderson, former editor of Wired magazine, has called "Freenomics": "Free" goods and services may involve those that are intended to encourage the sales of related products (e.g., razors requiring the purchase of razor blades), those that attract revenue through advertisements, or those that serve to promote a premium version (e.g., digital content or television programmes). While the concept of "free" goods and services has always existed, its rapid spread to new industries and markets can cause a shift in pricing paradigms. New classes of free goods and services may emerge, reshaping the underlying economics of entire industries.

- **Arise as second or third order effects of existing phenomena.**
  For instance, accelerating technological change and industry structuring may lead to some jobs becoming obsolete, pushing more workers to undergo retraining and mid-career changes. This may cause some careers to take on a roller-coaster path instead of a more traditional upward wage trajectory over the course of a working lifespan. In turn, this may make it harder to sustain traditional priorities such as home ownership and raising children.

- **Arise as the combination of two or more existing phenomena.**
  For instance, with greater social diversity (including transnational migration and mixed marriages) and economic empowerment (enabling more diverse life experiences), Singaporeans no longer necessarily identify themselves with a singular ethnicity, religion or class. This means that they are also less likely to see their interests as being adequately represented by the leaders of a particular community or group, making societal consensus harder to achieve.

FILTERING PROCESS

- Drawn from the ESI 2.0 Exercise done by the Centre for Strategic Futures

Within the Centre for Strategic Futures (CSF), ideas for ESIs are identified through interviews with experts, workshops with academics, and inter-agency discussions.

By evaluating the extent of each element — institutional surprise, plausibility, and impact on public policy — CSF then filters a wide span of ideas down to a shortlist of top issues.

See also *Wildcards*

Further Reading

1. Bernard Toh, "Emerging Strategic Issues and Wildcards", https://www.cscollege.gov.sg/Knowledge/Pages/Emerging-Strategic-Issues-and-Wildcards.aspx, last accessed Aug 2014.
2. CSF Annual Report 2012, http://www.psd.gov.sg/content/dam/psd_web/csf_web/resources/CSF%20Annual%20Report%202012.pdf.

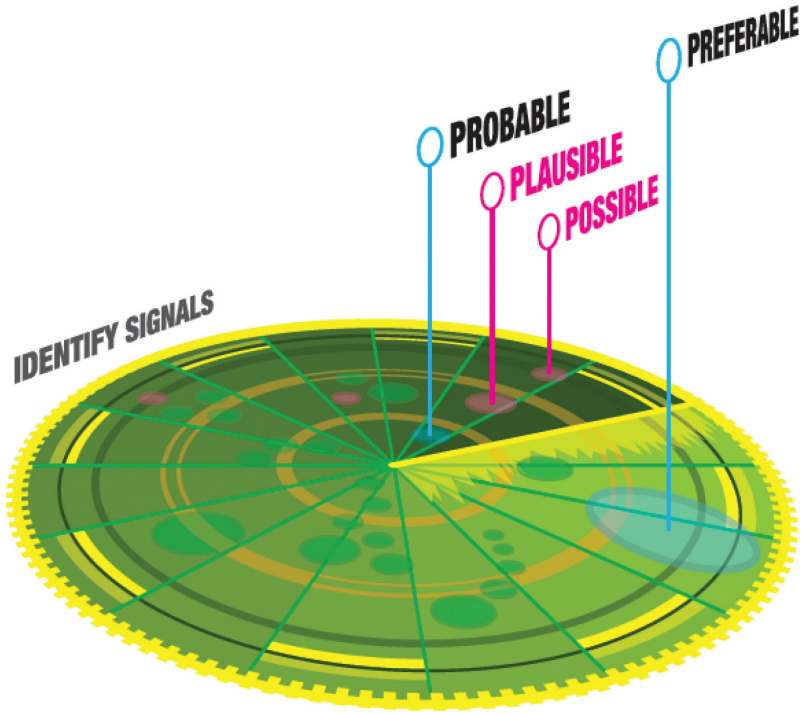
ENVIRONMENTAL SCANNING

The systematic process of picking up weak signals and trends to identify and monitor driving forces, potential discontinuities and emerging issues from regular scanning of diverse information sources. It is sometimes referred to as "horizon scanning".

OBJECTIVE

To systematically pick up weak signals and trends to identify and monitor potential discontinuities and emerging issues.

1. **Understand** the focus of **Environment Scanning**
2. Determine **Techniques and Tools** for scanning
3. Develop **Search Strategies** to increase relevance
4. **Identify Sources** to triangulate data
5. **Report and Communicate Findings**



Source: Image by the National Security Coordination Secretariat (NSCS), Singapore

EXPERIMENTATION

An empirical process that seeks to test and validate competing hypotheses.

Experimentation is a key feature of navigating complex environments. This is because the results and ramifications of any action within a complex system cannot be fully determined *ex ante*, due to the constantly evolving web of interdependencies between the system's different elements and actors.

In the context of governance, experimentation and related processes such as *rapid prototyping* can help policymakers better anticipate the future. For instance, the controlled testing of different policy options can help policymakers better gauge how citizens might respond.

See *Prototyping*

FORECASTING

A process for making justified statements on future events, based on quantitative analysis and modelling.

Quantitative analysis and modelling can be combined with *sensitivity analysis* to establish a range of possible trajectories.

Forecasts are entirely extrapolative in nature, e.g., the Ministry of Trade and Industry's economic forecasts.

FORESIGHT

The ability to consider and plan for the future.

See *Futures*

FUTURES

A concept that indicates the presence of possible alternatives that might happen, and the need to consider them.

See *Foresight*

FUTURES COMPETENCY FRAMEWORK

A framework, developed jointly by the Centre for Strategic Futures and the National Security Coordination Secretariat in 2012 to set out the functional competencies required of foresight/futures practitioners in the Singapore Government. It establishes behavioural indicators across 12 competencies in the following areas:

1. Information gathering and distilling
2. Critical thinking to develop insights
3. Knowledge of futures methodologies
4. Developing new futures methodologies
5. Training and facilitation
6. Networking
7. Domain knowledge
8. Policy thinking
9. Engaging and partnering
10. Consulting
11. Creative communication
12. Project management

The Futures Competency Framework should be viewed as an overlay to existing performance management frameworks such as the AIM Model used by the Singapore Public Service. It can serve as a tool for supervisors in relevant departments to guide staff development.

GAME THEORY

Game theory is a study of strategic decision-making, i.e., situations where two or more players (or agents) have to make decisions, and the way things turn out for each player may depend on the other player or players' choices. Game theory examines the strategies that a group of decision makers will converge on as they try to maximise their own payoffs.

Game theory may be used to analyse the behaviours of agents and the stability of the outcomes in agent-based modelling or other simulations.

HORIZON SCANNING

See *Environmental scanning*

INTERDEPENDENCE

The phenomenon where different factors within a system affect and are affected by one another.

When challenges are interdependent, an improvement in one makes it easier to address others and, vice versa, deterioration in one makes it harder to address others.

References
1. Jerome C. Glenn, Theodore J. Gordon, and Elizabeth Florescu, "State of the Future", *The Millennium Project* (Washington DC: United Nations, 2007).
2. Strategic Thinking and RAHS, Singapore, http://www.nps.edu/Academics/Institutes/Cebrowski/Docs/Rasmussen-docs/Singapore%20RAHS.pdf, last accessed Aug 2014.

MANAGEMENT BY DISCOVERY

A management style that emphasises the importance of continual reframing and adaptation. It builds on the traditional approach of *Management by Objectives*, which is based on the assumption that a project's objectives can be clearly defined in advance and will remain fixed throughout the project's course.

