Engineering Strategic Thinking

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Engineering Strategic Thinking

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Abstract

Strategy is generally identified as important. Unfortunately the field of strategy provides a number of challenges. For instance, there does not appear to be consensus within the literature on what strategic thinking is nor how to measure it. Additionally there does not appear to be any frameworks that allow strategic thinking to be engineered. For the purpose of this thesis, engineering refers to the process of design and implementation of a concept guided with appropriate metrics. That is, organisations, on identifying a lack of strategic thinking, can engineer the capacity for strategic thinking.

This thesis asserts that strategic thinking can be assessed and quantified. Furthermore, strategic thinking can be engineered within an accepted framework. This thesis proposes that an interdisciplinary approach can be used to investigate strategic thinking. This approach potentially provides a significant contribution to the field of strategy. The first contribution is the use of meta-analysis to form holistic definitions for strategy and strategic thinking. The second contribution of this thesis is a mixed methods approach to identifying measurable strategic thinking cognitive characteristics. Novelty is achieved in the triangulation of multiple domains to create an original self-reported assessment instrument of strategic thinking capacity.

After being piloted for validity, the assessment instrument was used to investigate the strategic thinking capacity of a major organisation. The results provided insights into the development of strategic thinking within a large and complex organisation. The resultant models also identified variations between strategic level headquarters. The third contribution is an assessment framework for strategic thinking in large organizations.

Finally, as strategic thinking could be argued as either the responsibility of the individual or the organisation, the fourth contribution of this thesis is the proposal of a framework that allows organisations to own the strategic thinking development process. Using semi-structured interviews and nodal analysis, this research was able to propose that strategic thinking can be engineered as a capability and thus can be the responsibility of the organisation.

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List of Acronyms

ACAUST .... Air Commander Australia

ACSC ..... Australian Command and Staff College

ADF ..... Australian Defence Force

AHQ ..... Army Headquarters

ARA ..... Australian Regular Army

CA ..... Chief of Army

CAF ..... Chief of Air Force

CLC ..... Capability Life Cycle

CN ..... Chief of Navy

FAR ..... Field Anomaly Relaxation (method)

FIC ..... Fundamental Input to Capability

MSC ..... Military Strategic Commitment

RAAF ..... Royal Australian Air Force

RAN ..... Royal Australian Navy

Chapter 1

Introduction

> "*We tend to use strategy as a general term for a plan, a concept, a course of action, or a vision ... Such casual use of the term to describe nothing more than what we would like to do next is inappropriate and belies the complexity of true strategy and strategic thinking*" [227, p. v]

1.1 Motivation

How is it possible to solve a problem when the fundamental variables within the problem are not well understood? This appears to be the case with strategy. The field of strategy is diverse and the use of the term is so varied as to be almost valueless [213, p.33]. Notwithstanding this diffusion of the term, strategy still attracts significant attention both within business and government organisations. A simple online search revealed over 4.8 million articles containing the word strategy. 17,500 articles were created since 2015 with strategy in the title[1].

[1] Search conducted on "Google Scholar" (`https://scholar.google.com.au`) on 08 July 2016 with the search term *strategy*

Similarly, there is very little agreement on the definition of strategic thinking and the make up of a strategic thinker yet, conversely, the importance of both of these appears to rate very highly amongst large and small organisations. For instance a report from the UK House of Commons stated that strategic thinking "is a valued skill in the Civil Service. It is one of the six core requirements in the Senior Civil Service competency framework" [54, p.20].

The need to develop the ability to think at the strategic level is not limited to a single government department or even organisation. A very quick review of the literature on the development of strategic plans showed a common theme. Most of the papers [23, 27, 28, 164] and books [210, 66] on strategic thinking and planning repeatedly emphasised the importance of the ability to think strategically. Bonn (2001), while claiming strategic thinking is crucial to remaining competitive in an "increasing turbulent and global environment", states that the "need for strategic thinking has never been greater" [27, p.63]. This claim is based on a comprehensive research project of a large body of corporate executives. All of the executives interviewed in the research asserted that their main problem was strategic thinking. Thus, in the words of Sloan (2006), "developing organizational capability for strategic thinking can be one of the most significant contributions executives and managers can make to organizational performance" [210, p.3].

Strategic thinkers are required in the highest levels of national office. Babbage (2008) held the view that the Australian National Security Council (NSC) "tended to focus far too little of its attention on longer-term strategic shaping, positioning

and security investment issues that are essential for effective pursuit of national security" [15, p.7]. There is simply too much attention given to the immediate issues. Strategic thinking is required to secure the long term future of nations and organisations because it is a prelude to designing that future [233, p.26]. The ability to think strategically is not just confined to the highest echelons. There is also a requirement for middle managers and even graduates to be able to understand the strategic picture. Tipler's 30 years experience in corporate strategic consulting reinforces Babbage's observation of the lack of depth in strategic thinking within organisations [219, 15]. Yet, despite the obvious importance, strategic thinking has appeared to have gone into hiding [32, p.76].

Evidently, while the processes and frameworks for strategic planning have been well established, the creative and explorative processes of strategic thinking remain "fragmented, under-specified and underemployed" [107, p.xv]. Arguably societal pressures, constraints and proliferation of government regulation has seen the increase of the talented adapters over the innovators. Those championing bold and ambitious strategies found themselves sidelined over the cautious, adaptive strategies of those who work within the system. Generally this type of behaviour is found within large, well established companies while younger venture capital groups (for instance) tend to attract the flexible minds [66].

Regarding the rapid changing environments that many organisations find themselves in, Zahn summarises the literature and states that traditional approaches to strategy fall short as they underemphasise the importance of creating and executing new strategies [234]. Organisations were unprepared for the dynamism of

modern environment [204, p.6]. So it appears that while strategy and strategic thinking are held to be important, there is a significant gap in the development of strategic thinking within organisations. This research is motivated to address this perceived gap.

1.2 Problem Definition

Strategy is popular. But is it important? In a recent text Prof Lovelace Jr also stated that "[no] subject is more essential in the preparation of national security professionals and military leaders than the teaching of strategy" [152, p v]. While it is an understandable obsession within the security industry, strategy is also fundamental to the success and sustainability of any organisation [24]. The importance of strategy would be difficult to understate.

However, despite the touted importance of both strategy and strategic thinking, the majority of CEOs cited the lack of strategic thinking as the main problem in their organisations. The UK Chief of Defence Staff, Sir Jock Stirrup, proclaimed that the UK had "lost an institutionalised capacity for, and culture of, strategic thought". Stirrup went so far as to say that the invasion of Iraq was a failure of strategic thinking due to a lack of vision, direction and long-term benefit [179].

In an Australian context, several operational reports from the Middle Eastern campaigns demonstrated that the Australian Defence Force also lacked strategic thinking. For example an operational report from 2012 stated that "...the Australian Defence Force (ADF) needs to identify and develop Commanders that think

at the strategic (macro) level in order to design and implement effective campaign plans" [11]. While another in 2011 said "...there is plenty of room to improve education of military planners and ... personnel to think in terms of effects" [10]. It certainly seems that the strategic thinking has gone into hiding [32, p76]

Ideally, given the evident importance of strategic thinking being present in organisations, strategic thinking would be able to be developed in a controlled way. That is, organisations, on identifying a lack of strategic thinking within the organisation, would be able to develop the capacity for strategic thinking. This ideal world is premised on two assumptions. Firstly that the capacity for strategic thinking can be assessed and, secondly, the capacity for strategic thinking is able to be developed.

Here then is the problem. There does not appear to be consensus on what strategic thinking is, let alone how to assess strategic thinking. Additionally there does not appear to be well established frameworks that allow the deliberate development of strategic thinking. This research proposes that strategic thinking can be assessed and quantified. Additionally, strategic thinking can be developed in a methodological manner and, using a framework, guide an organisation in designing for and tracking the progress of developing strategic thinking.

This research specifically addressed the lack of frameworks that create consensus on terminology, assessment and development of strategic thinking. The principle research question, and the subordinate questions, asked in this thesis are shown in Figure 1.1.

How to Engineer Strategic Thinking	What is strategic thinking?
	What are the requirements for strategic thinking?
	How can strategic thinking be assessed?
	How could strategic thinking be engineered?
	Who owns strategic thinking?

Figure 1.1: Thesis Research Questions

1.3 Contribution

This thesis hypothesises that strategic thinking can be assessed and quantified. Furthermore, strategic thinking can be engineered within an adequate framework. This thesis commences with the premise that an interdisciplinary approach can be used to investigate strategic thinking. This approach has the potential to provide a significant contribution to the field of strategy. The first contribution of this thesis is the synthesis of definitions for strategy and strategic thinking founded on a contemporary historical literature review.

Additionally, due to the lack of assessment tools for quantifying strategic thinking capacity, the second contribution of this thesis is the proposal of a strategic thinking assessment instrument. The study potentially provides a wealth of data on the development of strategic thinking in organisations. The assessment tool is developed using qualitative research methods using identified cognitive characteristics of strategic thinking. These characteristics are targeted and measured in an

original self-reported assessment instrument.

After being pilot tested for validity, the assessment instrument was then used to investigate the strategic thinking capacity of over 600 executives in a major organisation. The results provided significant quantities of data and new information on the development of strategic thinking within a large and complex organisation. The results were synthesised into an organisational strategic thinking model that can offer guidance on how strategic thinking could be engineered at the organisational level.

Finally, as strategic thinking could be argued as either the responsibility of the individual or the organisation, the last contribution of this thesis is the development of a framework that allows organisations to own the strategic thinking development process. Using semi-structured interviews and nodal analysis, this research promised that strategic thinking can be engineered as a capability and thus should be the responsibility of the organisation.

1.4 Thesis Layout

Chapter 2 addresses Research Question 1 - "What is Strategic Thinking?" As there does not appear to be a consensus on the definitions found in the literature and are being used within this thesis, specifically strategy and strategic thinking, this chapter evaluates contemporary texts on the concepts and provides a theoretical framework to guide the process for answering the primary research question.

Firstly the concept of strategy is reviewed as it is a general observation that there is little agreement on the key characteristics of strategy. Strategy, the noun, is a plan that has four key characteristics:

- Strategy connects capabilities with effects,
- Strategy plans for the long term,
- Strategy occurs in an environment where there is competition between actors, and
- Strategy requires independent action.

If we consider strategy to be a product to be developed, then the next level of analysis should be the process. In this case it appears that the process responsible for delivering a strategy is strategic planning, while strategic thinking is a prerequisite for successful strategic planning.

Finally strategic thinking is examined because, like the concept of strategy, there is no consensus among contemporary literature on the definition. To resolve this dilemma, this chapter examines selected literature to establish an understanding of strategic thinking. For the purpose of this thesis, strategic thinking is then defined as *a means-ends way of thinking that is future orientated and seeks to create value or an advantage for the system.*

This definition frames strategic thinking as a process (future orientated, means-end way of thinking) that creates a product (future value or system advantage). The process itself is generally thought of as a human-centric cognitive process.

Chapter 3 seeks to understand the requirements for strategic thinking or, as the case may be in a human-centric process, the requirements for a strategic thinker.

Research Question 2 ("What are the requirements for strategic thinking?") is specifically addressed by looking to identify the significant characteristics of a strategic thinker through the meta-analysis of contemporary research into the field. The result is a rich picture of the key characteristics of a strategic thinker. These characteristics are individually studied to identify the four significant cognitive characteristics of a strategic thinker, as the agent of strategic thinking. These characteristics are visionary thinking, intuition, creative thinking and systems thinking.

Having identified that there are very few measures of strategic thinking, **chapter 4** took the approach to evaluate the potential capacity of strategic thinking through the assessment of the underlying cognitive characteristics. These characteristics were previously identified as visionary thinking, intuition, creative thinking and systems thinking. Prior to investigating these characteristics, several variables were identified as being strong indicators of strategic thinking: cognitive ability and accumulated work experience.

While creative thinking, systems thinking and intuition had a selection of existing assessment tools, this chapter identified a gap in the assessment of visionary thinking. A novel assessment tool was created through an understanding of the original terminology found in the literature review. This assessment tool, while qualitative, was pilot tested with a small population and found to be broadly in-

formative.

Understanding each of the cognitive characteristics that are measurable allowed the development of a strategic thinking model. The four characteristics are normalised on a four-axis spider graph that allows for an illustration that can easily be inspected. This model, and the associated strategic thinking assessment, was then pilot tested using two small groups: one using ADF participants and the other comprised of civilian business executives. The pilot test found that the assessment tool was informative and easy to use. Chapter 4 answered Research Question 3 ("how can strategic thinking be assessed?") and its subordinate questions.

The previous chapter built on a solid understanding of strategic thinking and provided a valid strategic thinking assessment. The proposed assessment allowed changes in strategic thinking to be quantified. **Chapter 5** addressed research question 4 - How could strategic thinking be developed? This question was investigated using two sub-ordinate questions: 4a - What changes in strategic thinking can be observed? and research question 4b - Why is strategic thinking changing? The Australian Defence Force (ADF) agreed to cooperate in this research and, as a large organisation that identifies strategy as important, was an ideal population to address these questions [69, p. 13].

To gain an understanding of the development of strategic thinkers within the ADF the target population was serving military members within the ADF. Specifically, the population included *ab initio* officer entries from the three services currently at the Australian Defence Force Academy (ADFA) and a range of more

senior officers serving within the service headquarters. The total population size was estimated at about 2,000 across Royal Australian Navy (RAN), Australian Army, Royal Australian Air Force (RAAF), Australian Public Service (APS) and Foreign Military Service (FMS). The participants were contacted through a personalised email, sponsored by the Australian Army Headquarters (AHQ), providing a generic link to the online assessment. The invited participants were given two weeks to complete the assessment.

This chapter outlines the results derived from the experiment, specifically the variation amongst the participant demographics, the observations regarding changes in strategic thinking and pedagogy amongst the population. The final part of the chapter is an analysis of the results and how they relate to our hypothesis developed in the previous chapter.

Chapter 6 investigates at what level strategic thinking should be owned, and thus developed. Taking the view that strategic thinking should be an organisational capability, this research investigated and validated the concept of soft capabilities. It is this framework that allows strategic thinking to be described and developed in much the same way as any other operational capability.

Firstly soft capability appears to be people-centric. The humans in the system are the bearers of this capability. Examples included the ability to shape the environment or to create a trusting relationship. The biggest concern regarding soft capabilities though is the difficulty in applying quantifiable metrics. How do you measure trust? For that matter, how do you measure a strategic thinking

capability. This inherent intangibility also appeared to be one of the defining characteristics of a soft capability.

Secondly it appears possible to develop soft capabilities using the same capability development framework as hard capabilities. The foundational resources and Fundamental Input to Capability (FIC) models are the same however the focus is, as already discussed, upon people. Soft capabilities appear to rely on, and enhance, human capacity to affect the environment. Thus we can conclude that strategic thinking can be developed as a soft capability when there is an obvious connection to the effect. In most cases, organisations should expect that developing strategic thinking should allow the organisation to become more robust in the face of uncertainty and more proactive in influencing the operating environment.

Chapter 2

Literature Review

2.1 Introduction

This chapter is a literature review of contemporary texts on strategy and strategic thinking to distill a theoretical framework that can address the research question. The texts were found through online searches and selected based on the number of citations. The key research question is "how should a strategic framework be designed?" and requires a tiered understanding.

Firstly the concept of strategy is reviewed as it is a general observation that there is little agreement on the key characteristics of strategy. I propose that strategy, the noun, is quite simply a plan that has four key characteristics:

- Strategy connects capabilities with effects,
- strategy plans for the long term,
- strategy occurs in an environment where there is competition between actors,

and

- strategy requires independent action.

Noting that strategy is viewed using the lens of this thesis as a product, the next level of analysis then is of the process. In this case it appears that the process responsible for strategy is reliant on both strategic planning and strategic thinking. This chapter reviews both topics.

Strategic thinking is then examined as it, like the concept of strategy, appears to lack consensus among contemporary literature. To resolve this dilemma, this chapter examines key writings to establish an understanding of strategic thinking. In this case, due to the importance of the concept, a definition for strategic thinking is developed. For the purpose of this thesis, strategic thinking is then defined as: *as a means-ends way of thinking that is future orientated and seeks to create value or an advantage for the system.* That is strategic thinking is seen as a way of thinking that continually connects capability with effect, is future orientated and seeks to create value or an advantage for the system.

2.2 Strategy

> "*I see strategy as the purposeful actions undertaken by an actor within a specific environment with the intention of shaping future outcomes to the actor's benefit. So making strategic policy means solving a puzzle in three parts: understanding an environment largely not of our own making; determining our own global and regional role; and acknowledging*

a set of constraints that bound that role" [147].

Any discussion on strategy is bound to include an argument over definitions. The term strategy is widely used across a range of domains. For instant there are currently 4.8 million articles listed on "Google Scholar" that contain strategy, with at least 391,000 articles containing strategy in the title[1]. The search revealed titles ranging from very specific tasks ("Strategy for detection of prostate cancer based on relation between prostate specific antigen at age 40-55 and long term risk of metastasis: case-control study"; or "The split-apply-combine strategy for data analysis") to organisational ("International Marketing Strategy", "Human Research Strategy" or "the luxury strategy") to the State ("Competing visions for US Grand Strategy" and "A grand strategy for America"). Incidentally a casual search using Google search engine reveals an astounding *643 million* references to strategy[2]. From this it can be concluded that strategy is a popular term that appears to be used in a variety of contexts with different meaning. It is also worth noting that the business and the military fields contain most of the cited references.

2.2.1 The confusion surrounding strategy

The unfortunate position of the word *strategy* is that it has, in the words of Strachan, "acquired a universality which has robbed it of meaning" [213, p34]. This is a term that is "frequently invoked without any definition at all" [162, p.1]. Hooker terms it a minefield where, in the security domain alone, we find national security strategy, national defence strategy, national military strategy, grand strategy,

[1] 'Google Scholar' (`https://scholar.google.com.au`) search on 12 May 2015 looking for articles containing *strategy*.

[2] `https://www.google.com.au/search?q=strategy` on 12 May 2015

coalition strategy, regional strategy, theatre strategy, and campaign strategy [111, p59]. In the business literature a single book can hold 12 different paradigms of strategy from "strategy as intention and anticipation" to "strategy as creativity" to "strategy as numbers" [61]. Yet in another there can be ten different schools of thought that range from the design school to the cognitive school to the learning school [166]. Hooker goes on to explain that "the word *strategy* derives from the Greek *stratègia* [generalship], and *stratègos* [my leader]. Classically, strategy was quite literally *the Art of the General*."

The military origins of strategy has led to some theorists claiming that strategy belongs within the arsenal of the military rather than sitting in business or management parlance [213, p34]. However others claim that the only accepted aspect of strategy that is "known, indeed is uncontested, is the universal and eternal fact that strategy is always made by, in, and for a political process" [96, p.11]. Political though does not have to refer to matters decided between traditional political parties. At its core, politics concerns the exchange of power between humans [142]. As Tovstiga stated "strategy is practised in social contexts" [221, p viii]. Hence if strategy is related to political processes than it clearly involves social groups outside of the military.

Yet many theorists are influenced by the Prussian General, Carl Philipp Gottfried von Clausewitz, who stated that strategy is "the employment of the battle as the means towards the attainment of the object of war" [52, p.154]. The link to the military is reinforced by Colin Gray. Gray expands Clausewitz's definition to "strategy is the bridge that relates military power to political purpose; it is neither

military power *per se* nor political purpose. By strategy I mean *the use that is made of force and the threat of force for the ends of policy*" [95, p.17].

Usefully though, Gray makes great pains to ensure the reader understands the difference between cause and consequence or, instrument from effect. His example is that of air power. Gray states that the term *strategic air power* is wrong as it confuses the "capability with effect" [95, p.17]. Instead one should refer to the "strategic effect of air power" as this ensures that the capability or instrument (air power) is not mistaken for the effect. Air power in this case is merely a tool that can be employed to achieve tactical or strategic *effects*. Strategic then refers to the consequences of military behaviour, not to its conduct [115].

Linking strategy to the military domain is understandable given its epistemological ancestry. To state that strategy furthers policy ends would, however, misrepresent the strategic framework and strip it as "an important tool at every level of human endeavour" [129, p17]. Kennedy (2010) argues that policy should be viewed as a *means* and thus serve broader national goals. In fact the sum total of such policies is (or at least should be) a product of a grander strategy and, under such circumstances, policies serve strategy [129, p22]. It can be argued that policy then is merely another means, or even capability, within the national arsenal that can be used to further national ends or goals.

Late last century Murray and Grimsley remarked that confining strategy to military matters was overly restrictive and did not really reflect the contemporary understanding of strategy [178, p 1]. Furthermore, the Oxford dictionary

defines strategy as a noun with two meanings and it is the first that reflects this contemporary thinking [142]:

1. "A plan of action designed to achieve a long-term or overall aim, and
2. The art of planning and directing overall military operations and movements in a war or battle."

Sloan summarises the contemporary understanding of strategy in her review on strategic thinking to "imply a will to win, an element of competition, a process or framework to win, an extended time horizon, determination of a broad and major aim, unifying intent, and decision about resource allocation" [210, p4]. Alternatively strategy could be defined as "how you get from where you are now to where you want to be - and with real competitive advantage" [100, p.10]. As a definition this feels weak. It doesn't explain how the destination is decided nor, and perhaps more importantly, does it differentiate what level of management should concern itself with this. The same author further elaborates strategy as a "cunning plan". So, given this confusion surrounding the concept of strategy, how could we characterise strategy?

2.2.2 Characteristics of strategy

Good strategy almost always looks this simple and obvious [200, p.1]

The business and military domains appear to provide the most literature on strategy. Analysing text from these domains, it can be seen that there are four key characteristics [231, p.58]: these are connecting capabilities with effects; planning for the long term; competition between actors; and independent action.

Connecting capabilities with effects

Strategy is about connecting capabilities with intended effects or "the *integrated* application of available means to accomplish desired ends" [129, p.14]. The United States War College defines the strategy framework as the "relationship among ends, ways, and means. **Ends** are the objectives or goals sought. **Means** are the resources available to pursue the objectives. And **Ways** or methods are how one organizes and applies the resources" [73, p.11]. This framework has also been adopted by the Australian Defence Force [71, p.1]. Indeed the framework has proven to be very popular in modern strategy literature. For instance, Chilcoat defined the strategic art as the "skilful formulation, coordination, and application of ends (objectives), ways (courses of action), and means (supporting resources) to promote and defend the national interests" [50, p.205].

While this strategic framework is very military centric and does not appear to be fully embraced by the business world, there is still some utility in this thinking. The means are another term for an organisation's capabilities, the ways can be viewed as the functions and effects of the capabilities and the ends are the organisation's positioning or vision. In these terms Abbass defines strategy as "the "ways" in which we use the "means" (resources and capabilities) to reach and achieve the "ends" (objectives and goals)" [1, p.169]. This view certainly aligns with Gray's thoughts on separating the strategic effects (ends) from the capabilities (means) [95] and Jablonsky's "reworking of the traditional definition of strategy as the calculated relationship of ends and means" [117, p.143]. The general understanding of resources, inputs to capability, capabilities and effects can be combined with

the understanding of the strategic framework and is illustrated in Figure 2.1 on page 20 [231, p.57].

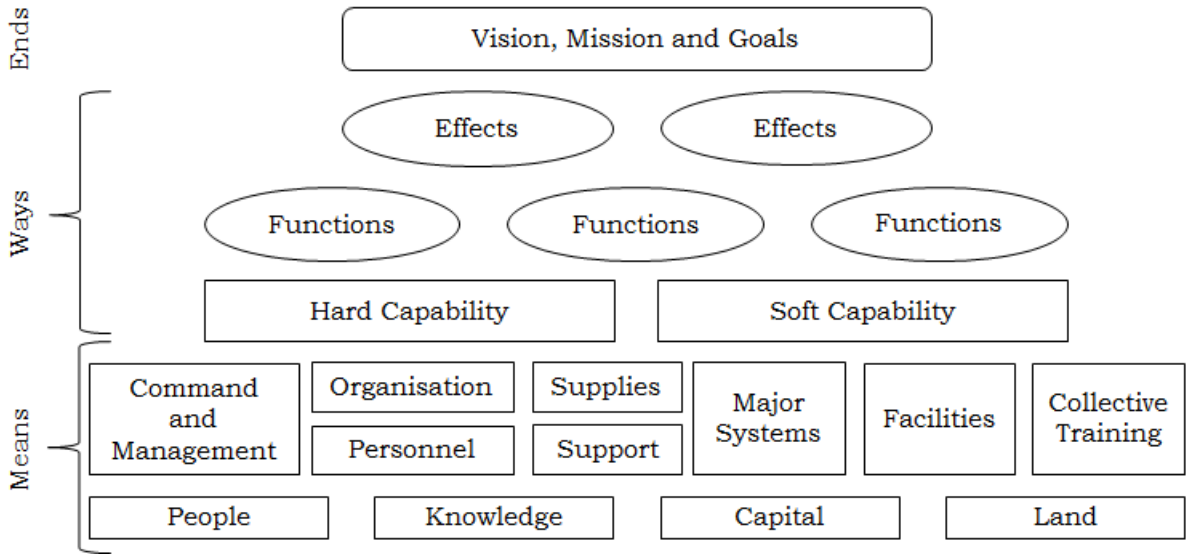


Figure 2.1: Mapping the "Ends-Ways-Means" strategy framework against a capability development hierarchy

Planning for the long term

There does appear to be consensus, in part, that strategy is about planning not doing. Quoting Hughes, Gray states that "[s]trategists *plan*, tacticians *do*" [95, p.20]. Sloan called it a "framework to win" [210, p.4]. In his insightful book on the difference between good and bad strategy Rumelt believes that good strategy has "coherence, coordinating actions, policies and resources so as to accomplish an important end" [200, p.11]. Strategy, to his mind is not a proven method but rather a "new hypothesis and its implementation an experiment" [200, p.241]. Hence it is about planning. Note also the connection Rumelt has made between ends and

resources.

Additionally strategy is focused on the future. Sloan believed that strategy involved an extended time horizon [210] and this is because strategy provides a "coherent blueprint to bridge the gap between the realities of today and a desired future" [227, p.5]. This view is soundly endorsed by Cook who believes that planning can only be strategic when it sees a new reality and pushes the existing system to that reality [55, p.75].

Competition between actors

Strategy involves competition between actors or wilful entities. The previous quotes by Sloan clearly define a level of competition, while Gray has stated that strategy was not a game played against nature [95, p.42]. Thirty years earlier Lumsden stated that a model only became strategic when "the source of uncertainty in the outside world is another actor (an individual or a group)" [145, p.259] as it implied a *choice of action* that may result in more than one outcome [146, p.289].

More recently Renee Malan, Ronel Erwee and Dennis Rose have articulated strategy as a competition for advantage [150, p.4]. The theme of competition was reinforced by Kennedy who didn't just see it as an act of "human intercourse" but about influencing behaviour by getting into the decision loop of others to "get them to do what they might not otherwise have done" [129, p.15-16].

Independent action

Strategy can only be practised by independent entities. While the use of the term strategy is varied and within a wide range of contexts, what appears to be common is that an effect is only strategic when it affects the whole system. Writers such as Lumsden, Levine or Malan all refer to the organisation when they define strategy [145, 138, 150]. Yarger states that strategy "differs from operational art and tactics in functional, temporal, and geographic aspects" [227, p.12]. Often, tactical actions are taken in response to a given task and accomplished with provided resources. Strategy, however, appears to rely on organic assets and the specific path is not directed by an external or superior agency.

2.3 Strategic Planning

Strategic thinking is often used as a synonym for strategic planning. It is actually the very utility of the word strategy and its many offspring that seem to create this confusion. The use of strategic art and strategic management are two classic examples. Chilcoat's seminal piece on strategic art described it as the "the skilful formulation, coordination, and application of ends (objectives), ways (courses of action), and means (supporting resources) to promote and defend the national interests" [50, p.3]. While Dickson referred to strategic management as the "investment, redeployment and restructuring of financial, human, organizational, and intellectual capital that create flows of revenues and cash beyond the short-term horizon" [72, p.216].

Both descriptions are basically the same with Dickson exchanging Chilcoat's military "Ends, Ways, Means" framework for a more business orientated framework that still connects ends (flows of revenue) with means (financial, human, organizational and intellectual capital). Incidentally Nuntamanop (2013) recent description of strategic management as the process of "building *capabilities* that allows a firm to create value for customers, shareholders, and society" demonstrates that Dickson's view is still prevalent [180, p.243].

The examples of strategic art and strategic management both serve to illustrate the point that one of the basic misconceptions still widely accepted is identifying strategic thinking with thinking about strategy [153, p.2-3]. This is despite the widely accepted view that strategic thinking could be distinguished from strategic planning, as proposed by Mintzberg, from as early as 1994. In his highly acclaimed work on strategic planning, Mintzberg states that "strategic planning does not mean strategic thinking so much as formalized thinking about strategy - rationalized, decomposed, articulated" [164, p.13].

Planning is a formalised procedure designed to produce an articulated result [164, p.13]. Mintzberg went to great lengths to separate strategic planning from strategic thinking. His papers in 1994 echoed earlier work by Armstrong who used the term strategic planning to encompass the development of strategies in an *explicit* process [8]. Mintzberg though went much further and saw planning as being about formalisation - or a "decomposition of a process into clearly articulated steps" [164, p.13]. Thus planning should become associated with "rational" analysis. Having successfully de-linked planning from thinking, Mintzberg then

looked to devalue the strategic planning process as irrelevant.

According to Mintzberg, strategic planning was not compatible with serious strategy making. His argument was based on the premise that strategic planning was a rational, linear process that is in fact incompatible to the dynamic strategy making process associated with significant and discontinuous change [164, p.16]. The argument is that effective strategy making was the result of innovation and synthesis. Both of which are not assisted through a rigid, analytical process. This view is supported by Cook (2004) who argues that the contemporary understanding of strategy is misconstrued and needs to be redefined [55, p.73].

Current literature refers to strategy as a management methodology to achieve pre-established goals. The most people, and organisations, are expected to do is "think outside the box". This infers that you are bounded by the initial "box". In fact strategy is not about compliance "to this box" (that's the role of management), rather it is about creation. Cook goes on to argue that strategic planning is not actually about "long-term" planning but rather about "creating capacity for constant emergence". Strategic planning thus assumes that the locus of control is *inside* the organisation and the future an "irrevocable commitment to purpose beyond the ordinary".

Jeanne Liedtka made a similar case six years earlier when summarising the then-current argument against traditional strategic planning processes (according to her they were choking initiative and favoured incremental over substantive change) [141, p.120]. The critics were holding up strategic thinking as the new

champion. Liedtka however warned that strategic thinking needed to be properly understood before it could successfully migrate into the manager's toolbox. Like Cook, Liedtka saw that strategic thinking was being misrepresented in the workplace. It was often used to categorise *thinking about strategy* rather than a way of thinking with its own specific characteristics. Referring to Mintzberg, Liedtka states that "strategic thinking is a synthesising process, utilising intuition and creativity" whose outcome is an integrated perspective of the enterprise.

Ralph Stacey (as cited by Liedtka) believed that strategy-making was only successful if it bases itself on new-learnings (referring to a closed learning loop or the double loop learning phenomena espoused by Argyris [7] and Heracleous [106]). Strategy was thus not about what is likely to happen, rather it is used to develop new ideas. Clearly the argument here is that strategic planning, in its traditional sense, has moved away from the high-end conceptual idea to a more analytical, method driven process. This is not to say that strategic planning is useless or has no place in this society, rather it should never be confused with strategic thinking. Similarly Bonn describes strategic planning as "a process that takes place after strategic thinking" [27, p.64]. It is clear that strategic thinking is not strategic planning, even if it is comprehensive and long term.

Strategy is about understanding what is outside of the box. In the end, Mintzberg's statements make sense when you realise that, in his view, the most successful strategies are *visions* not plans [165, p.107]. Thus according to Mintzberg, "when we are talking about the process of creating viable strategy, we had better drop the phrase strategic planning altogether and talk instead about strategic

thinking connected to acting" [164, p.18]. So strategic thinking is not strategic planning but the question still remains as to what is strategic thinking.

2.4 Strategic Thinking

> *"Strategic thinking is accepted almost as an axiom in strategy field."*
> [121, p16]

Logically a strategic thinker would have a capacity for strategic thinking. What this capacity is will be investigated in Chapter 3. However, in order to understand a strategic thinker, one must first understand what is meant by the concept *strategic thinking*. Like the concept of strategy, strategic thinking appears mired in confusion. There is no agreement on what strategic thinking is [27, p63]. In fact strategic thinking appears to have become accepted as an axiom within the strategy field [121, p2].

Strategic thinking can be used to explain simple interactions between two competitors such as that used in game theory and Cognitive Heuristics [34, 143]. Alternatively it is also used to refer to the ability to think in a manner that is creative, innovative and with vision [99, p.8]. Reflecting back on the "Ends, Ways, Means" strategic framework, Abbass defines strategic thinking as "the creative process used to design and connect the means, ways and ends" [1, p.169]. The first concern with strategic thinking, the oft used misconception that strategic thinking and strategic planning are the same, has already been addressed. But what is the contemporary understanding of the concept of strategic thinking?

2.4.1 What is strategic thinking?

When reviewing the literature for this thesis, almost all of the authors prefaced their articles and text on strategic thinking with a short comment stating that there is very little consensus on the meaning of strategic thinking [27, p.63]. Some, like Jelenc and Swiercz (2011), claimed that strategic thinking has turned into a synonym for almost all of the concepts with *strategic* as their first word [121, p.15]. It is clear that achieving consensus is seen to be too difficult [227, p.2]. This is likely to be because there does not exist a clear definition but rather a number of "slightly moderated descriptions and attributes" [216, p.1].

In order to understand the epistemology of the term strategic thinking, a historical literature review was conducted. What was immediately clear is that the confusion over the meaning of strategic thinking has prevailed for decades. Using online searches, 120 peer-reviewed articles were compiled and examined for definitions of strategic thinking. The articles were graded based on their number of citations. Of those, 45 provided an explicit definition and the quotes from each author that best described their view of strategic thinker are laid out in Table A.1 in Annex A. The table provides the definitions of strategic thinking as provided by most of leading authors from 1978 through to the present day (as supported by number of citations). Each definition was then deconstructed with the **boldfaced** words representing the key concepts from each author(s). Table A.1 is the result of this review, noting that each author and quote are itemised from 1 - 45.

On completion of the table, the key concepts were then reviewed using a cluster

analysis. Essentially all of the definitions were laid out and then grouped within like clusters. For example there were a number of definitions that emphasised the importance of creating value for the organisation whilst other definitions emphasised that strategic thinking was a way of thinking about problems. The clusters were then identified as domains with the name taken from the definitions. For ease of reference, this cluster diagram was de-constructed into four figures and are illustrated in Annex B.

Finally, to understand the historical validity of these concepts, the definitions were mapped on a time line. This visual representation of the historical evolution of the understanding of strategic thinking domains is illustrated on Figure 2.2 on page 29. Again, for ease of reference, each definition is referenced to its corresponding item number in Table A.1 from Annex A.

The resulting time line clearly illustrates that since 1978 the evolution of strategic thinking concepts has occurred over four quite stable domains: Creating value; Means-Ends Thinking; Future orientation; and Way of thinking. Interestingly several of the definitions provided cross-references across several of the domains (such as Future orientation / Create value; or Way of thinking / Future orientation). The linkages are indicated by the arrows. These four domains can now be explored and combined to create a definition of strategic thinking for this thesis.

Create Value

Strategic thinking, be it from a national, military or commercial perspective, has always been about creating an advantage for an organisation or a system. In

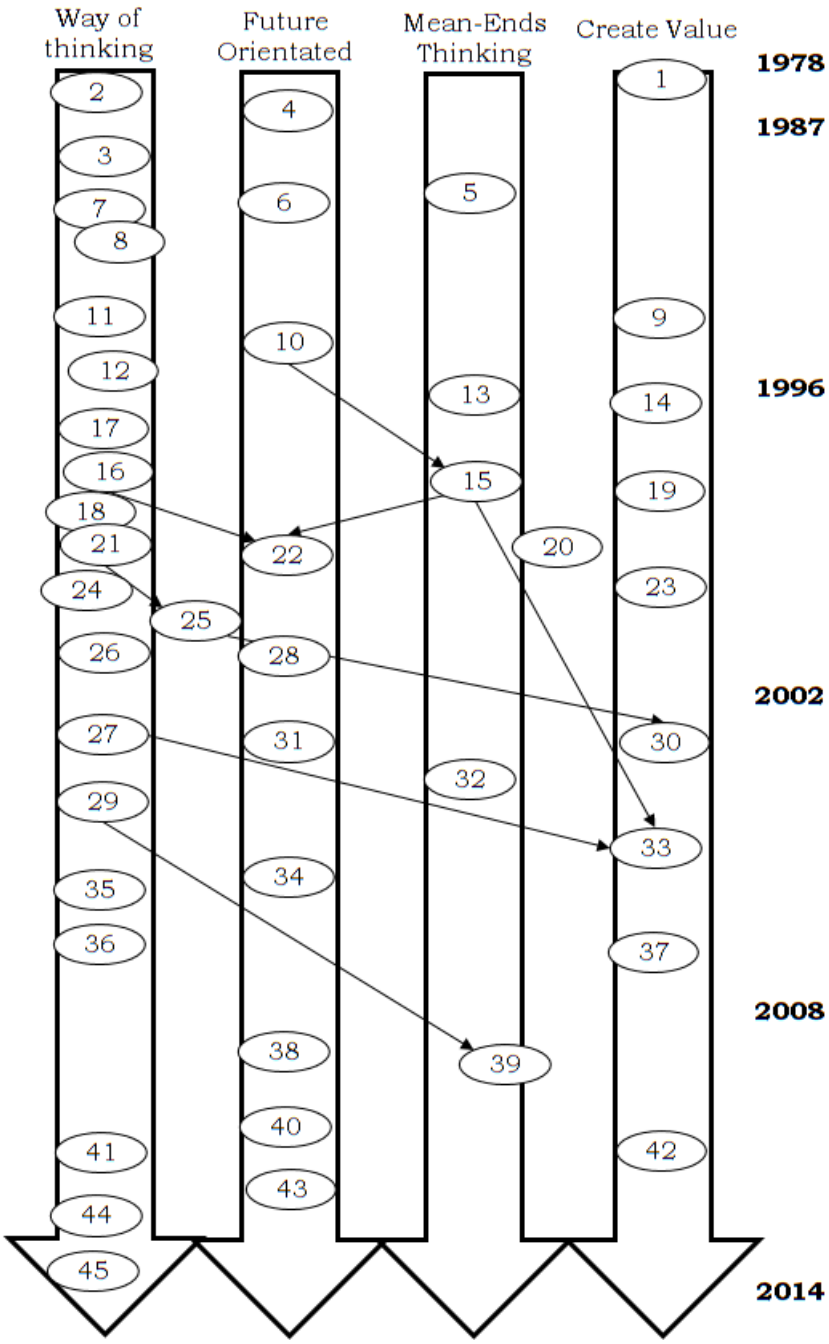


Figure 2.2: Historical evolution of strategic thinking concepts from 1978 to 2014 where the arrows indicate possible influence

fact this position was consistent through the literature review. Ohmae (1978) saw it as a combination of analytical method and mental elasticity used to gain competitive advantage [182, pp. 12-13]. The two great writers on business strategy, Mintzberg (1994) and Porter (1996), both reinforced this view as simply creating value however, over the next two decades, the domain evolved to include innovation (Abraham, 2005) and developing unique opportunities (Kamangar, 2012) [164, 193, 2, 124]. This focus on creative development appears to be influenced by the cognitive traits that started to appear in the *way of thinking* domain. The cross-domain influences are most apparent in Tavakoli and Lawton's (2005) description that is summed up as a "cognitive process that contemplates the future to create a competitive advantage" [216, p.6].

Means-Ends Thinking

The domain of "Means-Ends Thinking" is derived from the military theorists (such as Chilcoat (1995), Gray (1999, 2009, 2015), Larson and Hansen (2005), and Yarger (2006)) who strongly support the Ends-Ways-Means Strategic Framework described earlier [50, 95, 97, 96, 135, 227]. This domain looks at grounding strategic thinking and calls for practical application. The goals or aspirations need to be connected to the resources and capabilities (means) that are available or required by the organisation to produce the advantage or effect (ends). Interestingly this domain had the least number of references and were almost solely sourced from military theorists. The lack of recent literature that specifically mention Mean-Ends could be due to strong agreement within the military field yet little cross-pollination in the organisational management fields, though Malan (2009) description (way of solving strategic problems) resonates in this domain [150, p.4].

Future Orientation

The focus on the future is sporadic until Bonn (2001) invokes the use of visions [27]. This could be interpreted as a cross-over from Means-Ends as a way of recognising that strategic thinking focusses on the ends or goals. Strategic thinking, according to Bonn, would require a vision of the future. From 2001 there is support for a future or temporal orientation within strategic thinking. Masifern (2002), Henden (2004), Goldman (2005), Tavakoli and Lawton (2005), Eicher (2006), Sloan (2006), De Kluyver and Pearce (2009), Jelenc and Swiercz (2011), and Jans (2013) all describe strategic thinking as affecting the future of the system or organisation [153, 105, 90, 216, 77, 210, 65, 121, 120].

Way of thinking

Mintzberg, from 1994, really pushed the point that strategic thinking was not strategic planning [164]. While this has already been discussed, the recurring theme through the literature from Howard (1989) to the present is that strategic thinking is a way of thinking or a state of mind [113]. Liedtka (1998) specifically states that it is a way of thinking and both Bonn (2005) and Malan (2009) describe it as a "way of solving strategic problems" [141, 28, 150]. It appears to be from this perspective that we start to see the introduction of cognitive styles from Pelligrino and Carbo (2001) and the investigation by Bonn, Lietdka, Malan and Graetz (to name a few) of specific cognitive traits that correlate to strategic thinking [186].