While Management by Objectives introduces meaningful structure to the problem-solving process, it is less suited to leadership in complex and unpredictable environments, where goals and objectives tend to be emergent rather than well-defined. Under these conditions, neither the goals nor the path towards achieving those goals can be readily determined ahead of time.

With the Management by Discovery approach, managers need to recognise that details about a goal might only emerge in the course of a project. Goals themselves might also shift as a result of actions taken. Appropriate responses may include (i) conducting probes to sense changes in the environment, (ii) revising or reframing goals to better suit these changed circumstances, (iii) conducting experiments to test out new solutions and approaches, and (iv) building up organisational resilience to recover more quickly from failures.

Reference
1. Noel Bay, *Management by Discovery*, https://www.cscollege.gov.sg/Knowledge/Pages/Management-by-Discovery.aspx, last accessed Aug 2014.

MORPHOLOGICAL ANALYSIS

A method for exploring all the possible solutions to a multi-dimensional problem. In the context of foresight work, morphological analysis can be used as a tool to generate alternative scenarios or strategies.

It is most suited for multi-dimensional problems with many variables, where systems maps and simulation do not function well. Using a cross-consistency matrix, as seen below, the process of morphological analysis can help an analyst focus on more plausible solutions through the systematic elimination of illogical solution combinations.

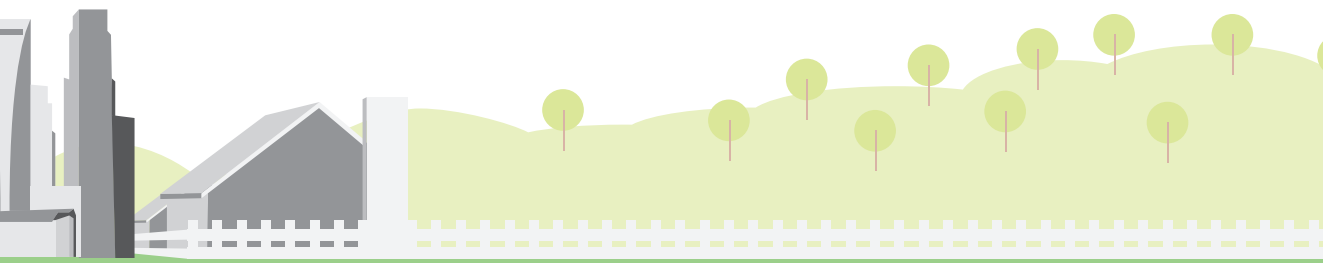
Geographic priority	Functional priorities	Size and cramming	New construction	Maintenance	General philosophy
Metropoles	All socio-tech functions	Large, not crammed	With new construction	More frequent maintenance	All get same shelter quality
Cities +50,000	Tech support systems	Large and crammed	Compensation	Current levels	All take same risk
Suburbs and countryside	Humanitarian aims	Small, not crammed	New only for defence build-up	No maintenance	Priority: key personnel
No geo-priority	Residential	Small and crammed			Priority: Needy

The six categories in the first row of the table above – Geographic priority, Functional priorities, Size and cramming, etc – show the different dimensions of the problem, i.e., the relevant issues involved. The cells below are the possible states of existence for each category. The combination of medium green boxes describes how possible elements can coherently co-exist within a single state.

In the case of developing scenarios, the categories in the top row can be replaced with key drivers, and the other cells with the possible ways each key driver can exist in the future.

Reference

1. General Morphological Analysis, http://www.swemorph.com/ma.html, last accessed Aug 2014.



N – S

NARRATIVE INQUIRY

A sense-making process that helps analysts identify key patterns, weak signals and key perspectives. These may surface from the narratives provided by participants through activities such as interviews.

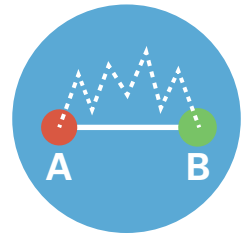
Further Reading

1. Larry Browning and Theirry Boudes, "The Use of Narrative to Understand and Respond to Complexity", E:CO 7:3-4 (2005), http://cognitive-edge.com/uploads/articles/51_Browning_Boudes_on_Weick_and_Snowden.pdf, last accessed Jul 2014.

NON-LINEARITY

See *Complexity*

PATH DEPENDENCY

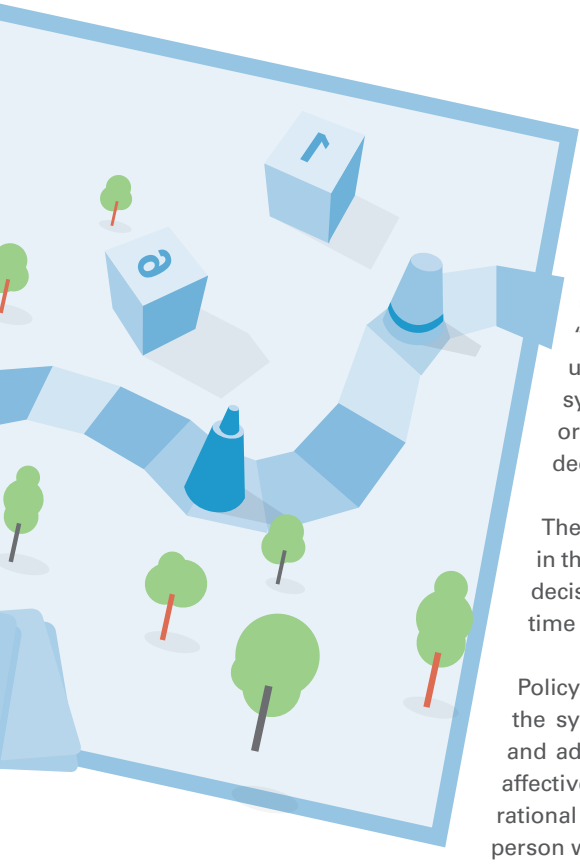


The tendency to stick to past practice even if newer and more efficient practices are available. This could be due to "sunk costs", i.e., the resources that have already been committed to a particular option, as a result of which it would not be cost-effective to make a switch. Cognitive biases can also give rise to path dependency. For example, being risk-averse can lead to a preference for the status quo or "tried and tested" solutions.

Path dependency can narrow the range of available policy options and force policymakers into making sub-optimal decisions. For example, it is difficult for Singapore to increase its MRT capacity in the short run because the rail technology already in place can only be stretched so far. Because of the constraints imposed by path dependency, policymakers should ensure that all policy alternatives are rigorously considered, and that contingency plans allow for a sufficient degree of flexibility, especially in situations where existing policies fail or are likely to lead down a trajectory to failure.

Further Reading

1. Stephen E. Margolis and S. J. Leibowitz, "Path Dependence", http://wwwpub.utdallas.edu/~liebowit/palgrave/palpd.html, last accessed Aug 2014.



POLICY GAME

An interactive activity or exercise that can take the form of a simulation, card game or board game. Policy games are set up to examine policy or to explore the landscape, by putting "players" through immersive experiences that help deepen understanding of the different interactions in a complex system. They are primarily focused on stakeholder interests or understanding the dynamics that influence policy-related decisions on different levels.

The policy gaming process is conceptually similar to wargaming in the military context. It seeks to allow the players to rehearse the decisions that they might have to make in actual situations under time pressure.

Policy games help to create awareness of interdependencies at the systems level and to make complexities explicit. They enrich and add nuance to the policy-making process by emphasising the affective aspects of society that cannot be readily described through rational analysis. They can also change behaviour by engaging the person wholly: cognitively, affectively and behaviourally.