2.4.2 Strategic Thinking Definition

Importantly each domain is independent of the other, as indicated by the number of definitions that only link to one domain, however there appears to be a distinct flow. For instance Graetz stated that strategic thinking seeks "innovation and imagine very different futures", indicating that "different futures" (*future orientation*) is a result of "innovation" (*way of thinking*) [94]. Similarly Tavakoli and Lawton state that strategic thinking is a cognitive process (*way of thinking*) that creates competitive advantage (*create value*) [216].

As both *create value* and *future orientation* result from *way of thinking*, it is possible to understand *way of thinking* as the ability or capacity to create an effect (*create value* and *future orientation*). *Mean-ends thinking* is described as matching the resources (or capacity) available with the desired ends (or effect). In this, it is possible to view *mean-ends thinking* as connecting the capacity (*way of thinking*) with the desired effect (*create value* and *future orientation*). That being the case, strategic thinking can now be visualised as a distinct process with discrete steps. This process is illustrated in Figure 2.3 on page 32.

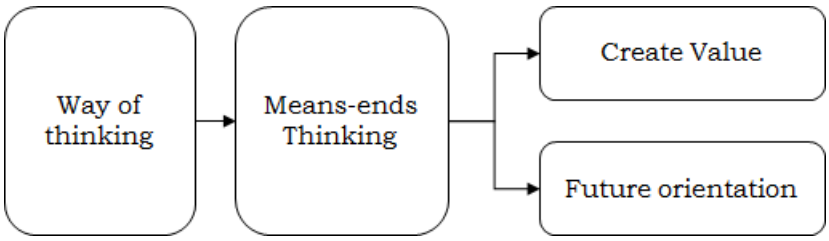


Figure 2.3: Understanding strategic thinking as a process that results in a product

It is through an understanding of the four domains of strategic thinking that

an appropriate definition can be found. In this case: *Strategic Thinking is a means-ends way of thinking that is future orientated and seeks to create value or an advantage for the system* [231, p.62]. What appears to be missing from the literature is a consensus on what characteristics identify someone as a strategic thinker and how those characteristics could be assessed.

2.5 Capability Development

As this thesis proposes that strategic thinking can be engineered as a capability, this section examines the literature on capability development.

2.5.1 The capability development process

The Defence Capability Development Handbook 2014 (DCDH14) defines capability as "the capacity or ability to achieve an operational effect" where an operational effect may be defined or described in terms of the nature of the effect and of how, when, where and for how long it is produced [38, p.2]. This definition appears to be heavily contextualised for defence and is further recognised in the Oxford Dictionary's expanded definition that capability refers to the forces or resources that give a country the ability to undertake a particular kind of military action [142]. The definition can be broadened to become a "measure of the ability of an entity to achieve its objectives, specially (sic) in relation to its mission" [33]. In business management terms, an organisational capability refers to the ability of an organisation to perform a coordinated set of tasks, utilising organisation resources, for the purpose of achieving a particular end result [104, p.999]. Simplified it is the ability to do something or "capacity to be or do or affect something" [89, p.3].

This thesis defines a capability as an entity that has the *capacity to achieve an effect*. A capability can thus be measured through indicators of its capacity and the effect it creates. The conception of ability as capacity is not new and is seen as a less subjective metric [118].

The traditional paradigm, in this case, refers to analogising capabilities with major systems. For instance, the Australian Strategic Policy Institute's recent review of capabilities within the Australian Army (Infantry, Special Forces, Armour, Aviation, Artillery, Engineers, Air Defence, Land Transport, Logistics and Combat Support, and Civic Military action) provides a very clear example of what could easily be interpreted as a platform-centric view of capability that is prevalent within the Australian Defence community [148]. This perceived focus on physical, or hard, capabilities is strongly reinforced within the DCDH14 and reflected in the Capability Systems Life Cycle (CSLC)[3]. The five phases of the CSLC are (1) identify capability gaps (Needs Phase); (2) define and cost solutions (Requirements Phase); (3) acquire the capability (Acquisition Phase); (4) operating, supporting and managing the capability (In-service Phase); and (5) withdrawing and disposing the capability (Disposal Phase) [38]. Colloquially this is known as the 'cradle to grave' approach and is broadly represented as the top process in Figure 2.4 on page 35.

While a military concept, this model reflects the stages of a product life cycle

[3]The ADF recently adopted a new capability life cycle that is still too new to evaluate completely[36]. Superficially the life cycle appears very similar to that being discussed here however there are several new policy and financial 'gates'. The new process does not fundamentally alter this analysis. Additionally they have added a ninth FIC - Industry

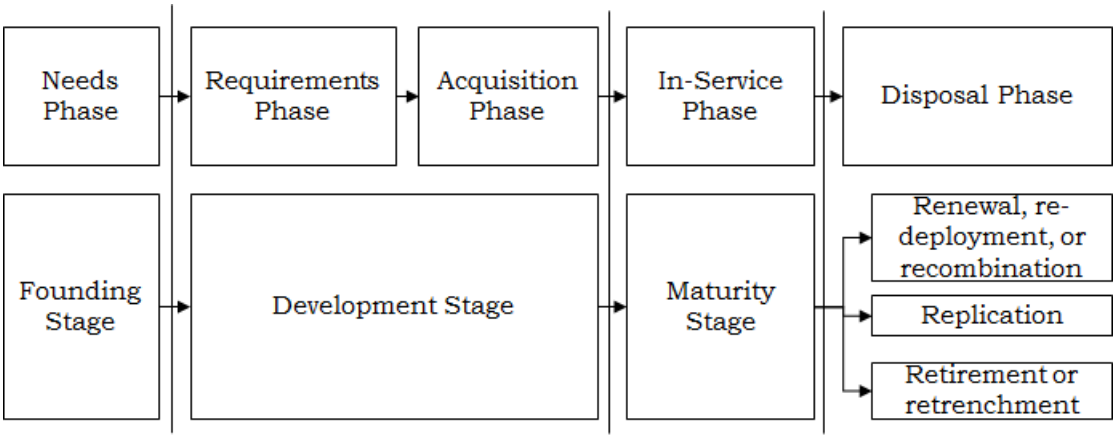


Figure 2.4: Comparison of a Defence Capability Life Cycle (top) with a Commercial Capability Life Cycle (bottom)

used in business terms (growth, maturity and decline) [104]. This is because the typical military capability appears to be based on a platform (product) rather than the produced effect. The bottom process in Figure 2.4 on page 35 is based on Helfat and Peteraf's description of the capability life cycle. The apparent differences reflect a difference in production paradigm rather than any significant difference in the life cycles. For instance the CSLC has split the development stage into a requirements phase and an acquisition phase to reflect organisational responsibilities. The key difference is the CSLC Disposal Phase. In the Defence CLC the capability is retired from service however in the Commercial CLC there is a recognition that a capability can undergo a renewal or a redeployment into a new market. Alternatively it could continue *ad infinitum* without change (replication).

2.5.2 Fundamental inputs to capability

> *[Fundamental Input to Capability] FICs work together to generate capability and hence achieve desired effects* [89, p3].

A key feature of the Defence Capability Development process is the adherence to a set of tenets that provide the basis for their approach [38]. While these tenets are outside the focus of this research, they do demonstrate the in-depth approach used by the Australian Defence Force. One feature that has proven to be useful is the recognition that capability is the combination of a set of Fundamental Inputs to Capability (FIC). This is inherently a system perspective of capability development. Systems are layered dependencies with the foundation level being the resources required [1, p.169]. The resources are those things that an entity has at hand and can control. Resources though are insufficient on their own to create a capability. It is the combination of these resources that create the fundamental inputs (second level) to capability (third level). Figure 2.1 illustrates these layers.

The eight broad FIC commonly associated with capability development are; personnel, organisation, collective training, major systems, supplies, facilities and training areas, support, and command and management [38]. These are represented in Figure 2.5 on page 37. In a similar paradigm, NATO approaches capability development in terms of Doctrine, Organisation, Training, Material, Leadership, Personnel, Facilities and Interoperability (DOTMLPFI) [101]. The UK Defence model recognises nine inputs (Organisation, Concepts and Doctrine, Training, Equipment, Infrastructure, Information, Personnel, and Logistics) while industry capability rests on the five pillars of People, Processes, Products, Technology and Facilities [232].

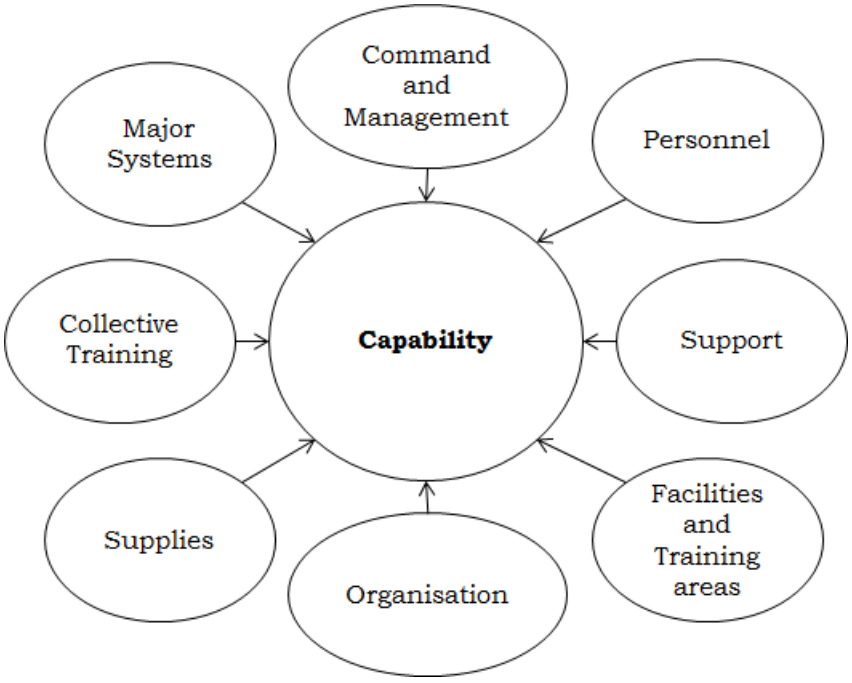


Figure 2.5: The key Fundamental Inputs to Capability (FIC) as identified by the Australian Defence Force

2.5.3 Alternate capability frameworks

> *As difference of "Hard Capability" among enterprises is getting reduced day by day, the role of "Soft Capability" gets more important* [51, p.147]

While the platform-centric view appears prevalent, a study by Francis and Bessant demonstrates that some thought has gone into other capabilities types [86]. In this case innovation management is cited as a capability that allows an organisation to survive and grow in the face of change. They define "innovation capability" as an underlying capacity to gain advantage by implementing more and better ideas than rivals. Here the operational effect, to use the military parlance, is "to gain advantage [over rivals]". Importantly this study demonstrates that a certain mind set or cognitive paradigm can be referred to in terms of capability.

Similarly Helfat and Peteraf's study into dynamic resource usage infers the existence of non-platform centric capabilities such as learning, change and adaption [104].

The term "soft capabilities", while rare, has turned up in literature for some time. For example in Moore and Chang's 1980 article on Decision Support Systems, soft capability referred to a stepped development of a system [170, p.12]. Soft, in that case, inferred that the final design had not been made concrete. More commonly the term "soft capabilities" has been used to refer to investments into education, workforce development and R&D [139, p.5]. This use of the term implies that soft capabilities support and enable hard capabilities as in the case of the relationship between operational and dynamic capabilities.

Operational and Dynamic Capabilities

Dynamic capabilities first rose to prominence in the late 1990s and research into dynamic capabilities has spread across a number of domains from strategic management to marketing to information management [18]. The term was developed as a result of a perceived gap in the *resourced-based view* (RBV) of a firm (the prevalent competitive theoretical framework of the time) [80]. RBV argues that resources that are simultaneously valuable, rare, imperfectly imitable and imperfectly substitutable are the source of competitive advantage [6].

RBV was unable to explain why certain firms had a competitive advantage in situations of unpredictable change. It is not a view that is able to explain how future resources are identified or created or even how current resources can

be refreshed to meet a changing environment. This lead to the development of the Dynamic Capability view. Dynamic capabilities initially referred to the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments [217]. The following table (Table 2.1 on page 39) illustrates some of the more popular descriptions of dynamic capability [18].

Capacity to *develop or modify* resource base or capability
Create new products (Teece & Pisano, 1994); build new ... competences (Teece, Pisano & Shuen, 1997); processes to gain... resources (Eisenhardt & Martin, 2000); Create new processes (Teece & Pisano, 1994); generates and modifies its operating routines (Zollo & Winter, 2002); create ordinary capabilities (Winter, 2003); capacity to create ... resource base (Helfat et al, 2007); Integrate ... competencies (Teece, Pisano & Shuen, 1997); processes to integrate ... resources (Eisenhardt & Martin, 2000); combining ... intangible and tangible assets (Teece, 2007); Reconfigure ... competencies (Teece, Pisano & Shuen, 1997); processes to reconfigure... resources (Eisenhardt & Martin, 2000); modify ... ordinary capability (Winter, 2003); ability to reconfigure ... resources and routines (Zahra, Sapienza & Davidsson, 2006); capacity to modify resource base (Helfat et al, 2007); reconfiguring intangible and tangible assets (Teece, 2007); Change the resource base (Ambrosini & Bowman, 2009)
Capacity to *respond* to environment
Respond to changing market circumstances (Teece & Pisano, 1994); address rapidly changing environment (Teece, Pisano & Shuen, 1997); The ability to sense and seize opportunities (Teece, 2000); Capacity to sense and shape opportunities and threats and seize opportunities (Teece, 2007); respond to environment (Ambrosini & Bowman, 2009)

Table 2.1: Main Characteristics of Dynamic Capabilities grouped as the capacity to develop or modify and the capacity to respond

In his review of the dynamic capability research Barreto made the observation that Teece et al (1997) assumed rightly that dynamic capabilities are typically built rather than bought and that their creation and their evolution are embedded

in organizational processes that are shaped by the firms' asset positions and the evolutionary paths they have adopted in the past [18, p. 260]. Ambrosini & Bowman came to a similar conclusion and added that the role of dynamic capabilities was to change the resource base [6, p. 34]. The use of *dynamic* and *capability* can create a misunderstanding of the term. If taken individually the words imply that the capability is dynamic when in fact the dynamism refers to the environment that dynamic capabilities respond to [6, p. 36]. Hence a dynamic capability can be stable in the manner an operational or "normal" capability is. In fact dynamic capabilities are not a resource. They are the processes that impact other resources or capabilities [6, p. 36].

Soft Power

> *The definition of power is the ability to influence the behaviour of others to get the outcome one wants* [181, p.2].

A recent National Strategy Information Center paper on soft-power demonstrates that the recognition of a set of capabilities that "do not rely on physical coercion" is not unusual [46]. The focus in this instance is the development of political capital by improving liberal ideas and pro-democratic elements to win political conflicts and competitions. The paper used examples such as the recruitment and training of personnel who are skilled at developing and implementing political strategy. These people are then used as trusted advisers and mentors for allies. While the focus of the paper was on the increase in the political contribution vis-à-vis the military aid, the proposal being put forward was still to build capacity to influence other nations. Interestingly, the National Strategy Informa-

tion Center also recognised that there is not a unifying term for these types of "soft" capabilities and proposed the use of the term "soft power".

Soft power started to appear in literature from 1990 and was used to differentiate two types of power: soft and hard [114]. Hard power generally refers to coercion and inducement while soft power refers to those intangible resources that invited others to want what you had. The argument is that hard power can be used to *make* an entity do something however soft power is able to *change the entity's preferences* and thus creating a longer-lasting change in your favour. This exact point is mentioned in Brigadier Jans manuscript on Defence leadership when he states that "Senior leaders can certainly influence what people do but they are usually much less successful in shaping how people think and feel" [119, p.2]. Hence the importance in soft power lies in its capacity to influence preference.

Soft power is not simply an extension of hard power and while its relative importance is often seems to be overlooked, examples can be seen in the public media. Prince William's trip to Japan in early 2015 was touted as a successful application in soft power for example [158]. Soft Power is much more difficult to evaluate as it is a less direct and visible source of a nation's influence compared to hard power [160, p.16]. Joseph Nye Jr., who is often cited as the originator of the term soft power, claimed that he regularly encountered leaders who did not understand the importance of soft power [181, p.ix]. However the concept of soft power has seen a strong growth in its value in China, particularly amongst its leaders [134, 140]. A significant reason of the popularity of the concept is the need from China to assure the world of the peaceful nature of its rise in relative power.

The concept of soft power as defined by Nye, while rarely criticised, failed to distinguish power behaviour from power resources and thus poses a challenge for the application of the concept [134, p.3]. Additionally it fails to delineate soft and hard power and their relationship still needs to be scrutinised and understood [140, p.3]. Frost recently remarked on the popularity of soft power as it implied a reduced spending on military hardware [88]. The problem with this perception is that it also implies that soft power can achieve the same effect in the total absence of hard power. Frost claims this is not so. Even so, the ADF have recognised that the ability to "judiciously and effectively apply soft power" was an important part of a coordinated national effort [110, p.12].

Knowledge Management

The idea that knowledge should be treated as a significant organisational resource has grown in importance in recent times [4]. Alavi and Leidner (2001) summarised the prevalent views on knowledge management emphasises (1) difference between data and information; (2) it must be expressed in a manner that is interpretable by the receivers; and (3) only information that is actively processed is useful [4, p110].

Knowledge could be viewed as a capability as it has the potential to influence future action. However the view espoused by Alavi and Leidner is that knowledge, as a capability, is not the capacity *for* specific action rather the capacity to *use* information [4, p110]. Examples used to illustrate this was the ability of an organisation to integrate directives, organisational routines and self-contained task teams to create an organisational knowledge capability [4, p122].

2.5.4 Generalising Capability Development

The literature provides a foundation of capability development and the capability development process is generally agreed upon with sufficient commonalities to apply a generalised theory. To consider strategic thinking as a capability would enable the use of a recognised development process and accepted paradigms. There does appear to be a gap due to the focus on platform-centric capabilities. There are a number of alternate approaches to capability development yet none appear to be tailored for strategic thinking. Additionally there is a gap in the literature as to who is responsible for the development of strategic thinking in an organisational context.

2.6 Gaps in Knowledge

While there is a generalised claim that the concepts of strategy and strategic thinking are without consensus, it now appears that suitable parameters can be placed around these concepts. Strategy can be described as a future-orientated intent by an independent actor that connects capability with effect and seeks to create competitive advantage. This description is not intended to be prescriptive, rather to identify the four key characteristics that appear to align with most descriptions of strategy.

In a similar vein, strategic thinking can also be framed as a means-ends way of thinking that is future orientated and seeks to create value or an advantage for the system. This definition was arrived at after a considerable literature review

that extended over 30 years of text. Given the evident lack of popular consensus on strategic thinking, it should be no surprise that there appeared to be a number of gaps in establishing a cohesive strategic thinking framework. Specifically, the gaps to be addressed by this thesis are:

- **Requirements for strategic thinking.** Understanding the concept of strategic thinking is only part of the problem. What is apparently missing is the requirement for strategic thinking. In this case, the requirements of a strategic thinker are used as a proxy for the agent of strategic thinking. Simply - what makes someone a strategic thinker?

- **Assessing strategic thinking.** The next step, after understanding what the requirements are, is to ascertain how strategic thinking could be assessed. How do we know that strategic thinking could take place, or has taken place? What are the practical tools that could be used to measure strategic thinking capacity?

- **Developing strategic thinking.** After designing indicators for strategic thinking, it would be logical to understand how to improve, or develop, that ability. There appears to be very little quantitative evidence on the potential influencers of strategic thinkers.

- **Responsibility for strategic thinking development.** Finally who is responsible for the development of strategic thinking within an organisation? Traditionally, strategic thinking has been seen as the providence of the individual, but is it possible for the organisation to treat strategic thinking as a developable capability?

Chapter 3

A meta-analysis of strategic thinking

"Strategic thinking is accepted almost as an axiom in strategy field."

[121, p.1]

3.1 Introduction

The previous chapter defined strategic thinking as a means-ends way of thinking that is future orientated and seeks to create value or an advantage for the system. This definition frames strategic thinking as a process (future orientated, means-end way of thinking) that creates a product (future value or system advantage). The process itself is generally thought of as a human-centric cognitive process. This chapter seeks to understand the requirements for strategic thinking or, as the case may be in a human-centric process, the requirements for a strategic thinker.

This chapter will look to identify the significant characteristics of a strategic thinker through a meta-analysis of contemporary research into the field. The result is a rich picture of the key characteristics of a strategic thinker. These characteristics are individually studied to identify the most significant cognitive characteristics of a strategic thinker, as the agent of strategic thinking. These characteristics are identified as visionary thinking, intuition, creative thinking and systems thinking.

3.2 Research Question and Methodology

> *"Being strategic is being less myopic - less shortsighted - than others"* [200, p.260].

The research question is "**what are the requirements for strategic thinking?**". As strategic thinking is a cognitive process that is, generally, associated with humans, the area of study for this question is strategic thinkers.

To state that confusion reigns when it comes to defining a strategic thinker would be a gross understatement. In fact there is no agreement on what the essential requirements for strategic thinking, or even characteristics of a strategic thinker, are. The literature originates from fields as diverse as psychology, strategic management, business leadership, military strategy and education.

Due to the quantity and quality of literature regarding strategic thinkers, a meta-analysis approach was used to synthesis the various results. Meta-analysis is an approach to information summary that is able to quantify results from quite

diverse studies [41, p. 1143]. Meta-analysis is generally considered to involve up to seven steps [56]. These steps are: formulating the problem; searching the literature; gathering information from the studies; evaluating the quality of the studies; analysing and integrating the outcomes of studies; interpreting the evidence; and presenting the results. In this case the research question has been formulated and steps two and three were achieved through a literature research using keywords that included "strategy", "strategic thinking", "strategic thinkers", and "strategic leaders".

The high variance in the study methods (ranging from cognitive personality assessments to semi-structured interviews) meant that the studies were not directly comparable. All of the sources are considered to be peer-reviewed (step 4). The studies were evaluated against each other for consistency and a cluster analysis used to integrate the outcomes. As it is often difficult to conclude when sufficient reports have been reviewed or included, the sample size used in this thesis needs to be addressed.

The sample size was guided by the concepts of saturation and probability. That is, the sample size must be large enough to ensure that all of the perceptions considered important to that study are uncovered [155]. Similarly the sample size should ensure that probabilistic clusters can be identified. While probability sampling is held to more rigorous standards for statistical testing, this may be insufficient for qualitative meta-analysis [198, p. 112]. For this thesis, the sample size was selected to ensure adequate coverage of a range of study fields and of sufficient quantity that clusters could be identified. While samples sizes can range from

five to 350, an accepted quantity would appear to be in the vicinity of 50 [155, p. 4].

55 sources were identified to be able to provide detailed descriptions of the characteristics of a strategic thinker. These were reviewed and the characteristics mapped to Table C.1. Each author was itemised from 1-55 to make cross-referencing the resulting illustrations a relatively simple process. In a similar manner to the previous review on strategic thinking, the individual strategic thinker characteristics, as identified by the 55 authors, were reviewed using a cluster analysis.

Each report provided between two and five characteristics. A cluster analysis method allows information to be split into separate homogeneous groups [205, p. 507]. A cluster analysis involves identifying the commonalities among the diverse results. Results can be visually mapped into dense groups that share information. While more often used to compare quantitative studies using probabilistic methods, a cluster analysis method translates well into qualitative results [85, p. 578].

The initial cluster diagram was visually busy as the characteristics were clustered using synonyms and similar concepts (such as *visionary* and *thinking in time*). This initial review of characteristics presented a number of clear clusters with several, such as systems thinking, visioning and creativity, demonstrating a very high number of references that represented up to 80% of the sources. This high number provided good confidence in the resulting characteristics. An abstract of the initial clusters is shown in Figure 3.1. Annex D provides the de-constructed clusters referenced against the sampled reports.

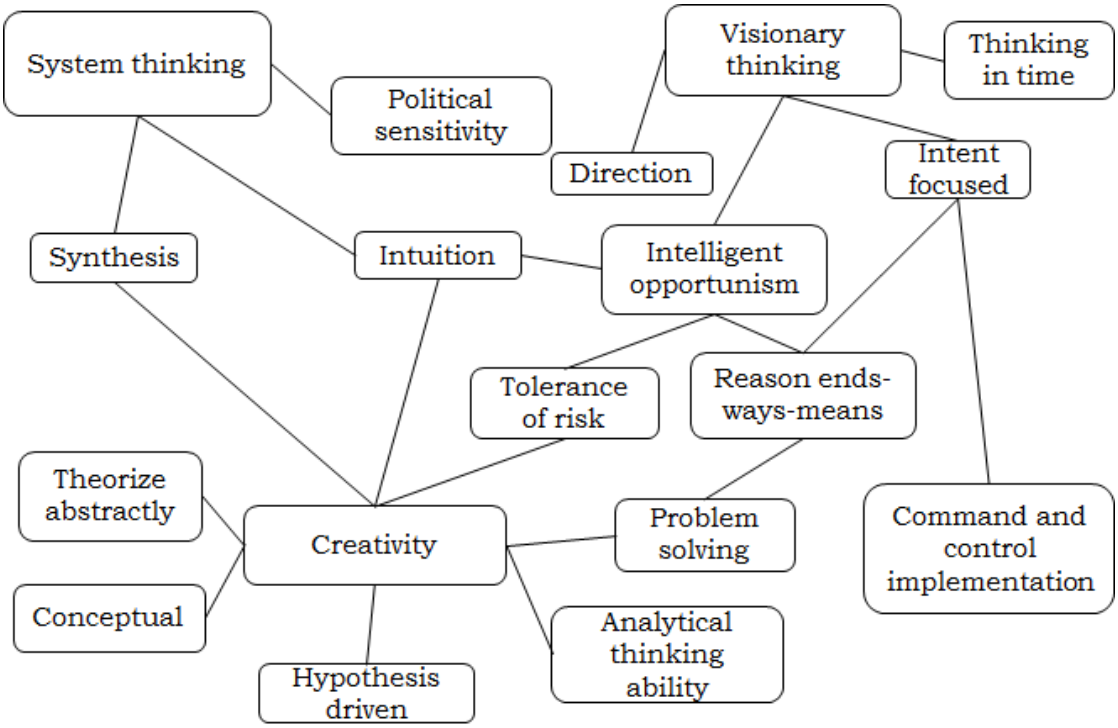


Figure 3.1: Identified cognitive characteristics of Strategic Thinking where lines indicate potential similarities in cognitive domains

As there were a number of clusters with only a few supporting reports, effort was made to understand if groups of clusters could be formed to describe major characteristics. The resultant clusters were named according to the dominant term within the cluster or using a term that best described the cluster. These clusters were able to provide strong evidence as to the historically understood characteristic requirements of a strategic thinker. The final step was to simplify the concept map and illustrate the relative importance (as per number of literature references) of each characteristic. The final cluster diagram (Figure 3.2) demonstrates the significant cognitive characteristics required for strategic thinking and how those characteristics were arrived at.

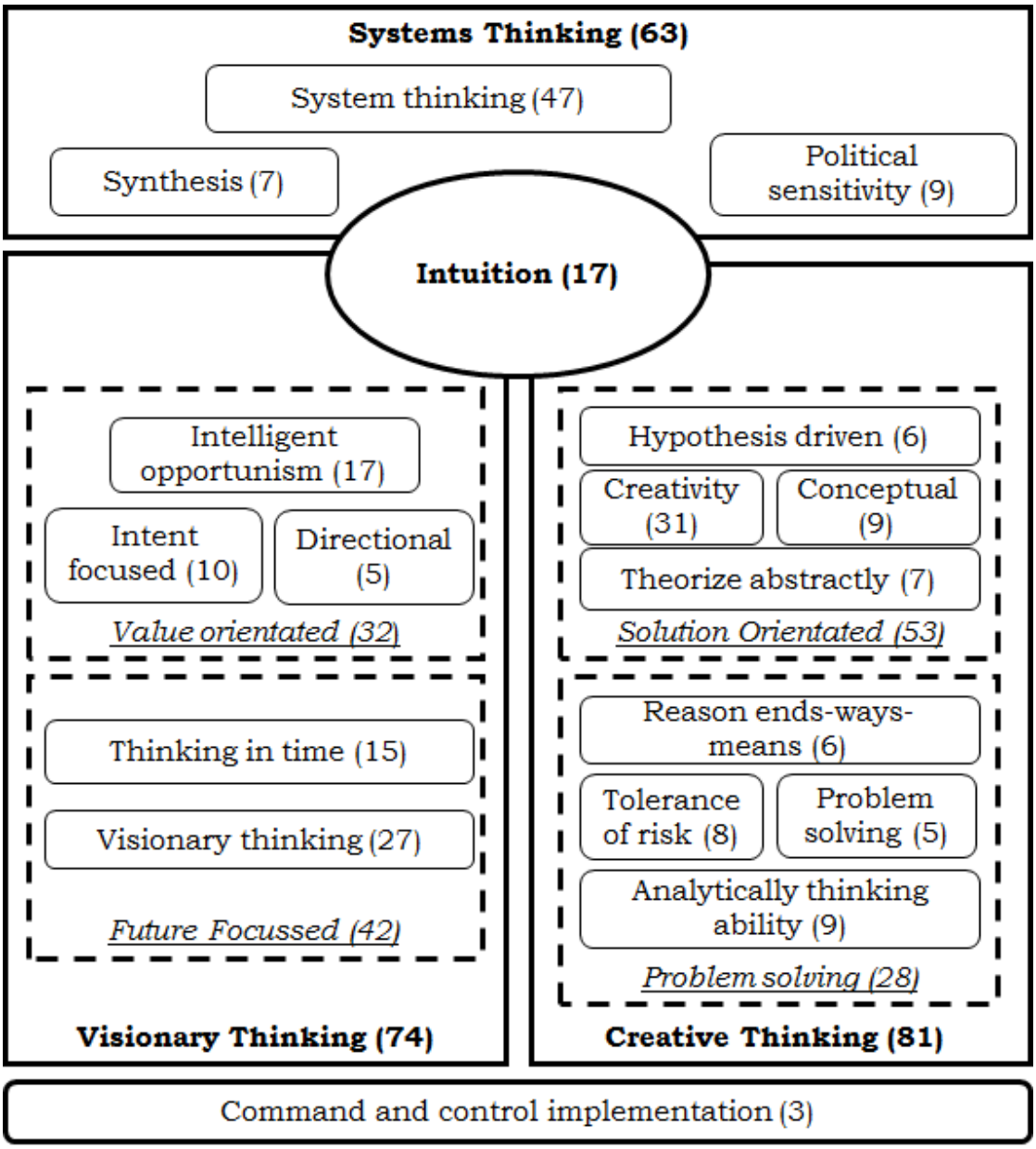


Figure 3.2: Strategic Thinking Cognitive Characteristics mapped using cluster analysis where (n) represents number of sources

3.3 Results

What became clear is that the associations between the characteristics required further analysis to determine if, in fact, the authors were just describing the same characteristic but from different perspectives. Metaphorically it is possible that different authors are trying to describe the same mountain from different valleys. The characteristics are the same even if they are focusing on different facets or sides of the mountain. The following section synthesises the definitions of each identified characteristic.

3.3.1 Visionary Thinking

Visionary thinking is derived from two groups of clusters; value orientated and future focussed. Both of these clusters directly relate to the output of strategic thinking - "create future value".

Value Orientated

The cluster "Value Orientated" comprises three sub-groups: intent focussed, intelligent opportunism and directional. These groups all refer to the ability to drive an organisation or system towards value creation. It is about ensuring all actions are aimed at creating a competitive advantage.

Intent Focused The importance of maintaining focus, or to be "intent focused", was cited in almost a dozen references. Stumpf (1989) called it the ability to "stay on strategy" [215, p.32]. He went on to state that it comprised of "(1) recognising and capitalising on the organisation's current strengths, (2) continually enhancing

its competitive advantage, and (3) focusing on specific target markets as well as knowing which markets to skip".

This characteristic, highlighted by Liedtka (1998) as one of the five required by a strategic thinker, was supported again by El-Farra (2008), Fontaine (2008), Jelenc and Swiercz (2011) Kamangar (2012), and Moghaddam and Amirkamali (2013) [79, 83, 121, 124, 168]. Liedtka described intent focus as conveying "a sense of direction... it implies a competitively unique point of view about the future", provides the focus that allows individuals within an organization to marshal and leverage their energy, to focus attention, to resist distraction, and to concentrate for as long as it takes to achieve a goal [141, p.123].

O'Shannassy (2001) preferred the term *strategic intent* and referred to the ability to "ensure staff retain their focus on the organisation's goals" [184, p.4]. It is this ability to stay focused that, according to Babbage (2008), "prevent senior decision-makers being distracted entirely by details, the tactical and the immediate" [15, p.20]. Eicher (2006) referred to intent as the *burning platform* or the imminent crisis that infers taking no action will be bad for the organisation. The variation though is that intent "defines why you must go to the future" [77, p.32].

Intelligent Opportunism Yet again Liedtka (1998) has proven to be quite influential given the number of the references to Intelligent Opportunism that directly reflect her interpretation [79, 83, 121, 124, 168]. She states that "within this intent-driven focus, there must be room for intelligent opportunism that not only furthers the intended strategy but also leaves open the possibility of new strategies

emerging" [141, p.123]. We can see the direct link here to the characteristic *intent focused*.

Easterby-Smith and Davies (1983) early reference to individual initiatives really refers to moving the onus onto the strategic thinker to be pro-active, rather than reactive, to his or her environment [76, p.46]. Goldman (2005, 2012, 2015) and Mellon and Kroft (2013) referred to it as *opportunistic* and defined it as "taking advantage of the organization's past achievements and present competitive and environmental conditions" [90, 91, 93, 161].

Stumpf (1989) initially wrote that one of the critical characteristics of a strategic thinker was the ability to manage sub-unit rivalry [215, p.32]. It appears that the inclusion of this characteristic was to ensure that the organisation was not disempowered through internal strife and friction. All organisations have resource constraints and it would not be unusual for the certain resources to be in high demand amongst various sub-units. Stumpf, it would seem, felt that the strategic thinker was required to ensure that the internal machinations were aligned, and available resources allocated, to ensure maximum benefit for the organisation as a whole. In this case the strategic thinker was required to think holistically, with the organisational as the unit of measure.

Monavvarian (2014) cited Napier and Albert (1990) as including the ability to think about long term profits, rather than short-term benefits, as an essential characteristic of the strategic thinker [169, p.319]. This inclusion implies that a strategic thinker must (1) look to gain advantage for the organisation whilst (2) maintaining a longer time horizon. Zabriskie and Huellmantel (1991) also stated

that to think strategically, a senior executive must be able to "reposition their resources to compete in tomorrow's markets" [233, p.26]. Additionally they also wrote that the senior executive must be able to "assess the risk, revenues, and costs of the strategy alternatives available to them". While this latter characteristic is reminiscent of intelligent opportunism it also ensures that focus is placed squarely on the relative competitive advantage available to the organisation at any one time.

In Abraham's (2005) article on stretching strategic thinking, two of his five identified characteristics almost exclusively looked to create competitive advantage: (1) being successfully different; and (2) emulating entrepreneurs [2]. The first characteristic is based on Porter's (1996) influential article on strategy where he states that to be better or more effective at something is not actually strategy [193, p.4]. This is because rival organisations can emulate and follow the same path - you are playing the same game. Abraham emphasises that strategy is about playing a *different* game, or operating in a manner that makes it difficult for a competitor to emulate. Ironically, his first characteristic appears to be the enemy of the second - that is to emulate successful people. What Abraham is actually talking about is ensuring that an organisation is constantly "trying to find ways to create and deliver value" [2, p.6]. It is really a combination of creativity and systems thinking - that is, complete awareness of the environment and the ability to generate alternates to create value.

Reflecting on Abraham, Malan (2009, 2010) saw that one of the four core elements of a strategic thinking framework was "thinking about sustainable competitive advantage" [150, p.5]. According to Malan this occurs "when an organisation

is able to sustain competitive advantage over the long-term and surpass its competitors" [150, p.5]. Malan is combining Liedtka's "intent focused" with Graetz's ability to build multiple alternatives - vision and creativity.

Directional Goldman (2005, 2012, 2015) used the term directional to mean "providing a sense of an aimed-for-future state which is different from the present" [90, 91, 93]. This exact definition is used by Mellon and Kroth (2013) when they explored pertinent experiences required to create strategic thinkers [161, p.71]. Yarger (2006) did not provide a definition however used the term to describe the characteristics of a strategic leader [227, p.3]. Here it appears to imply goal-orientated behaviour. In this context it would be reasonable to synthesise "directional" within the broader characteristic of visionary thinking.

Future Focussed

Creating competitive advantage or value can be short-term thinking. There are many Wall Street cases of short-term thinking creating huge profits however ultimately is detrimental to the organisation. This cluster refers to the ability to motivate a long-term advantage. In fact, having a future focus could result in short term losses however the long term game will ensure ultimate victory. As such this cluster includes visionary thinking and thinking in time.

Visionary Thinking When describing strategic thinking, Howard (1989) stated that it equated to *vision* and one of the greatest problems when discussing strategic thinking was that there was too much discussion on strategy and very little mention of strategic goals [113, p.76]. In his mind, a strategic thinker was goal-

orientated and strategic thinking could only be practiced by those with vision [113, p.77]. Hallinger and McGary's (1990) study of strategic leadership also related clear vision to the ability to set goals [102, p.94]. Additionally "vision" referred to the ability to see and plan ahead.

The ability to "envision a desired future" was a key characteristic of strategic thinkers according to Stumpf (1989) [215, p.33]. This view of *seeing* a desired future is a common theme. Zabriskie and Huellmantel (1991) felt that for senior leaders to think strategically they needed to be able to visualize what they wanted their organization to become [233]. This view is supported by Nuntamanop (2013) [180, p.256] and Monavvarian (2014) [169, p.324]. Mintzberg (1994) elaborated that visionaries are "able to look far and wide" [164, p.15]. Bonn (2001) also believed that strategic thinking at the individual level comprised of a vision for the future of the organisation [27, p.64]. She further defined this to include a strong sense of organisational purpose. This interpretation is strongly supported by Gross (2015) and Mandejin and Siahpoosh (2015) [99, 151].

Eicher (2006) defined vision as the *future perfect* - the ability to picture possibilities of what does not exist and assumes that the future possibility will be better than the current reality [77, p.32]. Vision defines "where your organisation is going".

An interesting association is that made by Boal and Hooijberg (2001) who saw the ability to vision as making up, what they termed, the *absorptive capacity* along with the abilities to learn, sense making and tolerance [26, p.517]. In their

view visioning had a positive moderating effect on strategic leadership and was comprised of both a cognitive and affective component. The cognitive component focused on the desired outcomes while the affective component made a direct appeal to peoples' personal values and belief systems. They proposed that visions were required to meet the tests of possibility, desirability, action-ability and articulation to be both charismatic and transformational. An organisation's absorptive capacity could actually rest on the vision of the leader. The idea of a "clear and powerful vision" is shared by McCauley (2012) who refers to the requirement of a strategic thinker to be able to create a vision of the future that is clear and powerful enough to sustain actions [157, p.5].

Another extraction of the term vision that differs from the norm is the reference to strategic leaders by Yarger (2006). Yarger borrows the strategic thinker framework from Chilcoat (2001) - who believes that a "strategic genius" is comprised of the strategic leader, strategic theorist and the strategic practitioner [227, p.3]. It is the leader who provides the vision, direction, organisational skills and inspiration. Unfortunately Yarger and Chilcoat do not go into detail as to the meaning of the word and one must assume that it complies with a standard dictionary.

Jelenc and Swiercz (2011) wrote about 10 constructs that made up a strategic thinking capability. One of those was *future vision*, though this reads as a tautology, as Jelenc and Swiercz refer to it as a thinking about impact of actions in the future and being guided by not only a formal plan but also a philosophy of long-range thinking [121, p.20]. Malan (2009) also saw that strategy was about "the future and the long-term effects of decisions" [150, p.8].

Thinking in Time According to Monavvarian, the term "thinking in time" was first used by Napier and Albert in 1990, however it was Liedtka's highly influential work on strategic thinking in 1998 that popularised the term. Liedtka felt that strategy was not driven by future intent alone but rather the gap between the current reality and the future possibility that was critical [141, p.123]. This was about connecting past, present and future and creating a an extreme misfit between resources and ambition. Her work influenced and guided the recent works of El-Farra (2008), Fontaine (2008), Jelenc and Swiercz (2011) Kamangar (2012), and Moghaddam and Amirkamali (2013) [79, 83, 121, 124, 168]. O'Shannassy (2001, 2003) also wrote that "thinking in time" referred to keeping the past, present and future in mind however employed it within a slightly different strategic thinker construct [184, p.5].

The reference to temporal thinking is also echoed in Costa-Gomes, Crawford and Iriberri (2009) who wrote that strategic behaviour referred to decision making that was temporal and relied on some degree of prediction [57]. Kaplan and Orlikowski (2013) stated that "temporal work was a central practice in strategy making" [125, p.990]. It was their shared view that strategic change would be incomplete without considering the link between the divergent interpretations of the past, present and future.

Back in 1983 the intention was the same however it was referred to as having a "longer time horizon" by Easterby-smith and Davies (1983) [76]. This frame of reference is continued by Das (1987) who discussed the requirement for a conscious decision on their future time perspective by organisations when planning

[64, p.204]. Short time horizons carried significantly different implication than longer time horizons. This view is shared, according to Jelenc and Swiercz, by Jacobs (1994) [121, p.15] and Babbage [15, p.18].