PRE-MORTEM

See *Stress-testing*

PROTOTYPING

The process of creating models (for objects) or early sketches of a policy. This can help to test ideas and spot potential problems so that subsequent prototypes come closer to addressing the issues at hand.

RED-TEAMING

See *Stress-testing*

RESILIENCE

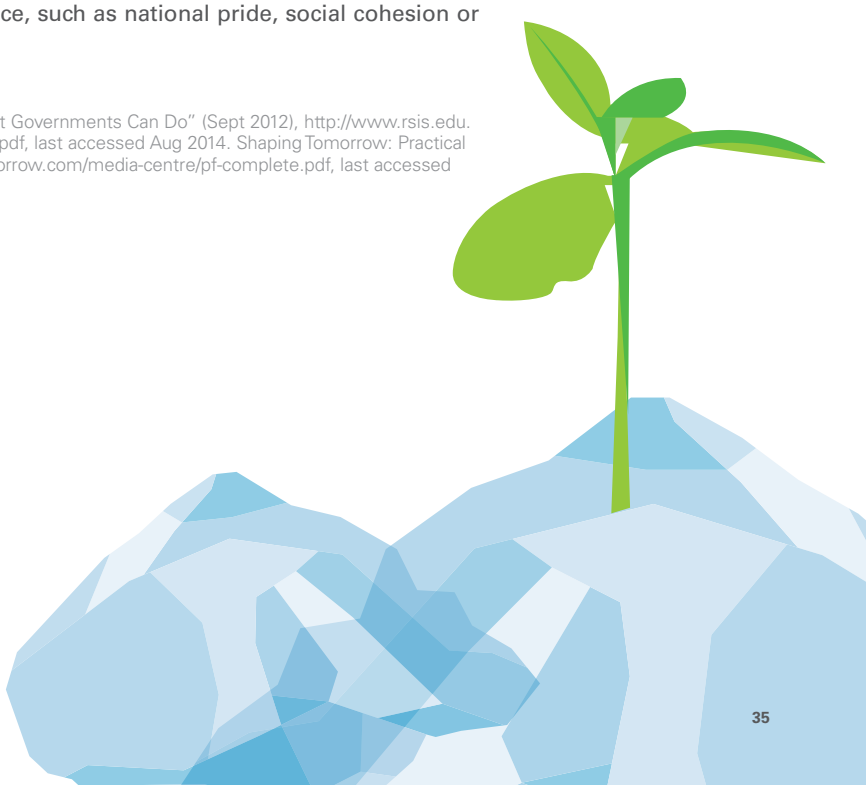
The measure of a system's ability to recover from a disruption or disturbance. This recovery need not take the form of a return to the status quo; resilient systems may cope with strategic shock by transforming themselves to adapt to new realities. At the national level, resilience refers to the ability of a nation to bounce back quickly in the aftermath of a crisis with its social fabric intact. It is the collective ability of institutions, society, physical infrastructure, and value systems to recover from a national crisis, integrate the lessons learned, and adapt to the post-crisis environment.

Conceptually, resilience is the corollary to the traditional security doctrine of resistance, where a system's responses tend to be top-down, and focussed on strategies to mitigate or prevent threats. However, as threats become more multi-dimensional and amorphous, it is hard for any single actor to cover all bases, or for any strategy to succeed all of the time. Security strategies centred on resilience recognise that occasional failures are inevitable, and seek to develop the capacity to recover from those failures.

A resilient strategy takes into account not just government actions, but also "soft" factors such as individual and community mindsets. As such, while resilience can be assessed in threat-specific or domain-specific terms, e.g., a society may be resilient to a terrorist attack but not a pandemic, there are also cross-cutting indicators of resilience, such as national pride, social cohesion or trust in the government.

Reference

1. Peter Ho, "Governing for the Future: What Governments Can Do" (Sept 2012), http://www.rsis.edu.sg/wp-content/uploads/rsis-pubs/WP248.pdf, last accessed Aug 2014. Shaping Tomorrow: Practical Foresight Guide, http://www.shapingtomorrow.com/media-centre/pf-complete.pdf, last accessed Aug 2014.



RETROSPECTIVE COHERENCE

The idea that a current situation always makes sense in hindsight. However, being able to explain the current state of affairs does not mean we are operating in a knowable world. In a complex system, even if we were to start again and make the same decisions, we cannot be sure that we will end up in the same situation.

Governments that do not grasp retrospective coherence will often dangerously assume that the lessons of history are enough to guide them into the future when this may not be true. For example, the 9/11 Commission Report identified a series of operational opportunities when the US government could have acted on the information it possessed, and thus foiled the terrorists' plans. However, the significance of the information held was only clear after 9/11 had occurred. The factors that led to 9/11 may also not be repeated in the future.

References
1. Peter Ho, "Governing for the Future: What Governments Can Do" (Sept 2012), http://www.rsis.edu.sg/publications/WorkingPapers/WP248.pdf, last accessed Aug 2014.
2. Peter Ho, "Governments Must Thrive in a Complex World" (Aug 2012), http://www.atlanticcouncil.org/blogs/new-atlanticist/governments-must-thrive-in-complex-world, last accessed Aug 2014.

RISK

In the Singapore Government context, risk is defined as the effect of uncertainty on objectives. Risks can be distinguished in different ways:

Risk Events versus Risk Issues

A risk event is an acute and discrete occurrence, whereas a risk issue is a development or trend that evolves over time. For example, extreme cold weather in North America caused by the unexpected breakdown of the polar vortex is an example of a discrete risk event, while shifts in weather patterns due to climate change constitute a risk issue.

Enterprise Risk and Strategic Risk

Enterprise risks have an effect on an agency's objectives and include both operational risks, i.e., risks that stem from the agencies' day-to-day operations and services and strategic risks, i.e., risks that would result in a failure to achieve the agency's mission and vision.

At the Whole-of-Government level, strategic risks refer to the threats to Singapore's national objectives. These often involve cross-cutting issues and require a focus on the inter-connections between risks.

Reference
1. Handout from Roy Rimington, Enterprise Risk Management (Advanced Course), Civil Service College.

RISK MANAGEMENT

Coordinated activities to direct and control an organisation with regard to risk. (See also *WOG-IRM*.)

A risk management process is the systematic application of management policies, procedures and practices to the activities of communicating, consulting, establishing the context, and identifying, analysing treating, monitoring and reviewing risk.

Reference

1. Handout from Roy Rimington, Enterprise Risk Management (Advanced Course), Civil Service College.

RISK REGISTER

A reference document that consolidates identified risks, including threat and hazard events that individuals or organisations may be concerned about, often with the aim of stimulating resource prioritisation, contingency planning and capability development. A threat event is an event resulting from malicious man-made acts that can cause harm. A hazard event is a non-malicious occurrence, man-made or natural, with potential negative consequences.

SANDBOX

Sandbox is a working-level meeting convened by the Centre for Strategic Futures involving members of other foresight and strategic planning agencies in government.

Good foresight work requires the free exchange of information across multiple levels of the hierarchy, not just at the senior levels. Platforms such as Sandbox help to build networks and trust within the government foresight community by providing a safe space for officers to share their learning from completed projects or solicit feedback on current projects.

SCENARIO PLANNING

A process that generates a group of plausible stories about the future. These can then be used to aid long-term planning. Well-written scenarios combine rigorous forecasts with immersive storytelling elements to bring possible futures to life. In so doing, they can help inspire readers to take action in a way that more "traditional" methods of communication might not.

The traditional scenario planning methodology, pioneered by Royal Dutch Shell, emphasises that scenarios are not intended to present definitive predictions about the future. Rather, scenarios help to articulate the risks and opportunities present in a range of plausible futures, and serve as a discussion tool to stimulate debate about strategies to shape the future.