Similarly Behm (2007) used the phrase "understand long-term" when referring to the mind-set required for good national strategy creation [23, p.65]. Interestingly Das demonstrated that while organisations preferred a 5 year planning horizon, the executives interviewed actually preferred a planning horizon mean of 2.85 years (a time-frame supported by Malan, 2009) [64, 150]. This disconnect between organisational and individual preferences could only cause friction in the planning and decision cycles.

3.3.2 Intuition

Intuition, as a critical component of strategic thinking, was first mentioned by Bates and Dillard (1993) however they cited its general use in previous literature without explaining its place or importance [20, p.103]. Graetz (2002) adopted a similar approach though intuition is cited as one of the five thought processes involved in strategic thinking [94, p.457]. Mintzberg is a little more direct, stating that strategic thinking involves intuition connected to creativity [167, p.108] and that strategy development required insight [164, p.19]. The use of insight as a synonym for intuition is not unusual (and also used by Monavvarian, 2014) as "insight involves *seeing inside* and is closely related to intuition" [157, p.1].

Masifern and Vilà (2002) refer to intuition briefly however appear to see it a

having a place in the *process* of strategic thinking rather than the state of mind [153, p.4]. Interestingly Liedtka (1998), Zahn (1999), Masifern (2002) and Henden (2004) all lean on Mintzberg's (1994) use of intuition. That is, strategic thinking is about synthesis, involving intuition, and resulting in an integrated perspective of the enterprise. Jelenc and Swiercz (2011) declare that "any significant activity of forecasting involves a large component of judgement, intuition and educated guesswork" [121, p.21]. Consequently they pose intuition as one of the ten constructs of strategic thinking and explain that "it presents the sum of experiences that people are not necessarily conscious of; through life, intuition is shaped as a mosaic grasping the wholeness and interrelationships of experiences" [121, p.22].

3.3.3 Creative Thinking

Creative thinking is a combination of two cluster groups that reflect the duality of problem solving - divergent thinking and convergent thinking. In this case the clusters are Solution Orientated (divergent) and Problem Solving (convergent).

Solution Orientated

Solution orientated refers to the ability to focus on an end result that is unconstrained to the present reality. Solution orientated people are defined by their creativity and their hypothesis, conceptual and abstract driven way of thinking.

Hypothesis Driven All six references to the term *hypothesis driven* are derived from Liedtka (1998) with little variation. Liedtka looked to solve the apparent analytic-intuitive dichotomy that resided in every definition of a strategic thinker and had "characterized much of the debate on the value of formal planning" [141,

p.124]. In this she was primarily referring to the ongoing debate during the early 1990s between Mintzberg and others. Liedtka believed that the use of a hypothesis-driven process would allow the thinker to be both creative and critical. This is because the "scientific method accommodates both creative and analytic thinking sequentially in its use of iterative cycles of hypothesis generating and testing" [141, p.124].

The use of hypothesis driven thinking, as proposed by Liedtka (1998) is a logical step in the development of strategic thinking as it purports to solve the apparent analytic-intuitive dichotomy. It does however only provide a process that allows both creativity and analytical thinking to co-exist and is not actually a separate characteristic. For this reason hypothesis-driven thinking (while an important process) is difficult to support as a stand-alone characteristic of a strategic thinker.

Creativity One of the strongest characteristics (based on volume of specific mentions in the literature) is creativity or creative thinking. As a characteristic it has been consistently included in the literature from at least 1989 (Howard, 1989) until the current day (Gross, 2015, and Mandejin and Siahpoosh, 2015). Howard described strategic thinking as a "creative process subject to regular examination and necessary readjustment" [113, p.76]. Mintzberg (1994) stated that creativity was required to develop new perspectives [164, p.19] while Foster (1996) wrote that strategic thinkers were required to "generate imaginative possibilities for action and operate easily in the conceptual realm" [84, p.111].

The idea of generative thinking is quite common. Sloan (2006) wrote that "suc-

cessful strategy across the centuries has proven to be dynamic and generative, not static and finite" [210, p.13]. Malan, quoting Abraham (2005) cited that "strategic thinking entails the process of finding alternative ways of competing and providing customer value" [150, p.3]. While Masifern (2002) stated that conceiving "the ideal strategy is mainly a creative process, driven by logical reasoning, imagination and the will to transform reality" [153, p.7].

It isn't all about seeking new ways, as Chilcoat (2001) wrote, the strategic thinker needs to be able to "see beyond the limitations of the present, to sense new opportunities, and then to propose means to attain them" [50, p.210]. Graetz (2002) also believed that strategic thinkers needed to see the opportunities but, more importantly, be able to deal with "novelty and ambiguity, build multiple, simultaneous alternatives" [94, p.456].

Downplaying creativity though, Gray (2009), citing Antulio Echevarria, actually wrote that "critical thinking is far more important to achieving a successful transformation than is creative imaginative thinking. One could add that the better critical strategist might even dare to question whether transformation is desirable" [97, p.48]. This does not negate the importance of creativity, rather it appears to be included to ensure that the decision makers are critical of the final strategy and the need for the strategy.

While not specifying the requirement of creativity, Kennedy elaborated on the creative process, stating that strategists require analysis to stimulate the "creative processes, to test the ideas that emerge, to work out their strategic implications, or

to ensure successful execution of high-potential "wild" ideas that might otherwise not be implemented properly" [129, p.25].

Similarly Nuntamanop, Kauranen and Igel (2013) and Monavvarian (2014) stated the importance of creativity as a characteristic of strategic thinking however declined to describe or define the effect of this characteristic [180, 169]. Gross (2015) is a little more descriptive however also relies on the implicit meaning of creativity when he wrote "when organizational employees are able to think in a way (e.g. creatively, innovatively, and with vision) that produces organizational results by taking action that is framed in experience and knowledge; they are considered to by strategic thinkers" [99, p.8].

Conceptual The use of the term conceptual flexibility was cited by Jelenc and Swiercz (2011) as one of the ten constructs of a strategic thinking capability [121, p.20]. Jelenc and Swiercz borrowed the term from Jacobs (1994) however used it in a manner that reflects Liedtka's intelligent opportunism. In other words Jelenc and Swiercz felt that strategic thinker should be open to the "possibility for new strategies to emerge when complex and difficult situations unfold".

Foster (1996) however felt that strategic thinkers should be able to "operate in the conceptual realm" because that was where ideas and insights were generated [84, p.111]. This view is shared by Goldman (2005, 2012, 2015) who defined strategic thinking as conceptual, in that it "reflected ideas, models, and hypothesis" [90, p.26]. Mellon and Kroth (2013) used the same definition in their description [161, p.71], while Nuntamanop, Kauranen and Igel (2013) included conceptual thinking

as a result of a literature review without any further explanation [180].

Chilcoat (2001) related the term to the temporal aspect with a focus on the long-term [50, p.209]. He states that because strategy deals with an expanded time-frame and relates the present with the future (similar to Liedtka's *thinking in time* concept), it needs to balance short and long-term considerations. Chilcoat specifically wrote that "conceptual thinking is the gateway to long-range planning".

Theorize Abstractly Citing G. Stamp of Brunel University, Mason declares that managers who are most apt at developing powerful strategies also have a holistic, but abstract or symbolic, view [154, p.73]. This however was in a reference to the initial stage of a strategic management methodology that involved developing direction and a vision. Bates and Dillard (1993) also refer to abstract thinking as an essential criteria of a strategic thinker however do not elaborate on the characteristic [20, p.103].

On the other hand, Chilcoat (2001) states that the ability to think abstractly is essential to be able to "understand dilemmas, possibilities, and relationships that may not be obvious to casual observers" [50, p.210]. This view is lightly echoed by Gray (2009) who stated that strategists needed to theorize abstractly and "contribute to the development, or more accurately the interpretation, of strategy's eternal and universal general theory" [97, p.13]. Keelin and Arnold (2002) proposed that successful business leaders had a strategic perspective that involved (1) abstraction with powerful engagement of imagination and (2) abstraction, illus-

trated with concrete examples [128, p.40]. To them, the ability to think abstractly was essential for the development and communication of ideas.

Problem Solving

This cluster recognises the present reality of the organisation and how solutions impact that system. Here tolerance of risk, ends-ways-means thinking, problem solving and an analytical thinking ability are grouped together.

Tolerance of Risk Stumpf (1989) referred to both finding and overcoming threats and accommodating adversity as separate abilities [215, p.32-33]. The ability to diagnose threats was essential according to Stumpf and required the "ability to view issues from multiple perspectives, consider alternatives and remain open to new ideas". The complimentary ability to accommodate adversity required the individual / organisation to be resilient and flexible in the face of failure. Thus it appears that the first is a process-orientated approach to mitigating risk whilst the latter refers to an emotional response to the consequences of the risk.

Pro-activeness and risk-taking were described as potential attributes of a strategic thinker by Thakur and Calingo (1992) however this was not the focus of their study [218, p.47]. In this case they were referring to a study by Miller and Friesen (1978) into strategy formulation. The base definition used for risk-taking was "the degree to which managers are willing to make large and risky resource commitments" [163, p.923]. Interestingly the study found risk-taking behaviour in both successful and unsuccessful organisations. In a similar vein, Bates and Dillard (1993) describe the tolerance of risk and tolerance of ambiguity as an attributes

of a strategic thinker without providing the context [20, p.103].

Keelin and Arnold (2002) viewed the ability to embrace alternatives and uncertainties as an essential characteristic of the strategic thinker [128, p.40]. In their case they were describing successful business leaders who demonstrated a strategic perspective. It was their ability to understand the competitive forces shaping the industry, the potential conflict and the possible opportunities. In the words of Mintzberg and Quinn, the "effective strategist is one who can live with contradictions, learn to appreciate their causes and effects and who can reconcile them sufficiently for effective action" [121, p.22].

It would appear that the references to tolerating risk is actually twofold. Firstly there seems to be a requirement to understand the potential risks and corresponding mitigations that are available. This would require a good understanding of the environment or system within which the organisation is operating. Secondly there appears to be an emotional requirement to tolerate the uncertainty surrounding the potential effects and potentially flexibility to avoid or endure those effects should they be negative to the organisation.

Reasoning Ends-Ways-Means The term *reasoning ends-ways-means* originates from the military theorists and foremost amongst these is Colin Gray. He specifically states that "to think strategically is to reason ends-ways-means" [97, p.60]. This statement refers to the End-Ways-Means strategic framework discussed earlier and infers that a strategic thinker must first understand the desired ends. They then need to create a match (ways) with the available means to facilitate

those ends. The noticeable difference in this posited statement is that reasoning ends-ways-means is often viewed as being rooted in reality. A thought process that does not match with visionary thinking, where, as discussed, it is the mismatch between today's reality and tomorrow's goal that really creates a strategic vision. That said, ends-ways-means thinking allows for the gaps to be identified and perhaps exploited or explored.

Related to the idea of *ends* is the importance of identifying the strategic questions that the thinker is required to answer. Zabriskie and Huellmantel (1991) emphasised the importance of identifying the strategic question as the simplest way of keeping the planning process on target [233, p.27]. For instance, in terms of a strategic plan, the questions should see the whole organisation as a unit of analysis and directed to defining the organisation's relationship with the external environment. The remaining references predominantly refer to identifying the higher goal (or ends) and ensuring that developed strategies achieve these [128, 3].

Problem Solving Problem solving was only specifically mentioned by O'shannassy (2001, 2003) and referred to by Eicher (2006) and Zabaskie and Huellmantel (1991). This low count probably reflects the dichotomy between strategic planning and strategic thinking. Eicher's described planning as *staging the event* and one of the three elements of strategic thought [77, p.32]. In his view, planning was required to enable the development of operations and processes that would support the future state. In a way this future focus solves the Ends-Ways-Means conundrum mentioned earlier. Planning defines "how and when you are going to the future".

O'Shannassy felt that problem solving was a core focus of strategic thinking though he relates it to a systems perspective and a scientific orientation [185, p.55]. Problem solving included the identification of problems and "hypothesis or propositions for investigation with an understanding of the wider business context". The linked output was stated as "solving strategic problems". The use of problem solving appears to connect systems thinking with vision thinking.

The inclusion of problem solving as a separate characteristic of strategic thinking is problematic. Firstly the very act of strategic thinking looks to create value or an advantage already implies that there is a problem to be solved. Secondly the authors who referred to problem solving used the term in place of other-like-characteristics such as system thinking (O'Shannassy, 2003) or even ends-means thinking (Eicher, 2006).

Analytical Thinking Ability The phrase *analytical thinking* is derived from the study of strategic thinking characteristics by Nuntamanop, Kauranen and Igel (2013) [180, p.256]. In their study they found that analytical thinking was required for the strategic management skills of information analysis and strategy formulation. Unfortunately they refrained from exploring the use of analytical thinking and merely included it due to the number of repetitions. Monavvarian (2014), while citing analytical thinking as critical to the strategic thinker, also left the term to stand by its own [169, p.325].

Analytical thinking is referred by Zabriskie and Huellmantel (1991) as thinking "logically and systematically about the planning steps and models the strategic

leader will use to activate their strategic thinking in the company's operations" [233, p.26]. This reference appears to be focused on the strategy formulation and implementation phases. Foster (1996) use of the term *critical* however seeks to explore the fact that strategic thinkers should subject their own and opposing views to rigorous debate and investigate the information available (information analysis from earlier) [84, p.111]. In Foster's view "research is an exploration in critical thinking" [84, p.112]. Kennedy (2010) called it a rational and methodical mindset [129, p.25].

Gray (2009) though termed it scepticism and believed that a healthy amount was required to inure the thinker from apparent novelty in strategic ideas and methods [97, p.48]. He also stated that the scepticism is developed through a healthy education in strategy and it is this that allows the strategist the ability to exercise judgement. Chilcoat (2001) provided a slightly different perspective by stating that strategists should *think normatively* [50, p.209]. In this case, like Gray, Chilcoat is referring to value judgements where the strategist must "decide not only what is attainable, but also what is preferable".

Initially analytical thinking appears to sit on its own as it encourages the logical, systematic examination of information and ideas. However it is the intended result of this characteristic that allows us to understand its place. The authors, specifically Gray (2009) and Chilcoat (2001), saw that the analytical and critical mindset was required to allow the thinker to exercise judgement that is based on a sound understanding of the environment. In this case judgement allows novel ideas to be valued by their usefulness to the problem at hand.

3.3.4 Systems Thinking

The systems thinking cluster was characterised by three smaller clusters: political sensitivity, synthesis and systems thinking. The cluster systems thinking was the largest at 47 references and could have stood by itself. Political sensitivity and synthesis were added as the thinking process appeared to be complementary, if not the same, to systems thinking.

Political sensitivity

The inclusion of political sensitivity appears to be a recognition of the relevant stakeholders within the strategic decision making process. While the reference was made several times in the earlier literature by Thakur and Calingo (1992) and Jacobs (1994), it appeared to be more of an afterthought. Jelenc and Swiercz (2011) explained that a "manager should be sensitive to both extreme political situations within the firm, and broad social and political issues within the society" because they can impact on any direction the firm would like to take [121, p.21]. O'Shannassy (2001, 2003) however, described it as the *participation of stakeholders* because "staff at all levels have an input to strategy and are given greater autonomy in their roles as the firm devolves responsibility from the centre in response to uncertainty" [184, p.5]. Abraham (2005) takes this a step further and states that strategic thinkers must consider collaboration as part of their strategic approach - both with other organisations and with customers [2, p.8-10].

Political sensitivity appears to require the recognition of internal and external threats to the implementation of strategy. It could also assist in recognising pos-

sible opportunities. The response to these threats and opportunities within the operating environment however, is collaboration, or participation of stakeholders. Thus it seems that political sensitivity is merely a perspective of systems thinking - in that an understanding of the important causal relationships is required, and collaboration is merely a *way* of mitigating, or taking advantage of, any strong influences. For these reasons, political sensitivity would logically fall into the systems thinking sphere.

Synthesis

Strategic thinking is about synthesis, declared Mintzberg, as it "involves intuition and creativity" [167, p.108]. Whilst synthesis has been cited as a separate characteristic[1], the connection to creativity appears to be very strong. McCauley (2012) stated that "creativity and critical thinking are necessary components of synthesis" [157, p.3]. previously Mintzberg (1994) wrote that "... creativity requires synthesis" because put another way, "it is creativity, by definition, that rearranges the established categories ..." [164, p.14]. Masifern (2002) also drew the connection in his statement that "strategic thinking, in contrast, is a process of synthesis, using intuition and creativity, that results in 'an integrated perspective of the enterprise'" [153, p.4].

Synthesis is included as one of the main characteristics of strategic thinking by Graetz (2002). However she does not include an accompanying explanation but rather based it on previous authors (specifically Mintzberg, 1994). Nuntamanop,

[1]Mintzberg states that strategy development requires insight, creativity, and synthesis [164, p.19]

Kauranen and Igel (2013) also included synthesis based on literature without an explanation [180]. Henden (2004) however followed a similar line to the previous authors and stated that strategic thinking was a "process of synthesis, based on intuition, where the outcome is an integrated perspective of the enterprise". This view draws heavily upon the previously cited Masifern (2002) and supported by Heracleous and Jacobs [107].

An alternate view of synthesis is provided by Malan (2009) who uses Mintzberg's previous quote (that strategic thinking "requires synthesis and involves intuition and creativity") as justification for her strategic thinking characteristic *thinking analytically and creatively* [150, p.7]. Synthesis is the ability to "connect the dots" and to understand relationships. It is because of this that it is included under systems thinking.

Systems Thinking

The use of *Systems Thinking* as a critical component of strategic thinking appeared to be prevalent across literature and was consistently mentioned over the last three decades. There does seem to be three distinct ways (holistic, understanding relationships, and systems thinking) to describe the requirement of understanding the operating environment and systems within it.

Holistic Easterby-Smith and Davies (1983) wrote that to be able to act in a strategic manner, a manager must be aware of the broader context [76, p.46]. Meanwhile Mason (1985), quoting G. Stamp of Brunel University, called it a holistic view [154, p.73], and Foster (1996) referred to it as the ability to grasp the

big picture [84]. Bonn (2001) explains that having a holistic understanding is to have "an understanding of how different problems and issues are connected with each other, how they influence each other and what effect one solution in a particular area would have on other areas" [27, p.64]. The importance of a holistic approach is also recognised by Chilcoat (2001), Keelin and Arnold (2002), Sloan (2006), Yarger (2006), El-Farra (2008), Malan (2009, 2010), and McCauley (2012) [50, 128, 210, 227, 79, 150, 149, 157].

Bonn also stated that a holistic approach allowed one to see how "problems and issues are connected to the overall pattern that underlies particular details and events". Napier and Albert (1990), as cited by Monavvarian, call it the ability to identify repetitive patterns [169, p.319]. It is the requirement for a strategic thinker to understand the patterns, connections and influences within the system and environment that appears to have led to this following stream.

Understand relationships Hallinger and McCary (1990) believed that leaders engaging in strategic thinking "consider the interplay between actions and responses in light of a set of purposes" [102, p.91]. Foster (1996) believed that in research and writing, the prospective strategist would improve their ability to not only grasp the big picture, but also "discern important relationships among events" [84, p.111].

Chilcoat (2001) plainly stated that strategists "must be particularly strong in understanding cause-and-effect relationships" [50, p.210]. This view is strongly supported by Kunc (2012) who also wrote that it was important to teach "future

managers ... to understand causal relationships in a comprehensive way [because it] will improve their strategic decision-making processes" [131, p.41]. Dickson, Farris and Verbeke (2001) elaborated that strategic management required the ability to "understand and anticipate the effects of the complex, often chaotic, dynamic interactions between a firm's deployment its resources and its evolving business environment" [72, p.216].

System Thinking This broad, holistic view that focuses on understanding the important internal and external relationships within the operating environment, as stated above, reflects the more commonly understood phrase *systems thinking*. Liedtka (1998) called it a systems perspective and elaborated that "a strategic thinker has a mental model of the complete end-to-end system of value creation, and understands the inter-dependencies within it" [141, p.123]. This view is directly supported by a number of other authors [79, 83, 121, 124, 168].

Mintzberg (1994), Masifern and Vilà (2002), and Henden (2004) believe that this "integrated perspective of the enterprise" is critical to strategic thinking, however it is also a result of the process of *synthesis* [164, 153, 105]. O'Shannassy (2003) didn't see it as an outcome but rather proposed that one of the five elements of a strategic thinker was the ability to have "a clear mental picture of the complete system of value creation within the organisation and the individual's role within the larger system" [185, p.55].

While earlier Bonn (2001) had used the term holistic, she later described the characteristic as systems thinking in 2005 [28, p.338]. Citing Senge (1990) and

Stacey (1996), Bonn explains that an "integrated perspective of the organisation requires a thorough understanding of the internal and external dynamics of organisational life, in particular of how organisations and managerial actions change over time and of the feedback processes that lead to such changes". This is the definition of systems thinking that is also used by McCauley (2012), Gross (2015), and Mandejin and Siahpoosh (2015) [157, 99, 151].

3.3.5 Command and Control Implementation

The use of the term *command and control implementation* was taken from the military theorist Colin Gray's 2009 manuscript on teaching strategy. Gray specifically stated that "command and control of the attempted implementation of plans by troops *in the field*, a broad duty that entails choice of subordinate commanders, over-watch of their performance, and, to repeat, readiness to adjust plans as events unfold" [97, p.13]. The context of this reference sits heavily within classic military generalship that is necessary at several levels of responsibility, involving command and leadership. Yarger (2006) called it organisational skills and saw it as a characteristic of the strategic leader [227, p.3].

In business terms what is being referred to here is *embedding*. Acur and Englyst (2006) describe this as "the building of a shared understanding, the acceptance of strategic choice throughout the organisation, and thus the establishment of a basis for change" [3, p.78]. Command and control implementation is certainly important to the whole strategy development and implementation process however, rather than being a characteristic of a strategic thinker, it covers the complemen-

tary process of, embedding.

The relationship of embedding to strategic thinking is as close as that of strategic planning. They are complementary, not exclusive, however are not the same. If anything the idea of establishing a basis of change would be the affective component of visioning. What should be noted is that the idea of command and control implementation is critical to the success of an actionable strategy. It appears to rely on motivation, often found within the affective component of a leader's vision and a certain political sensitivity to the human dimension.

3.4 Discussion

The literature review revealed 18 common cognitive behaviours that assisted in defining a strategic thinker. While this is quite comprehensive it does make it difficult to frame or model the behaviour due to the high number. Fortunately many of the characteristics appeared to be perspectives of the same behaviour and this allows the development of an appropriate model. From these linkages it is possible to posit four of the characteristics as dominant. The others are either combined or present slightly different perspectives of one of these dominate characteristics, being: Vision Thinking, Intuition, Creative Thinking and Systems Thinking.

3.4.1 Vision Thinking

> *"Strategies are directed towards achieving goals, but goals must flow out of the leader's vision"* [195, p xiv]

Both vision thinking and thinking in time appear to reflect the same idea of temporal awareness, while goal orientated behaviour is also reflected in the term direction(al). Directional was linked to intent focused by Jelenc and Swiercz (2011) however the reference to intelligent opportunism implies a certain dynamism and pro-active behaviour.

Genuine vision is a *sense of direction and provides the focus for all activities within the organisation* [27, p.65]. It even goes beyond this as a deep understanding of organisation's reason for existence and provides a sense of common identity [27]. Mintzberg saw a visionary as someone with a sense of direction. Visionaries look far and wide while planners often focus on the short term problems [164].

Visionaries create their strategies in a very different way, more personalised or intuitive. Mintzberg also notes that strategy making is a visionary and learning process taken in small, iterative steps. Thinking leads to action and action leads to thinking. Ideally the visionary actor is connected to the process and is able to participate in interactions, as it were, allowing for a more developed vision to be able to evolve and mature.

Liedtka, by para-phrasing Hamel and Prahalad, sees that strategic thinking needs to be intent focused - it should convey a sense of direction, discovery and destiny. Ultimately strategic thinking is fundamentally concerned with and driven by the shaping and *re-shaping* of intent. The re-shaping of intent is linked to the oscillation between past, present and future (referred separately by Liedtka as *thinking in time* [141]. From the literature it is clear that a strategic thinker must

be able to articulate desirable, actionable and plausible visions of the future.

3.4.2 Intuition

> *"When action and awareness merge, consciousness narrows to focus attention"* [103, p.340]

Zahn emphasises the importance of insights in strategy a few times in his paper (citing Campbell and Alexander, 1997, Christensen, 1997, and of course Mintzberg, 1994) [234]. Zahn also discusses the existence of two different schools of thought on strategy, content and process. The Content school views strategy as focused on the development of competitive superiority. The Process school, influenced by evolutionary economics, complexity theory and systems thinking, is more eclectic and, whilst broken into subordinate streams, focuses more on human influence on strategic decision making. Whilst both of these views are complementary, this research seems to discount or not acknowledge the very non-commercial strategic decision making fields such as state developed strategy or even military strategy. In line with this commercial thinking, Zahn continues to expand on a number of strategic concepts developed for the commercial world such as the 'Delta Model' developed by the Sloan School of Management.

A consequence of the changing environment is the development of an individual's capacity for dealing with uncertainty when engaging processes of strategy development [229]. Uncertainty in this case refers to complex adaptive systems or systems where there are a number (greater than 3) of interacting feedback loops. The ability to predict outcomes using standard analytical methods, in these cases,

becomes very difficult. To quote Yorks (2012): "Under the conditions of increasing complexity and the uncertainty it generates, strategy development and execution are less and less a part of a linear process of analysis, planning, action and adaptation. Rather, strategy development and execution are parallel and inter-twined processes of strategic action" [229, p.184].

Yorks and Nicolaides explore the affect of the increasing complex world on the development of strategy [229]. Specifically the use of insight. They argue that a *consequence of complexity is that experience is both an asset and liability* as it can provide a foundation for further action, however it inhibits awareness of potential real-time solutions and possibilities. Yorks and Nicolaides focus their attention on fostering the use of strategic learning practices in the simultaneous practice of developing strategy and cultivating strategic mindset awareness. It is in the implications of adult development literature that adaptive and generative learning actions can be found.

Henden (2004) used the Myers Briggs Type Indicator on 105 top Norwegian managers and determined that they had a strong preference for intuition [105]. Henden sought to address the apparent gap in study of the place of intuition in strategic thinking. In fact he found that there was a dearth of writing on intuition not only in management / leadership research but also in the field of psychology. Henden characterises rational or pure intuition as being necessary, infinite, innate, psychological, subjective, co-operative and *a priori* representation. Additionally he found a consistency in the writing of Plato, Spinoza, Descartes, Kant, Bergson and Buddhism that the intuition state of mind is perceived as superior to the

Strategic Thinking	*Intuition*	*Analysis*
Synthesis	Synthesis	Analysis
Integration	Integration	Seperation
Unification	Unification	Fragmentation
Pattern	Pattern	Pieces
Whole precedes the part	Whole precedes the part	Part precedes the whole

Table 3.1: Comparing Strategic Thinking to Intuition and Analysis by Henden, 2004

discursive, analytic, dualist state of mind. This philosophical point of view differs from that encountered in psychology where intuition is treated as unconscious, biased and automated processing and thus 'bad'.

When Henden compares strategy to intuition, several of the key aspects have "intrinsic" similarities. Accordingly Henden's proposal that "studying intuition is a way to create a more realistic view of how strategic decision makers actually think" makes more sense [105, p.9]. This view is supported by Eisenhardt and Zbaracki who contend that the development of intuition by managers is intrinsically linked to the thinking of strategic decision makers [78]. They cite a number of examples from Mintzberg and Waters (1982) and Eisenhardt (1989) where radical strategic decisions are made quickly on what can only be described as intuition. The similarities extend to the distinction between analytical and intuitive cognition and the commonly understood view that decision makers do rely on oversimplified rules-of-thumb and a mixture of analysis and intuition [105]. Henden summarises his comparison of strategic thinking with intuition and analysis in Table 3.1 on page 80.

Intuition is also treated separately to creativity. Liedtka sees strategic thinking as a synthesising process using intuition **and** creativity [141]. While Jelenc and Swiercz (2011) refer to the importance of intuition when they state that "individuals lacking professional capability appear slow in understanding the provided information and may fail to utilize properly the material and human resources in order to accomplish the mission. A top manager needs to be familiar with the technical processes in the firm since they represent the cornerstone for any form of strategy development" [121, p.20]. Intuition then appears to be the characteristic that allows strategic thinkers to contextualise organisational circumstances.

3.4.3 Creative Thinking

> *"The source of all human creativity is the ability to hold multiple conflicting thoughts in suspension simultaneously and without judgement."*
> [128, p.41]

Creativity appears to be generally used as a synonym for creative thinking however most of the authors reviewed in this meta-analysis held different perspectives. Creativity is about the novel, or new, product / process / idea etc. Creativity is most often associated with divergent thinking. The key difference with creative thinking, in a strategic thinking context, is that application of a value lens [94]. That is, all ideas are subjected to a valuation and only those ideas that are useful are retained. The clustering of the characteristics into "solution orientated" and "problem solving" is indicative of this.

The solution orientated cluster reflected the idea of divergent thinking where the diversity of concepts, often in the absence of explicit boundaries, is encouraged [224, 203]. "Divergent thinking" is usually used in conjunction with the creative process or problem discovery [201]. As divergent thinking is included in several definitions of giftedness and predicative of creative thinking it could be inferred that this is a natural rather than learnt skill [201, p.213]. However, as problem-finding skills depend, in part, on mature cognitive structures, it would be fair to assume that these results and definitions are not generalised and divergent thinking can be taught.

The problem solving cluster is more likely to be associated with a convergent mindset. The requirement to link "ends, ways and means" and accommodate risk appears to require the introduction of boundaries around the problem. These boundaries then require an optimisation mindset, where the value of that choice is closely scrutinised. The concern for a creative thinking mindset is the ability to harmonise seemingly polarised, even antithesis, mindsets.

On reflection, the divergent-convergent mindset is similar to that experienced in the "Design Thinking" literature. Design thinking is a user-centred methodology (some would say sub-culture) that seeks to create future value [16, 31]. The generalised design process is split into *inspiration / problem framing*, *ideation / visualisation*, and *experimentation /implementation* [30, 44]. It is the first two phases that reflect the idea of the "solution orientated" cluster while the last reflects "problem solving". Independent of the above, what is clear is that creative thinking, with its accompanying divergent-convergent mindset, is critical to strate-

gic thinking.

3.4.4 Systems Thinking

As one of the largest clusters, systems thinking is clearly a significant characteristic of strategic thinking. Here systems thinking is used in the holistic sense. That is, taking the broad view rather than a decomposed view. In fact, within the systems thinking "sub-cluster" there existed three view points: holistic, understanding relationships and traditional systems thinking. What ties these together is a way of thinking that looks to understand the internal relationships within the system and how that system interacts in its environment.

Political sensitivity is subsumed by systems thinking as it infers an understanding of social influences within the system. Political needs of individuals and groups are significant drivers of change as they provide the will or motivation. It is generally accepted that misrepresenting or not taking into account the motivation of key decision makers will inevitably cause any proposed change to stall. In this context, political sensitivity is a good fit for systems thinking as it identifies internal and external variables that could change the system.

The appearance of synthesis is interesting as it could fall under any of the other three clusters, particularly creative thinking. Here though, synthesis refers to the ability to understand the interrelationships between broadly dissimilar variables within a system. Generally variables are clustered into homogeneous groups and the interaction between these groups is often ignored. Synthesis of the groups

actions allows the cumulative effect to be understood by a systems thinker.

3.5 Contribution

This chapter addresses the fundamental knowledge framework of strategic thinking and strategic thinkers. Like strategy, strategic thinking is an oft-confused term that suffers from over-use. To reconcile the volume of research and diversity of ideas, and to understand the contemporary stance of strategic thinking, a meta-analysis was conducted. This analysis revealed a set of domains that are common within literature when defining strategic thinking. The domains (create-value, means-ends thinking, future orientation and way of thinking) were then synthesised to define strategic thinking as *a means-ends way of thinking that is future orientated and seeks to create value or an advantage for the system.*

This approach allows strategic thinking to be viewed in Chapter 6 as capability with the capacity (way of thinking) to generate an effect (create value and future orientation). A capability lens then proves useful to understanding the agents of strategic thinking: the strategic thinkers. Moreover, the meta-analysis proved useful in developing a meaningful understanding of the contemporary research into strategic thinkers. The initial analysis revealed 18 different characteristics of a strategic thinker. While all of these were supportable, 18 characteristics presented an unwieldy set and were further reduced through grouping. What emerged were three strong characteristics (systems thinking, creative thinking and visionary thinking) and one unifying characteristic (intuition).

This chapter leveraged the understanding of strategic thinking to explore the characteristics of a strategic thinker. The findings in this chapter provide a useful framework for building strategic thinking as an organisational capability.

Chapter 4

Designing indicators for strategic thinking capacity

4.1 Introduction

This research has identified four key cognitive characteristics of a strategic thinker: Visionary Thinking, Intuition, Creative Thinking and Systems Thinking. This chapter examines recent works for appropriate cognitive instruments that could contribute to a generalised strategic thinking assessment. While there was an abundance of instruments for creative thinking and intuition; visionary thinking and systems thinking measures proved to be more elusive. This chapter discusses a novel visionary thinking measure and the feasibility of a simplified systems thinking measure.

A strategic thinking assessment instrument is proposed and subjected to a pilot test. In the pilot test, a small population is asked to take the proposed strategic

thinking assessment. Validity is assessed through self-confirmation by the pilot population. The pilot test also provided sufficient results to generate an easy-to-visualise strategic thinking model.

It should be noted that a recently released paper proposed a strategic thinking measure based on individual behaviour [92]. The instrument used to measure strategic thinking looked at scanning, questioning, conceptualising and testing behaviours. These behaviours appear to be those required for the development of strategy rather than an enduring capacity for strategic thinking. Visionary thinking, holistic intuition, creative thinking and systems thinking appear to be underlying cognitive characteristics that are likely to be required for the previously mentioned behaviours.

4.2 Research Question and Methodology

The research question is "**how can strategic thinking be assessed?**" The idea is that a change in strategic thinking capacity should be quantified if it is to be engineered, or developed. Thus, the start and end points should be measurable through some sort of assessment. Due to the nature of this problem, and that this thesis has already identified four significant cognitive characteristics, this question will be answered by exploring a cognitive assessment instrument.

4.2.1 Instrument design method

Cognitive psychology is concerned with the internal processes that are used to make sense of the environment and the way the brain processes information [81, 98]. As

cognitive processes are not visible and happen rapidly, researchers infer the process through indirect reflections of these processes. Eysenck describes four approaches that allow a full understanding of cognitive processes and structures: experimental cognitive psychology, cognitive neuropsychology, cognitive science, and cognitive neuroscience [81, p. 4]. Of these, cognitive science appears to be the most relevant approach. This approach involves developing computational models to understand human cognition and is generally considered to be good at modelling and supporting theories. For the purposes of this thesis, human strategic thinking cognitive traits will be inferred through the responses resulting from specific stimuli - an assessment instrument.

In Chapter 4, a meta-analysis approach is used to develop a strategic thinking assessment instrument. Research into the separate cognitive characteristics revealed a number of different instruments. Instruments needed to be simple and quick to apply as they were being combined into a single strategic thinking assessment instrument. Over-complex or lengthy was undesirable as it may reduce the ability of organisations to adopt the resultant models without specific domain knowledge. Naturally reliability of the instrument was important and was based on existing peer-review of that instrument.

For one of the characteristics, visionary thinking, there did not exist a suitable instrument. Meta-analysis was again used to understand the meaning of the term as used in the original reports. The reports were synthesised and important descriptors of visionary thinking were identified. These descriptors formed the basis of an original instrument that was piloted in this thesis.

While design research was initially developed to explore educational designs, the process involves *progressive refinement* [53, p. 18]. Progressive refinement is an iterative process that involves placing the design into the real world and making changes to the design as part of a feedback loop. Design research acknowledges the large amount of variables within complex subjects and relies on both quantitative and qualitative observations to inform change to the design [53, p. 19]. Here, a strategic thinking assessment instrument is proposed and piloted. The pilot test provides feedback that informs refinement of the instrument.

4.2.2 Instrument validation method

The assessment instrument was validated through a small pilot test. The assessment was completed by two different groups. The first population was limited in number and only included Defence employees. It was limited to Defence employees to ensure that organisational, occupational and cultural variability was limited. The participant numbers were limited as this was a pilot test and time taken for testing and analysis was directly proportional to the number of participants. The second group was conducted as part of an external workshop and involved non-defence participants from a variety of backgrounds. While the first group was completely anonymous, the participants from the second group were individually provided their results, accompanied by a short descriptive narrative, and asked to self-assess the accuracy of the assessment.

The assessment instrument was applied through an online survey to remove

any interaction with the assessor and created an easily accessible platform for the participant. In the case of the second group, an independent moderator was utilised. The use of an electronic, online platform also allowed for the data to be captured electronically without a translation filter being required.

The survey consisted of five items and are described in Annex F. The items were:

1. Participant data and discriminators (this included military branch, length of service, age bracket, gender, and education specialisation)
2. Systems thinking assessment
3. Creative thinking assessment
4. Intuition assessment
5. Visionary thinking assessment

To ascertain the accuracy of the assessment, the results of the survey were returned to the participants in Group 2, with a word picture and though a moderator, for a self-assessment. That is, the participants were asked to provide feedback on the accuracy of the word picture and results. While accuracy is being measured through a ultimately biased self-assessment, it provided a good indicator whether the survey was broadly accurate or not.

Ease of use was again a qualitative judgement based on two things: feedback from participants and completion rates. High completion rates could infer a relatively user-friendly survey tool while low completion rates would infer the reverse.

Additionally, given the potential numbers involved in future experiments or surveys, the tool had to be simple and quick to assess.

Finally, the results from the Defence group were broadly analysed to see if there were any strong correlations amongst the collected data.

4.3 Designing the strategic thinking assessment instrument

One of the primary objectives of this thesis is to improve organisational capacity to think strategically. This necessitates the design of a model that could employ quantitative metrics or qualitative assessments to assess, monitor and track the ability of the organisation and its employees to think strategically. Preferably this model would be as applicable with organisations as it is with individuals.

This section will explore the contemporary measures of the identified strategic thinking domains: Visionary Thinking, Intuition, Creative Thinking, and Systems Thinking. In doing so, suitable measures for each domain will be identified. These measures will then be applied to a strategic thinking model that enables visual representation of the style of strategic thinking.

4.3.1 Visionary Thinking

Uotila et al (2006) are cited as referring to the visionary capability as the "ability to outline the possible potential development trajectories based on the paths trav-

elled and utilizing the opportunities emerging as the techno-economic paradigm changes" [188, p.841]. This unnecessarily constrains the taxonomy to technology and economics and appears to ignore the relevance of other domains such as cultural values and politics. That said, this quote is useful to highlight the future focus of visionary thinkers that is also linked to past and present capability.

The quote appeared in a piece investigating the role of dynamic capabilities in changing social inertia. While visionary thinking was well articulated as a variable within the visionary capability, there appeared to be an assumed understanding of what visionary thinking was. This example illustrates the lack of research into quantifying visionary thinking. Confusingly, contemporary use of the adjective visionary includes creative as a synonym[1].

Documented tests for visionary thinking are few on the ground. In fact the research only uncovered one test that appeared relevant and measurable - The DARPA Hard Test. Carleton (2015) describes the DARPA Hard Test as a simple tool used to embrace a culture that focusses on the big vision [43]. Essentially this test is designed for assessing a research idea based on four dimensions:

1. **Far-reaching** ideas require a completely new mental model;
2. **Technically challenging** ideas reach beyond the edges of what is currently technically possible;
3. **Multidisciplinary** ideas require the integration of multiple, disparate bodies of knowledge for their implementation;

[1]Google search for "synonym visionary" made on 06 November 2015

4. **Actionable** ideas are not magical or hypothetical. There is a clear path to the goal [43, p13].

Table 4.1 demonstrates that each dimension is scored on a scale from one to seven [43, p.13]. One being the lowest. The scores are not aggregated, rather are visually represented on four parallel bars. This allows each dimension to be compared.

As a tool for assessing ideas, the DARPA Hard Test has a strong practical use and evidently works well within the research community. As a test for individual or organisational visionary thinking, as a component of strategic thinking, there are a few short comings. The four dimensions themselves are relevant, though domain specific. Of particular use are the two dimensions *far-reaching* and *actionable*. However it does not appear to address all of the attributes previously associated with visionary thinking. For example there is the apparent lack of consideration of the long-term value and this tool is designed for individual ideas rather than an organisation-wide commitment.

The previous example demonstrated that it is possible to apply a quantitative measure to ideas and, probably more importantly, has organisational acceptance. Visionary thinking can be thought of as a collective term for a number of characteristics articulated by strategic thinking theorists. The literature review certainly highlighted the disparity among the authors with regard to this characteristic of a strategic thinker. Nevertheless, it should be possible to construct a broader assessment tool after examining the terminology used by these authors.

	Scale (1-7)	
Dimension	**Score 1**	**Score 7**
Far-reaching	Requires no change in how people think about solution	Requires a paradigm shift in how solution is viewed
Technically Challenging	Requires no new technical knowledge	Requires major advancements in technical knowledge
Multi-disciplinary	Requires only one class of knowledge	Requires multiple, distinct bodies of knowledge
Actionable	Requires so much clarification that the next step is another meeting	Requires little effort to begin moving toward a solution

Table 4.1: The Dimensions of DARPA Hard

While the majority of authors used the term vision or visionary thinking, there were equal numbers who used five other terms. In short, the terms can be explained as:

- visionary thinking - desired outcomes based on future possibilities;
- directional - providing a sense of a path aimed towards a future state which is different from the present;
- thinking in time - connecting the current reality with future possibility;
- intent focused - provides a sense of direction by focussing on a specific target;
- intelligent opportunism - provides a target but is open to the possibility of emergent strategy; and
- sustainable competitive advantage.

These individual terms are discussed in more detail in earlier chapters however Figure 4.1 on page 95 illustrates the main indicators of each of these terms. That

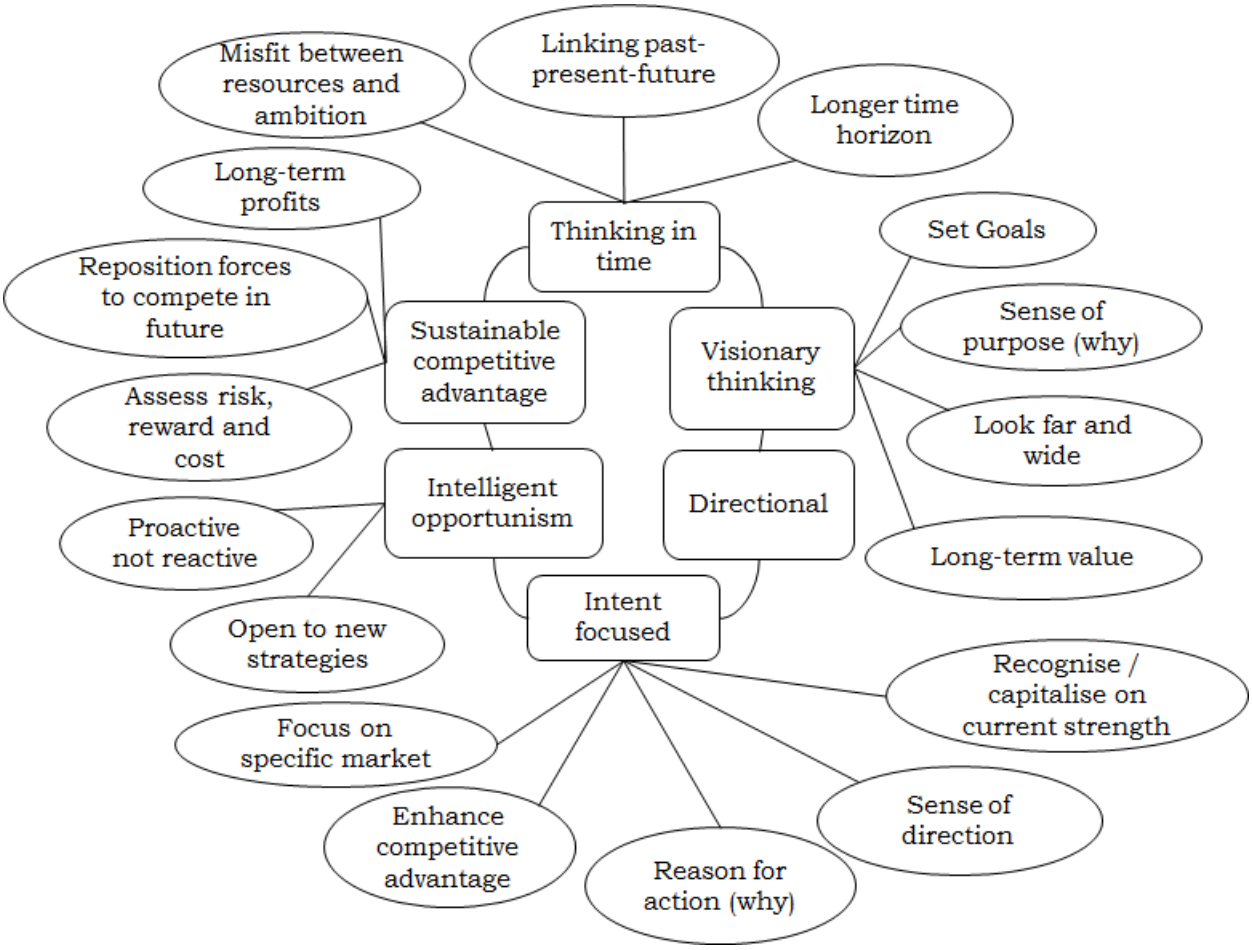


Figure 4.1: Visionary Thinking characteristics identified through a literature review and clustered using a hierarchy method

is, the individual should be *able to* "set goals" or "provide a sense of direction" or even be "proactive not reactive". The group appears to cover a lot of ground. To make the list more comprehensible, commonality amongst the attributes was sought by simply clustering like attributes. Figure 4.2 illustrates this organisation.

The aggregation of the various characteristics, as illustrated in Figure 4.2 allows us to postulate that visionary thinking produces an <u>articulated</u> goal that is

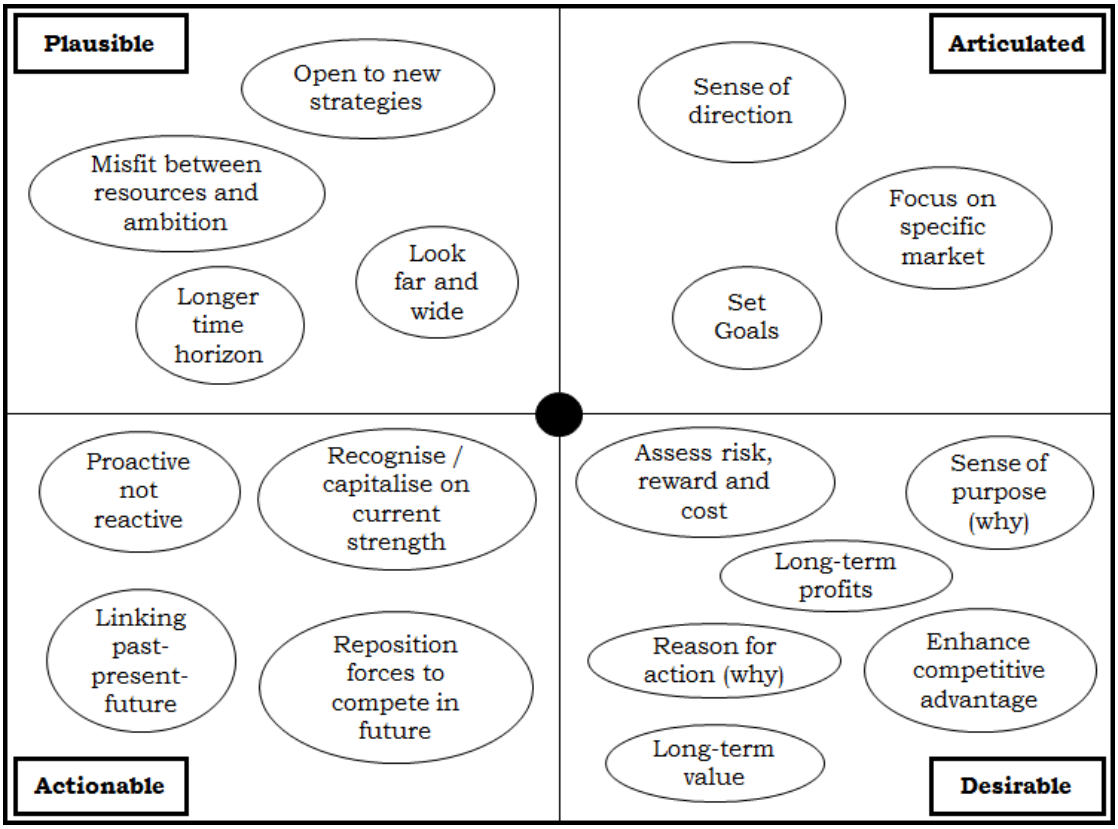


Figure 4.2: Visionary Thinking characteristics clustered into four measurable attributes

plausible, desirable and actionable. This working definition provides four thematic groupings that base their titles on the work of Boal and Hooijberg (2001), who proposed that visions should meet the tests of "possibility, desirability, actionability and articulation" [26, p.21]. Campbell and Yeung (1991), Berson, Shamir, Avolio and Popper (2001), and Strange and Mumford (2002) are all very specific that vision statements need to be clearly articulated [35, 25, 214].

The thematic groups also reflect the framework proposed by Van Der Helm (2009) that all visions share three aspects: (1) they are a vision *of the future* (thus

possibility); (2) they are a *preferred* future (desirability); and (3) they are required to *converge* actions in a desired direction (action-ability) [223, p.99]. At this point, we can identify the difference between the two adjectives visionary and creative. From the literature review, we distil the following definitions for an individual or an organisation to become creative and visionary. Figure 4.3 illustrates this point.

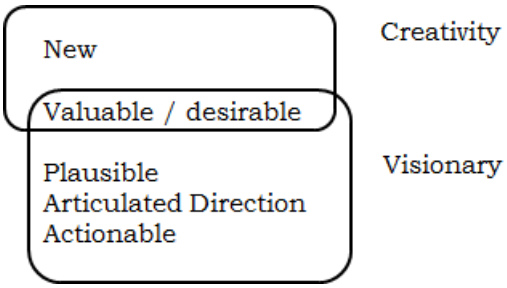


Figure 4.3: The difference between the adjective Creative and Visionary

Each group of attributes was then investigated for appropriate measures that could allow a given statement (such as a vision statement) to be simply assessed. The result is Table 4.2 titled The Four Visionary Thinking Measures.

4.3.2 Intuition

Perhaps indicative of the elusiveness of strategic thinking, intuition, like the other domains, appears to lack a "comprehensive, overarching framework" [208, p.3]. Dane and Pratt (2009) though believe that there is a conceptual convergence in the study of intuition [63, p.2]. In their study, Dane and Pratt propose that most conceptualisations of intuition (the process) include:

1. *Non-conscious information processing.* This idea of non-consciousness processing is based on the the idea of two cognitive *systems.* System 1 is expe-

Vt	Attributes	Measures		
Articulate (0-5)	• Is able to provide a sense of direction • Sets out goals • Focuses on a particular 'market'	**Direction**	**Goals**	**Market**
		Direction is not clear (0)	Goal(s) not clearly expressed clear (0)	Unfocussed attention across a range of market (0)
		Direction is weak (1)	Weakly expressed (1)	Focussed attention on a specific market(1)
		Direction is clear (2)	Clearly expressed (2)	
Plausible (0-5)	• Long time horizon • Open to new strategies • Misfit between resources and ambition • Look far and wide	**Ambitious**	**Time horizon**	**Broad view**
		Extremely unrealistic and definitely unachievable (0)	Short term (<2yrs) (0)	Does not take into account or leverage other fields (0)
		Easily achievable (1)	Medium term (<5yrs) (1)	Accounts for and/or leverages other fields (1)
		Possibly achievable (2)	Long term (>5yrs) (2)	
Desirable (0-5)	• Reason for action • Sense of purpose • Long term value • Long term profits • Enhance competitive advantage • Assess risk, reward and cost	**Purpose**	**Long term value (5+years)**	**Risk**
		Reason for action is unclear (0)	Less valuable in the long term (0)	Risk is not accounted for (0)
		Reason for action is weak (1)	No change in value in the long term (1)	Risk is accounted for (1)
		Reason for action is strong and clear (2)	More valuable in the long term (2)	
Actionable (0-5)	• Able to reposition resources / forces to compete in future • Capitalise on current strength • Links past, present and future • Proactive not reactive	**Resources**	**Strengths**	**Pro-active**
		Do not have resources or unable to reposition resources to compete (0)	Goal not aligned with strengths (0)	Reacting to current threat (0)
		Have resources and able to reposition to compete (1)	Goal weakly aligned with strengths (1)	Reacting to future threat (1)
			Goal strongly aligned with strengths (2)	Not a reaction to current or future threat (2)

Table 4.2: Visionary Thinking Assessment Measures including key measures and subordinate metrics as a guide for assessment

riential, automatic and often not rational, while System 2 is often referred to as rational and rule-based;

2. *Holistic associations.* These associations often stem from simple cognitive heuristics that are often linked to environmental stimuli;

3. *Affect.* Intuition is often linked with *gut-feeling*, a highly emotive term, and there is strong support that intuition is *affectively charged*; and

4. *Speed.* Unlike rational evaluations, intuitions often arise rapidly through *immediate apprehension* [63, p.3].

According to Pretz et al (2014) intuition itself is a multi-faceted concept that can be conceived as three distinct types [194, p.454]:

1. *Holistic intuition* - judgements based on qualitatively non-analytical process made by integrating multiple, diverse informational cues into a whole that may or may not be explicit;

2. *Inferential intuition* - judgements based on automated analysis. Inferences and decisions that were once analytical have been automated with practice. This type of intuition is often characterised as expert judgement; and

3. *Affective intuition* - judgements based primarily on emotional reactions to decision situations regardless of any explicit or rational support. This type of intuition is readily associated with *gut-feel.*

Strategic thinking requires a broad view and the ability to connect weak, diverse cues. Thus, of these three intuition types, holistic intuition and possibly inferential

intuition are selected as the most appropriate to strategic thinking.

A working definition of intuition that appears to fit the strategic thinking framework is "a non-sequential information processing mode, which comprises both cognitive and affective elements and results in direct knowing without any use of conscious reasoning" [209, p.357]. This definition, though, does not lend itself easily to quantitative measuring.

Another barrier to simple measuring is the importance of broader environmental factors. According to Sinclair and Ashkanasy (2005) intuitive decision making is affected by four broad factors: (1) problem characteristics, (2) decision characteristics, (3) personal disposition, and (4) decision-making context [209, p.360].

Almost all of the intuition assessment models employ a form of self-assessment. The Myers-Briggs Type Indicator (MBTI), the Rational Experiential Inventory (REI), Preference for Intuition and Deliberation Scale (PID), Perceived Modes of Processing Inventory, Intuitive Behavior Questionnaire and lastly the Types of Intuition Scale (TIntS) [194, p.455].

The self-reporting scale, TIntS, developed by Pretz et al (2014) looked to assess the three types of intuition previously mentioned [194]. Their research suggested that the well-known Myers-Briggs Type Indicator (MBTI) for Intuition (using the intuitive/sensate scale) reflected holistic intuition [194, p.455]. Their studies demonstrated the validity of TInts to not only differentiate between the three types of intuition (holistic, inferential and affective) but also as a predictive indi-

cator of behaviour that uses intuition. The use of two scales for Holistic intuition (Holistic-Big picture and Holistic-Abstract) is useful in this case, as holistic intuition appears to best represent the behaviour required from strategic thinkers. The final 23 item TIntS is shown as Table E.1 [194, p.456].

Their results were encouraging, with the TIntS demonstrating strong correlations with other well-established assessments. The Holistic-Abstract correlated strongly with the MBTI Intuition while the Affective intuition correlated with MBTI Feeling. Holistic-Big Picture did not correlate well with the REI, indicating that the REI may not be an appropriate assessment for this domain.

4.3.3 Creative Thinking

> "Creative thinking is a key capability that helps individuals and organisations deal with and manage change" [109, p.117]

Like most definitions within this field of enquiry, the term creativity has attracted broad attention and acquired a complexity that "poses major problems for measurement" [21, p.15]. The field itself suffers from the most basic problems, "such as lack of definition and limited educational applications" [112, p.291]. This, in turn, has led to a situation where most measures and methods used to assess the creative processes, products and persons are found to be wanting [112, p.270].

That does not mean that creative thinking cannot be measured. However, terminology is important. Houtz and Krug (1995) defined measurement as the process of assigning numbers to some phenomena [112, p.271]. The most impor-

tant questions being the reliability, meaningfulness, and predictability (or validity) of the number assignments. Assessment though involves the process of "appraisal and comparison" and the focus is on "ranking or ordering performances on a variety of scales" [112, p.271]. Thus, given the nature of this thesis, an assessment of creativity is probably the most correct term.

But what is being assessed? Creativity itself is a "complex phenomenon involving the operation of multiple influences as we move from initial generation of an idea to delivery of an innovative new product" [176, p.109]. Creativity assessments often focus on the product, process, person or press (environment or sometimes individual motivation) [22]. Yet even the most basic assessments of creativity emphasise the "production of novelty as the crucial aspect" when simple novelty on its own is not enough: "a product must also be relevant and effective" [58, 59].

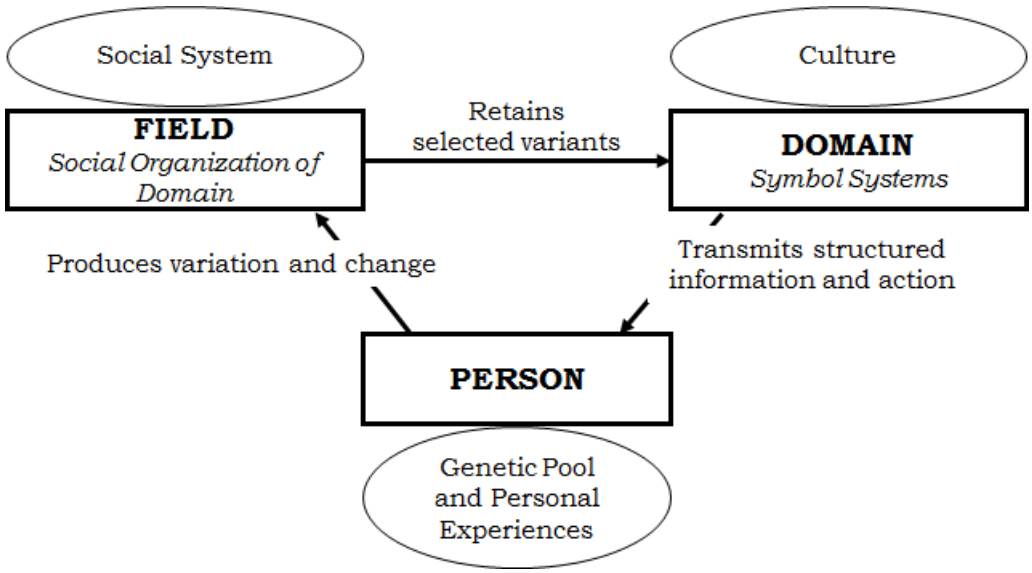


Figure 4.4: Csikszentmihalyi Creativity Map showing how valuable ideas are absorbed in a system [60]

Csikszentmihalyi (2014) proposed a creativity map (see figure 4.4) that highlighted the idea of value [60, p.52]. The map illustrates that the individual obtains information from their culture and applies a change to a specific field. If the change is deemed to be valuable by the society it is retained in the domain and thus provides a new starting point. Again the emphasis here is on the value assessment of the change rather than the change itself.

That said, at this point, the distinction needs to be made between innovation and creativity. There is clearly a relation between the two as this definition of creativity demonstrates: "creativity is defined as the ability to innovate and move beyond what is already known" [116, p.173]. Innovation, though, appears to be greater. Cropley (2009) neatly describes innovation as having two phases: invention and exploitation [59, p.258]. Creativity in this case sits within the invention process and includes processes such as idea generation, idea evaluation and opportunity recognition. Exploitation meanwhile embodies the concepts of developing and commercialising. Moos et al (2010) defined innovativeness as the "ability of a firm to continuously generate and *implement* innovations" [171, p.1]. Whilst seemingly a circular argument it is clear that innovation requires creativity however creativity is not the whole of innovation.

In order to assess creative thinking, the options are numerous and include approaches that explore product or process to the person and press (environment). Mumford (2011) argues that creativity is "a product of work on a particular type of problem" [177, p.39]. Batey (2007) cites numerous studies that indicate creativity is a confluence of factors including intelligence, thinking style, personality

etc) [22, p.89]. However by stating that *Product = Person x Process x Press* (commonly referred to as the 4Ps), Batey (2007) also reaffirms that creativity, through a synergy of the 4 P's can be investigated through a single facet - product [22, p.101].

While this field of research has received much attention, the lack of crystallisation of the very concept of creativity creates problems with regard to measurement or assessment [187, p.259]. Thus, it is important to disambiguate what needs to be measured. The goal is to understand the capacity of the individual for strategic thinking. Capacity can be equated to the potential for action. For instance, a water tank has the capacity (or potential) to hold an amount of water. Thinking in these terms, we are then interested in the *creative thinking potential* of an individual or organisation.

Divergent and Convergent Thinking Styles

Creative thinking has often been strongly correlated with divergent thinking [5, 49, 22, 126, 202]. However there is a strong argument that creative thinking involves much more than just divergent thinking [222, p.5]. Divergent thinking appears to be the thinking style that elicits new or original ideas yet it is convergent thinking that ensures these ideas are assessed as valuable to the problem at hand [177, p.55]. As a thinking process, De Haan (2009) describes creativity as having three distinct, and testable elements: (1) divergent thinking (novelty); (2) convergent thinking (evaluation); and (3) analogical thinking (communication of idea) [67, p.174]. It is this combination of divergent and convergent thinking that allows Csikszentmihalyi's (2014) Creativity Map cycle to be improved as the individual applies a coarse filter of their ideas rather than just the social system.

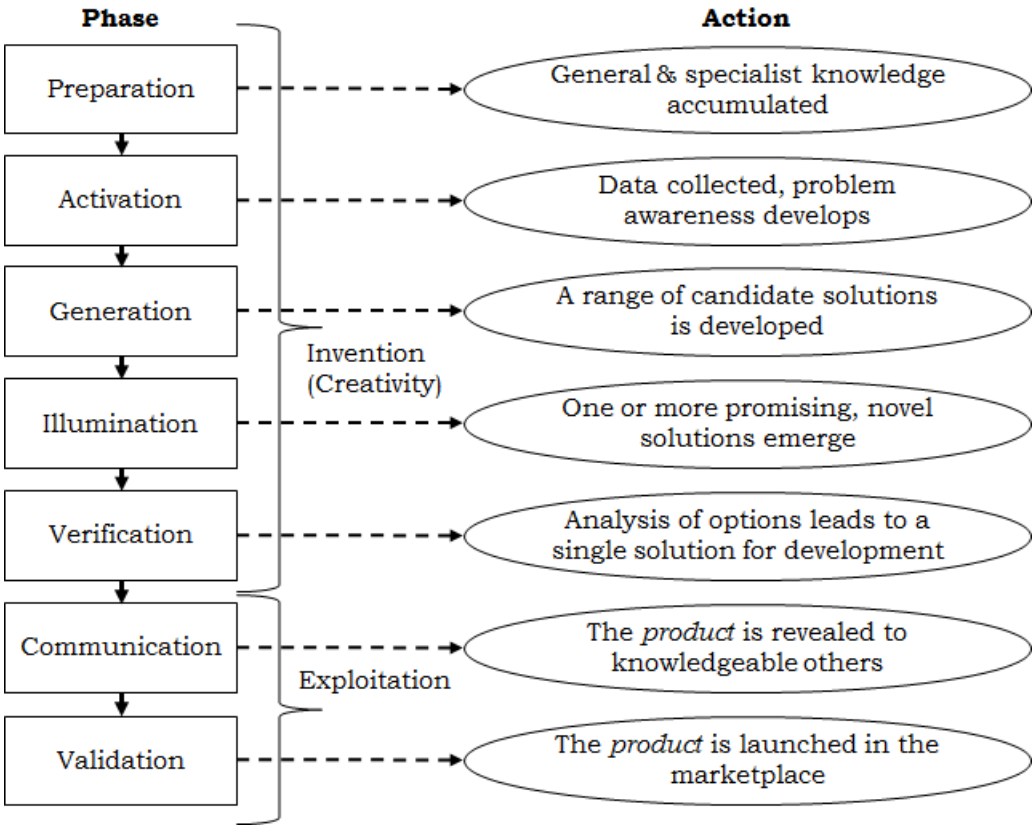


Figure 4.5: Cropley's (2009) Expanded Phase Model of the Innovation Process [59, p.270]

It is thus apparent that the seemingly paradoxical thinking styles (divergent and convergent) are both needed for the type of creative thinking important to our problem - strategic thinking. It appears that the reason for these seemingly antagonistic styles is that creativity requires fluctuation and alternate thinking and behaviour [59, p.265].

Cropley's (2009) Expanded Phase Model of the Innovation Process (shown at Figure 4.5), describing the phases of creativity and exploitation, is one of the bet-

ter models that illustrates the conflicting styles [59, p.270]. According to Cropley, only the activation and generation phases require divergent thinking [59, p.273]. The surrounding phases require convergent thinking, particularly verification as it requires the analysis of the options to create a single (valuable) solution.

As creative thinking appears to be strongly correlated to both divergent and convergent thinking, tests of these two measures should provide a good indicator of creative thinking potential. So how do we test both Divergent and Convergent thinking styles?

Much of the testing of creativity focusses on Divergent Thinking (DT) as an indicator of creative potential. Popular tests include the Torrance Test for Creative Potential (TTCP); the Test for Creative Thinking - Drawing Production (TCT-DP); Wallach and Kogan Creativity Test (WKCT) and the corresponding electronic form (e-WKCT) and Guilford alternate uses test [225, p.318].

Most of these tests rely on uniqueness and fluency as indexes however the addition of "quality" has been proven to improve the construct validity of divergent thinking scores [202, p.4]. The use of a quality index has strong appeal as it could be used as an indicator of convergent thinking (through the verification phase mentioned previously). A final index that has gained in popularity is the idea of flexibility [202, 136]. That is, the flexibility of the participant to employ creativity across a number of categories.

Alternate scoring includes judges awarding a single score for the *ideation pool*

provided by the participant with weighting to quality of those collective ideas [202, p.5]. Zarnegar, Hocevar, and Michael (1987) proposed limiting the sample to producing one idea [202, p.5]. This not only required the sample to generate ideas but also to evaluate them. Runco (2012) felt that this combination (idea generation and evaluation) was probably consistent with the natural environment [202, p.5]. However this was balanced with the acknowledgement that this type of scoring ignored the theories and research that suggests time is necessary for finding creative ideas [202, p.5].

Thus a metric for assessing creative potential can be developed based on this research, specifically using the indexes fluency, originality, flexibility and quality. Table 4.3, modified from Shah, Millsap, Woodward, and Smith (2012) work on divergent thinking testing in the field of design, will be used [206, p.3].

Sub-skill	Definition	Metric
Fluency (flu)	Ability to generate many solutions consistently	Quantity of ideas generated
Flexibility (flx)	Ability to explore design space in many directions	Variety of ideas generated
Originality (org)	Ability to generate unexpected solutions	Originality of ideas generated
Quality (qlty)	Ability to consider feasibility, value and appropriateness	Closeness of fit with goals, tech and economic feasibility, and potential value

Table 4.3: Divergent Thinking (DT) subskills and measures

The sub-skills could then be applied to wide domain or non-domain specific tests. For example participants could be asked to create designs for space ship or create objects from a short list of items (such as a gear box, rubber band, pencil

and piano wire). The results would be objectively scored by several judges (to avoid subjective bias) against each sub-skill.

4.3.4 Systems Thinking

> *"Systems thinking is the ability to see systems holistically by understanding the properties, forces, patterns and interrelationships that shape the behaviours of the systems which provides options for actions."*
> Pisapia, Reyes-Guerra and Coukos-Semmel, 2005 [189, [p.48]

Systems thinking involves a number of steps [224]. It first requires the consideration of the boundaries of the problem or framing the problem. Note that there is no such thing as a closed system thus forcing the planner to consider the wider implications of their decisions. Following the definition of the boundaries, a system thinker must think in terms of the three *inters*:

1. interaction of components,
2. inter-relationships of the processes within the system, and
3. interconnections between systems across time.

Waldman explains the methodology as:

> *"To explicate these inters, systems thinkers apply archetypes like accidental adversaries. They identify characteristics, such as self-stabilizing, goal-seeking, self-programming, programme-following, anticipatory, environment modifying, self-replicating or self-maintaining. They organize using loops, such as balancing or reinforcing and internal processes*

like escalation. Finally, the systems analyst projects all the possible outcomes" [224].

Waldman continues the analogy with a comparison of a linear thinker versus a systems thinker vis-a-vis the disparity between resources and allocation. The linear thinker simply looks to reduce allocations with no thought of the wider impact. A systems thinker will look at the problem and see the interconnectivity of the systems and acknowledge the impacts of any change.

Stave and Hopper addressed the question as to how to determine an individuals level of systems thinking at any point of time [212]. Their initial research showed that while there was consensus on placing systems thinkers along a continuum there was little agreement on how this should be achieved (specifically what type of characteristics should be measured). Further, review of the literature revealed seven characteristics that are agreed upon:

1. **Recognizing Interconnections.** The base level of thinking is systemically recognizing that systems exist and are composed of interconnected parts. This includes the ability to identify parts, wholes and the emergent properties of a whole system. A number of authors used the analogy of being able to see both the forest and the trees. Recognizing interconnections requires seeing the whole system and understanding how the parts of the system relate to the whole.

2. **Identifying Feedback.** This characteristic includes the ability to identify cause-effect relationships between parts of a system, describe chains of causal relationships, recognize that closed causal chains create feedback, and

identify polarity of individual relationships and feedback loops.

3. **Understanding Dynamic Behaviour.** A key component is understanding that feedback is responsible for generating the patterns of behaviour exhibited by a system. This includes defining system problems in terms of dynamic behaviour, seeing system behaviour as a function of internal structure rather than external perturbations, understanding the types of behaviour patterns associated with different types of feedback structures, and recognizing the effect of delays on behaviour.

4. **Differentiating types of flows and variables.** Simply recognizing and being able to describe causal relationships is not sufficient for a systems thinker. Understanding the difference between; being able to identify rates, and levels, and material and information flow; and understanding the way different variables work in a system is critical.

5. **Using Conceptual Models.** Being able to explain system behaviour requires the ability to synthesize and apply the concepts of causality, feedback, and types of variables.

6. **Creating Simulation Models.** The ability to create simulation models by describing system connections in mathematical terms is an advanced component of systems thinking. This category includes the use of qualitative as well as quantitative data in models, and validating the model against some standard. It does not specify which type of simulation model must be used.

7. **Testing Policies.** Most people see the use of simulation models to identify leverage points and test hypotheses for decision making as the full expression

of systems thinking. This includes the use of simulation models to understand system behaviour and test systemic effects of changes in parameter values or structure.

Using Blooms Revised Taxonomy of educational objectives, Stave and Hopper mapped the seven characteristics onto a continuum resulting in a Taxonomy of Systems Thinking Objectives (Fig 4.6) [212]. Further work allowed Stave and Hopper to develop draft measures of assessment as shown in Appendix G.

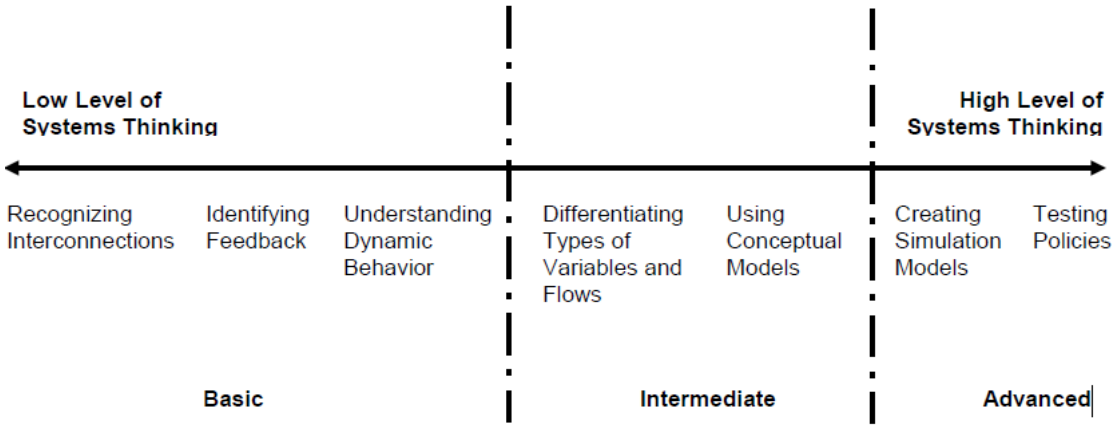


Figure 4.6: Stave and Hopper - Taxonomy of Systems Thinking Objectives

Plate and Monroe (2014) also developed an assessment framework based on Stave and Hopper [190]. They felt that Stave and Hopper's continuum of systems thinking, while a useful guide, presented an overly simplified image of a students progress [190, p.3]. As a result they developed and presented a scale of measurement for each level. This is shown in Appendix I.

While a very useful framework for assessing Systems Thinking, the authors ad-

mit that the use of a hierarchy hid the complexity of the topic. When consulted, many of their peers felt that the measures were correct, however that they were often concurrently used. Thus it is more appropriate to view these measures as a cumulative measure. Cardenas et al (2010) blended the framework with a simple questionnaire to create an assessment tool [42, p.289]. The assessment tool (shown in table 4.4) looked to categorise individuals into Low, Medium or High System Thinkers [42, p.290]

'The pattern of consumption of oil as a main source of energy is unsustainable in the long-term (Mexico's oil reserves are expected to be depleted in ten years). There are alternative sources of energy such as solar, wind, sea currents, nuclear, fuel cells, etc.; nevertheless each of them presents disadvantages. We may even consider energy sources not yet developed. A sustainable decision consists on selecting a path to substitute finite energy sources with renewable sources'. Please, answer the following questions. All may be considered correct, we ask you to choose the one that you consider most appropriate.
A. Choose only one of the following actions to address this global problem:
1. I propose to analyze and combine energy sources according to the goal in each case as well as strategies for their diffusion and correct use.
2. I would first identify the pros and cons of each alternative, study their implications and relevance of each factor in our context, as well as their implementation effects.
3. I would analyze all the variables that determine the advantages and disadvantages of each energy source.
B. Please, explain in a paragraph your choice and the contribution of your academic specialization to a multidisciplinary team that works on this area.
C. Personal data: Academic program you are enrolled and sex

Table 4.4: Cardenas et al Strategic Thinking Questionnaire

This form of assessment tool allows for quick assessment (about 10 minutes) however only provides a three level result. This does not appear to provide sufficient fidelity for comparison although is a useful quick measure. The study also concluded that it is difficult to escape a learning effect. That is, participants could develop their systems thinking while elaborating on their ideas. Thus any assessment is not likely to record a snap shot of an individuals thinking. However - due to the complexity of the previous assessment methods, the Caldenas questionnaire appears to be the most suitable for a generalised assessment.

4.3.5 Assessing the results

Once applied, the strategic thinking score is calculated as described below.

Visionary Thinking

The participants were finally asked to: *write a vision statement of where you would like to be in the future. Provide a time-scale, be descriptive and provide justification, where possible, for your decisions.* The open responses were reviewed by the assessors against the visionary thinking framework described earlier in Table 4.2 on page 98.

Intuition

Intuition was measured using the TinTs scale previously described in Table E.1 on page 314. Of particular interest were the respective scores for Holistic-Big Picture (HB) and Holistic Abstract (HA). The participant's intuition score is the sum of HB and HA.

Creative Thinking

In this question the participant is presented with a fairly simple and abstract scenario.

> *"While travelling overland, you encounter a flooded pass. You have a shovel and a length of rope. You have to physically cross the water. Describe the different ways you could cross."*

The participant is then expected to list the number of different ways they would approach this problem. The list is then reviewed by the assessor for Fluency (flu), Flexibility (flx), Originality (org) and Quality (qlty). Table 4.5 describes the Creative Thinking Assessment Framework (CTAF) developed by Shah et al and is the basis for the work here [206, 207].

Subskill	**Definition**	**Metric**
Fluency (flu)	Ability to generate many solutions consistently	Quantity of ideas generated
Flexibility (flx)	Ability to explore design space in many directions	Variety of ideas generated
Originality (org)	Ability to generate unexpected solutions	Originality of ideas generated
Quality (qlty)	Ability to consider feasibility, value and appropriateness	Closeness of fit with goals, tech and economic feasibility, and potential value

Table 4.5: Creative Thinking Assessment Framework (CTAF)

For this experiment, CTAF is altered to fit the context of strategic thinking. **Fluency** is the quantity of answers (A) generated by the individual (p). This is represented as:

$$flu_p = \sum A_n \tag{4.1}$$

Flexibility is the variation in ideas that are generated. Shah et al found that responses tended to fall into a set of defined categories [206, p.5]. Here, flexibility equates to the number of significantly different categories (C) these ideas fall into.

$$flx_p = \sum_{n=1}^{flu_p} C_n \tag{4.2}$$

Originality is dependent upon the number of participants that provide similar answers. The score is based on the presumption that the more rare the idea, the more original [206, p.5]. Originality is scored higher if less participants provide that solution. This is calculated as a function of frequency ($Freq$) of the answer (k) relative to the frequency range of the other answers [207, p.118]. The score for originality (O) of category k can be expressed as:

$$O_k = 9(\frac{\%H - \%C_k}{\%H - \%L}) + 1 \tag{4.3}$$

Where $\%H$ is the highest frequency, $\%L$ is the lowest frequency and $\%C_k$ is frequency for category k [206, p.5]. Once the originality of each answer is calculated, participant originality scores O are then calculated as the mean of their answers respective originalities. This is expressed in equation 4.4 (where Q_k is the quality of category k) as:

$$O_p = \overline{(A_k O_k)} \tag{4.4}$$

Finally each category (C_k) is assessed for **quality**. Does the category fit the goal? Is it feasible? And what is the potential value? Each category is normalised on a scale from 1 - 10, with 10 having the highest quality. The calculation for the score for quality Q for each participant p is the mean of their quality of their answers and is shown in equation 4.5.

$$Q_p = \overline{(A_k Q_k)} \tag{4.5}$$

The final creativity score is the summed total of Fluency, Flexibility, Originality and Quality. Summation was chosen over product to reduce the variance span. The participant p creative thinking score CT_p is calculated using equation 4.6:

$$CT_p = flu_p + flx_p + O_p + Q_p \tag{4.6}$$

Systems Thinking

The participant is given a fairly abstract scenario. The scenario is abstract enough to ensure that participants are unlikely to have an expert knowledge of the field nor would they be unfamiliar with the topic. The scenario is:

> *"The pattern of consumption of oil as a main source of energy is unsustainable in the long-term (Mexico's oil reserves are expected to be depleted in ten years). There are alternative sources of energy such as solar, wind, sea currents, nuclear, fuel cells, etc.; nevertheless each of them presents disadvantages. We may even consider energy sources not yet developed. A sustainable decision consists on selecting a path to substitute finite energy sources with renewable sources"*

The participant is then asked to choose an assessment method to answer the problem. The participants are told that all options are considered correct, and are asked to choose the one they consider most appropriate. The actions are:

- "I propose to analyse and combine energy sources according to the goal of replacing finite energy sources as well as strategies for their diffusion and correct use."
- "I would first identify the pros and cons of each alternative, study their implications and relevance of each factor in our context, as well as their implementation effects."
- "I would analyse all the variables that determine the advantages and disadvantages of each energy source."

The responses are directly mapped into the three categories: low-level (answer 3), mid-level (answer 1) and high-level (answer 2) systems thinking. Due to the restrictive nature of the multiple choice question, the participant is asked to explain their choice in a paragraph. This open-ended response is used to confirm the initial choice and amended, if appropriate, by the assessor into a three point system thinking score, guided by a framework. The framework is presented in table 4.6.

Strategic Thinking Score

Participant strategic thinking capacity was initially calculated as the sum of the four characteristic scores (Visionary thinking, Intuition, Creative thinking and Systems thinking). This presented a problem when each characteristic had different ranges. For instance, systems thinking was scored out of five however intuition was

Low	Medium	High
Analyse all advantages and disadvantages in order to make a decision	Relativistic understanding depending on context, needs, priorities, applicability. Find appropriate solutions for every case	Consider time: choose the best moment to act; understand the stages of the energy cycle from generation to use and disposal
Compare, implement, optimize, integrate, improve, increase efficiency; as soon as possible.	Consider the effects, particularly those that may turn into bigger problems in the future.	Design new strategies; focus on new knowledge and evidence; simulate future scenarios; consider 'plan-B'
Analyse all the variables or features of the alternatives, and design the best solution for all.	Build and reinforce a culture of saving, help people realize how they consume and waste energy.	Consider second and third order effects over time.

Table 4.6: Systems Thinking Assessment Framework for guiding categorisation of responses into Low, Medium or High Systems Thinking

scored out of 35. To overcome this, each individual characteristic score was normalised before being summed into the final strategic thinking score. This resulted in a score out of four. At this point, each characteristic was weighted equally.

4.3.6 Strategic Thinker Model

The capacity for strategic thinkers can be quantified through four key cognitive characteristics: Visionary Thinking, Intuition, Creative Thinking and Systems Thinking. Each of these characteristics, or traits, while related, are also beneficial in different situations. When an organisation finds itself in a new situation or environment, particularly one that appears to be complex, the benefits of a strong systems thinker is immediately obvious. Systems thinkers are able to understand the future impact of actions within systems. This form of understanding quickly

enables an organisation to chart its place within the environment.

Conversely, when the organisation is at cross-roads, or languishing without direction, the benefits of a visionary thinker is also obvious. The visionary thinker creates the magnet or driving force that shapes the decision making process of the organisation. The importance of each trait in different situations means that while strategic thinking can be measured, and compared, with a synthesised score, the relative strengths of each strategic thinker (individual or organisation) should also be kept in mind. These strengths then allow comparisons to be contextualised.