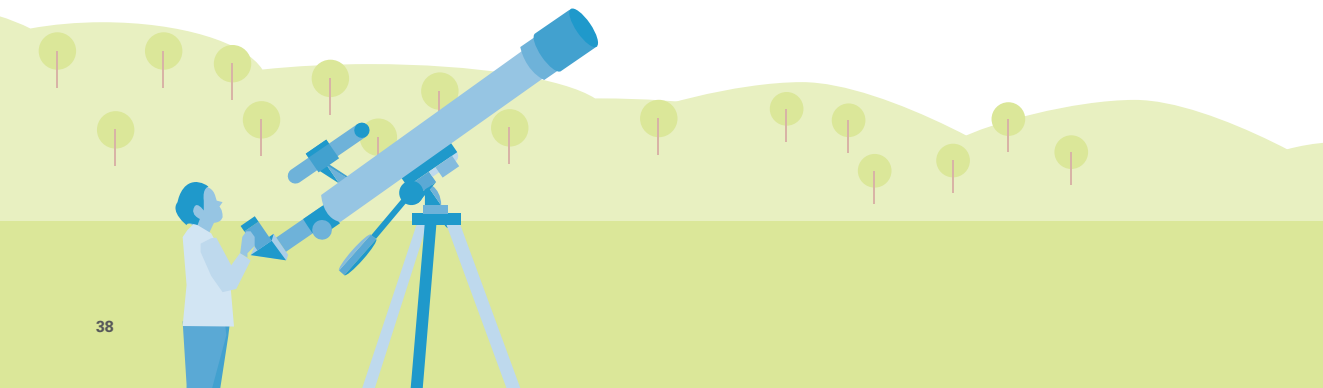
Scenario planning can also be seen as a change management tool -- specifically, a way to sensitise the participants in the process to indicators of change and to the unpredictability and volatility of the future. They can help cultivate a "contingency mindset" and build the capacity to react quickly when the need arises.

Adam Kahane, who facilitated the Mont Fleur scenarios in South Africa in the 1990s, suggests an alternative scenario planning methodology, which he terms transformative scenario planning. This constructs scenarios "not only to understand the future, but also to influence it", and is an adaptation of Shell's scenario planning methodology. In transformative scenario planning, organisations and participants are not merely reactive players which should be "sensitised to signals of change" and "adapt to the changing external environment". Instead, they are seen as transformative agents who must forge a consensus on their desired future and the strategy for achieving this desired future together.

The Singapore Government produces a set of National Scenarios every three to five years to spark discussion and fresh thinking about issues related to Singapore's future. The National Scenarios are complemented by Focused Scenarios, which are in-depth studies into specific topics, such as climate change or new media.

Further Reading

1. Peter Schwartz, *The Art of the Long View: Planning for the Future in an Uncertain World* (New York: Currency Doubleday, 1996).
2. Adam Kahane, *Transformative Scenario Planning: Working Together to Change the World* (San Francisco: Berrett-Koehler Publishers, 2012).



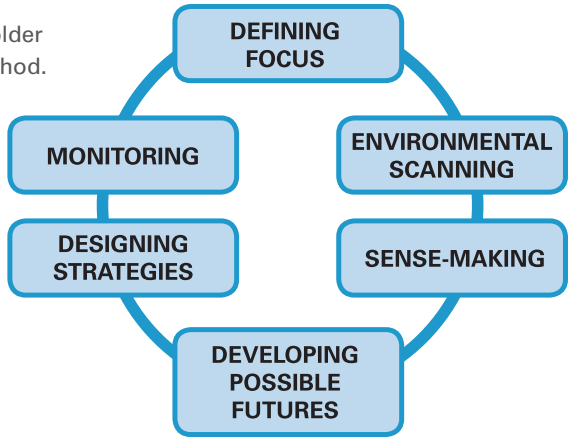
SCENARIO PLANNING PLUS (SP+)

A toolkit put together by the Centre for Strategic Futures and the Risk Assessment and Horizon Scanning Programme Office (RPO, then Horizon Scanning Centre) in 2009 to complement and enhance the use of scenario planning methodology in government. It enhances the Singapore Government's ability to manage discontinuities and respond to dynamic change. Called "Foresight to Strategy" in RPO, it has been an important guiding framework that has helped RPO to develop its suite of foresight development and engagement tools since 2004.

While the SP+ toolkit is presented as a cycle, with one step leading to the next, it is important to note that the steps do not have to be applied in sequence or in a fixed direction — foresight work is frequently experimental and iterative and it is not uncommon for steps to be revisited within a single project. It is also not necessary for all the steps to be deployed in any given foresight project.

The SP+ toolkit is targeted at six key areas:

- **Defining focus:** Tools to evaluate the significance of particular trends and issues, in order to determine priority areas for the organisation, e.g., Cynefin Framework.
- **Environmental scanning:** Tools to engage stakeholder groups and surface new insights, e.g., Delphi Method.
- **Sense-making:** Tools to relate these new insights to the organisation, e.g., by categorising, visualising or prioritising these insights for particular stakeholders.
- **Developing possible futures:** Tools to generate scenario narratives, e.g., morphological analysis.
- **Designing strategies:** Tools to develop and test strategies and action plans to help the organisation attain its desired futures or avoid feared ones, e.g., back-casting, stress-testing.
- **Monitoring:** Tools to determine the organisation's progress towards particular futures, e.g., through the identification and monitoring of indicators, signposts and milestones.



Source: Centre for Strategic Futures Annual Report 2011

SENSE-MAKING

The process of clarifying and articulating an organisation's understanding of complex situations in order to build situational awareness and shared understanding within the organisation. It supports decision-making by establishing an understanding of the interconnections between various elements and actors within a complex system.

Sense-making typically begins with sensing processes, e.g., crowd-sourcing. The feedback gathered from various sensors and stakeholders forms the basis for analysis.

While it is impossible to fully map the interconnections within a complex system because complex systems constantly evolve, sense-making is nevertheless useful in reducing uncertainty within the operating environment and keeping potential risks below acceptable thresholds.

Reference

1. Dave Snowden, "What is Sense-Making?", http://cognitive-edge.com/blog/entry/3840/what-is-sense-making/, last accessed Aug 2014.

SENTIMENT ANALYSIS

The use of natural language processing, computational linguistics and text analytics to identify and extract subjective information in source materials. Generally speaking, it aims to determine the attitude of a speaker or a writer with respect to a particular topic. The attitude may be their judgment or evaluation, their mood, or the emotional effect the author wishes to have on the reader.

The first step in determining the tone of a document is to break up the document into its basic parts of speech (part-of-speech or POS tagging). POS tagging is a mature technology that identifies all the structural elements of a document or sentence, including verbs, nouns, adjectives, adverbs. The tool then identifies the emotive phrases within a document and scores these phrases (–1 to +1, for most negative to most positive). It then combines them to discern the overall sentiment of the sentence.

Sentiment analysis is commonly applied in the private sector to track and understand perceptions of an organisation or brand.

Reference

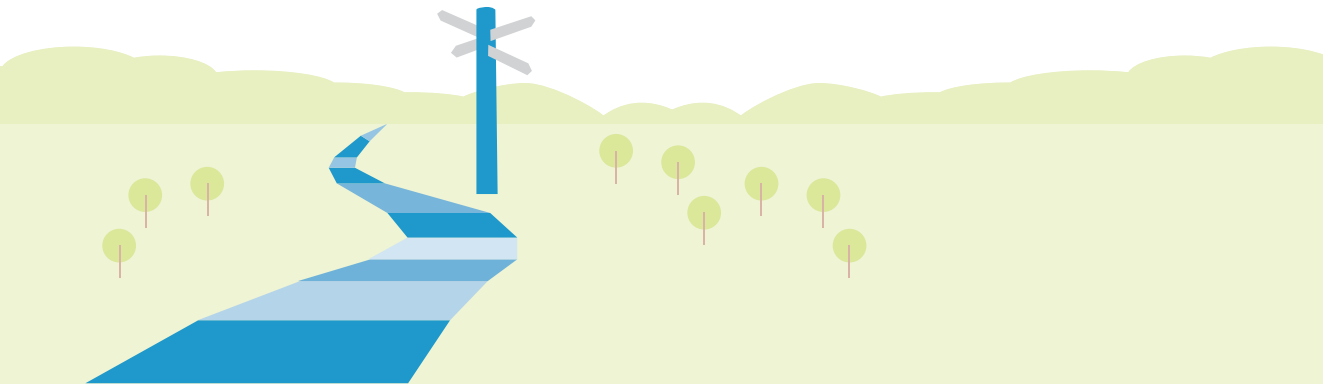
1. Bo Pang and Lillian Lee, "Opinion Mining and Sentiment Analysis", http://www.cs.cornell.edu/home/llee/opinion-mining-sentiment-analysis-survey.html, last accessed Aug 2014.

SIGNPOSTS

Indicators that mark milestones or "waypoints" between a given future and the present day. They can take the form of discrete events or thresholds, but they can also be much more loosely defined, such as trends or patterns.

Signposts are useful because it is easier to visualise the future if the path towards it is broken up into familiar or manageable blocks of time, i.e., months or years, instead of decades. In the context of foresight work, signposts help to gauge the extent to which a particular scenario has materialised. In this, they can help to update decision-makers' thinking as new information becomes available and keep the organisation responsive to changes in the environment.

See also *Early Warning System*



SIMULATION

Representations of real or hypothetical processes, mechanisms or systems. Through these structured processes, stakeholders can "play out" scenarios that simulate possible real world environments of interest, typically for the purpose of analysis or education.

SINGAPORE FORESIGHT WEEK

A week-long series of foresight-related events, organised every 18 to 24 months in Singapore, which currently includes the following:

- The International Risk Assessment and Horizon Scanning Symposium by the National Security Coordination Secretariat
- The Foresight Conference by the Centre for Strategic Futures
- The Complexity workshop by the Nanyang Technological University

Such events are an important platform in Singapore's foresight landscape as they serve as a seedbed for fresh thinking and collaboration, in line with the core foresight philosophy of canvassing widely for new insights. They also help to keep Singapore at the forefront of futures thinking globally.

STEEP ANALYSIS

A framework for a holistic scan of the external environment for factors, from various domains, that an agency needs to take into consideration in its decision-making. STEEP stands for:

- **Social** factors include social and cultural values, and demographics.
- **Technological** factors include R & D activity, new horizons and research, and the rate and extent of technological change.
- **Economic** factors include items such as economic growth, interest rates, inflation and international trade.
- **Ecological/Environmental** factors include aspects such as weather and climate as well as energy and fuel.
- **Political** factors include a government's policy focus as well as movements on the political scene, e.g., change of power among political parties. This can also include legal and regulatory factors.

Similar frameworks include STEEPLED (adding Legal, Ethics and Demographic factors) and STEER (Socio-cultural, Technological, Economic, Ecological and Regulatory factors).

STRATEGIC FUTURES NETWORK (SFN)

A committee in the Singapore Public Service which provides guidance and oversight on foresight-related issues, the building of futures-related capabilities and capacities within the public service, and Whole-of-Government risks.

The SFN seeks to build high-level oversight of long-term trends and issues with an impact on the government's work. The committee is chaired by the Head of Civil Service, and committee members include Deputy Secretary-level representatives from Ministries and Statutory Boards.

STRATEGIC PLANNING

The process of determining and articulating what goals are to be achieved in the medium to long term, where the nature of the operating environment is subject to change, as well as how to reach these goals.

Strategic planning contrasts with operations planning, which seeks to maximise an organisation's efficiency within near-term constraints, without considering how things might change in the longer term. In the context of government, strategic planning seeks to develop action plans stretching across budget (and even electoral) cycles.

Strategic planning has a foresight element, such as scanning the horizon for potential opportunities and risks and determining how these might affect the direction of the organisation. However, sound strategic planning should also involve many other activities and processes, ranging from crowd-sourcing from multiple stakeholders and synthesising diverse views into coherent narratives, to communicating and championing organisational directions once they are determined.

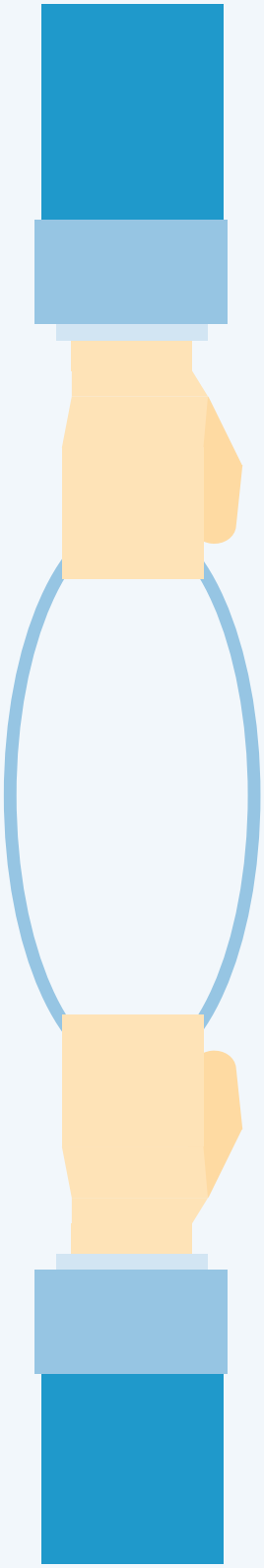
Strategic planning also has a human resource or organisation development function. If communicated well, strategy can help to align different parts of an organisation and generate a shared sense of purpose and identity.

STRESS-TESTING

A method of identifying weaknesses or flaws in existing policies. This can help decision-makers assess and evaluate the robustness of their policies by identifying potential breaking points and instances of failure along possible policy trajectories.

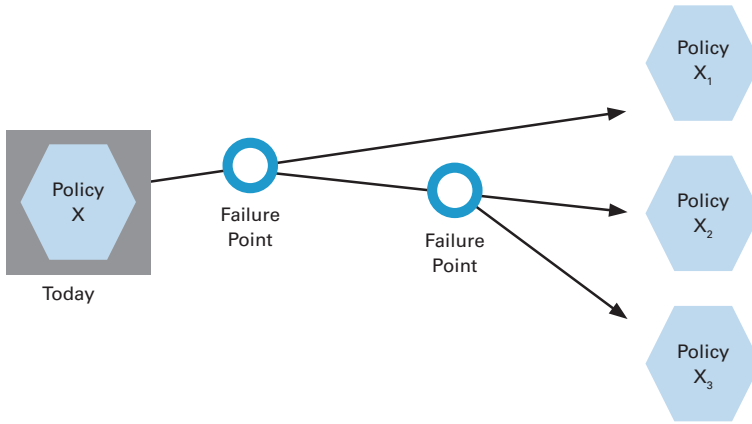
Stress-testing can help establish whether existing thresholds of failure are robust and sufficiently acceptable by painting a picture of how bad things could get and identifying breaking and tipping points for the policy in question. It can also help to sensitise decision-makers to early indicators of failure or potential stress points down the road.