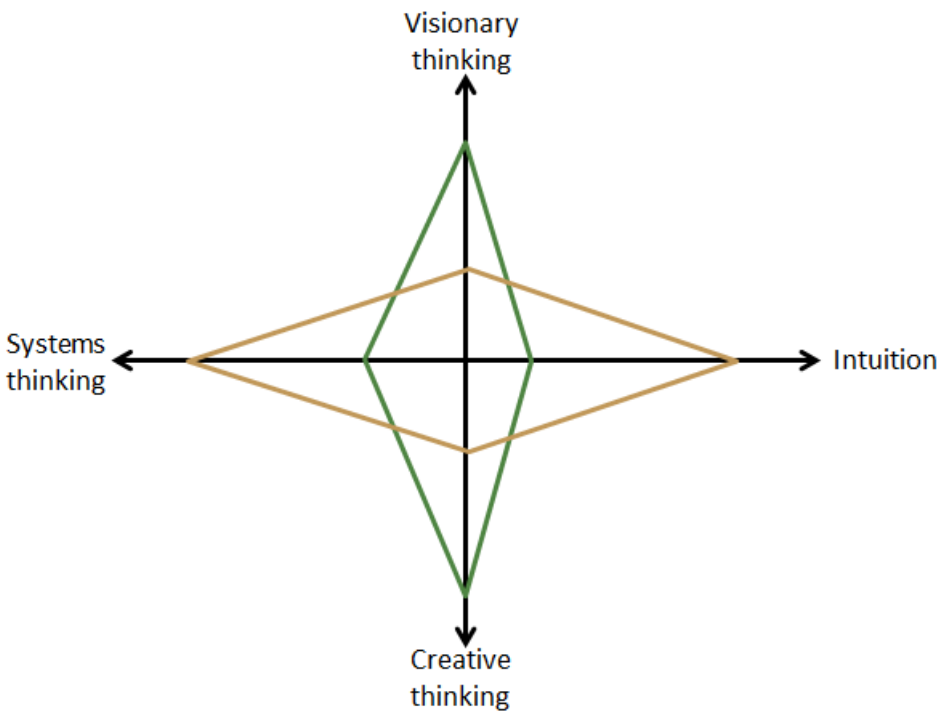


Figure 4.7: Strategic Thinking Capacity Model using a spider graph to illustrate relative difference on a normalised scale

Figure 4.7 on page 119 illustrates a useful comparative model. Each character-

istic is quantified, using the assessment instruments discussed in previous sections, and graphed onto a separate axis on a spider graph. While the scores don't have to be normalised, the axis do have to be re-sized. For instance, systems thinking is measured on a three point scale while creative thinking could go up to 35 (as an example). For simplicity, and because relative importance of each characteristic has not been established, in this case each score is normalised.

The benefits of this visual representation of strategic thinking capacity is illustrated in Figure 4.7. It is immediately obvious which strategic thinker is stronger in which areas. This allows relative value to be contextualised and also relative weaknesses to be readily identifiable.

4.4 Results of the Strategic Thinking Assessment Pilot

This section describes a pilot test of the strategic thinker model using a five item assessment. The results are detailed in Annex H. The pilot test had several objectives of which the principle to investigate whether the assessment provided a broadly accurate summary of participants. The objectives were:

1. Accuracy of assessment - Did the assessment produce results that were broadly representative of the participant?

2. Ease of use - Was the assessment tool simple to use for the participant and the assessor?

3. Indication of variables - Were any influencing variables or correlations immediately obvious?

4.4.1 Participants

Group 1, or the Defence group, involved 13 participants from all three services. That said, Army ($n = 9$) dominated with only one participant from the RAN. There was a large variety of experience (measured by time in service) ranging from 3 years to 20 years. All of the participants in this group had, or were completing, tertiary education with most participants being students in engineering or the Arts.

Group 2, or the Civilian group, involved nine ($n = 9$) participants from a variety of backgrounds. Most were in a leadership or senior management position within small to medium businesses. This group was sourced through a third-party workshop facilitator.

4.4.2 Accuracy of Assessment

The feedback was overly positive. Each participant in Group 2 were provided a spider graph illustrating their results with an accompanying word picture. The word picture was included to provide the participants contextual relevance to the results. Examples of the results are provided in Figure 4.8 and Figure 4.9.

In all cases, the participants informed the moderator that they felt the results were consistent with their own reflection and reflective of their own self-

You have a high inferential intuition which is ideally suited for 'tactical', fast paced operations. Your creative nature make you ideally suited to problem solving. Noting that, should you encounter novel situations or find yourself involved in large operations, you are well advised to employ more procedural systems thinking methods. This will allow you to understand the important levers that can influence your environment. You appear to have a vision however it is recommended that you spend some time articulating that vision in manner that is accessible to others.

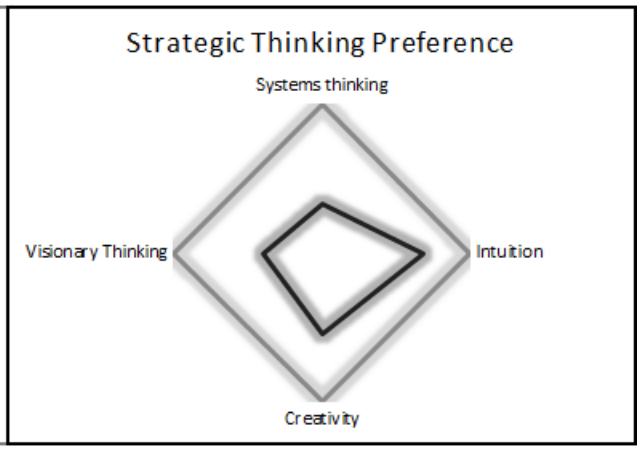


Figure 4.8: Pilot Test Feedback results - Example 1

assessments. However, a primary point of confusion was the use of the word picture. In some cases, participants felt the description was not easy to understand. While individual results, and thus the word picture, were not provided for the remainder of the research (for instance in Chapter 5), this issue will be addressed in future research.

4.4.3 Ease of use

Participation rate was very high (100%) though the sample size was quite small and selective. This result really only indicates that participants are able to complete the survey with no additional external assistance. The average time taken to complete the survey was about 26 minutes. The informal feedback received from the participants indicated that, generally, the survey was self-explanatory. Several indicated confusion regarding the item on systems thinking. They felt the wording was a little opaque and would have preferred more detail within the descriptions.

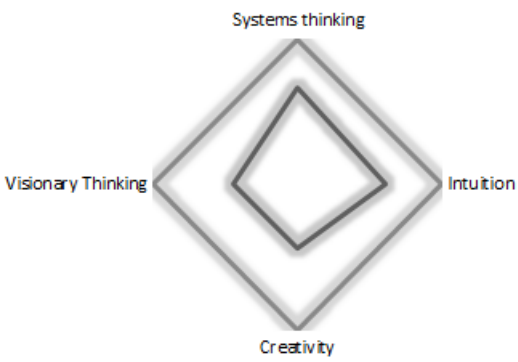
Your high level of systems thinking and holistic intuition allows you to quickly see the broader implications of an action. Your strength appears to be at strategic levels. When encountering novel problems or situations, you would be recommended to look beyond the obvious. Your creativity appears to be driven rather than exploratory. That is, fixated on a single type of solution rather than a broad range of solutions. Similarly, your ability to develop a rich vision could be improved. It is recommended that you understand the underlying values to your vision as this will allow you contextualise your action space. You are well placed for positions that require strategic planning.	

Figure 4.9: Pilot Test Feedback results - Example 2

4.4.4 Indication of variables

The correlative relationship (illustrated in Figure 4.10) with strategic thinking is only indicative as the sample sizes were not large and did not generally represent either the ADF or the general public. For instance, while there appears to be higher strategic thinking within the Army over RAAF, the population is not alike. The age distribution across these two populations differ with Army having a higher average. Hence, while it would be useful if we could assign difference in strategic thinking increase to service or to age, the sample size is insufficient.

Noting that, it is possible to hypothesise a link between both experience and age with strategic thinking. The correlation between experience and strategic thinking is 0.664. The correlation between age and strategic thinking is 0.656. Both are strong correlations. It would also be reasonable to infer that experience generally increases with age. In fact the correlation between age and experience is

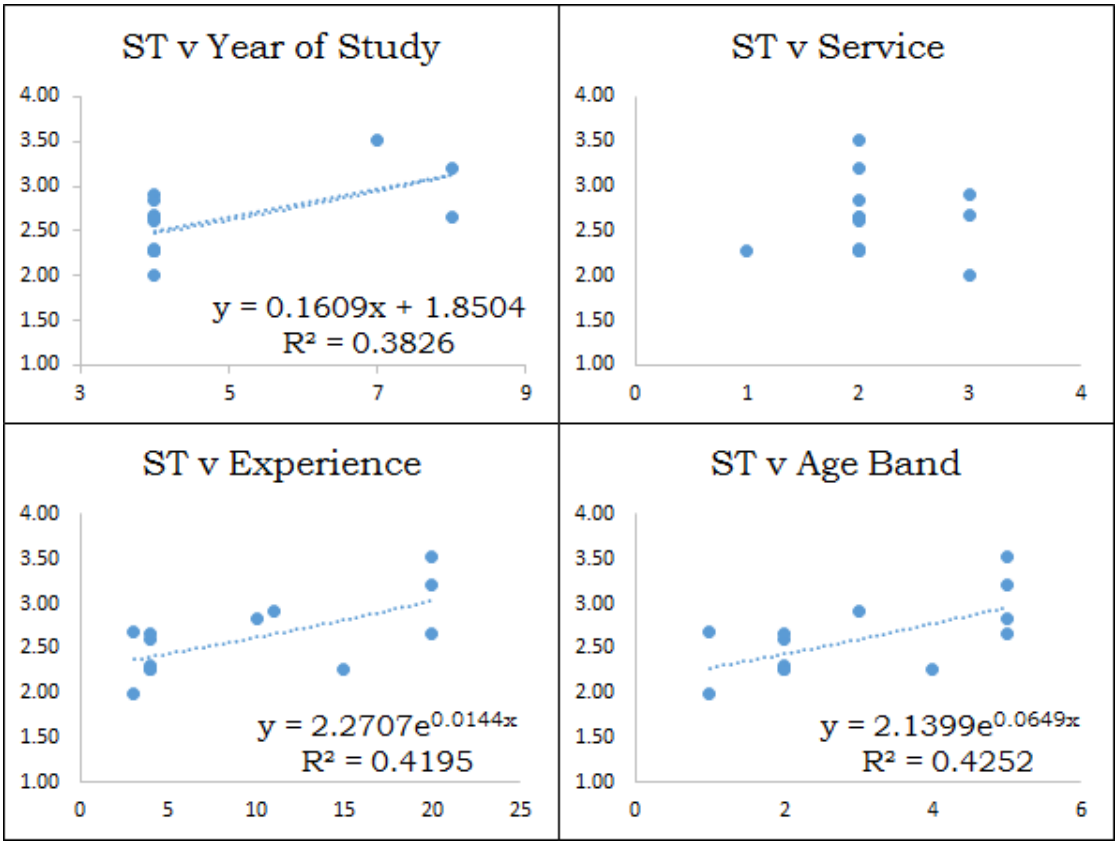


Figure 4.10: Indicative Independent Variable correlations with Strategic Thinking based on Pilot Test, with trend lines

0.917.

4.5 Initial Insights

The pilot study had limited data that may not be suitable to draw firm conclusions or make firm assertions. However, the purpose of a pilot study is to validate the design of the assessment method that was developed. As such, the following insights are the most significant that influenced the larger study to be presented in Chapter 5.

Experience, in this sample population at least, appeared to be almost indistinguishable from age. This is due to the experience metric being based on the number of years spent within the current profession. The correlation then, between age and experience could mean they are interchangeable, however due to sample size and restricted population, this finding should be treated with caution. The experience also does not account for variety of experience or experience at different levels within an organisation. For instance, it would seem to be reasonable to state that 20 years of experience in an organisation's board-room would be more likely to grow strategic thinking than 20 years experience in the same line unit as a production assistant.

The assessment for systems thinking required a qualitative assessment of a written answer. The possible risk that may have risen here is that cognitive bias could have had an influence on the results. The three point-scale system seemed to limit the results; that is, a participant could only be a low, medium or high systems thinker. There was no flexibility that a participant would fall in the middle ground between levels. The systems thinking tool could probably be improved through the use of a five point scale with 2 and 4 reserved for those participants who don't appear to fit neatly into the low, medium or high paradigm.

Alternatively, the creative thinking assessment appeared to work very well. The answers were generally simple to categorise (into ten separate categories this time) though, again, there is a risk of assessor bias. The four creative metrics (fluency, frequency, originality and quality) were easy to assess for each participant.

This assessment method is constrained as the the resultant score is relative to the population. This is due to the originality component. Answers are only original in comparison to the answers within the population. Thus the score is not transferable into other populations without re-assessment using the whole population.

4.6 Contribution

This chapter piloted the approach to evaluate the potential capacity of strategic thinking through the assessment of the underlying cognitive characteristics. These characteristics were previously identified as visionary thinking, intuition, creative thinking and systems thinking. Prior to investigating these characteristics, several variables were identified as being strong indicators of strategic thinking: cognitive ability and accumulated work experience.

While creative thinking, systems thinking and intuition had a selection of existing assessment tools, this chapter identified a gap in the assessment of visionary thinking. A unique assessment tool was created through an understanding of the original terminology found in the literature review. This assessment tool, while qualitative, was pilot tested with a small population and found to be broadly accurate.

Understanding that each of the cognitive characteristics were measurable allowed the development of a strategic thinker model. The four characteristics are normalised on a four-axis spider graph that allows for an illustration that is quickly understood and compared. This model, and the associated strategic thinking as-

sessment, was then pilot tested using two small groups: one using ADF participants and the other comprised of civilian executives. This pilot test found that the assessment tool was easy to use. Furthermore it identified that experience was likely to be strongly correlated with strategic thinking.

Chapter 5

A causal approach to understanding strategic thinking development

The previous chapter transformed the recognised strategic thinking cognitive characteristics into a strategic thinking assessment instrument. This instrument was validated in a pilot test and identified potential indicative independent variables such as experience and education. The proposed assessment creates a relative strategic thinking measure. This chapter addresses research question 4 - "**how could strategic thinking be developed?**"

Understanding the *how* requires that firstly change can be observed, and secondly the reason for change is known. Thus this question will be investigated using two sub-ordinate questions: 4a - What changes in strategic thinking can be observed? and research question 4b - Why is strategic thinking changing? The

Australian Defence Force (ADF) agreed to cooperate in this research and, as a large organisation that identifies strategy as important, was an ideal population to address these questions [69, p.13].

To gain an understanding of the development of strategic thinkers within the ADF, the targeted population included serving military members within the ADF. Specifically, the population included *ab initio* officer entries, from the three services currently at the Australian Defence Force Academy (ADFA), and a range of more senior officers serving within the service headquarters. The total population size was estimated at about 2,000 across Royal Australian Navy (RAN), Australian Army, Royal Australian Air Force (RAAF), Australian Public Service (APS) and Foreign Military Service (FMS). The participants were contacted through a personal email, sponsored by the Australian Army Headquarters (AHQ), providing a generic link to the online assessment. The invited participants were given two weeks to complete the assessment.

This chapter outlines the results derived from the experiment, specifically the variation amongst the participant demographics, the observations regarding changes in strategic thinking and pedagogy amongst the population. The final part of the chapter is an analysis of the results.

5.1 Introduction

While the previous chapter identified the dimensions for assessment, the influence of these dimensions on each other was not revealed. In this section, a literature

review is conducted to distill these influences and establish a baseline for reference.

Bain and Mabey state that there has been two historical approaches to designing indicators for strategic thinking: underlying personal attributes which are fundamental to strategic thinking competence (relevant traits include analytical reasoning, ability to draw inferences from complex information, independence of mind, conceptual thinking, innovative, critical evaluation and forward planning); and whether the individual is able to use these attributes to manifest high quality strategic thinking [17, p.186]. Assessing strategic thinking as a whole competency is normal (the latter option), however Bain and Mabey claim it is more helpful to break it down into four relatively independent components [17, p.187]:

1. Idea formulation - lateral thinking, use of imagination, retaining an open mind, more conceptual thinking;

2. Critical evaluation/review - logical review, critical evaluation, high-level analytical reasoning;

3. Implementation - planning skills, seeing implications, optimizing the allocation of resources; and

4. Decision making - balancing options, weighing probabilities, tolerance of risk, and the confidence to make a radical proposition.

Incidentally Bain and Mabey strongly promote the value of knowledge as the greatest source of competitive advantage, citing Peter Senge's The fifth discipline as a template for the *learning organisation* (systems thinking, personal mastery,

mental models, building shared visions, and team learning) [17, p.188].

Boyett and Curry's study into the influence of middle managers on overall organisational strategy revealed that the limiting factor was often the poor understanding of the new environment [29, p.64]. This strongly suggests the importance of the ability to quickly comprehend the implication of certain options within the specified environment. Additionally, they found that good strategy was not too descriptive so as to provide an inherent flexibility for local customisation by middle management.

Daghir and Al-Zaydie found that while there were a number of studies that measured human thinking, none actually measure strategic thinking using a cognitive approach logic (a process that emphasises the pro-activeness of managers and the reaction to external stimuli) [62, p.37]. In their words, there were two approaches to understanding cognition - (1) the physiological interpretation of how the brain functions and (2) psychological division of thinking into collecting information and evaluation such as the McKenney and Keen (1974) model of cognitive style [62, p.38].

Daghir and Al-Zaydie use a similar model to McKenney and Keen by combining Hellriegel, Solcum and Woodman (1989) Problem Solving Model with Jung's Theory of Personal Types [62, p.40]. They propose that strategic thinking occurs when an extreme personality type (paired combinations of Logic-Intuition-Feeling-Sensation) is not favoured [62, p.42]. They characterised strategic thinking by [62, p.44]:

1. Continuous interaction between the two brain halves,
2. Their disbelief in environmental determinism which goes along with the essence of strategic thinking,
3. Obvious tendency toward future and change,
4. Since strategic thinking is the result of interaction of all the other types of thinking, so it must also have the characteristics of the other types of thinking.

The importance of personality was examined by Dragoni et al and found to be the least important predictor of strategic thinking competency when compared to cognitive ability and accumulated work experience [74]. They saw strategic thinking competency as the "knowledge, skills, and abilities needed to detect market opportunities, formulate a vision to capitalize on these opportunities, and engineer feasible strategies to realize organizational and stakeholder value" [74, p.830].

When examining work experience, Dragoni et al looked to broaden the extant narrow view that focussed on tenure or number of times a task is completed. They sought to instead define "the accumulation of work experience as the extent to which executives have amassed varied levels of roles and responsibilities (i.e., contributor, manager, lead strategist) in each of the key work activities that they have encountered over the course of their careers" [74, p.832].

Dragoni et al hypothesised a development model for strategic thinking (illustrated in 5.1 on page 133) [74, p.834]. It should be noted at this point that there

are four inputs in their model: Cognitive ability, accumulated work experience and two personality traits (extraversion and openness). It appears that their view is that accumulated work experience is the variable that can be most influenced by the others. For instance, cognitive ability is directly proportional to the amount of job knowledge acquired and the speed it is acquired [74, p.835].

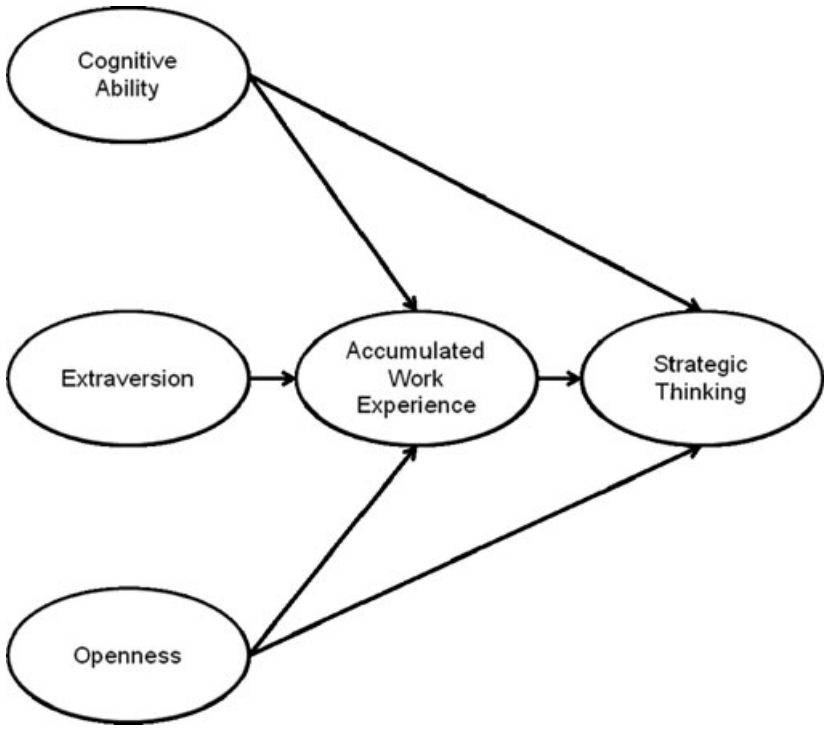


Figure 5.1: Dragoni et al Hypothesized Model of Antecedents and Consequence of Executives' Accumulated Work Experience

Cognitive ability was also presumed to predicate the ability to solve problems. i.e. executives with higher cognitive ability were better and more quickly able to figure out difficult, abstract and unstructured questions and adapt to change better. Additionally, it was seen that individuals with high cognitive ability sought out complex and demanding jobs that were increasingly more complex over time.

"The accumulation of work experience is efficacious in enhancing strategic thinking competency because it provides developing leaders with two elements that are instrumental to developing problem solving skills: repetition and the introduction of novelty" [74, p.837]

Strategic Thinking Competency was assessed through five assessment centre exercises including background interviews, simulated cross-functional task force team, business management simulation and a series of simulated stakeholder meetings. The participant was evaluated on their ability to articulate vision and shape of strategy, sound business judgement and attend global business issues [74, p.840]. Cognitive Ability was tested using the Wesman Personnel Classification Test to measure crystallized intelligence and the Watson-Glaser Critical Thinking Appraisal Form A to assess fluid intelligence.

The results of Dragoni et al experiment (see Figure 5.2) showed that Cognitive Ability had the greatest effect (over three times work experience and almost eight times personality) on Strategic Thinking Competency and did not in fact influence Accumulated Work Experience [74, p.851]. This finding is supported by Boal and Hooijberg (2001) who believed that cognitive complexity was directly proportional to absorptive capacity [26, p.538]. That said, Dragoni et al found that the accumulation of work experience was related to the ability to think strategically and suggested that there was developmental value in re-encountering the same work activity with varying levels of responsibility. These findings support the indicative results from the pilot test where education and experience appear to be related to strategic thinking capacity.

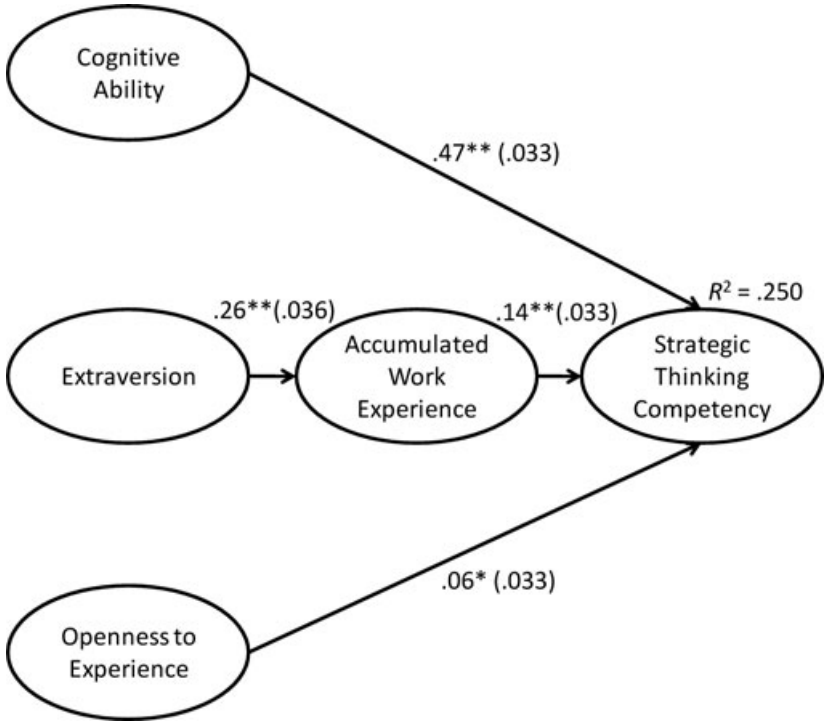


Figure 5.2: Dragoni et al Confirmed Model Featuring Antecedents and Consequences of Executives' Accumulated Work Experience

5.2 Research Question and Methodology

The research question is "How could strategic thinking be developed?" This question is investigated using two sub-ordinate questions: 4a - What changes in strategic thinking can be observed? and research question 4b - Why is strategic thinking changing? The Dragoni model provides a foundation to explore the potential variables that are likely to contribute to strategic thinking.

5.2.1 Research Question 4a - What changes in strategic thinking can be observed?

The capacity for strategic thinking can be measured through an individual's strategic thinking preference. That is, an individual with a greater preference for strategic thinking is more likely to have a greater capacity for strategic thinking. It would be highly desirable to observe change in strategic thinking capacity from an individual perspective however that would require a longitudinal study. As a longitudinal study was out of scope of this particular research, change is thus inferred through the comparison of population groups. The limitations due to variable difference are discussed later in the chapter.

We have shown that the preference for strategic thinking can be demonstrated through an individual's exhibited cognitive traits of visionary thinking, Intuition (specifically Holistic Big-picture and Holistic Abstract), creative thinking and systems thinking. As discussed previously these individual traits can be measured. In this case, participants will be asked to complete an online questionnaire that measures each characteristic. The assessment instrument is sourced from the pilot test designed in the previous chapter. The only significant change to the instrument is to the Systems Thinking item as described in Section 4.5.

5.2.2 Research Question 4b - Why is strategic thinking changing?

While the variety in responses is interesting, the goal is to link cause with effect. In this case it would be useful to see a change in military pedagogy that causes (or is indicative of) a change in strategic thinking. However, the research so far has also shown that there are other variables that may cause a change in strategic thinking preference. These include age and personality type. The list of discriminators used to account for variability in answers are shown in Table 5.1 on page 138.

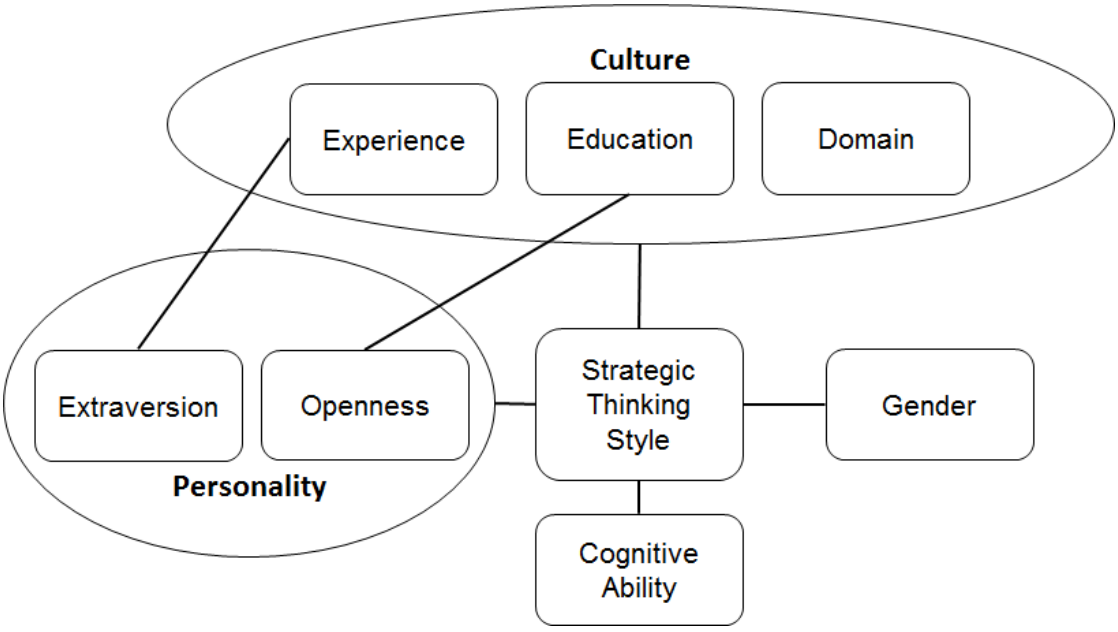


Figure 5.3: Hypothesised Model of Strategic Thinking dependent and independent variables

Personality

Dragoni et al (2011) attribute individual personality as a predictor of strategic thinking, specifically openness to experience and extraversion [74, p.835]. Of these

Discriminator	**Type of response**	**Range of response**
Service	Multiple choice	RAN, Army, RAAF, APS, Foreign military, Public sector
Experience (length of service)	Open	Rounded up to a whole number
Experience (type)	3 x 3 Matrix Multiple choice	([Contributor, Manager, Leader], [Single Service, Joint Service, Civilian])
Experience (other service)	Multiple choice	Yes, No
Gender	Multiple choice (not mandatory)	Male, Female
Education (academic bias)	Multiple choice	Arts, Business, Science, Engineering
Education (completed study)	Multiple choice	ADFA year 1, ADFA year 2, ADFA year 3, ADFA year 4, RMC, Captain (E) Promotion Courses, Major (E) Promotion courses, Australian Command and Staff Course, Capability and Technology Management Program (or equivalent), Apollo Course, CDSS, Bachelor degree, Masters Degree, Doctorate
Personality	Multiple choice	modified BFI

Table 5.1: Discriminators used to account for variability

two, extraversion is more strongly correlated (0.48) then openness to experience (0.06). Interestingly both of these *Big Five* personality characteristics are often grouped as Factor β. According to Mount, Barrick, Scullen and Rounds (2005) Factor β refers to actualization of the self, venturesome encounters with life, openness to new experiences, and use of one's intellect [175, p.451].

While the Big Five Instrument (BFI) is a relatively short assessment, at ten minutes it was likely to reduce the completion rate of the assessment instrument, where the average completion time for the pilot test (from chapter 4) was 26

minutes [122]. Rammstedt and John (2007) reduced the BFI down to ten questions that could be completed in a couple of minutes [196]. Due to their high reported correlations, this assessment provides a good indication of someone's Factor β measure.

Gender

There appears to be no literature that has evaluated the importance of gender in strategic thinking. Thus it would be remiss not to include gender as a potential variable. This assessment requested the applicant to identify themselves as male or female. For ethical reasons, this question was not mandatory.

Cognitive Ability

The other variable strongly correlated to strategic thinking is cognitive capability. In Dragoni's study it displayed a correlation of 0.47. All officers selected and appointed to the Australian Defence Force Academy and the Royal Military College are required to achieve a minimum General Aptitude Score (GAS) on an initial entry aptitude test [191, p.710]. GAS is scored from 0 - 19 and the minimum entry requirement for Australian Officers is 12. This number represents the top 35% of the population[1]. As each participant has been required to achieve this level prior to entry, and the GAS is indicative of cognitive ability, we can reliably argue that

[1]In a personal communication on 06 June 2016, Geoff Galls, Director Occupational Psychology & Health Analysis, Joint Health Command, Australian Defence Force stated "To answer your question quite specifically, Officer canidates [sic] (including ADFA) need to perform at or above the 65th percentile on the ADF's core measure of general cognitive ability. From our view point, although we acknowledge that certain diversity groups are currently under-represented in that applicant pool, there is no reason to doubt that the ADF applicant pool is significantly different to the rest of society in terms of their IQ (cognitive ability). This cut-off level has been in place since 1998 when recruiting psychology standards were made tri-service, and is consistent with the previously existing single-Service officer entry standard"

cognitive ability is accounted for in this experiment.

Measure pedagogical processes

The Australian Defence Force consists of three separate services, the Royal Australian Navy (RAN), the Australian Army (Army) and the Royal Australian Air Force (RAAF). Entry into the service is broadly conducted at two levels, Officer and Other Ranks (OR)[2]. Progression through the ranks is generally linear and often require the achievement of certain promotional gates. For instance, promotion to Lieutenant Colonel in the Army generally requires successful completion of the Australian Command and Staff Course (Joint) [3].

Given the nature of the courses, and that completion of the course does not equate to an automatic promotion, there will be individuals at each rank level who have either completed a promotional course or not. Additionally, the different services have different educational development models. We can then use this difference (between services and at similar ranks) to understand if the courses modify the individual's cognitive behaviour. Specifically their strategic thinking.

Due to the variety of developmental models, this experiment seeks to cast a wide net and understand where the differences may lie. For instance, if a specific service or degree stream exhibits different levels of strategic thinking, then one could propose that the developmental model of that service or degree could be the

[2]See Defencejobs.gov.au for more detail

[3]This information is based on the author's 20 years experience in the Australian Army as an Army Officer. Details of the college can be found at http://www.defence.gov.au/ADC/ACSC/Course/ (sourced on 27 April 2016)

cause.

Accumulation of experience

The accumulation of work experience is correlated to, and could be used as a predicator of, strategic thinking ability [74]. The accumulation of work experience, in this case, is defined as the "extent to which executives have amassed varied levels of roles and responsibilities (i.e., contributor, manager, lead strategist)" [74, p.832]. Thus we are looking for a function related to the accumulation of experience variance.

Generally most officer careers have similar developmental paths, so variation, at least early in the career, should be accounted for. There is a greater chance of variation the further along a career an officer progresses. Possible substitutes for experience include age or years in service. The concern with both of these are that age, while corollary, is not equivalent to experience variation. Similarly, years in service does not account for variation.

For example, imagine the individual who has spent 20 years in service. All of these years have been spent in the line units. While this individual would have accumulated vast amounts of experience, the experience would be specialised - in this case at the tactical level. Alternatively, a second individual, with only ten years of experience in the organisation, has moved through a number of unit types (from line unit to headquarters) and has worked as both a contributor and a leader. It is easy to see that the second individual has potentially the most valuable accumulation of experience (as it relates to strategic thinking) however

their age and years in service would not reflect this.

Therefore, we are looking for a measure that is a function of *flexibility* (different work experiences) and time (recognises that more time generally results in greater expertise and familiarity with the target system). For simplicity sake, we will call the time variable *fluency*.

Imagine you have three participants applying for a job where you require strong strategic thinking. Two of the applicants have served for 21 years within the organisation while the third has *only* served 15 years. Noting that the organisation (theoretically) has up to six different types of experience that add value, how do you determine who has accumulated the most valuable work experience?

Where Fluency (fl) is a measure of the years of service, Experience Variation (E) is the number of experience types available and Flexibility (fx) is the number of types actually experienced by a participant. This thesis proposes that work experience value (W) can be described as:

$$W_n = (\frac{fl_n}{E})fx_n \tag{5.1}$$

In our case the value for the three participants are calculated as:

1. **Participant 1** has experienced five of those types over 21 years

$$W_1 = (\frac{21}{6})5 = 17.5 \tag{5.2}$$

2. **Participant 2** has experienced three of those types over 21 years

$$W_2 = (\frac{21}{6})3 = 10.5 \tag{5.3}$$

3. **Participant 3** has experienced five of those types over 15 years

$$W_3 = (\frac{15}{6})5 = 12.5 \tag{5.4}$$

This function allows us to place a higher value on diversity of experience while still accounting for time. Thus Participant 1, who has experienced more variety over the same time as Participant 2, scores relatively higher. Again, Participant 3, while serving for less time than Participant 2, scores higher due to the greater variety of experience.

The challenge is to quantify the variety of *useful* work experiences that could be experienced by the participants. Experience can be categorised into three types: Contributor, manager and leader [74]. These correlate well with the typical military officer experience. That is a contributor is any position where there is no responsibility for others. Examples include soldier, student or staff officer. A manager has responsibility for the management of other individuals but not legal command. Examples include officers managing civil servants within a larger headquarters. Leader are those positions where there is a legal command appointment and the participant is responsible for the group performance.

Command, in this case, is defined as authority that a commander exercises

lawfully over subordinates by virtue of rank or assignment. Command includes authority and responsibility for using resources effectively and for organising, directing, coordinating and controlling military forces in the accomplishment of assigned missions. It also includes responsibility for health, welfare, morale and discipline of assigned personnel [47, para 1.4].

In addition to these three categories, experience within Defence can also differ between joint (more than one service) or single service environments. This is due to the cultural differences between the services [211, p.238][226]. Additionally there is experience that is external to Defence, commonly referred to as civilian experience. Using these six descriptions we arrive at Table 5.2.

	Single Service	Joint Service	Civilian
Collaborator	CS	CJ	CC
Manager	MS	MJ	MC
Leader	LS	LJ	LC

Table 5.2: Experience Variation within target ADF population

The work experience of the targeted ADF population can be measured using these nine, useful experience types. Thus the work experience function for this population is described in equation 5.5:

$$W_n = (\frac{fl_n}{9})fx_n \tag{5.5}$$

Education

An interesting correlation is that between openness-to-experience and academic performance [192, 130]. While not as strong as Conscientious, it is still recognised as strongly, positively correlated. In the military context the education program differ slightly between the services. For instance, Army officers are expected to complete a range of generalised, pre-promotional courses throughout their career while Air Force officers generally only undertake trade specific education.

Education in this survey is focused on generalised education (such as under and post graduate tertiary qualification) and military courses aimed at improving strategic understanding (such as the Australian Command and Staff College (ACSC) and Apollo Course on Future War). The scoring did not take into account trade specific courses such as logistic, navigating or pilot courses. The final rubric is shown in Table 5.3.

ADFA was separated into individual years due to the concurrent military program and ongoing exposure to the military.

5.3 Results

5.3.1 Participant Demography and Population Grouping

Over the two weeks allotted to the conduct of the experiment, 562 results were submitted with another 248 partially completed but not submitted. Due to the nature of the population (military officers within the Australian Defence Force),

Course	**Score**
ADFA Yr 1	1
ADFA Yr 2	1
ADFA Yr 3	1
ADFA Yr 4	1
RMC (or initial officer training equivalent)	1.5
Captain (E) Promotion Courses	0.5
Major (E) Promotion Courses	0.5
Australian Command and Staff Course	1
Capability and Technology Management Program (or equivalent)	1
Apollo Course	0.1
Defence and Strategic Studies Course	1
Bachelor degree (not ADFA)	3
Masters Degree	2
Doctorate	4
Total	**18.6**

Table 5.3: Education Rubric for strategic thinking assessment

there were two immediately obvious variables to cluster the population: Service and rank. The available service options were Royal Australian Navy (RAN), Australian Army, and the Royal Australian Air Force (RAAF). The break up across the services is illustrated in Figure 5.4. Of these responses, as illustrated in Figure 5.5, 495 were officers or officer cadets. Due to the nature of the problem, it is these 495 answers that will be examined in detail. Due to the inability to account for cognitive ability in the non-officer sample (the remaining 67), they were not considered in the final analysis.

Of the officers, the sample participants were generally either in their early career (cadets and midshipmen in training) or were established at the director level. Table 5.4 on page 148 outlines the demographic breakup by service and by rank. While the ranks and titles across the services differs, the ADF use a

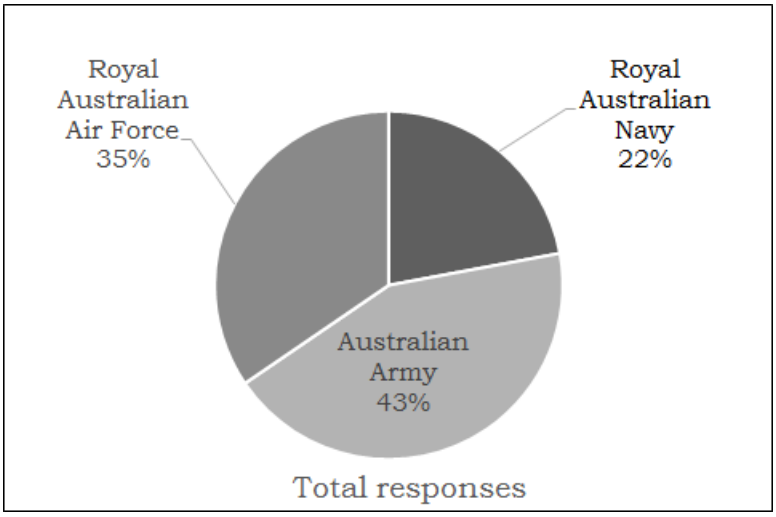


Figure 5.4: Total responses by service

equivalent rank system utilising the letter "O" and a number [70, Chap 1, Part 4, Para 1.4.1]. The number increases with rank seniority. Thus a O4 Army Major is equivalent to an O4 RAAF Squadron Leader but still junior to an O7 Army Brigadier. In general, the higher the number, the more senior the rank. For the purpose of this thesis, the rank will be identified using this numbering system. However, due to the number of non-officers, the following modifications have been used for comparison purposes:

- All non-commissioned officers (such as Corporals and Warrant Officers) are given the numeral "0"; and
- All Officer Cadets and Midshipman (those officers in training) are designated by the numeral "1".