Stress-testing can take several forms, such as "red-teaming" of military tactics in the armed forces (i.e., getting a team to take the perspective of the "enemy"), sensitivity analyses (studying how changes in various factors will affect the system), or "pre-morteming" (assuming the strategy has already failed and analysing the causal factors for this). In the Singapore government, stress-testing has been piloted in several inter-agency projects as a means of systematising the review of established policies and policy paradigms.

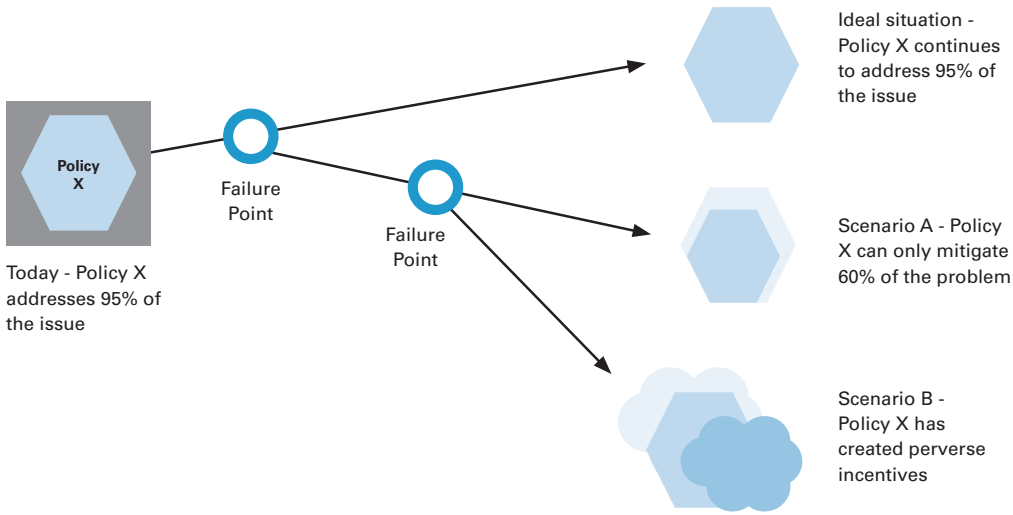


SCENARIO ANALYSIS

Holding the policy parameters constant and changing the external environment, how might the policy **fail** under plausible scenarios of the future? Where are the **critical failure points** along the trajectory? What **drivers of change** will cause the policy to fail?



Holding the policy parameters constant, what might be the **gaps** or **unintended consequences** of the policy under different plausible scenarios of the future?



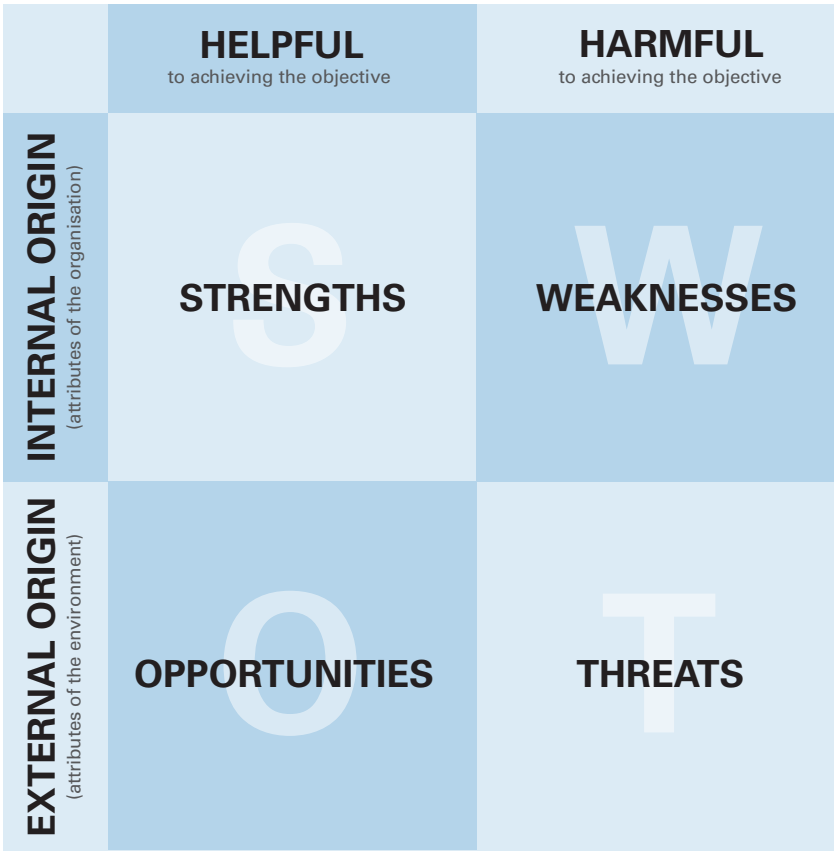
References

1. Gary Klein, "Performing a Project Premortem", http://hbr.org/2007/09/performing-a-project-premortem/ar/1, last accessed Aug 2014.
2. Adrian Taylor and Cory Costanzo, *Foresight to Strategy* (Trainers Handbook) (RAHS Programme Office, 2010).

SWOT ANALYSIS

A tool typically deployed in planning or facilitated discussions that helps to surface the **Strengths** and **Weaknesses** of an organisation and the **Opportunities** and **Threats** that it faces. The SWOT framework distinguishes between elements that are internal to the organisation (Strengths and Weaknesses) and those that are external to the organisation (Opportunities and Threats).

SWOT is a good way of visualising and mapping out key success factors and vulnerabilities for the organisation. It is particularly useful in encouraging discussants to consider the flip side of their preferred discussion frame, e.g., balancing an inward-looking discussion with the broader external context.



SYSTEMS THINKING

An analytical approach that takes into account the full range of interactions between different elements in a system. This is different from traditional analyses, which tend to focus on particular elements or a limited range of interactions in isolation of the system as a whole.

Systems thinking can yield surprising insights and uncover new policy options, especially when the elements in a particular situation are dynamic, i.e., they change over time, or are influenced by the external environment and other elements that may not be immediately obvious to an observer.

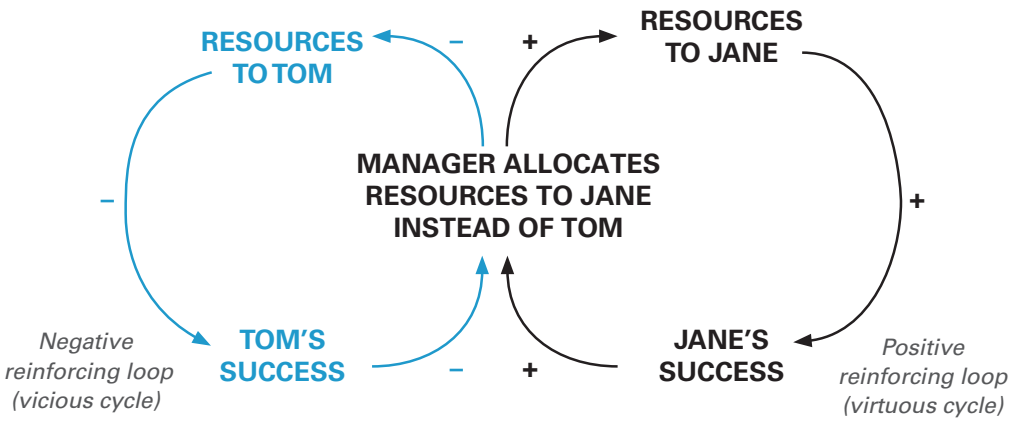
While it is impossible to comprehensively map out all the elements and interactions in any given system, systems thinking can nevertheless help decision-makers appreciate the "big picture" and the linkages between the different sections of the system that they oversee. This can help foster collaboration and shared understanding between different parts of an organisation.