The large number of officer participants at the Rank level of "1" (235 participants) allows for a baseline to be established. Thus, the first grouping is Rank 1 (broken into subgroups - Total, RAN, Army and RAAF). There is also significant

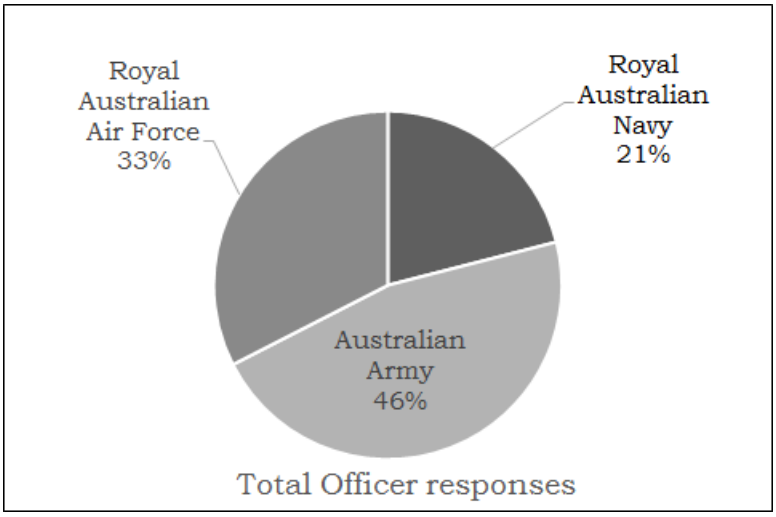


Figure 5.5: Total officer responses by service

Rank	RAN	Army	RAAF	Total
0	20	14	33	67
1	37	116	82	235
2	0	2	0	2
3	11	4	19	34
4	31	63	30	124
5	19	32	19	70
6	5	11	8	24
7	1	2	3	6

Table 5.4: Demographic breakup by Rank and Service

numbers at the 4 and 5 rank bands. These numbers (124 and 70 respectively) offer another good group to use for comparison purposes. Importantly, the participation rate (about 31%) across the services and ranks is a good representation of the ADF Officers. Hence the results obtained in this experiment can be extrapolated across the organisation at the O1, O4 and O5 levels. The results from the other levels may represent the populations within the headquarters, due to comparatively small population numbers, however are only indicative of the relevant service populations.

Military pedagogy is the "part of military sciences that inquires into the philosophies, conceptions, visions, doctrines, aims, methods, and technologies of military education and training" and thus includes education, training and culture [220, p.52]. For the purpose of this experiment, pedagogy has been separated into education, service experience (accumulated work experience) and culture (defined as a function of service and rank).

A comparison of education across service and rank

Education was previously identified as potentially influencing strategic thinking capacity. For this experiment, education was measured through a self-reporting survey item. Participants were asked to check which formal educational courses they had undertaken. The courses ranged from ADFA participation, civilian university degrees or in-service promotional courses. The results were averaged by service and rank with the results illustrated in Figure 5.6. Education can clearly be seen to increase with rank. Table 5.5 shows that the correlation with education is strong across all services. For example r=0.96 across the population.

Service	r
RAN	0.8011
Army	0.9531
RAAF	0.9615
Total	0.9756

Table 5.5: Correlation between rank and education across services

Before comparing the education values of the two key ranks (O1 and O4) across services, an analysis of variance (ANOVA) was conducted to test for any significant

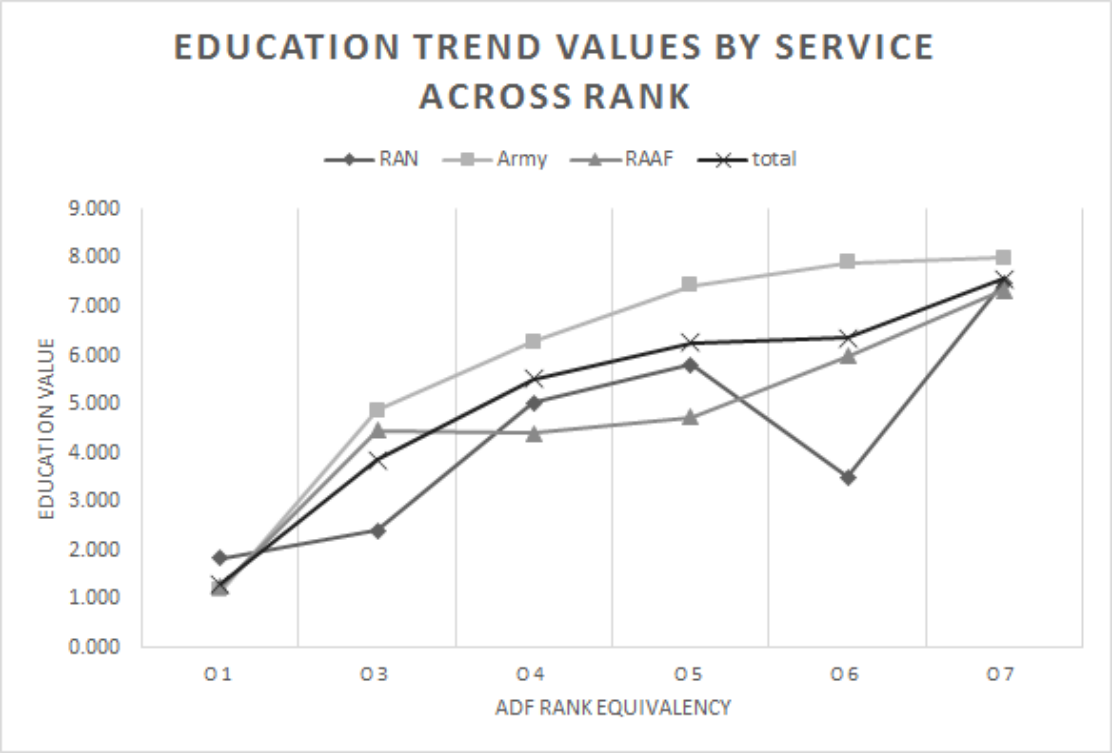


Figure 5.6: Comparing education growth by service across rank

differences in the means. The results are shown in Table J.1 at Appendix J. The P-value (2.012E-50) is significantly less than the Alpha of 0.001. Therefore we can reject the null hypothesis (that variation occurs due to chance) and conclude that the sample groups are directly comparable. While the variance within each group is fairly high, particularly at the O4 level, that variance is similar across the groups (total, O1 and O4) and the standard error (SE) is still quite low (particularly at the O1 rank).

Each service demonstrates an understandable increase in average education value with respect to rank. The higher the rank, the higher the education value. The RAN education value for O1 is much higher than the other two services. This

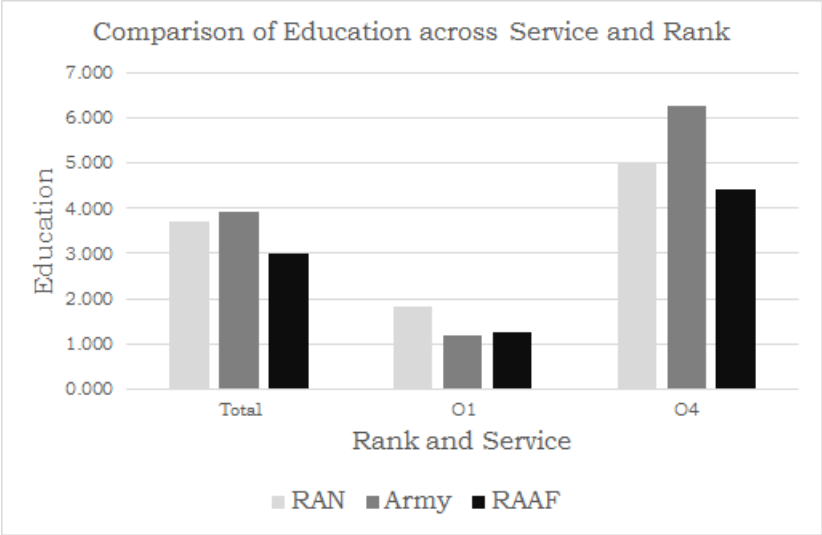


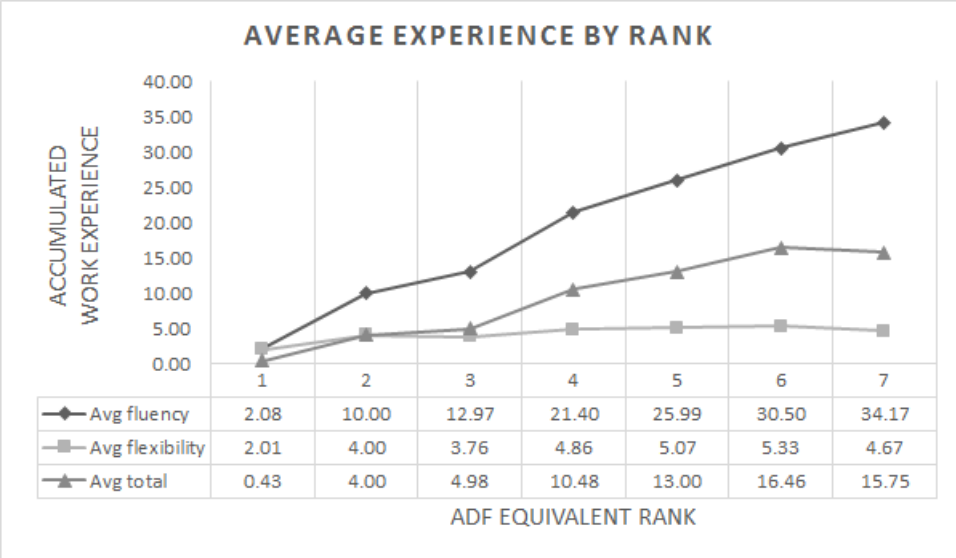
Figure 5.7: Comparing education values by rank and service

is simply explained. All RAN officer trainees are required to undertake a 5 month New Entry Officers' Course (NEOC) prior to commencing training at ADFA (from where all of the O1 participants were sourced) [199]. This course includes leadership and personal development subjects. Hence the higher education value.

What is also apparent in Figure 5.6 and Figure 5.7 is that the RAAF value at the O4 rank appears to be significantly lower than the other two services, specifically Army. While there appears to be significant disparity at the O4 and O5 ranks there also appears to be convergence at the O7 rank. This observation should be treated carefully though as the total sample size for the O7 level (n=6) is comparatively small.

Comparing accumulated work experience across service and rank

The work experience function was designed to account for (1) accumulated experience, and (2) variety of job functions. Accumulated experience was a measure of time spent within a service. The rationale being that greater exposure created a better understanding of the system. The variety of job functions was found to be important as it allowed participants to have different perspectives of that system. These perspectives enhanced the strategic thinking. Figure 5.8 illustrates that, unsurprisingly, the value of accumulated work experience was strongly correlated with rank and time. Importantly though, the deviation was also high. This recognised that not every individual had the equivalent work experience based on time served or rank.



	1	2	3	4	5	6	7
Avg fluency	2.08	10.00	12.97	21.40	25.99	30.50	34.17
Avg flexibility	2.01	4.00	3.76	4.86	5.07	5.33	4.67
Avg total	0.43	4.00	4.98	10.48	13.00	16.46	15.75

Figure 5.8: Average Accumulated Work Experience by Rank

In Figure 5.8 the three lines represent the average years spent in the nominated

service (Avg Fluency (fl)); the variety of jobs taken by the participant (Avg flexibility (fx)). The last line is the total Accumulated Work Experience (AWE) value calculated using the function below. Note that the total number of experience types available (previously described as E) is ten. This is to account for every participant providing a "Not Applicable" answer as a result of the survey design and thus increasing the available 'experiences' to ten.

$$W_n = (\frac{fl_n}{10})fx_n \tag{5.6}$$

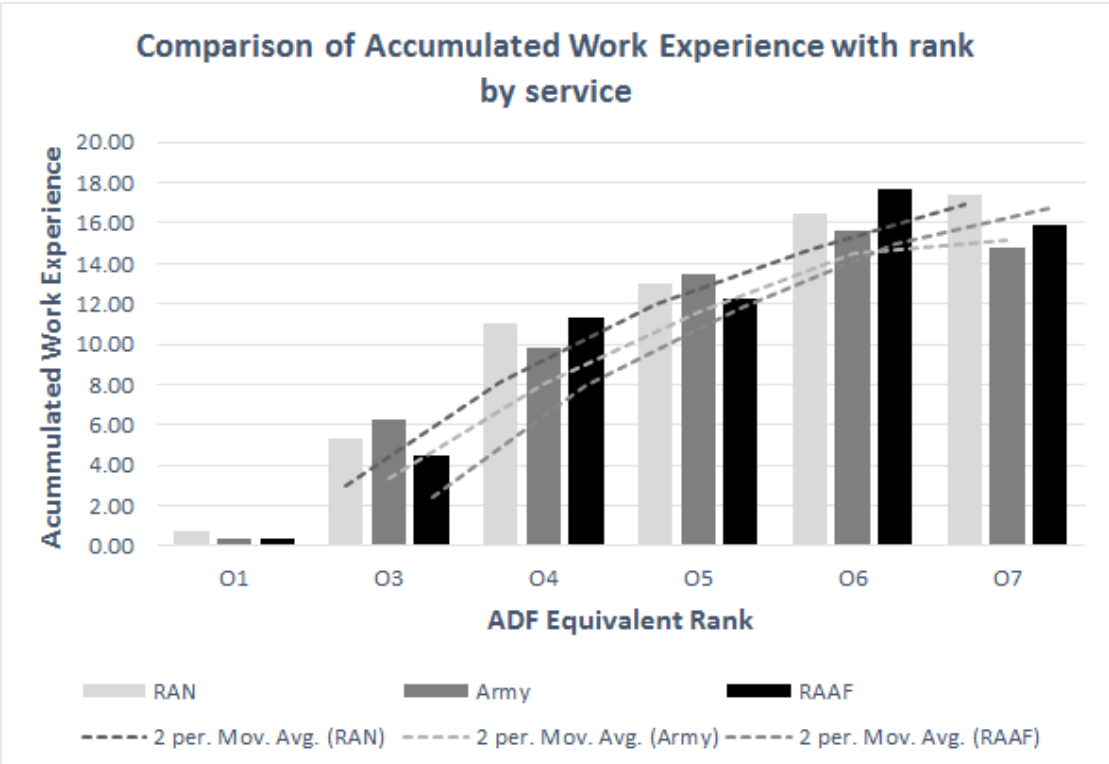


Figure 5.9: AWE by rank and service

Figure 5.9 illustrates the difference in AWE between the services at each rank level. The O2 rank was left out due to the low sample size (n=2). The dotted

line is a two-point moving average that serves to illustrate the change in AWE by rank. Unsurprisingly, the average AWE increases with rank. Experience, in this case, is strongly correlated with rank. The r values are shown in Table 5.6.

Service	r
RAN	0.986
Army	0.968
RAAF	0.957
Total	0.972

Table 5.6: Correlation between rank and accumulated work experience across services

Before comparing the experience values of the two key ranks (O1 and O4) across services, an analysis of variance (ANOVA) was conducted to test for any significant differences in the means. The results are shown in Table J.2 at Appendix J. The P-value (3.193E-101) is significantly less than the Alpha of 0.001. Therefore we can reject the null hypothesis (that variation occurs due to chance) and conclude that the sample groups are directly comparable. The variance within each group is compatible across service groups, however, significantly different across ranks. For instance the variance at O1 is between 0.05 and 0.12, which is quite low. However at the O4 rank, the variance ranges from 19.14 to 33.87, significantly higher than at the O1 rank level. The standard error (SE) though is still quite low (particularly at the O1 rank).

The final comparison is between the service groups at Rank O1 and O4, as shown in Figure 5.10. The obvious observation is that AWE increases significantly. This is no surprise given that the participants at Rank O1 have only spent, on

average, just over two years in the military while those at the rank of O4 have spent, on average, about 21 years in service. The difference is evident in Figure 5.8.

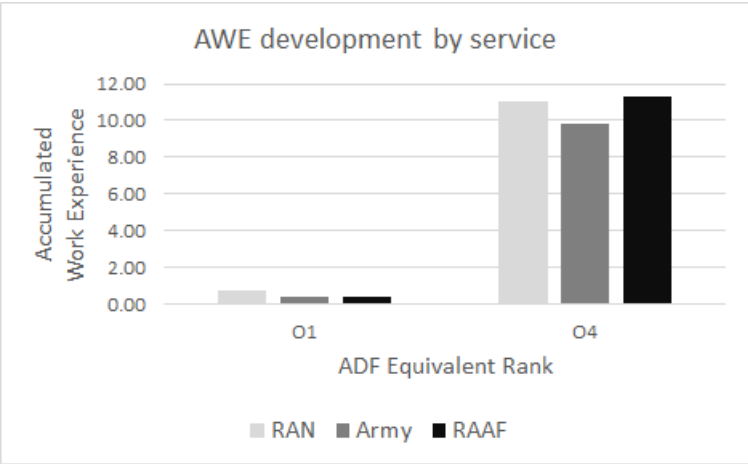


Figure 5.10: AWE comparison at O1 and O4 levels

The differences between services at Rank O1 is marginal at best. Similarly, the increase in AWE across the services from O1 to O4 appears to be fairly uniform (they all increase significantly to scores ranging from 9.80 to 11.32). There are differences though. Army clearly has not only the least AWE value at the O4 level, but also the least increase in AWE value (see Table 5.7). RAAF also shows the greatest increase in AWE value from the O1 to the O4 rank level. Interestingly RAAF also demonstrates the highest variance at this rank (33.87) while Army has a significantly lower variance (19.14).

Comparing Service Culture

Service culture refers to the individual service characteristics that are qualitative and not necessarily easy to capture. It attempts to account for service specific

	Absolute AWE Value		
Service	**O1**	**O4**	**Increase**
RAN	0.71	11.05	10.33
Army	0.37	9.80	9.43
RAAF	0.39	11.32	10.94

Table 5.7: Increase in Accumulated Work Experience from the ranks O1 to O4 across the three services

policies, career progression and experiences that are unique to that service.

Pedagogy though can be quantified through the relationship between rank, experience and education. As Figure 5.11 illustrates, these three variables are moderately to strongly correlated to each other within the population. Interestingly the service correlations differ somewhat as illustrated in Figures 5.12 to 5.14.

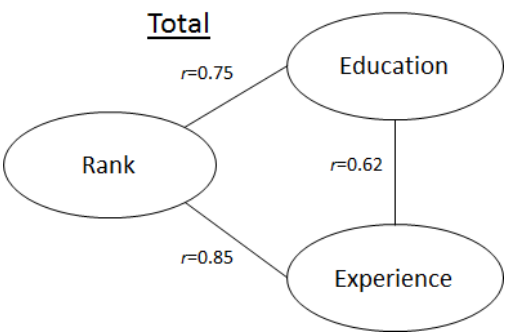


Figure 5.11: Correlations of pedagogy domains across whole sample

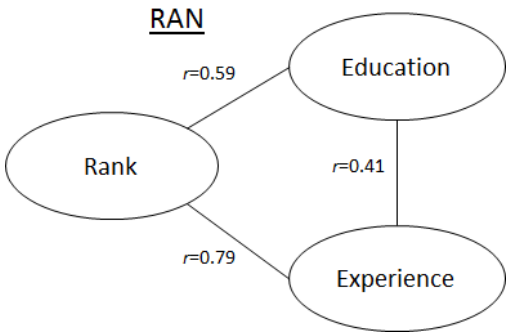


Figure 5.12: Correlations of pedagogy domains across RAN

Army demonstrates the strongest correlations across all three variables. It would be reasonable to use rank, as the most obvious and public individual labelling, to indicate Army Officer education and experience. This is not the case with the RAN where the correlations are weaker. The correlation between educa-

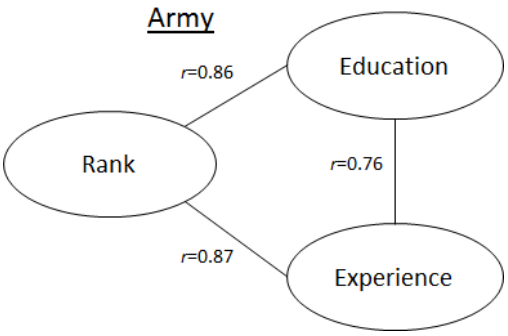


Figure 5.13: Correlations of pedagogy domains across Army

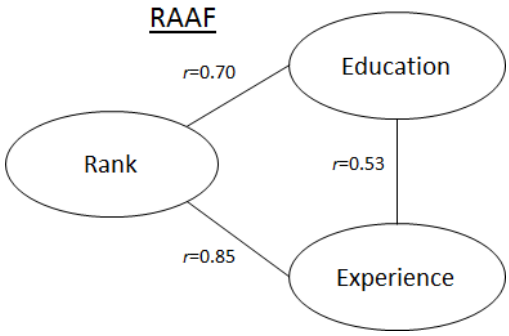


Figure 5.14: Correlations of pedagogy domains across RAAF

tion and experience within the RAN, while strongly positive, is relatively weaker than all other links. The RAAF is midway between these extremes. Again, all three variables are strongly correlated, however the link between education and experience is weaker. As is the case with Army, Rank is a good indicator of both education and experience.

5.3.2 Measuring change in strategic thinking capacity

The change in strategic thinking capacity is measured through the strategic thinking assessment. This assessment used four key items to measure (1) Visionary thinking; (2) Intuition; (3) Creative Thinking; and (4) Systems Thinking. The aggregation of these four characteristics creates a relative measure of strategic thinking capacity.

This section explores the changes in the four individual characteristics across the population. These changes are viewed through a rank and service lens. As before, the critical ranks are O1 and O4. The three services (RAN, Army and

RAAF) are compared by these ranks. The final part of this section explores strategic thinking capacity.

Visionary Thinking

> *"My vision statement is not that far away, five years in fact, and I'll be simply cooking burgers. Not just any burgers rather the kind that I enjoyed when I was a child, the good wholesome kind. In retirement we'll, the wife and I, will open that little burger joint that produces a quality product based on selective produce. Not being able to procure any type of high quality burger has given us the vision and direction leading to this decision. It's not based on a returning income as the the superannuation will take care of that, it is desire to reproduce something that is missing from todays [sic] society and give me the satisfaction of reminding people of how it once was. Three years after that, my daughter can decide what she wants to do with the business as it will ultimately become hers to do with as she pleases."* Participant 91

The range of vision statements varied from null answers or "not sure" to quite emotionally appealing responses. The previous quote is an example of the latter. This example provided clear articulation of direction, the goal was plausible though not easily achievable and the reason for action is clearly centred on sharing childhood delights. It is an emotionally strong vision.

Vision statements were scored using the rubric illustrated in Figure 4.2 on page 98 with maximum score of 20. Accordingly the the vision statement from Participant 91 scored 18 in Visionary Thinking. When compared to the average officer population, as illustrated in Figure 5.15, this is a very high score.

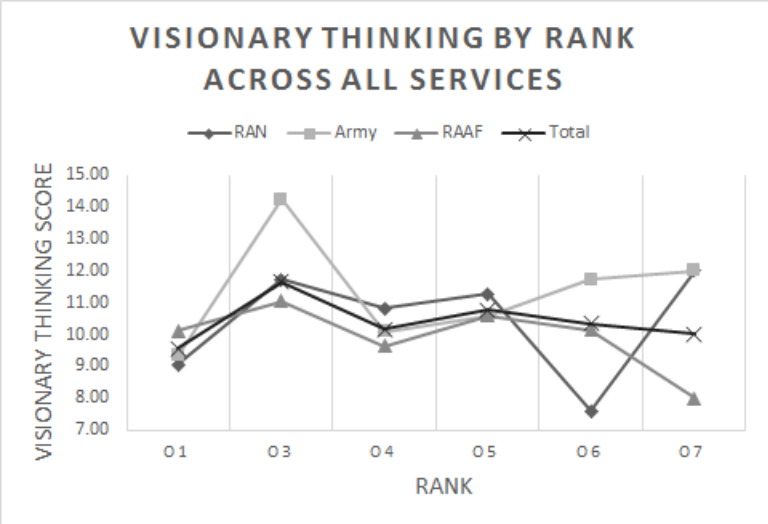


Figure 5.15: Comparison of Visionary Thinking change across rank by service

It is difficult to visualise any increasing or decreasing trend as it appears that, except for obvious spikes, there is no real change in visionary thinking as participants change in rank. The scores at the O1 rank appear very similar across all three services. The convergence at this level could possibly indicate a relative narrow recruiting profile. The reliability of the data results was confirmed through the conduct of an ANOVA (shown in Table J.3 at Appendix J). What is immediately clear is that the p value is quite high (0.37). This means that there is a 37.40% chance that the variation within the groups has occurred by chance. Looking at the variance within each service and at each rank, it is evident that the spread of scores is very wide. For example in the RAN, at the O1 rank, the average score is 9.05 however the variance is 14.11. Given the high p value and corresponding variance, it would be difficult to compare the collective visionary thinking scores by service or rank.

Intuition

Intuition was measured using the TIntS scale previously described in Table E.1 on page 314. As the intuition item was mandatory, 100% of the participants provided a result. Of particular interest were the respective scores for Holistic-Big Picture (HB) and Holistic Abstract (HA) as they reflect the intuition described by other researchers. The maximum total score for HB and HA is 35. The population mean was 22.76 with a standard deviation of 3.6.

The average scores by rank across all services are illustrated in Figure 5.16. What is apparent is a gradual upward trend from junior to senior officers. The disparity across the services at the O7 rank is likely due to the low sample size (RAN: n=1; Army: n=2; and RAAF: n=3). That said, the total population at the O7 rank within the headquarters is respectively small[4].

Again, an ANOVA was conducted to assist in understanding the reliability of the data. The results are contained in Table J.4 at Appendix J. The p value is very low at 3.04562E-06. This indicates that groups are directly comparable. That is, we can directly compare the total service results and also compare O1 with O4 rank levels.

Intuition increases with rank, however, the variance is quite large across all groups. This is reflected in the correlation between rank and intuition (HA+HB) score as shown in Table 5.8. Across all services and the total officer population

[4]In 2010 the Australian Army employed 55 officers at the O7 level however most of these are employed outside the Army Headquarters where the sample was taken [159].

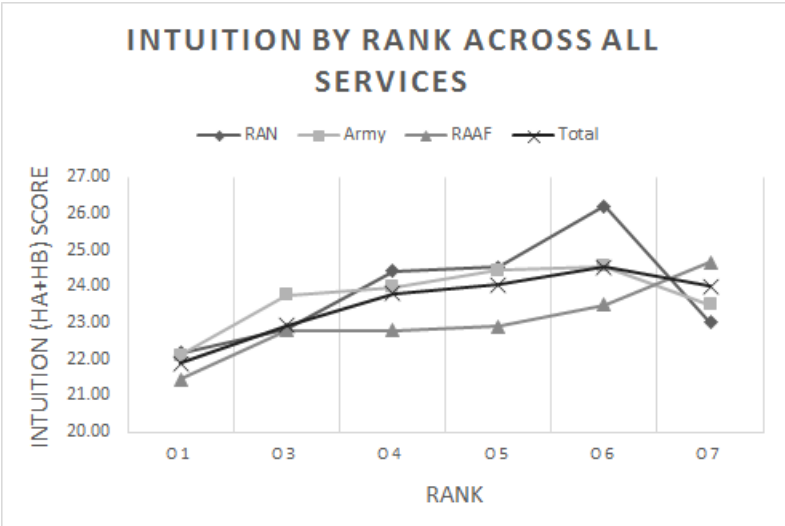


Figure 5.16: Comparison of Intuition (HA+HB) Score across rank by service

Service	r
RAN	0.298
Army	0.290
RAAF	0.209
Total	0.270

Table 5.8: Correlation between rank and intuition across services

rank is positively correlated with intuition. Additionally the gain, from O1 to O4, is not significant. It would be difficult to use rank, or even service, as a predictor of intuition.

Creative Thinking

Creative Thinking was assessed using a simple, open-ended question as described in Table 4.5 on page 114. While a very useful tool, the results are bounded by the population results. That is, creativity scores are not absolute, rather they are relative to the population. This relativity is principally dependent upon both the number of categories of answers and the originality of those answers. Of all the

items, this assessment presented the greatest range of results and, thankfully, some quite imaginative answers. The creative thinking score for each participant was an aggregation of their answers' fluency, flexibility, originality and quality. This is expressed in Equation 4.6 and replicated below.

$$CT_p = flu_p + flx_p + O_p + Q_p \tag{5.7}$$

Fluency Fluency was simply a measure of the quantity of ideas produced by the participants and can be expressed as $flu_p = \sum A_n$, where p is the participant and A is the answer. The summary of the results for Fluency are contained in Table 5.9.

Total Answers	1950
$\overline{flu_p}$	3.186
SD	2.052
Min	0
Max	13

Table 5.9: Creative Thinking fluency results for the sample

There were a number of participants (n=21) who did not provide a meaningful answer. It appears that most of these participants were unable to operate in the abstract and required more information. The following quote is a representative example of these participants: *"not enough information provided, without seeing the area and equipment or having a more detailed description then any solution is based on multiple assumptions."*

Flexibility Flexibility referred to the number of different category (k) answers the participant provided. The initial ten categories were developed through a pilot

test. The categories were then confirmed during the marking process. When an answer was provided that did not fit within an existing category a new category was developed. At the end of the experiment, 12 distinct categories became apparent and they are listed in Table 5.10 and the summary of the results in Table 5.11.

Category C_k	Total answers in C_k	Example
Damming water	162	*Use the shovel to pile dirt into the water and walk across* and *Dam the river using dirt with the help of the shovel*
Diverting water	148	*divert the river* and *Dig a trench from the river in order to attempt to drain the path*
Rope and anchor	669	*Form the rope into a lasso and attach to an object in the other side of the bank* and *anchor the shovel in the ground and tie the rope to that, navigate the river*
Raft	107	*Use the shovel to dig up a tree and use the tree to float across the pass* and *Find fallen trees and tie them together to make a raft*
Bridge	87	*Use the shovel to create a bridge to walk across* and *Find a long stick, and lower it across the river using the rope, then traverse the stick*
Walking Aid	95	*using the shovel to steady yourself to the ground under water* and *use the shovel to divert the water around you*
Fantastical	37	*Drink all the water until its dry* and *found a religion and commence walking on water*
Tunnel	32	*Tunnel beneath the pass* and *Dig passage under water*
Swim or wade	339	*Wade /swim across* and *wade in, taking the tools on hand*
Jump	78	*If the pass was narrow enough to jump over - I would do that* and *Jump if narrow enough*
Alternate Route	144	*Walk around the water* and *I could, of course, simply walk the 25m upstream to the serviceable foot-bridge (not visible in the diagram) which crosses the flooded pass and walk across it*
Wait	52	*Wait for the flood waters to receed [sic] and walk across* and *I could wait until the pass is not as flooded*

Table 5.10: Creative Thinking flexibility results for the sample

There appeared to be a number of approaches taken by the participants. Most appeared to answer the question as an exercise of problem solving. Another approach was to list a number of actions that really just described one solution in

separate phases. There were a few who attempted to answer but as this quote shows, struggled to think in the abstract:

> *"I am probably over-thinking this question. Struggle with the limited amount of information - looking for more to work with to develop realistic solutions!"*

Yet another group took the opportunity to really stretch the imagination as the following answers illustrate:

> *"It's hopeless. Use the shovel to dig your own grave then hang yourself with the rope. With any luck you'll fall into the grave after the rope decays. Otherwise a friendly stranger may bury you."*

> *"Use the shovel to make a very impressive sand castle. When curious onlookers with a Toyota 4x4 stop to admire your handwork, tie them up with the rope and drive their 4x4 across the flooded pass. Not very consistent with ADF values, but hey, needs must! (send them a nice thank you note afterwards)."*

Total Answers	1950
$\overline{flx_p}$	3.685
SD	1.552
Min	0
Max	9

Table 5.11: Creative Thinking flexibility results for the sample

Originality Originality was calculated as the sum of the originality of the categories the participants answers fell into. This is expressed in Equation 4.4 as

$O_p = \overline{(A_k O_k)}$ where k is the category and O is the originality score. To get to this point, each of the 12 categories were assigned an originality score based on the presumption that the more rare the category, the more original it was. The frequency is calculated by dividing the number of answers in category k by the total number of answers. The formula, as expressed in Equation 4.3 is replicated below. The resulting originality scores (normalised from 1 - 10) for each category is shown in Table 5.12.

$$O_k = 9(\frac{\%H - \%C_k}{\%H - \%L}) + 1 \tag{5.8}$$

Category	Total Answers	Frequency	Originality Score
Damming water	162	8.308	8.16
Diverting water	148	7.590	8.36
Rope and anchor	669	34.308	1
Raft	107	5.487	8.94
Bridge	87	4.462	9.22
Walking Aid	95	4.872	9.11
Fantastical	37	1.897	9.93
Tunnel	32	1.641	10.00
Swim or wade	339	17.385	5.66
Jump	78	4.000	9.35
Alternate Route	144	7.385	8.42
Wait	52	2.667	9.72

Table 5.12: Originality scores for each category of answer

The most popular category (rope and anchor) is thus the least original while tunnelling was the rarest. Understandably though, the originality of an answer does not predict the usefulness of the answer. Tunnelling would take quite some time and may have been dismissed out of hand by some of the participants. The final part is determining the usefulness, or quality, of the category.

Quality Quality refers to the usefulness of each category of answer in solving the problem. The problem, in this case, was how to cross a flooded pass with only a shovel and rope available. Each category was assigned a score that reflected its relative usefulness against the other categories. These scores are shown in Table 5.13.

The rope and anchor category had the highest probability of success as it allowed the participant to cross safely and in varying conditions. Tunnelling, however, represented a category that would be close to futile given the amount of time and effort required.

Category	Usefulness
Damming water	2
Diverting water	2
Rope and anchor	10
Raft	4
Bridge	4
Walking Aid	8
Fantastical	1
Tunnel	1
Swim or wade	9
Jump	6
Alternate Route	7
Wait	5

Table 5.13: Quality scores for each category of answer

Creative Thinking composite results The final creative thinking score became an aggregation of the four sub-characteristics (fluency, flexibility, originality and quality). Aggregation reduces the potential variance, and thus sensitivity, caused through a minor change in qualitative scoring. The creative thinking scores across ranks and by service is illustrated in Figure 5.17. It should be noted that

null results (participants who did not provide an answer) were removed as it these created disproportionate effects on the groups results. Hence they were treated as outliers.

Again, an ANOVA was conducted on the creativity groups centred on service and the O1 and O4 ranks. These results are shown in Table J.5 at Appendix J. In this case p=2.8731E-12, thus the services are comparable, as are the groups at the O1 and O4 rank. What is immediately apparent is that the service average creativity scores at both ranks (O1 and O4) are very similar and almost indistinguishable. There is an apparent increase in creative thinking from the O1 rank to the O4 rank though, like the other characteristics, variance is still high.

In fact, the variance changes quite significantly from O1 to O4 in both the Army and the RAAF groups. While RAN decreases slightly (15.30 and 13.85), the other two services increases quite significantly. The RAAF shows an increase from a variance of 8.91 to 20.48, while Army sees an increase from 13.54 to 22.66. Even more interestingly is the rapid decrease in creative thinking exhibited by Army O6 ranks.

The correlation between rank and creative thinking is, unsurprising given the illustration, moderately positive. Table 5.14 shows the r values by service. As with intuition, the correlation is strongest in the RAN and weakest in the RAAF. The difference here is that the range in correlation strength is much greater. Of particular interest is the negative correlations with quality. Particularly in the RAN where the correlation is quite moderate.

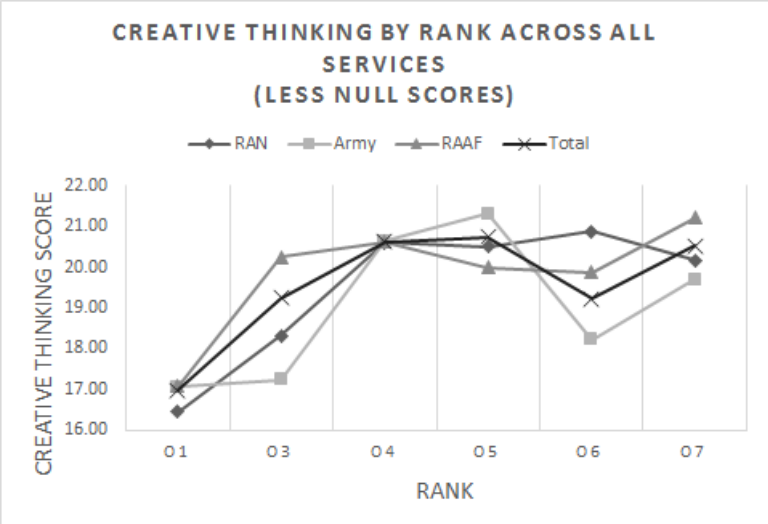


Figure 5.17: Comparison of creative thinking across rank by service

	RAN	Army	RAAF	Total
CT Score	0.490	0.359	0.286	0.360
Fluency	0.449	0.330	0.355	0.356
Flexibility	0.438	0.295	0.330	0.332
Originality	0.388	0.168	0.156	0.212
Quality	-0.317	0.021	-0.164	-0.100

Table 5.14: Correlation between rank and creative thinking across services

Systems Thinking

Systems thinking was assessed using a simple multiple choice (n=3) question with an explanatory paragraph. The initial selection in the multi-choice provided an indicative score of the participants preference for systems thinking. The pilot experiment scored the three levels from one to three, with one equating low systems thinking. This did not provide much variation within the population so in this experiment the scoring was from one to five, allowing two extra mid-way points. Examples of the marking is demonstrated in Table 5.15.

	Multi-choice	Explanatory paragraph	Final Score	Comment
25	Low	*IMAP process serves me well*	1	No indication of considering broader issues
31	High	*Having identified the pros and cons of alternative energy I would then seek to introduce alternative energy in the order of least to greatest disadvantage in order to off set the dependence on oil. Noting that disadvantages are not measured soling in terms of monetary cost. We will also need to consider climate, social, political and industrial aspects as well*	5	Demonstrates consideration of a greater system and change over time
86	Med	*It is too linear to just consider each source in isolation of the others. There will be second and third order effects to consider also in the various combinations that might be considered*	4	While initial answer is valued at 3, explanation indicates consideration of flow on effects
87	High	*In my opinion, my choice provides more of a strategic course of action as it considers the issue from a hollistic approach*	4	While this participant considers the broader picture, there is no apparent consideration of change over time

Table 5.15: Example marking of system thinking answers

The difficulty presented by this item was the inherent qualitative nature of the marking and the lack of detail in the accompanying explanatory paragraphs. Generally, the low and high scores were relatively easy to mark given the nature of the comments. (e.g "*its the way I roll*".) The use of the three middle marks did make it easier to split the differences when participants provided an initial choice that was not reflected in the explanatory paragraph. The average results across rank by service are illustrated in Figure 5.18.

The One way ANOVA is shown in Table J.6 at Appendix J. This immediately illustrates that the service and rank groups are not comparable with $p = 0.12$. Even with service discounted and an ANOVA conducted on all the ranks $p = 0.67$.

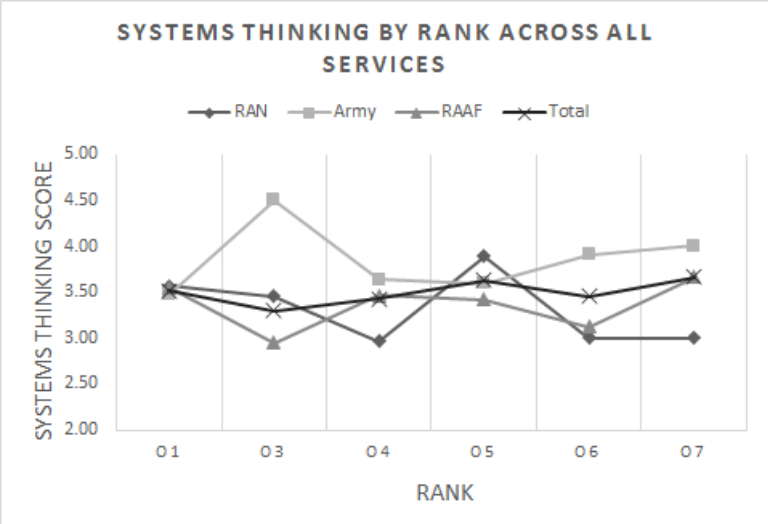


Figure 5.18: Comparison of systems thinking across rank by service

The correlation is almost non-existent at 0.003. The Mean score is 3.49 with SD = 1.039.

Strategic Thinking Capacity

Participant strategic thinking capacity was initially calculated as the sum of the four characteristic scores (Visionary thinking, Intuition, Creative thinking and Systems thinking). This presented a problem when each characteristic had different ranges. For instance, systems thinking was scored out of five however intuition was scored out of 35. To overcome this, each individual characteristic score was normalised before being summed into the final strategic thinking score. This resulted in a score out of four. At this point, each characteristic was weighted equally.

Figure 5.19, illustrates the mean strategic thinking scores across ranks by service. Before the scores are compared, an ANOVA was conducted. The results are

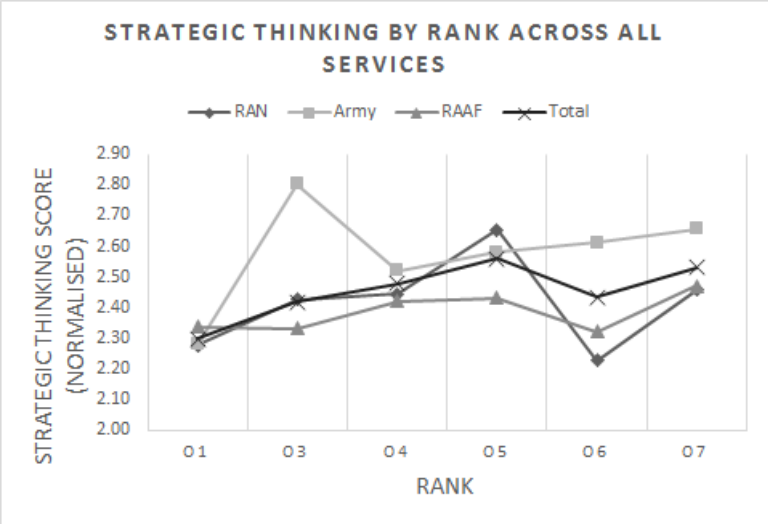


Figure 5.19: Comparison of normalised strategic thinking scores across ranks by service. This figure should be read cautiously when considering inherent measurement errors in the data and the possibility that the strategic thinking score is not sensitive enough to variations in strategic thinking.

listed in Table J.7 at Appendix J. As $p = 0.00094241$ the service groups, as a whole and at ranks O1 and O4, are comparable. While the differences are apparently small, there is a distinct increase in strategic thinking from O1 to O4. The greatest increase occurs in the Army population while the least occurs in the RAAF population - though the RAAF O1 group have a higher strategic thinking base. However, as it is being discussed at the end of this chapter, these changes may exist as an artifact of measurement errors. Because of this, the above statements need to be read cautiously.