Systems thinking also allows policymakers to pick out cause-effect relationships and how they manifest across an entire system, e.g., balancing loops and reinforcing loops. These are useful ways to visually communicate the cause-effect relationships within the system in consideration:

SYSTEMS ARCHETYPE — SUCCESS TO THE SUCCESSFUL

Imagine that Tom and Jane are equivalent in terms of their abilities. Given the same amount of resources, they will produce the same results. Tom and Jane work in a company where their manager allocates resources based on relative performance. The underlying philosophy here is meritocracy. The organisation rewards performance.

Now imagine that Tom goes through a bad patch one year. The manager responds by allocating fewer resources to him that year. Yet, even though Tom bounces back to his same level of ability as before, his performance never quite recovers. **Why?**



Taken together, these two reinforcing loops illustrate the problem of self-fulfilling prophecies. What the manager does not realise is that because of his allocation system, he has unwittingly created a situation where his one-time assessment of Tom will result in a self-fulfilling prophecy where Tom repeatedly appears less capable. This archetype describes how small differences or random factors can lead to one actor being hugely more successful than others, helping to explain effects such as how success in the school system leads to success later in life.

U – W

UNKNOWN UNKNOWNS

WHOLE-OF-GOVERNMENT

WHOLE-OF-GOVERNMENT INTEGRATED RISK MANAGEMENT

WICKED PROBLEM

WILDCARDS

WIND-TUNNELLING

UNKNOWN UNKNOWNS

Issues which have not yet been surfaced to the organisation and are blind spots.

The phrase "unknown unknowns" was used by then US Secretary of Defence Donald Rumsfeld in a press briefing in 2002 to explain that, despite intelligence agencies' best efforts, it was often not possible to get a complete picture of a situation, and that it was important to acknowledge that there would be gaps in knowledge and unrecognised blind spots..

The following table maps out the conceptual distinction between "knowns" and "unknowns":

		Knowledge Does anyone out there know about this issue?	
		"Knowns"	**"Unknowns"**
Meta-knowledge What is my organisation's relationship with this issue?	**"Known"**	**Known knowns** Issue is on the organisation's radar, and there currently exists a working understanding of the issue and its impact on the organisation	**Known unknowns** Organisation recognises that this issue is a current blind spot In the ideal scenario, the organisation makes an effort to study it further and estimate its impact
	"Unknown"	**Unknown knowns** "Wilful blindness" – cognitive biases have blinded the organisation to the existence or significance of the issue Information asymmetries – knowledge may be out there, but there is uneven awareness of it within the organisation	**Unknown unknowns** Issue whose existence is unknown to the organisation, or whose relevance, impact or significance has been underestimated because of the lack of knowledge Donald Rumsfeld: "... there are so many unknown unknowns. There are things we do not know we don't know."

WHOLE-OF-GOVERNMENT (WOG)

A term used in the Singapore Government to describe a networked approach to governance, where officers in different parts of government are able to overcome intra-government differences, e.g., differences in individual agency priorities and tackle problems as a coherent and coordinated whole.

"Joined-up government" is a similar concept and has been used in instances to refer not just to a government that is internally integrated but also integrated with broader societal actors.

In a complex world, governments will increasingly face problems that cut across multiple policy domains. For example, modern-day terrorism is a multi-dimensional threat that requires not only collaboration between security agencies, but also social agencies with oversight of issues affecting local communities.

This is not to say that agencies should no longer be responsible for specific issues or develop specialised expertise in particular domains. Rather, WOG is about optimising policy-making at the national level rather than the agency level, recognising that certain compromises will have to be made across agencies in the pursuit of broader government- or national-level objectives.

References

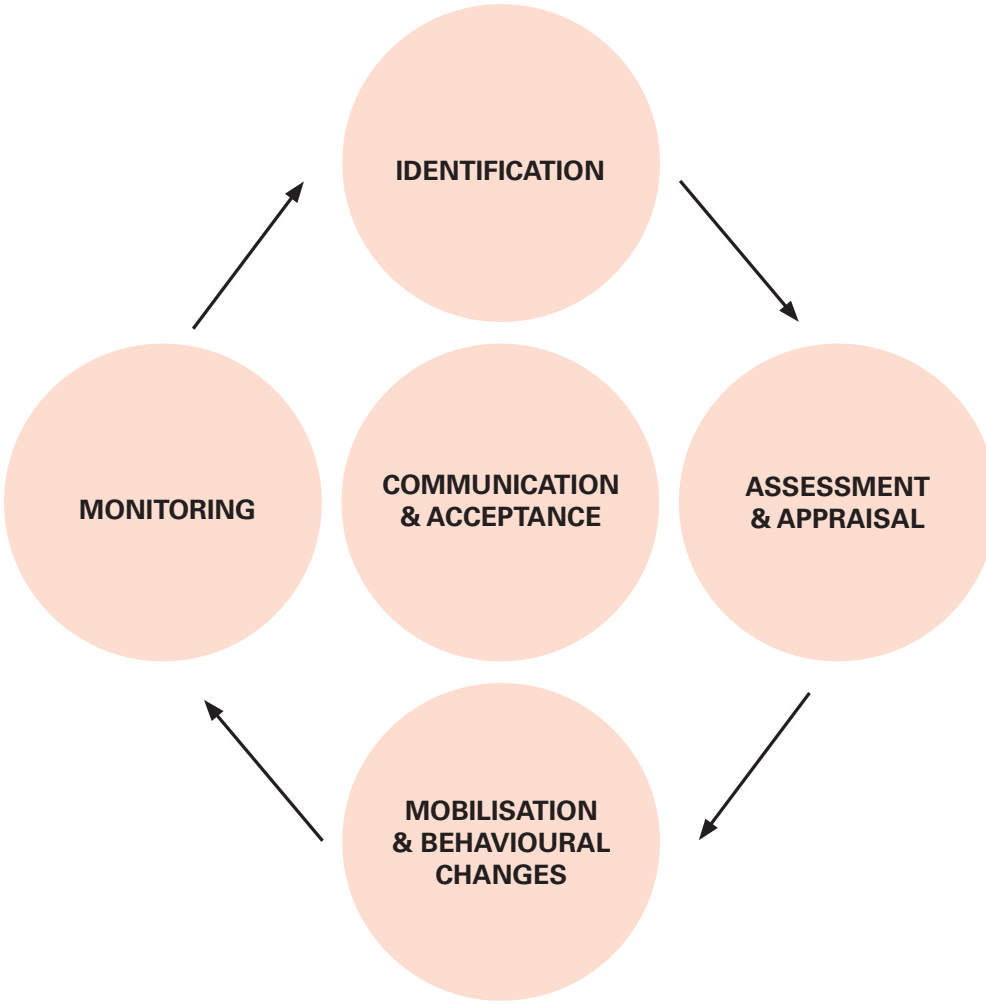
1. Peter Ho, "Governing for the Future: What Governments Can Do" (Sept 2012), http://www.rsis.edu.sg/publications/WorkingPapers/WP248.pdf, last accessed Aug 2014.
2. Lim Siong Guan, Many Agencies, One Government, speech at 2004 Commonwealth Association for Public Administration Conference.

WHOLE-OF-GOVERNMENT INTEGRATED RISK MANAGEMENT (WOG-IRM)

The Singapore Government's risk governance framework. It focuses on strategic risks that affect more than one agency, e.g., unanticipated changes in the operating environment, and interconnections among risks, such as how one risk facing an agency can have spill-over effects on other agencies.