5.3.3 Measuring correlations between variables and strategic thinking

Service Culture

While initially labelled as domain, what is being referred to is the culture inherent within each service. It is service culture that shapes decision processes, career profiles and promotion targets. As such, service culture is best indicated through the participant's rank. Rank, as a result from promotion, is a recognition of an appropriate fit between individual and organisation. Higher rank thus equates to better integration and fit with that service, particularly given the competition associated with promotion up a traditional hierarchy.

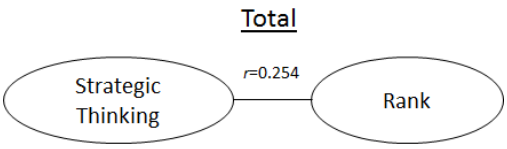


Figure 5.20: Correlation of Strategic Thinking and rank across sample

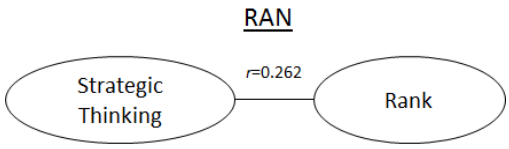


Figure 5.21: Correlation of Strategic Thinking and rank across RAN

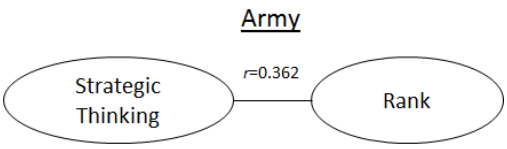


Figure 5.22: Correlation of Strategic Thinking and rank across Army

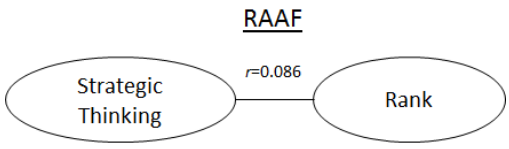


Figure 5.23: Correlation of Strategic Thinking and rank across RAAF

The relationship between rank (as a proxy for service culture) and strategic thinking is illustrated in Figures 5.20 to 5.23. The correlation between rank and

strategic thinking score across the whole sample is weak to moderate where $r = 0.25$. This correlation strength is reflected in the RAN ($r = 0.26$) and the Army ($r = 0.36$). The RAAF however have a very weak, if at all, correlation between rank and strategic thinking with $r = 0.09$. This is a dramatic difference when compared to the total population and the other two services.

Experience

Experience is short hand for Accumulated Work Experience where fluency (volume) and flexibility (variety) in experience is valued. As previously established, the service groups are comparable. The correlation between experience and strategic thinking is illustrated in Figures 5.24 to 5.27.

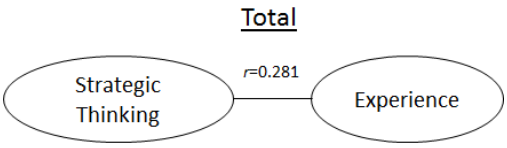


Figure 5.24: Correlation of Strategic Thinking and Accumulated Work Experience across sample

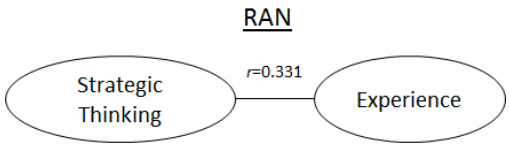


Figure 5.25: Correlation of Strategic Thinking and Accumulated Work Experience across RAN

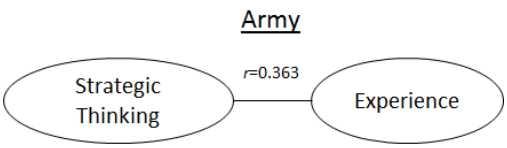


Figure 5.26: Correlation of Strategic Thinking and Accumulated Work Experience across Army

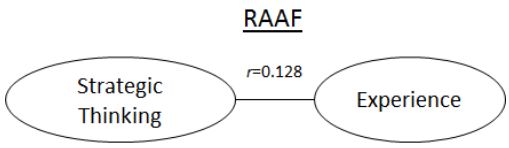


Figure 5.27: Correlation of Strategic Thinking and Accumulated Work Experience across RAAF

The correlation between experience and strategic thinking across the whole

sample is moderate at $r = 0.28$. Two of the services, RAN and Army, had correlations that were also moderate to strong at $r = 0.33$ and $r = 0.36$ respectively. Interestingly, RAAF had a relatively weak correlation (less than half the total) at $r = 0.13$.

Education

Education is a measure of formal courses (both technically professional and academic) completed by the participants. As the service groups are comparable the correlations were established and are illustrated in Figures 5.28 to 5.31.

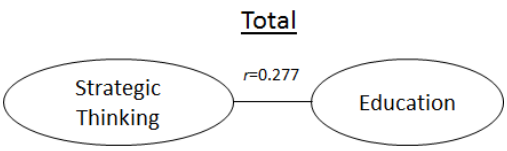


Figure 5.28: Correlation of Strategic Thinking and Education

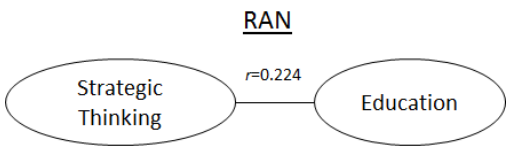


Figure 5.29: Correlation of Strategic Thinking and Education across RAN

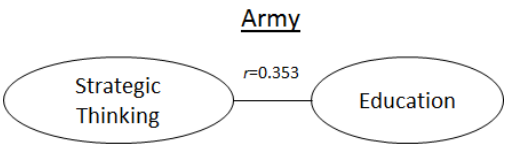


Figure 5.30: Correlation of Strategic Thinking and Education across Army

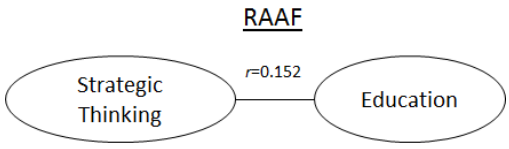


Figure 5.31: Correlation of Strategic Thinking and Education across RAAF

The correlation between education and strategic thinking across the whole sample is moderate at $r = 0.28$. The correlations across the three services were quite varied. Army had the strongest at $r = 0.35$ with RAN at $r = 0.22$. Yet again, RAAF demonstrated a weak correlation with $r = 0.15$.

Gender differences

The strategic thinking model identified gender as a potential variable in the development of strategic thinking. This was purely speculative as there did not appear to be any research identifying gender as an influencer or discounting gender. For this reason, each participant was requested to indicate their gender, given the choice of male, female or no answer. Of the total sample tested, 448 (73.20%) identified as male; 150 (24.51%) identified as female; and 14 (2.29%) did not answer. As a comparison, the ratio of females within the Australian Defence Force, as of 01 April 2015, is 14.88% [68].

Before comparing the strategic thinking scores across genders (in this case only using the responses identified as male and female while excluding the nil answers), an analysis of variance (ANOVA) was conducted to test for any significant differences in the means. The results are shown in Table J.8 at Appendix J. The P-value (p = 2.02176E-06) is significantly less than the Alpha of 0.001. Therefore we can reject the null hypothesis (that variation occurs due to chance) and conclude that the sample groups are directly comparable.

The male and female scores were compared to see if there were any differences in scores. First the total male and female populations were compared before looking at the development rates across the genders. The comparisons are illustrated in Figure 5.32. Noting the maximum normalised score was 4, the difference between the genders appears to be minimal. For instance the average strategic thinking score for the total male population was normalised at 2.390, while the the female

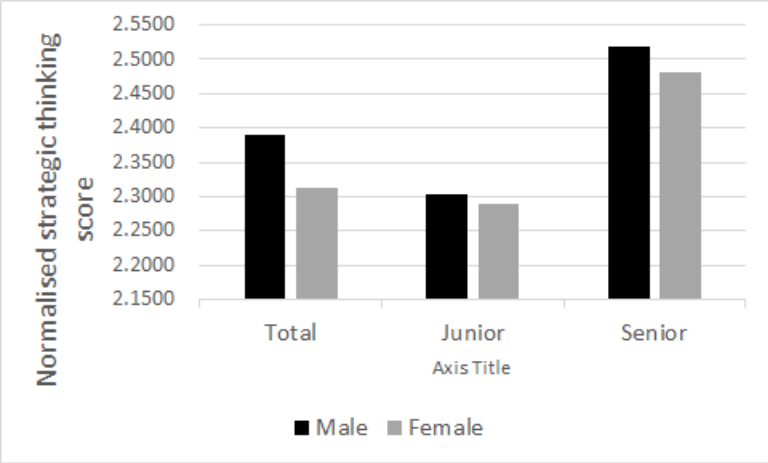


Figure 5.32: Comparison of Strategic Thinking across Genders

score was normalised at 2.31. The difference (0.08) is 1.93% and should be considered marginal at most.

The correlation between gender and strategic thinking is $r = 0.09$. This result is modelled in Figure 5.33. For two of the services, RAN and Army, the correlation is very low at $r = 0.01$ and $r = 0.07$ respectively. However, the correlation between gender and strategic thinking is weakly positive in the RAAF at $r = 0.16$. That is, correlated towards male.

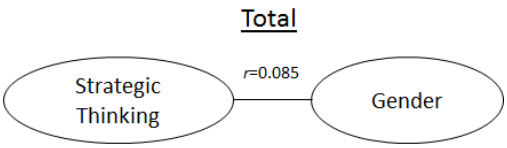


Figure 5.33: Correlation of Strategic Thinking and Gender

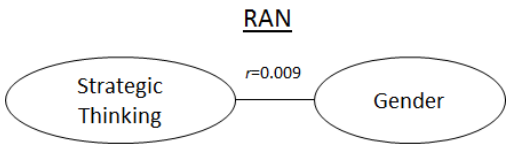


Figure 5.34: Correlation of Strategic Thinking and Gender across RAN

The difference in scores at specific rank levels is even smaller. At the junior

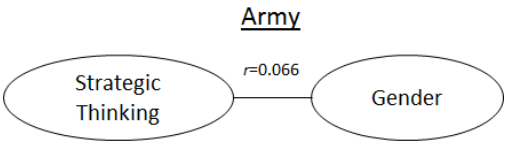


Figure 5.35: Correlation of Strategic Thinking and Gender across Army

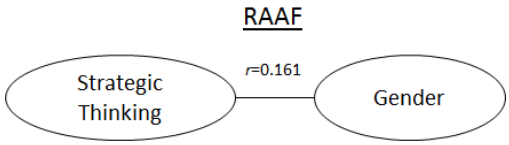


Figure 5.36: Correlation of Strategic Thinking and Gender across RAAF

officer level (equated to the O1 and O2 level), the difference is 0.03 (0.69%). At the more senior officer level (O4-O5) the difference is marginally greater at 0.04 (0.88%). While it is interesting to note that the normalised scores consistently showed males scoring higher, the difference is insignificant. Table 5.16 shows the final results.

	Male	Female	Difference	Percent
Total	2.390 (+/-0.38)	2.313 (+/-0.38)	0.077	1.925%
Junior	2.302 (+/-0.37)	2.275 (+/-0.34)	0.028	0.688%
Senior	2.493 (+/-0.36)	2.458 (+/-0.34)	0.035	0.878%

Table 5.16: Normalised Strategic Thinking Scores by Gender

Cognitive Ability

As previously discussed, the cognitive ability of the participants were not specifically calculated or captured. All Officers appointed within the Australian Defence Force are required to meet a general intelligence threshold. This threshold ensures that the total population is comparable.

Extraversion

The previous chapters highlighted extraversion as a possible indicator, or influencer, of experience. This was based on the theory that extraverted individuals

sought out positions of greater responsibility, thus leading to an increase in experience. To check whether this held true in the more formulaic career progression models of the Australian Defence Force Services, the correlations between extraversion and experience were calculated. The results are illustrated in Figures 5.37 to 5.40.

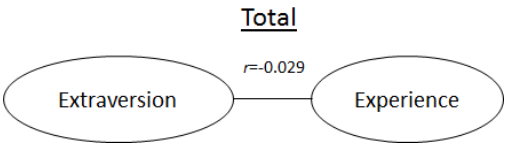


Figure 5.37: Correlation of Extraversion and Experience across sample

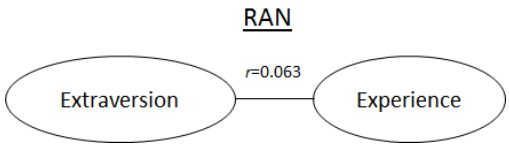


Figure 5.38: Correlation of Extraversion and Experience across RAN

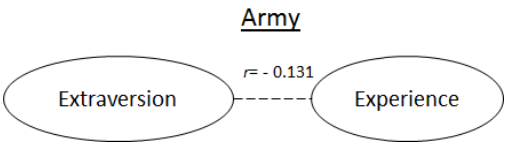


Figure 5.39: Correlation of Extraversion and Experience across Army

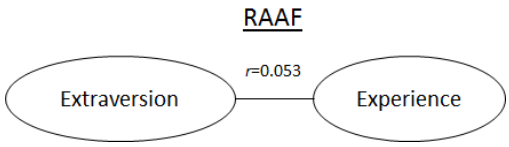


Figure 5.40: Correlation of Extraversion and Experience across RAAF

It is immediately apparent that the participant personality has almost no positive correlation with experience within this target population. For the total sample $r = 0.03$. This very weak to no correlation is reflected in both the RAN and RAAF with $r = 0.06$ and $r = 0.05$ respectively. Interestingly the Army population demonstrated a weak negative correlation between extraversion and experience with $r =$ -0.13.

Openness to experience

An individual's openness to new experiences or ideas has been reported as to positively correlate with education. Again, while it makes sense in a purely volunteer workforce, the nature of the military promotional and education system was thought to elicit different results. Again the correlation across the services between openness and education was calculated with the resulted illustrated in Figures 5.41 to 5.44.

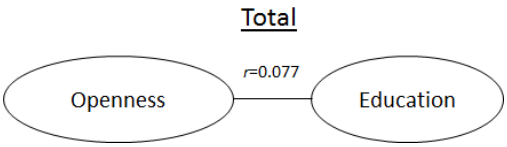


Figure 5.41: Correlation of Openness and Education across sample

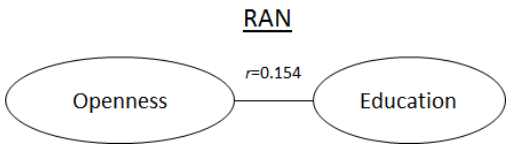


Figure 5.42: Correlation of Openness and Education across RAN

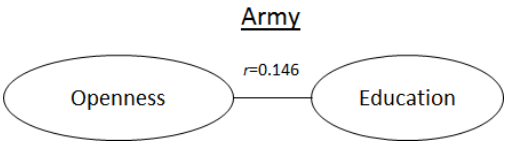


Figure 5.43: Correlation of Openness and Education across Army

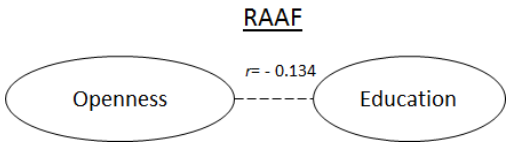


Figure 5.44: Correlation of Openness and Education across RAAF

While the total correlation appears to be very weak, with $r = 0.08$, this hides the stronger correlation between openness and education amongst the three services. The RAN and Army have weak to moderate positive correlations between openness and education, with $r = 0.15$ and $r = 0.15$ respectively. The RAAF however is quite different. The correlation strength is similar to the other two services however is negative with $r =$ - 0.13. Hence the greater the openness the

less educated the individual.

Factor β

Factor β refers to the combination of the two personality traits Extraversion and Openness. The initial model postulated that Factor β scores would positively correlate with strategic thinking scores. To test this, within the ADF Officer population, a four-way correlation was conducted: Openness and Extraversion, Openness and Strategic Thinking, Extraversion and Strategic Thinking and, finally, Factor β and Strategic Thinking. The results are illustrated in Figures 5.45 to 5.48

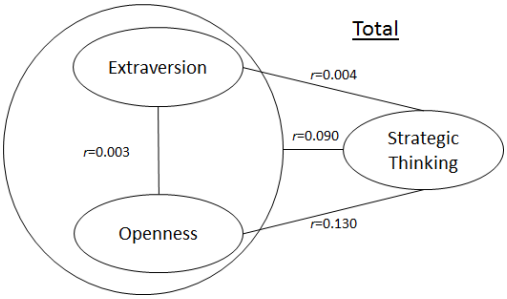


Figure 5.45: Correlation of Factor β and Strategic Thinking across sample

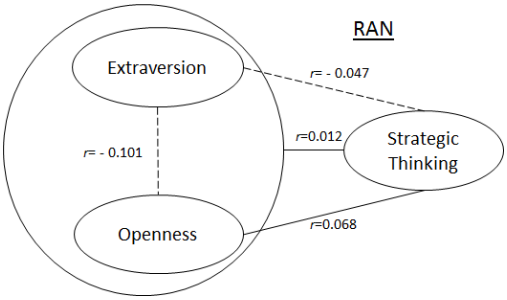


Figure 5.46: Correlation of Factor β and Strategic Thinking across RAN

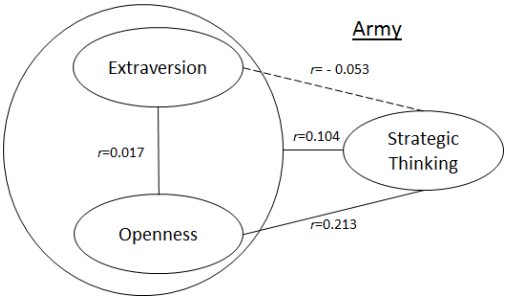


Figure 5.47: Correlation of Factor β and Strategic Thinking across Army

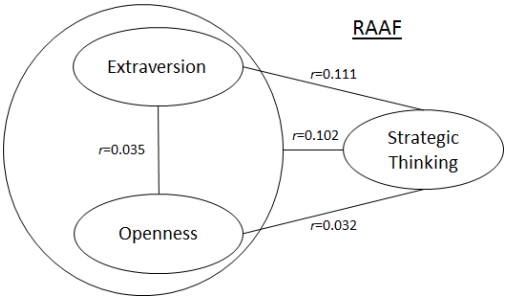


Figure 5.48: Correlation of Factor β and Strategic Thinking across RAAF

The relationship between personality (specifically Factor β) and strategic think-

ing is mixed across the services. Across the total population, the only significant correlation is that between openness and strategic thinking with $r = 0.13$. This result is predominantly based on the Army population where there is a moderate correlation ($r = 0.213$) however both RAN and RAAF recorded very low correlations ($r = 0.07$ and $r = 0.03$ respectively).

Interestingly, the only significant correlation within this model for RAN was that between Extraversion and Openness. The RAN recorded a weak *negative* correlation (r = - 0.10). The other services though recorded very low, almost insignificant, correlations with $r = 0.02$ (Army) and $r = 0.04$ (RAAF). Extraversion is seen to be very weakly, negatively correlated to Strategic Thinking in the Army (r = - 0.05) and the RAN (r = - 0.05). In contrast, the RAAF recorded a weak positive correlation between Extraversion and Strategic Thinking ($r = 0.11$). Finally, Factor β is shown to be weakly correlated with Strategic Thinking in both the Army ($r = 0.10$) and RAAF ($r = 0.10$) but almost insignificant in the RAN ($r = 0.01$).

5.4 Discussion

The experiment allowed the development of correlated links across the variables within the hypothesised strategic thinking model. It also allowed for the exploration of the respective development of strategic thinking both within the total population and across the three military services. While the development was similar, using rank as the base measure, there appeared to be a relative difference with the RAAF results against the others. That is, strategic thinking did not develop

as strongly within the RAAF as it did for the other two services, particularly the Army.

The relationships described in the previous sections are synthesised to develop a single strategic thinking model for each group. To reduce complexity, any relationship with a correlation less than $r = 0.10$ was removed. To aid in visual recognition, all negative correlations are illustrated with a dashed line, while stronger correlations are indicated with thicker lines.

5.4.1 RAN Strategic Thinking Variables

The strategic thinking model for RAN is illustrated in Figure 5.49. As previously discussed there existed a moderate to very strong relationship between experience, education and rank within the RAN sample. Perhaps more significantly though, each of these variables were moderately correlated to strategic thinking with $r = 0.22$ (Education); $r = 0.33$ (Experience); and $r = 0.26$ (Rank). This appears to reflect a culture with RAN that encourages, or provides mandatory, education to secure promotion and also encourages a range of position types. This allows individuals to develop their experience and education as they progress up the ranks.

The positive relationship between openness and education reflected previous findings and further validates the education scoring system [74]. The correlation between openness and strategic thinking is weak however still a useful measure. It was interesting to observe that there did not exist a significant relationship between Extraversion and Experience as expected. This would probably indicate that

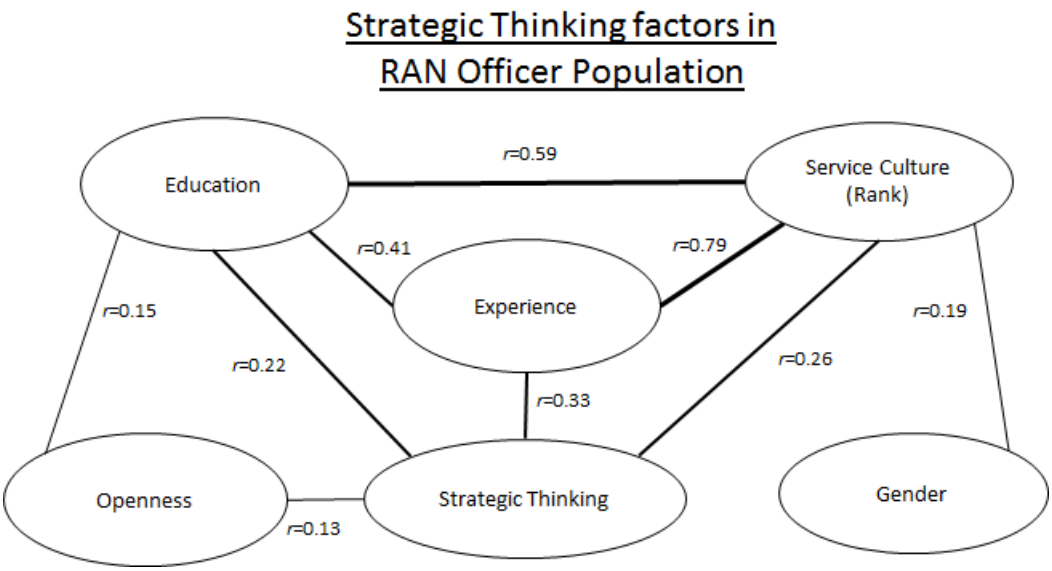


Figure 5.49: RAN Officer Strategic Thinking Model

personality has very little effect on determining career progression and associated postings.

5.4.2 Army Strategic Thinking Variables

The strategic thinking model for Army is illustrated in Figure 5.50. In a similar manner to RAN, there exists a very strong relationship between Experience, Education and Rank. In the Army sample, more so than the others, it would be reasonable to substitute one of the variables as a proxy for all three. While this negates variability at each rank, as a basic organisational measure, it would be a useful short cut.

The relationship between these three variables and Strategic Thinking is stronger than in the RAN sample, particularly with Education ($r = 0.35$) and Rank ($r =$

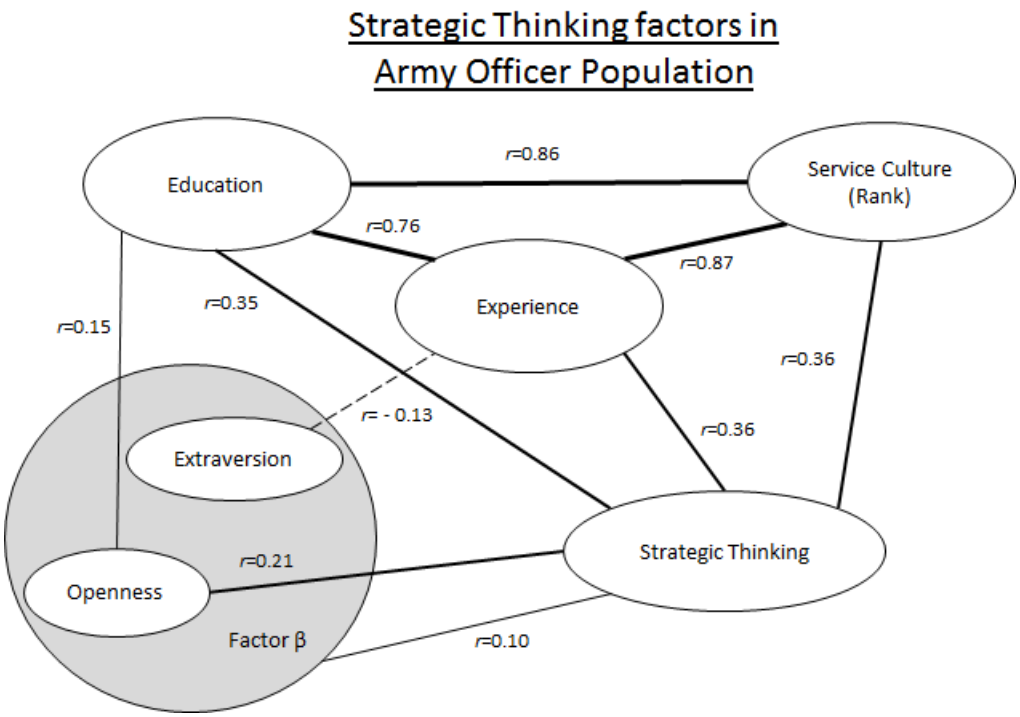


Figure 5.50: Army Officer Strategic Thinking Model

0.36). Given the strong tri-variable relationship, it is not really surprising that the correlations with Strategic Thinking are so similar.

It was surprising to see a negative correlation between Extraversion and Experience. Previous research by Dragoni et al (2011) indicated that there should be a weak positive relationship [74]. This negative relationship could be indicative of the type of jobs valued within the Army culture. For instance, given extraverted individuals are more likely to seek out higher profile positions, it is possible these sought-after positions are all very similar, such as single service positions. That said, there was a very weak negative correlation between Extraversion and Strategic Thinking which may indicate this phenomenon.

Again, similar to RAN, there exists a weak positive correlation between Openness and Education ($r = 0.15$). Also Openness has a slightly stronger positive correlation with Strategic Thinking ($r = 0.21$) than RAN. Unlike RAN, the Army sample demonstrated a weak positive relationship with Factor β ($r = 0.10$).

5.4.3 RAAF Strategic Thinking Variables

The strategic thinking model for RAAF is illustrated in Figure 5.51. Of the three services, the RAAF model proved to be quite different, both in correlation strength and in design. Firstly, and similarly, there exists a moderate to strong correlation between the big three variables, though the relationship between Education and Experience ($r = 0.53$) is much weaker than the other two services.

The strength of the correlations between Education and Strategic Thinking ($r = 0.15$); and Experience and Strategic Thinking ($r = 0.13$) are much weaker than the other two services. The relationship between Rank and Strategic Thinking is not even significant enough to include in this model. Given the strong correlations between the three variables, it appears that the type of education may contribute to this. Certainly, at the O4 and O5 ranks, the RAAF have the lowest education score of the three services.

One of the most curious features of the RAAF model is that Gender has the highest correlation with Strategic Thinking of all the values. This may be indicative of male-female ratio within the ranks however is certainly an avenue for further

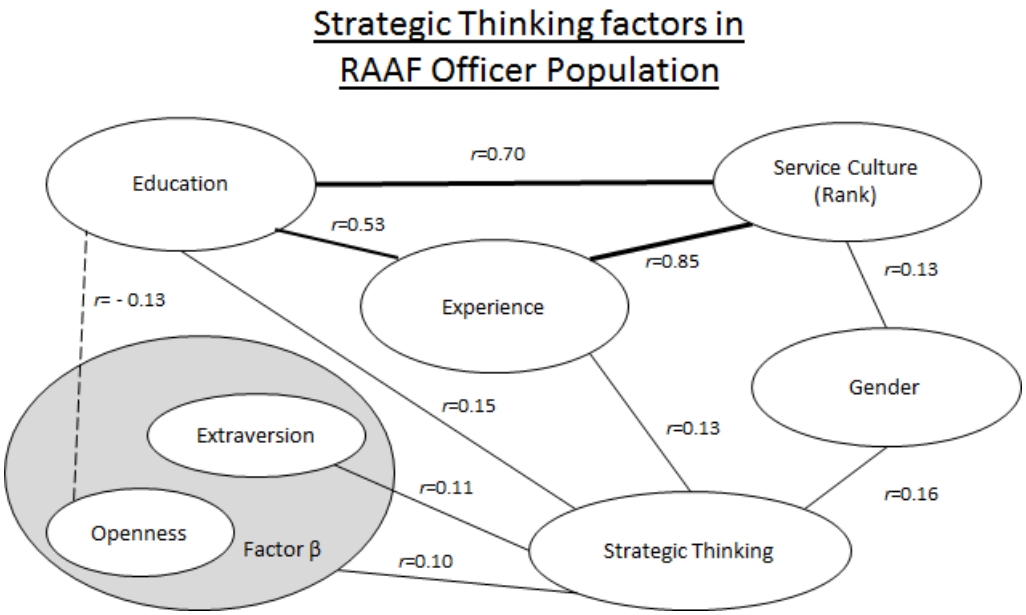


Figure 5.51: RAAF Officer Strategic Thinking Model

research. Similarly, the negative relationship between Openness and Education (r = - 0.13) is quite odd and unexpected. A possible explanation is, given Education is strongly correlated with Rank, individuals who have a greater openness trait are less likely to be promoted. This appears to be a reasonable explanation as the correlation between Openness and Rank, in the RAAF sample, is negative (r = - 0.15). It is quite the reverse in the Army population ($r = 0.14$).

This link to promotion, and the correlated increase in accumulated work experience, may also account for the lack of a significant link between Openness and Strategic Thinking as exhibited by the other two services. Here though, Extraversion is positively correlated with Strategic Thinking ($r = 0.11$) and so to is Factor β ($r = 0.10$).

5.4.4 ADF Officer Strategic Thinking Variables

The strategic thinking model for the full ADF Officer population is illustrated in Figure 5.52. Noting the apparent differences between services, we can see that there are four factors with which strategic thinking could be indicated: Education, Experience, Rank and the personality trait Openness.

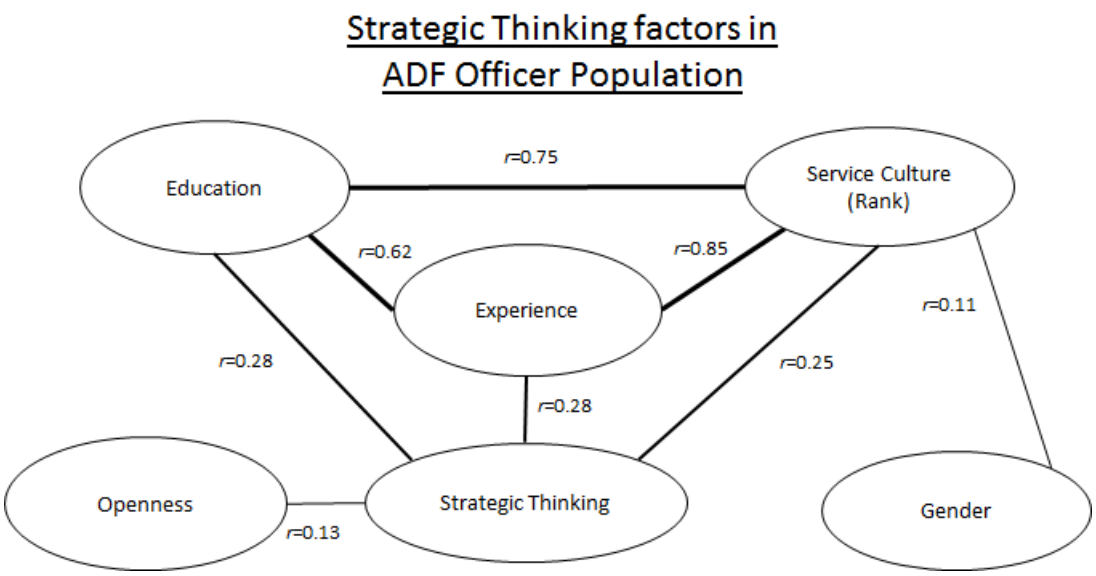


Figure 5.52: ADF Officer Strategic Thinking Model

Gender does appear to be indirectly correlated to Strategic Thinking, however this is through the promotional system (as articulated by rank) and, in itself, has no significant relationship (less RAAF) with Strategic Thinking.

5.4.5 Understanding the relationship(s) between strategic thinking and independent variables

The previous sections have identified low to medium correlations between the independent variables and the dependent variable strategic thinking. The next step is to understand if we can conclude causation from any of the independent variables. While causality is a very complex concept to deduce from the data collected in this study, we relax this aim from finding causal relationships to identifying the interdependencies in the data. We do this by regressing the factors identified previously to influence strategic thinking on the indicator for strategic thinking. This led to a regression analysis using a simple linear regression model. This resulted in the following equation where ST_n is the strategic thinking value of n; AWE_n is the accumulated work experience value of n; E_n is the education value of n; and O_n is the openness to experience value of n:

$$ST_n = 2.0978 + 0.0097 * AWE_n + 0.0203 * E_n + 0.0244 * O_n \tag{5.9}$$

Equation 5.9 confirms the strategic thinking model depicted in Figure 5.52. Specifically that strategic thinking can be influenced by education, experience and personality (openness to experience). Additionally the regression model did not confirm rank as an indicator of strategic thinking. However rank is used as a proxy for culture in that higher ranks are deemed to be a better fit to the organisational culture. When the data is analysed by service, the differences become apparent.

$$ST_n = 2.2775 + 0.0178 * AWE_n \tag{5.10}$$

Equation 5.10 is derived from the Navy results and clearly shows a deviation from the previous population whole. According to this linear regression equation, the only independent variable that appears to indicate strategic thinking is accumulated work experience. Neither education nor personality appear to be a significant indicator.

$$ST_n = 2.0062 + 0.0129 * AWE_n + 0.0182 * E_n + 0.0376 * O_n \tag{5.11}$$

Equation 5.11 represents the regression equation for the Army population. Here it can be seen to be very similar to the population equation. Experience, education and openness to experience appear to influence strategic thinking though to varying degrees.

$$ST_n = 2.2451 + 0.1391 * G_n - 0.0524R_n + 0.0101 * AWE_n + 0.033 * E_n \tag{5.12}$$

The final equation represents the RAAF sample. Equation 5.12 is significantly different to the other two services. Of note is the apparent influence of gender (G_n) and rank (R_n). These four equations (5.9 - 5.12) demonstrate the validity of the previously constructed models. Additionally the variation between the service regression models also demonstrate that strategic thinking is affected by the individual organisational culture. While rank is not necessarily the most correct independent variable to measure culture, each service is different enough to warrant different correlation and regression models.

5.5 The effect of measurement error

Notwithstanding the previous discussion, the results provided in this chapter are not free of uncertainty, specifically regarding measurements. In the broadest terms "uncertainty of measurement" indicates that there is a level of doubt about the validity of the result of a measurement [123, p. 2]. Measurement errors, sometimes referred to as observation errors, are generally difficult to quantify [183, p. 1-6]. Measurement errors are normally created during data collection, as opposed to sampling, coverage or processing errors [183, p. 6-1].

Measurement errors, the sources of uncertainty, are characterised by the difference between the value of a variable provided by the respondent and the true value of that variable. The total survey error is a function of fixed errors (referring to the bias created by repeated or systematic differences) and variable errors (or simple response variance that reflect random variations) [183, p. 6-1]. The main source of concern when conducting a behavioural study is systemic errors as these do not cancel each other out and, generally, require a modification [75, p.107].

The exact measurement error is not available as it is not possible to either compare the received responses against an independent source or compare responses to a second survey (due to the anonymity condition of the survey). However, the following sub-sections will describe the possible sources of error (fixed and variable) and discuss how these errors could affect the results obtained here.

5.5.1 Sources of Fixed Error

There appears to be three main sources of fixed error in this study. These are the questionnaire, interviewer or assessor bias, and discretization error.

The questionnaire

The design, content and wording of the questionnaire can create error. This error is introduced when the meaning or intent of the survey is properly conveyed to the respondent. This could create confusion or varied levels of understanding by the respondents. Additionally it could initiate a non-response [183, p. 6-2].

Of the four strategic thinking indicators, three were established tests. The visionary thinking assessment is new and, while it is likely to have created some level of confusion, only 3.43% of the respondents did not provide a response. The length of the survey introduced an error of non-respondents as 248 did not complete the survey. While about 45% of the total population commenced the survey, about 27.25% of those (12.4% of the total) did not complete the survey.

Interviewer or assessor bias

Where an interviewer is required to administer a survey, the effect of that interviewer on the response can be a source of error [183, p. 6-9]. The effect is also seen in assessments involving human judgement [228, p. 911]. The key idea is that individual judgement is affected by their experience and other cognitive biases.

Several of the items in the assessment required a qualitative judgement. The

visionary thinking and systems thinking assessments particularly. It is almost certain that the use of a human assessor introduces a systemic error into the measurement of strategic thinking. This error could be minimised by employing multiple assessors. While we acknowledge this as a limitation of the study, it was not feasible, given the large sample size, to train and employ a large number of assessors. Employing a small number of assessors would have likely shown variations in scoring. But it would have been infeasible to identify how these variations will asymptotically converge to a stable variance. In summary, the error resultant from using a single assessor was not avoidable in this study. Assuming that there was no impact of fatigue or variations in the criteria used by the assessor to make any answer; that is, the assessor was continuously consistent, the systematic bias from the assessor would cause a shift in the data; thus, won't impact the correlation analysis or trends. But we do acknowledge the limitations of these assumptions.

Discretization error

A "discretization error" is introduced when a discrete variable is used as a proxy for a continuous variable. The error corresponds to the number of discrete "contacts" along the continuous line. Hence the fewer the number of contacts, the higher the potential error due to the coarser approximation each discrete variable provides [12, 137].

A simple way to estimate the discretization error present in the strategic thinking assessment is to sum the approximation of a single variable for each indicator. For instance, the systems thinking item provided a discrete score from 1 - 5. This score was then normalised into a score ranging from 0 - 1. In this case the potential

error is the top score divided by the number of discrete variables, or (1/5=0.2). The error on the other three items are likewise calculated and summed to give the overall approximate error. For this study, the discretization error is approximately 0.31 (or 7.7%) on a continuous line from 0 - 4.

5.5.2 Sources of Variable Errors

The respondent

The effect of the respondents can manifest from the differences in respondent experiences, knowledge and attitudes and their subsequent interpretation of the survey items. The items were designed to measure the effect of these differences however the main concern for this study is the individual respondent behaviour at the time of the assessment.

The assessment took the respondents an average of 26 minutes to complete. The assessment assumes that every respondent was behaving within their normal range at the time of the assessment. It is likely that a number of respondents, for reasons unknown, were either operating above or below their normal range. This introduces an error that is difficult to measure. Given the number of respondents, and that each group was comparable (using ANOVA), it would be reasonable to proceed on the basis that these errors distributed normally and symmetrically around the mean; thus, their aggregate impact would be minimum.

5.5.3 The effect of error on this research

The design, content and wording of the questionnaire may have lead to the large number of non-respondents; however, of those that responded, there appears to be little uncertainty. The assessor bias is potentially significant if the strategic thinking score was an absolute value. In this study though, the assessment was used as a relative score and thus, if the errors are consistent across all scores, this variation has little bearing on the final comparisons.

The random errors introduced by individual respondent behaviour could be assumed to have cancelled each other out when group averages were assessed. Hence the overall effect on the conclusions is likely to be minimal. The discretization error is seen to be approximately 7.7%. Thus the reliability is no higher than 0.93. It is unlikely that the other errors would reduce the reliability below 0.70. Thus, for the purpose of this research, the results are sufficiently reliable. It is important to emphasise that the majority of the analysis in this thesis relied on correlation analysis. Measurement errors underestimate the correlation between two variables. As such, while it is possible that the true correlations are higher than those presented, the existence of correlation among the variables is an indication of the validity of the proposed model.

5.6 Contribution

This chapter contributes to the foundational knowledge of strategic thinking development. It expands on established research that identified strong indicators of

strategic thinking (such as cognitive ability and accumulated work experience) and identifies a number of other indicators (such as education, openness to experience and organisational culture). For example, while the recent work of Goldman et al identified a set of four behavioural indicators of strategic thinking, this research consolidated the existing literature to identify four cognitive characteristics of a strategic thinker [92]. Dragoni et al identified Extroversion as a significant indicator of strategic thinking due to the desire of extroverted individuals to seek demanding jobs. This research identified that in the military the converse could apply and Openness to Experience is a more significant indicator [74]. The resultant models are organisational (service and ADF) specific however, given the nature and size of the organisation, these strategic thinking development models are useful frameworks for other organisations.