With this approach, national-level risks are assessed in a Whole-of-Government process involving all Ministries and key agencies.This process prioritises different kinds of risk, identifies risk owners, and pinpoints gaps in risk governance. WOG-IRM prevents the fragmentation of risk perception and response in a government comprising many agencies. Ultimately, it seeks to build a common culture of risk awareness and communication across all of government.

WOG-IRM FRAMEWORK



WICKED PROBLEM

A problem which has no simple solution because the precise nature of the problem cannot readily be defined. Wicked problems are commonly found within complex environments, where constantly evolving interdependencies make it difficult to define problems precisely. (Here, "wicked" is used in the sense of "complex" or "challenging", as opposed to "ethically deplorable".)

One example of a wicked problem is climate change. There is no single or definitive solution. Individual solutions aren't categorically correct or incorrect, but better or worse, depending on the context and who is evaluating the solution. As demonstrated by the continuing debate on climate change, wicked problems typically involve multiple stakeholders, each of whom will approach the issue with different interests, values and biases.

There is no way to determine whether a solution has completely or conclusively solved a wicked problem. After a solution has been implemented, complex interdependencies are likely to result in impacts that cannot be fully appreciated *ex ante*, not only because they take time to emerge, but because there is a degree of unpredictability to how different impacts interact with one another.

Reference
1. Horst Rittel and Melvin Webber, "Dilemmas in a General Theory of Planning", http://www.uctc.net/mwebber/Rittel+Webber+Dilemmas+General_Theory_of_Planning.pdf, accessed Aug 2014.

WILDCARDS

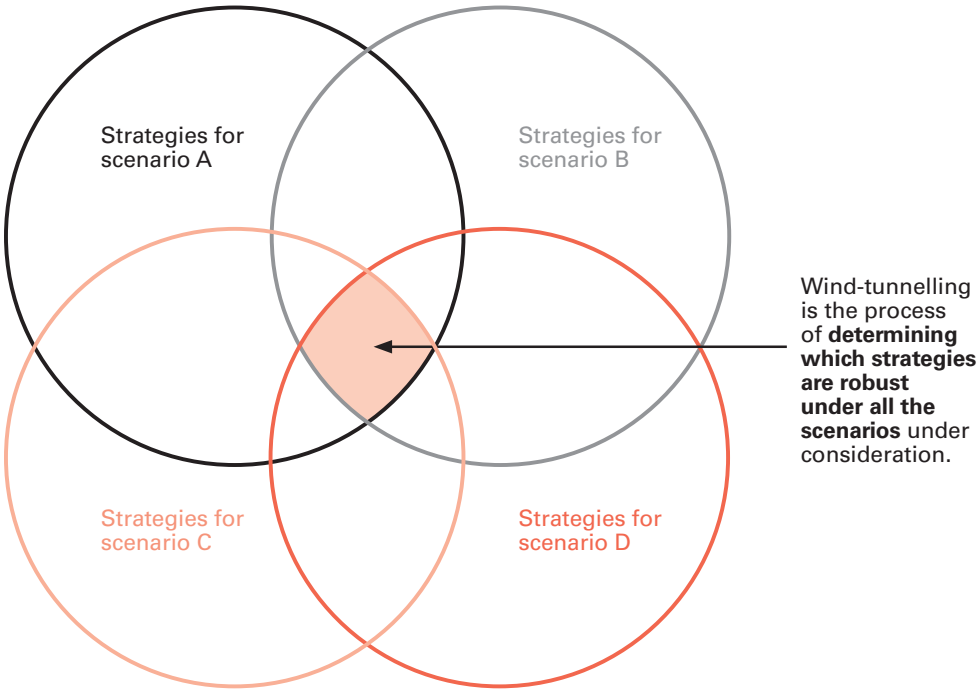
Low probability, high impact opportunities and threats that would be disruptive should they occur, but for which there may not be any evidence today that they will eventually happen, e.g., an asteroid from space striking a large population centre on Earth.

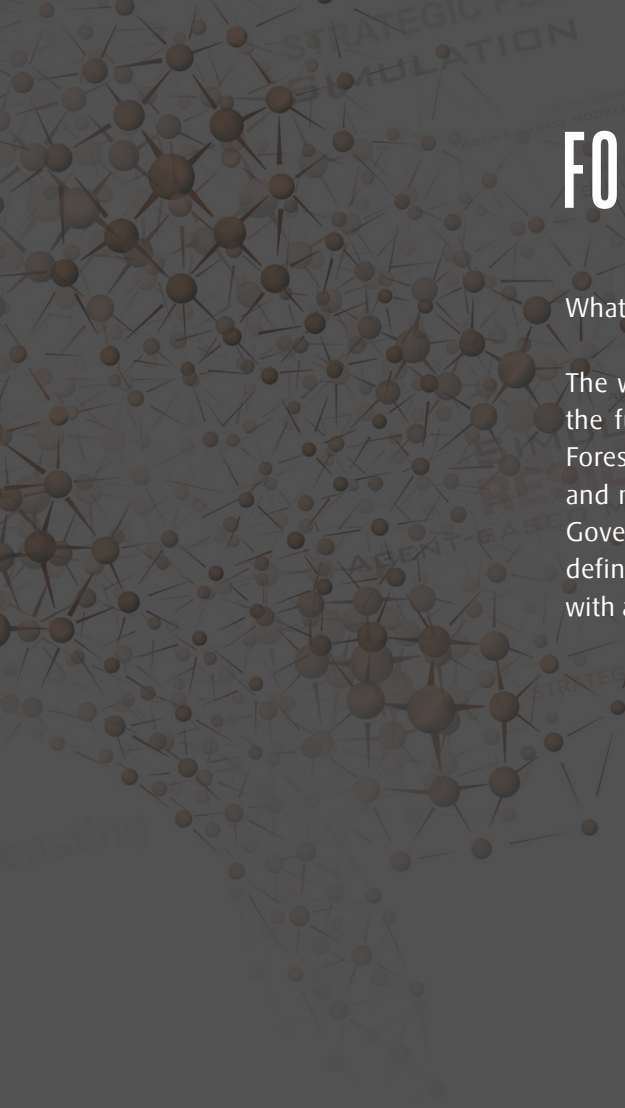
See also *Black Swans* and *Emerging Strategic Issues (ESIs)*

WIND-TUNNELLING

A means of assessing the robustness of strategies in multiple scenarios, as part of the scenarios-to-strategies effort.

Wind-tunnelling is a term borrowed from aerodynamic research. It refers to a tool used to study the effects of air moving past airframes to find the weak points. Likewise, the robustness of a strategy is assessed by placing it in each scenario to see which of the strategies holds up best in all the scenarios.





FORESIGHT: A GLOSSARY

What is a "**black swan**"? What are "**wicked problems**"?

The work of imagining, anticipating and planning for the future has acquired a language of its own. This Foresight Glossary is a guide to the concepts, tools and methodologies commonly used in the Singapore Government foresight space. Each entry provides a definition and overview of a concept or term, along with a listing of resources for further information.

About Us

The Centre for Strategic Futures is part of the Strategic Policy Office in the Public Service Division. It builds capacity for futures thinking across Government, and focuses on issues of strategic importance.

The Civil Service College (CSC) Singapore is a statutory board under the Public Service Division with a mission to develop people for a first-class Public Service. As the public sector's core institution for training, learning, research and staff development, CSC builds strategic capacity in governance, leadership, public administration and management for a networked government in Singapore.