The demographic variation within the participant body ensured that the results were statistically representational of the organisational headquarters. Furthermore, the results provide a strong indication of the strategic thinking development within the broader organisations. The experiment was able to firstly prove that a change in pedagogy created a change in strategic thinking capacity. In this case, the RAAF population appeared to have a lower strategic thinking capacity and the variable correlations were much weaker than the other two services. The use of regression models supplemented the correlations models and supports the conclusion that organisational culture influences the development of strategic thinking capacity.

Chapter 6

Understanding strategic thinking ownership through qualitative research

> *"Most companies - or leaders - don't fail because of a lack of technical skills. It's almost always due to what many would call a lack of a critical soft capability"* [156, p1]

Is it the individual who is responsible for developing strategic thinking as a personal trait? Or, alternatively should organisations assume ownership and nurture strategic thinking as a capability? This chapter examines the final research question and poses the question: "**who owns strategic thinking?**" To do this, this chapter takes the stance that strategic thinking is an organisational capability and thus developed and maintained in much the same way as any other capability. This chapter examines what a capability is and how strategic thinking could be defined within a capability framework.

6.1 Introduction

A study of Japanese business organisations showed that many of the companies whose success could be expected to be a result of superb strategies were severely "handicapped" by their lack of resources [66, p.79]. While these companies did not have the strategy staff they usually had an individual of great natural talent. This talent is distinguished by their mode of thinking, not their education:

> *"Insight is the key to this process. Because it is creative, partly intuitive, and often disruptive of the status quo, the resulting plans might not even hold water from the analyst's point of view. It is the creative element in these plans and the drive and will of the mind that conceived them that give these strategies their extraordinary competitive impact"* [66, p.79].

The above quote inspires an important question - why is strategic thinking so difficult to cultivate within organisations? In other words, we ask how can an organisation cultivate strategic thinking as an organisation capability? In a sense strategic thinking is treated as a manufactured or developable capability. This approach could ensure that the inputs and outputs of a strategic thinking capability are well-defined and get monitored over time. In this way, ownership of the strategic thinking development process rests within the organisation instead of being spread over individuals who may work against one another in a non-coordinated manner.

The central thesis looks to understand how strategic thinking can be developed as a capability. A capability is quite simply the ability to do something, and it certainly appears that traditional capability development is skewed towards hard capabilities. Yet there does not seem to exist a domain that can be used to adequately quantify a strategic thinking effect. On an individual scale, it becomes difficult to ascertain if a person is a "good" strategic thinker or if they are actually suited for strategic work. On an organisational scale, it is difficult to assess the ability for that organisation to think strategically. In other words, how effective is their strategic thinking capability? The proposed strategic thinking assessment instrument aims at addressing this gap.

Taking a step back, current literature does not speak of strategic thinking in capability terms even though the produced effect is clear and required. This is due to the current paradigm that the term capability only refers to "hard" capabilities - i.e. those that can be seen and quantified. Thus, to understand if organisations should own the strategic thinking development process, strategic thinking must first be able to be described as a capability - in this case a "soft capability". Similar to the field of operations research, "soft" refers to the "orientation of the approach as qualitative or interpretative rather quantitative" [108, p. 3].

6.2 Research Question and Methodology

The research question is "who owns strategic thinking?" and the proposal is that strategic thinking should be owned by organisations. Thus, organisations are responsible for developing strategic thinking in much the same way as they would

with any other operational capability. Hence, for strategic thinking to be owned by an organisation, strategic thinking must be able to be described within a capability framework. As it does not appear to match existing "platform-centric" capability frameworks, this research further proposes that soft capabilities, like strategic thinking, can be developed. Thus the questions supporting RQ5 (Who owns Strategic Thinking?) are:

RQ5a. What is a soft capability?

RQ5b. How could a soft capability be developed?

RQ5c. When can strategic thinking be developed as a (soft) capability?

Due to the novelty of the subject and lack of published work, it was critical that the data was collected from individuals who could be considered subject matter experts (SME) in the field of capability development and acquisition. The goal of the research then was to ensure that the data collected from the "specialists" within the field of capability and strategy was rich in detail. Semi-structured interviews were conducted to capture the required rich data for this study.

Semi-structured interviews allowed a much greater depth of investigation (and thus quality of detail) compared to a survey or written correspondence. The style of interview combined aspects of a conceptual interview and discursive interviews [133]. In this style, the interviews are semi-structured and the interviewee is seen as a collaborative participant. Thus the specific questions and examples discussed would vary between individuals as it is dependent upon the participant's experiences and knowledge. Common to all interviews were the set of guiding question-

s/themes that all conversations needed to cover. The set of guiding questions used in this research were:

- Please describe an example of a soft capability?
- Why do you think "soft" capabilities do not appear in the higher level documents such as the Defence Capability Plan?
- In your example, what would be the Fundamental Inputs to a "soft" Capability?
- Do you believe that there is an appreciation of "soft" capabilities within Defence?

The data from the interview was analysed using qualitative research methods (including word maps, codification and influence diagrams). The data from all the interviews were then synthesised and used to produce a visual representation of the soft capability concept. This representation was then validated in a second round of interviews. To ensure the quality of the research, the data was collected during the course of two interviews separated by approximately one month. Each interview took no more than 45 minutes.

The thesis previously established that the concept of capabilities is heavily used within military organisations, so the research scope was confined to the Australian Defence Organisation (ADO). As an example of the importance of developing capability, the Australian Army currently streams Officers with graduate qualifications and professional experience in Capability and Acquisition [45]. This recognition

was used as a foundation to evaluate expertise within the field across the services.

The participant population were from within the ADO. As a specialist population, it was correspondingly small. Due to the small size of the population, selection bias had to be mitigated. First, the sample needed to be balanced as much as possible to cover the views from the Australian Army, the Royal Australian Navy, Royal Australian Air Force and Australian Public Servants. Secondly, the level of seniority and years-in-service had to be balanced across rank and public service levels (noting the requirement for SMEs). This ensured that organisational bias (specifically Army as the larger service) was not prevalent and that there was a variety of perspectives (experience appears to be correlated to rank in this case). These two rules aimed to ensure that the synthesised information represents the broad conceptual understanding within the field.

The question of sample size is important and should be addressed. The sample size used within this qualitative research was guided by the concept of saturation [155]. That is, the sample size must be large enough to ensure that all of the perceptions considered important to that study are uncovered. The size, however, should not be so large as to have repetitious (and superfluous) data. Unlike quantitative research, frequency of occurrence is not the primary consideration as one occurrence is often considered sufficient. Mason (2010) observed that while the mean sample size in the PhDs he researched was 31, saturation can be much lower [155]. This is particularly evident in studies that involve a high level of homogeneity within the sample. In fact, the development of meaningful themes and useful information could be achieved in a sample size as low as six [155]. An example of

such a population would be the Australian Defence Force (ADF).

Participants were selected based on their experience within the capability development and acquisition area. In this case, known individuals with considerable experience within Capability Development Group and Defence Material Organisation were targeted[1]. Importantly those members who are involved in the strategic acquisition process (generally O6 level and above) were specifically targeted. Participants were all members of the ADO or had very recent experience within the ADO.

The data from the interviews were analysed using well-established qualitative research methods (including word maps, codification and influence diagrams). The data from all the interviews were then synthesised and used to produce a visual representation of the soft capability concept. This representation was then discussed and validated by the participants.

Transcription

The data collection process involves a number of qualitative research methods [133]. The transcription from an oral record to a written record is particularly problematic as it requires an interpretation of the data from one language (verbal) to another (written). As with all interpretation tasks, the translation process is informed by judgments and personal decisions [133]. This is particularly evident when one considered that the oral recording immediately loses access to body lan-

[1]These two organisations merged in 2016 (after the research was conducted) to form the Capability Acquisition and Sustainment Group with many of the SME moving back into their respective service.

guage such as postures and gestures.

Based on the depth and fidelity of transcription, the process may reduce the value of the record through the loss of tone, intonations and breathing. Thus, the act of transcription required a number of choices regarding the depth of translation required. As this is a conceptual study that looks to synthesis different perspectives, the relative importance of remarks to the participant was required to be recorded. For instance, emphasis intonations and pauses were considered to be an important part of the translation, however, sighing and frequent repetition was not. Deliberate irony or sarcasm were required to be notated as they had the capacity to change the final interpretation of the concept.

Risks

The following are generally considered to be risks when interviewing specialists within a specific field or organisation [82]:

- *The expert blocks the interview* in its course, because he or she proves not to be an expert for this topic as previously assumed.
- *The expert tries to involve the interviewer in ongoing conflicts in the field* and talks about internal matters and intrigues in his or her work instead of talking about the topic of the interview.
- *The expert often changes between the roles of expert and private person*, so that more information results about him or her as a person than about his or her expert knowledge.

- *The expert gives a lecture on his or her knowledge instead of joining the question-answer game of the interview.* If the lecture hits the topic of the interview, the latter may nevertheless be useful. If the expert misses the topic, this form of interaction makes it more difficult to return to the actual relevant topic.

The interviews were recorded on a digital voice recorder and then transcribed by the researcher. Transcription was achieved by "parroting" both the interviewer and interviewee into a voice recognition software (Dragon Naturally Speaking). As this was not 100% accurate the transcriptions were then reviewed several times. The transcriptions followed the conversation faithfully, in that pauses, stutters, repeated phrases and emphasis were recorded. Gap fillers such as "um", "ah" et cetera were replaced with a pause ("..."). An example of the transcription can be seen in the following frame. Transcriptions were edited to remove any reference to names or specific details that could identify the participant. This is a normal ethical requirement and was explained in full to the participant prior to the interview commencing.

Example of Transcription

I: yeah, what you mean by that though? What does that actually mean? So... I guess without contextualising it... I'm after your initial thoughts. Is soft capability, to you, just a random term or does it actually... are there any tags hanging off it?

P: I would... without... it is a hard question because... But I would say soft capability is the levers, mechanisms... and tools you have available that... develops... the education, the thought processes, the thinking that

utilises the capability.

Participants

13 participants were interviewed. The identity of the participants remains anonymous, however, it is important to note the variety of backgrounds as this potentially influenced their perspective. All of the organisations are significant groups in the ADO. These are shown in Figure 6.1 on page 205. Importantly, the sample captured a range of backgrounds and ranks levels - thus mitigating selection bias.

		Type of Employment				Total
		Army	Navy	Air Force	Public Servant	
Organisation	DMO				2	2
	CDG	1		1		2
	Army	5				5
	Air Force			1		1
	VCDF		1			1
	DSTO				2	2
Total		6	1	2	4	13

Figure 6.1: Participant Attributes

Conduct of Research

All interviews were conducted privately with only the interviewer and the participant present. In most cases the interviews were conducted in private office

spaces and were uninterrupted for the duration. Several interviews had minor interruptions from external parties; however, this only had a minor effect on the conversation flow. The interviews varied from 28 minutes through to 43 minutes and were conducted during normal working days. All participants were guided through the ethics requirements prior to consent being provided. At no stage were there any concerns regarding anonymity or consent withdrawn.

Each interview was conducted in a semi-structured way and subsequent questions during the conversation were built on the participants answers. For example, if "strategic policy" was provided as an example of a soft capability, then the fundamental inputs to strategic policy were explored rather than an example provided by the interviewer. On a couple of occasions, domain specific terms such as "fundamental inputs to capability" tended to elicit monologues from the participants that did not establish new or confirmatory information. On those occasions alternate phrases, in this case "building blocks" were used to move the conversation forward.

6.3 Results

6.3.1 Initial Impressions

The interviews were all conducted by the same interviewer (the author) and thus invites an initial comparative impression regarding the topics discussed and the depth of understanding displayed by the participants. The interviews themselves developed a large variety of very interesting discussion topics. It became clear

from the start that, while all participants had an intuitive understanding of soft capability, their association with this particular term appeared to rely on their experiential background rather than founded on academic grounds.

It became rapidly apparent that none of the participants had devoted any significant amount of time exploring the concept of soft capability except in the lead up and conduct of the interviews. This would indicate that either the concept is obviously apparent in its description and could be regarded as an axiom or that the concept is, at this stage, unexplored and not developed enough to cross the participants' awareness threshold. Given the variety of discussion points, examples and thoughts provided by the participants, the first explanation is deemed unlikely.

After the first four interviews, it became apparent that there were a number of different perspectives of soft capability and also a large number of similarities. The perspectives varied from seeing soft capability as synonymous to national levers of soft power down to individual cognitive behaviours. It seemed that the participants generally approached the concept of Soft Capability from four different perspectives: Soft Power, Soft Operations Research, Enabling Capability, and Individual Cognitive Behaviour. The perspective of the participant appeared to represent their field of expertise and implies a broad utility of the concept of soft capability rather than any specific characteristic. For instant the senior military officer who was used to thinking in terms of strategic implementation of capabilities tended to use the phrase "soft power" as synonymous to soft capability. Alternatively, one of the scientists with a background in operations research drew strong parallels with the ongoing discussion regarding hard and soft operations

research.

Soft Power is discussed previously and refers to the ability to shape an adversary through non-violent means. Typically this involves economic enticements or cultural "magnets". In this instance, soft capability is seen to reflect, or be synonymous with, soft power. For example, the military, as an institution, was described by one of the participants as a hard power. It is a capability that is employed by the nation state when you wanted to force the hand of an adversary. As a capability, the military was generally very visible and quantifiable. The impression left with the interviewer was that, despite the synonymous usage, soft power is in fact an example of a soft capability, albeit at a macro level, which refers to the international or state-to-state dialogue. That said, the same participant reflected on the labelling of the military as a soft power and presented a line of thought where the military actually consisted of soft and hard capabilities. The specific example provided was "military diplomacy". Normally, diplomacy is a function of (in the Australian context) the Department of Foreign Affairs and Trade, however, the role of the military in forging and developing relations was important. Military diplomacy, in this case, was an example of a soft capability.

The reference to individual cognitive behaviour was not expected, however, it was central to two of the participants view of soft capability. Both of these participants had significant experience in capability development work and both held post graduate awards in related areas. In one case though, the interviewer was left with an impression that this particular participant almost unconsciously denied that soft capabilities were able to be described in the same terms as hard capa-

bility. When questioned on this ("could soft capabilities be described in the same terms as hard capability") the participant insisted that the interviewer should ignore hard capability terminology such as FIC and instead create a new model from scratch. This argument reinforced what appeared to be a belief that soft capability was in fact only useful as an input to a hard capability. While on the surface inconsistent to the other views, this belief is actually consistent with the nested definition view. In the same way a traditionally *hard* capability such as the military could also be expressed as a mix of both soft and hard capabilities. This layering of capability is consistent across the other interviews and is perhaps a key characteristic of large capabilities.

The idea that soft capability is an enabling capability is consistent with several business articles on *dynamic* capabilities and is discussed previously. The traditional view is that dynamic capabilities only exist to improve and support operational capabilities. Whilst this view is supported by the participants, when questioned further they agreed that soft capabilities produce their own independent effects that, whilst often more "important" than hard capabilities, were just too intangible to quantify.

Finally, after the interviews were transcribed, a basic word query was run. It was restricted to the top 250 words containing four or more letters and included synonyms. This was run through the program NVIVO 10 from QSR International. The result can be seen in Figure 6.2 on page 210. This word query was useful to confirm that the interviews focused broadly on capability and specifically on the concept of soft. The high use of the word "know" reflects the high usage of the

phrase “you know” by most of the participants. The appearance of “knowledge” separately refers to the use of the term in the cognitive domain.

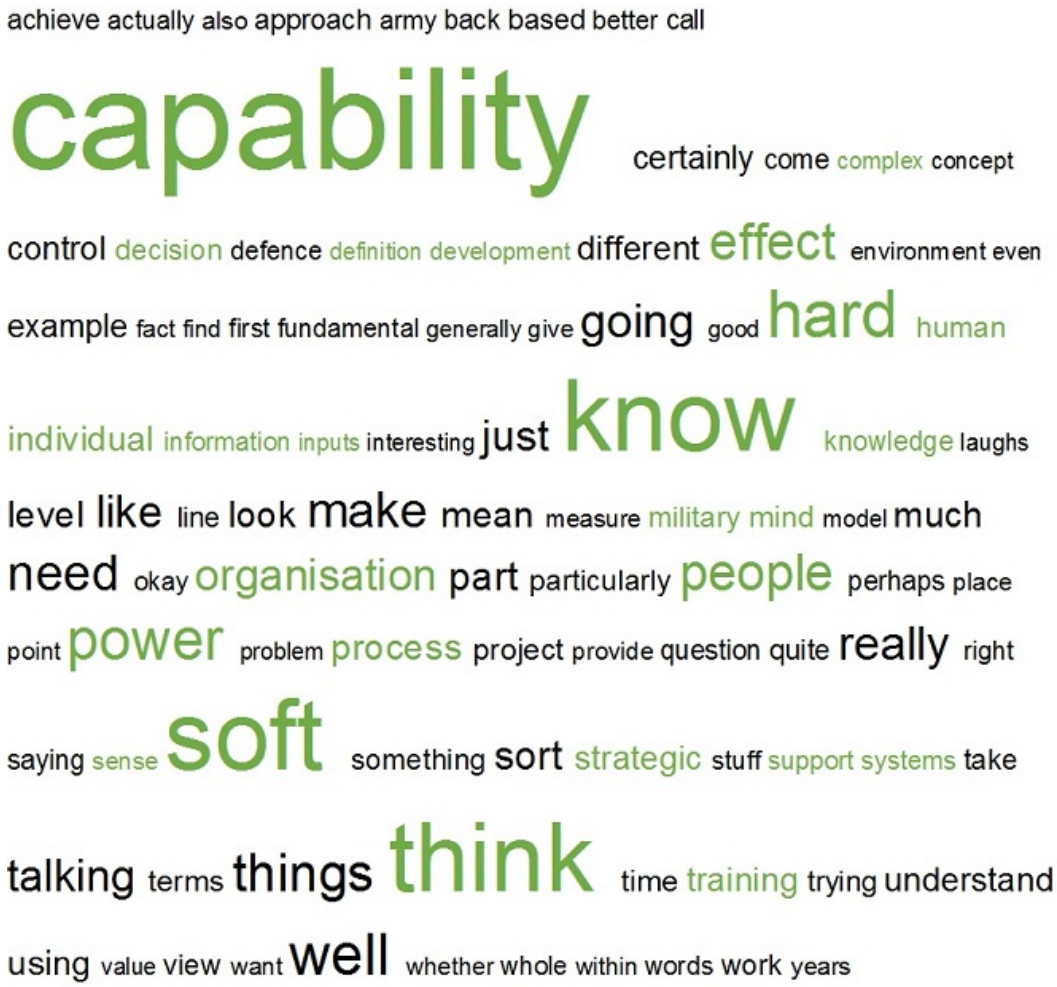


Figure 6.2: Word Frequency Query from transcribed interviews

6.3.2 Nodal Analysis

When conducting qualitative research, it is important that the information gleaned from the interviews cover all relevant aspects of the topic. In other words, the information needs to reach a point of saturation where further interviews are unlikely to

elicit new and important information regarding the research [155]. In this project, the transcripts of the interviews were initially reviewed and coded according to the subject matter being discussed. The codes represented nodes (clustering of ideas) and were developed organically based on significantly different ideas. A list of the nodes can be found in Appendix N and example is shown in Figure 6.3. For instance the discussion of soft capability examples is sufficiently different to fundamental inputs to capability to register as a separate code. These nodes were reviewed continuously through the analysis and, when new ones were created, previous transcripts were re-coded.

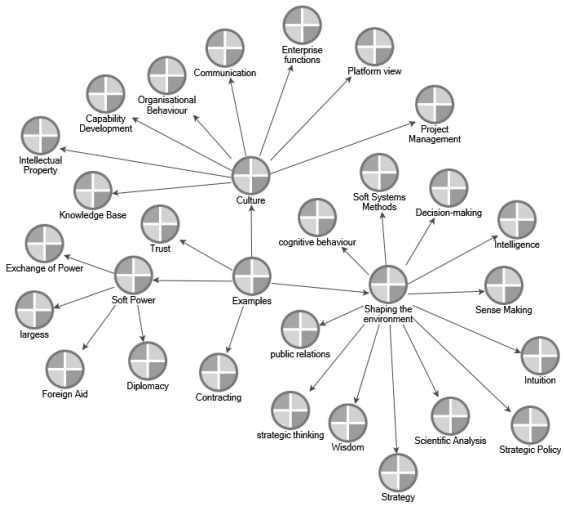


Figure 6.3: Example of nodes

Figure 6.4 on page 212 illustrates the number of nodes initially created as part of this first review. It should be noted here that the participants, ranging in seniority from the lower Executive Level to very Senior Executive positions, covered viewpoints from the Navy, Army, Air Force and Australian Public Service. They also covered the organisational areas of Defence Material Organisation, Capability

Development Group, Army Headquarters, Defence Science and Technology group and the Australian Defence College. A quick view of Figure 6.4 shows that it appeared saturation was achieved after six interviews. This finding is consistent with Mason's view that homogeneous populations can yield sufficient results after very low sample sizes[155].

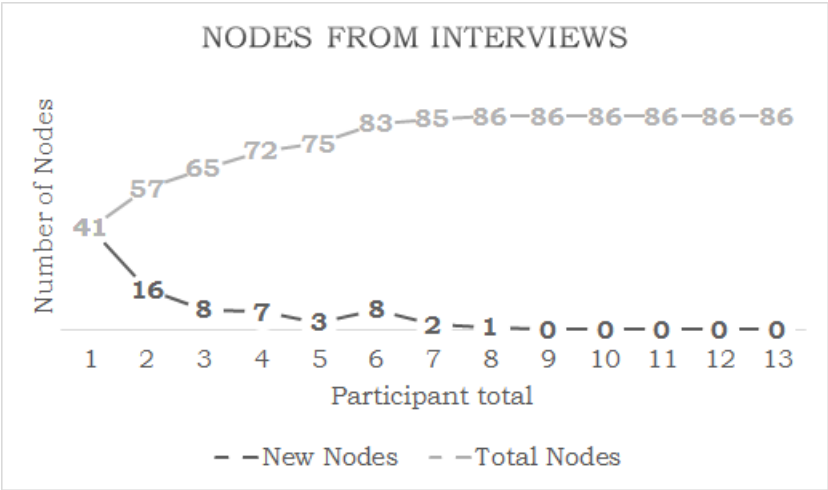


Figure 6.4: Number of Nodes created by participants

The 86 nodes generated by the participants were then reviewed for themes through the use of a mind map (shown as Appendix N on page 344). This simple technique yielded four broad themes (Soft Capability Characteristics, Soft Capability FIC, Soft Capability Example and Hard Capability Example) and several nodes that appeared, on the surface at least, to be unrelated. Included in this later group were nodes such as funding, quotes and appreciation of soft capability. These outliers were examined in detail to ensure they were sufficiently distinct to warrant their own theme. As "quotes" related to the development of this report rather than the concept of soft capability it was removed. "Economy" covered

the same idea as "funding" and were thus combined and, on consideration, were moved under the "Soft Capability Characteristics" theme for further analysis. The nodes within the "Hard Capability Example" theme were not distinct enough to justify a separate node and were also combined into one node called "Hard Capability". The node "Appreciation of Soft Capability" was sufficiently distinct and deep enough to remain independent as a fifth theme. Thus the five broad themes developed as a result of the interviews are contained below and will be explored in following subsections:

1. Appreciation of Soft Capability
2. Characteristics
3. Inputs
4. Examples
5. Hard Capability

6.3.3 Appreciation of Soft Capability

In order to be able to scope the importance of soft capability within a Defence context it became useful to understand the common perception or appreciation of soft capability. Most of the participants were specifically asked "is there an appreciation of soft capability within Defence" although the terminology was slightly different depending upon the context of the discussion. For instance, in one of the interviews the question was posed as a statement to elicit a response (*So you believe that there is an appreciation for soft capability within defence ...*). Whereas in a couple of other interviews the participant either directly referred to or indirectly

inferred the level of appreciation within Defence. As an example, one participant referred quite frequently to an article on "The four steps to chaos" with the very obvious implication that Defence was ignoring soft capabilities to its own detriment.

> "*Particular people really, fundamentally know it to be true.* But others would say "oh no. That's just ... you know, soft rubbish, let's get down to the real detail here"" [P4]
>
> "yeah, I do. I do, actually and *a growing appreciation* of the importance of sense making and the effect of soft things in operations" [P7]
>
> "*yeah, in some quarters*...but if you talk to a hard-core serving infantry officer they wouldn't have a clue. Because it's all about shooting guns and running up hills." [P8]
>
> "*Yes, there is an appreciation of it.* But our issues, and I'll speak bluntly, is that we know a lot but we don't do much about it" [P9]

The *italicized text* from the previous quotes demonstrate that it appears there is an appreciation of soft capability within the Department of Defence even if the exact definition is unclear. While the growing appreciation should be comforting, many of the participants noted major concerns in the same breath. These are underlined.

The concern expressed by many of the participants was that, although they felt confident that senior leaders appreciate the concept, they were not confident that this resulted in any definite action. So while the organisation seems to get the importance of "soft things" on operations, and its resultant effect, there was a universal acknowledgement that nothing was being done to develop the "soft things". The reason for this appeared to stem from the perceived intangibility of soft capabilities and thus the inherent difficulties in campaigning for a budget.

6.3.4 Characteristics of Soft Capability

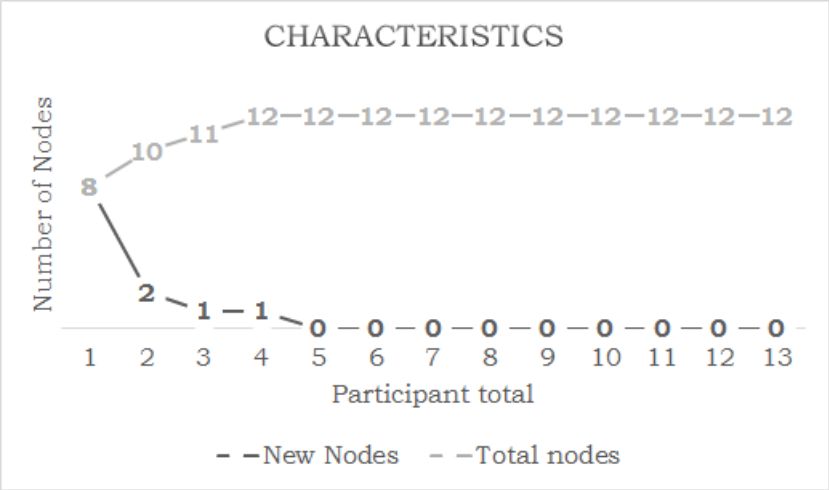


Figure 6.5: Characteristics Node Development

The concept of Soft Capability appears to be broadly recognisable by most people in the field and the characteristics are generally agreed upon. In fact the nodal analysis, illustrated in Figure 6.5 on page 215, show that it only took four participants to develop the full list of characteristics. The actual characteristics, listed in no particular order, are:

- People
- Intangible
- Complex System
- Temporal
- Processes
- Deliver an Effect
- Nested Definition
- Paradigm
- Multi-level
- Funding
- Defined by tool
- Inter-dependency

All of the participants were asked to say what they immediately thought of when hearing the term "soft capability". This allowed the interviewer to explore what were regarded as important characteristics of soft capabilities or those things that distinguished a soft capability from any other type of capability. Interestingly the first nine participants provided a list of 20 characteristics, that were then whittled down to 12, however only two characteristics dominated all discussions. These were "people" and "intangible".

People As stated, the idea that people were central to the concept of soft capability was universal, though to what level is debatable. The following quotes illustrate a common thread throughout the interviews that people[2] were an important element of soft capabilities.

> *They [people]) are THE part of it, yes, yes. I can't actually see anything else being part of soft capability originally* [P6]

[2]Interestingly several participants preferred the appellation "humans"

In my view anyway, it's fundamentally a human activity [P5]

People are the bearers [P2]

So you see it as a more of a... people orientated capability [P8]

a soft capability enhances the potential of a human to contribute to an outcome or an effect of ... many different types [P2]

The feeling that people were the defining characteristic of a soft capability was so strong that several participants went as far as to state that without people it could not be a soft capability. This raises the question of whether People are a characteristic of a soft capability or are a fundamental input to a soft capability in a similar manner to hard capabilities. The distinction appeared to be, for some of the participants, in the use of people as the "bearers" of the capability. They saw that people (or humans) were the binding thread that drew in all those disparate and intangible elements such as experience and wisdom. Although it could be argued that experience is merely a training tool used to bring about a certain behaviour and wisdom is really an outcome or effect of the capability.

Intangible Like the people characteristic, the very intangibility of the concept is what made it "soft". This argument is akin the early discussions regarding the polar difference between soft and hard operations research. That is quantifiable, mathematical and generally linear problems were solved using Hard Operations Research while qualitative, non-linear and often socially complex problems were investigated using Soft Operations Research methods. The following quotes

demonstrate this idea quite clearly.

> *you can't grasp it* [P1]
>
> *They are more important. They're just not tangible...* [P2]
>
> *I mean, I've always thought of the idea of soft capabilities as something you can't really measure. Precisely that is why I think of it as soft.* [P6]
>
> *so, soft capability to me... It's the, you know, it's the... I suppose, it's the intangibles.* [P9]

To all of the participants, a capability became soft when they were no longer able to measure it. Did this mean though that they merely did not have the appropriate tools? The argument regarding access to tool is not overwhelmingly comprehensive when the population attributes are examined. About four of the participants had formal Operations Research / Analysis training and experience that included the use of Checkland's Soft System Methodology [48]. This meant that they were at least aware of most of the common techniques used to explore intangible problems. That stated, it certainly seemed that the remainder of the participants either did not have the tools to investigate these capabilities or were overwhelmed by the complexity of the problem.

Complex System Several participants made specific reference to complex systems however many of the others discussed the requirement to navigate the human interaction environment.

the sorts of messy, wicked problems that defence capability into the future really is [P4]

if you were to analyse the lead up to the making of any decisions you would see that there are complex human processes performing the decision [P5]

And the, you know, the life in this sort of complex adaptive system is, you know, a constant exchange of influence [P5]

well it helps me anyway, to provide a framework for at least feeling comfortable about being part of this complex adaptive system [P5]

This perception of complexity is consistent with of the Cynefin Framework developed by Kurtz and Snowden (2003) in which they describe the complex domain [132]. Specifically, they describe the difficulties in applying agent-based modelling and similar tools on human interaction systems. This is due, in their view, to three reasons:

- Humans are not limited to one identity - their personae is not constant in all situations
- Humans are not limited to acting in accordance with predetermined rules - humans exhibit free will and are quite capable of disrupting the system or not accepting a limited range of pre-determined options
- Humans are not limited to acting on local patterns - scale of awareness can influence local behaviour

These three reasons were heard throughout the course of the interviews in various guises. Of note, a particularly detailed example of the need to understand the political environment when developing major capability systems was provided. This example was deemed important as the external influences were strong and even the need to understand the power exchanges that occur on a daily basis within the working environment was required. The concept of power exchanges was also commented upon by other participants.

Temporal The idea of time came up a number of times under different guises. The temporal characteristic was only brought up by three participants and seems to be more of an observation of the effect delivered by a soft capability. It did not sound as if the participants were claiming that soft capability had a specific and unique temporal characteristic; nor was there consensus on the characteristics.

They're passive in that sense [P1]

I: so you see it as cyclical and continuous? P: yes. Absolutely. [P6]

There's no discrete time-limit to that soft power, soft capability influence [P9]

So yes I get those sort of arguments of, you know, not seeing the fruits of your labour based on some of the soft capability until potentially a long time down the track. The same can be said for the tools that this soft capability is using and those hard elements [P9]

The strongest example was the use of "soft power" and that strategic, or national, level effects could often take a significant period of time. Time was also brought up when one participant compared the delay between a strategic action vis-a-vis a tactical action as similar to the delays between a soft and hard capability. Specifically, tactical actions and hard capabilities had short feedback loops with minimal time and interference while strategic actions and soft capabilities had longer feedback loops containing greater interference.

Processes The concept of processes was not common amongst the participants and seemed to be randomly distributed (i.e not common to any specific attribute of the participants).

> *So you need processes, which is the soft systems methodologies...* [P7]
>
> *so scheduling, financial management, good contracts. You know. All of those I would put in the hard* [P3]
>
> *it's all of that, is not quite tangible as you said. But it brings all sorts of things in. The culture, professionalism, knowledge... process is another one. Good processes ... accountabilities[sic], all that sort of stuff.* [P8]

Processes were described by a number of participants as essential for the development of capability, though opinion was divided on its utility. This division was generally based around whether the participant saw the process as a tool that could be used to develop capability or whether it was actually an outcome. Those who saw processes as a distinct capability generally regarded it as a hard

capability as it was measurable. Those that saw it as just another tool, expressed that the process could be applicable regardless of capability type. Soft Systems Methodologies was cited as an example of this.

Defined by tool This was an interesting characteristic which was only explicitly brought up by one participant [P1] and shown in the following quotes.

> *soft power or soft capability ... I would imagine it was those things that we choose to do that do not rely on military hardware*
>
> *When you talk about the institution though, which is clothed soldiers with weapons in tanks inside brigaded organisations. That is a hard capability. It doesn't mean that you can only use them for hard things. You can use them for both*

This person strongly felt that the tool (or major system used) was the determining factor in whether a capability was hard or soft. As an example, consider an organisation, X Corps, who is employed by the nation state to conduct Humanitarian Aid and Disaster Relief (HADR) with a neighbouring country. If X Corps is a Non-Government Organisation (NGO) then the capability being employed by that nation is a soft one. This was akin to flexing soft power within the region. Whereas if X Corps is actually a large military unit, then that nation is now employing a hard capability. Yet the immediate effect is the same (i.e. our neighbouring country received assistance in a time of crisis). The contention was that when a military unit is employed, it sends a strong "you owe me" message whereas a NGO could be perceived as a gift.

This concept of the capability being defined by the tool appears to be based on perception, however, is not unique [40]. The participant overlaid another nation's societal paradigm in assuming the long term effect of the employment of the capability. In this case, the paradigm was that military forces are solely a government tool and do not help the population. In fact the military is often used to police the population and thus could be perceived as a subtle threat. This example is understandable but does not seem to be supported by the use of nations' military forces in recent HADR events, particularly in the Asia-Pacific region [172].

Paradigm The significance of individuals paradigms should not be underestimated. Throughout the interviews it became quite apparent that while there appears to be an intuitive understanding of the soft capability concept, a lack of published and digested material meant that the participants resorted to their personal experiences and knowledge to explain the concept.

you use soft capability as a synonym for soft power [P1]

I am a construct of my education which has been the existing military paradigms [P1]

That's right. I'd say its perspective orientated [P4]

is this way of conceiving a capability, in terms of soft capability, a useful model of the world? [P7]

While the population interviewed as part of this study shares a level of homogeneity (all participants had deep experience within the Australian Defence capability development), their paradigms differed from a soft power view to a soft operations research to enterprise processes through to an individual cognitive behaviour. All of the perspectives are equally valid and serve to demonstrate the lack of general consensus within the community of the concept of soft capability.

Deliver an Effect Only several of the participants put forward that soft capabilities could create equitable effects as to hard capabilities. When directly challenged by the interviewer, most participants admitted that a soft capability could deliver an effect. However, as shown in the first quote, the level of effect was questioned.

> *So... when we are talking about soft capability, I don't think we're talking about anything that directly impacts on the environment.* [P6]
>
> *In the effects are largely about the effect it has on people.* [P7]
>
> *I will initiate a program that will move our culture from point A to point B* [P2]

Generally, the participants could see that soft capabilities could produce tangible effects, however the examples used varied considerably. This variation is understandable given the paradigms under which each participant was operating under. Three examples that illustrate the ability are as follows and they are discussed in more detail in later pages:

- *Shaping the environment* - this specifically refers to both the ability to shape a committee or organisational process to deliver a desired result and to shaping a cultural environment to deliver certain desired outcomes;
- *Trust* - similar to the last example, this revolved around building trust internally (to develop organisational robustness) and externally so as to reduce a operational threat environment on foreign soil; and
- *Sense Making* - this referred to the individual and collective ability to understand the environment and generate feasible strategies and policies that allowed progress in a desired direction.

Nested Definition The idea of a nested definition was not discussed broadly, however, it seemed to strike a chord with those who recognised the concept. The idea is that there is not one level of capability but many. A capability can be comprised of many capabilities. For example, the Army is built from a large number of capabilities such as offensive, humanitarian relief or defensive and these could be employed as a national power to achieve a specific effect [174].

> *Then the military contains both hard and soft capabilities to achieve the outcome that you want* [P1]
>
> *what we're really doing is recognising the nested definition of capabilities* [P6]
>
> *So our capabilities are things. And... combining them in some way can... can result, in a way, in a meta-capability that might be dynamic* [P7]

There were not many comments regarding this characteristic and thus it is difficult to support or contend the concept. That said it also does not appear to be a unique condition of soft capabilities as it applies equally to all types of capabilities. This very point is emphasised in the first and last quote.

Multi-level Like the idea of nested definition, the idea that a soft capability is pervasive and resides at multiple levels of an organisation was not specifically discussed by the majority of participants.

> *soft power would be you know the overarching system that uses soft capabilities to you know achieve your outcome* [P1]
>
> *no, no, no... It permeates through the whole lot. I mean, you can't delineate it ... If we are talking in the context of capability development then it doesn't matter whether it's one rifle or one nuclear submarine* [P8]
>
> *my interpretation of soft capability being pervasive* [P9]

This does not negate the idea though as most of the participants recognised that soft capability could operate both within an individual and the group. This implies that depending upon what level this group is working, be it developing strategic policy or the rapid deployment of small team, the capacity of a soft capability still exists.

Inter-dependency The concept of inter-dependency was generally referred to when participants viewed capability as more of a continuum rather than discrete

boxes. In other words, it became difficult to specifically attribute soft or hard characteristics to broader capabilities. It seemed that the delivery of an effect required both measurable, hard capabilities and softer, intangible capabilities.

> *You won't execute a project without hard capabilities ... But neither will you execute major projects just by having hard capabilities* [P3]
>
> *Look, all things you do are intertwined* [P3]
>
> *There's no wall between the two of them. And, yeah, so... That's a problem isn't it? The moment it becomes a continuum you are not really sure what you're talking about...* [P6]
>
> *Then the military contains both hard and soft capabilities to achieve the outcome that you want* [P1]

The previous quotes reflect a perceived problem with defining capabilities. The problem being that the constituent parts of a capability will vary and change depending on the resultant effect required. Hence a desired effect on the environment could be achieved with either a hard capability, a soft capability or both. There does not appear to be a strong desire to rely just on one specific type of capability.

Funding The participants were specifically asked why soft capabilities were not published or scheduled in higher level documents such as the Defence Capability Plan (DCP). In all cases, the response was that firstly, the DCP was about buying things and, secondly, soft capabilities were difficult to budget for.

we have no line of funding and intellectual application to military diplomacy [P1]

I mean to me a DCP is a statement of ... in effect... hard things to be purchased, things pretty much. You know, its expressed in, you know, general terms but it's things [P3]

they are hard to...quantify the costs and sometimes ...quantify the outcomes that you are achieving in a way that...is really persuasive to government and maybe the nation [P4]

when we're talking FIC, it is all about money, the people, the asset, as opposed to what the people can do themselves [P9]

Notably, there was a recognition that the softer capabilities still required funding. For example a knowledge base - one of the fundamental resources from which all capability is derives - still requires funding to maintain a "warm" base. The concern appears to be related to the concept of intangibility. People perceive soft capabilities as intangible and impossible to measure, therefore what is unmeasurable can not be costed.

6.3.5 Inputs to Soft Capability

After discussing the characteristics of soft capabilities and exploring feasible examples the participants were asked to extrapolate the requisite inputs (or building

blocks) for the capability. In many cases there was either a momentary look of panic or a considerable pause. This indicated that most of the participants had not consciously considered developing these soft capabilities and were having to evaluate the requirements on the spot. Surprisingly, whilst the initial number of inputs (before clustering) was about 16, the eight final inputs were developed in the first three interviews (see Figure 6.6 on page 229). These were:

- People
- Human Resource Management
- Human Performance
- Major Systems
- Collective Training
- Facilities
- Command and Management
- Organisation

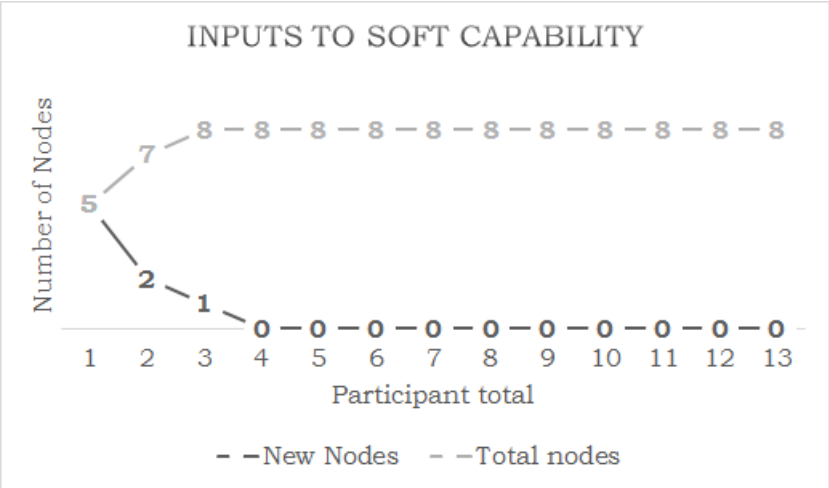


Figure 6.6: Perceived Inputs to Soft Capability

Unsurprisingly most of the inputs bore strong resemblance to the FIC as defined by the Defence Capability documentation previously discussed. Of interest though three of the inputs (People, Human Performance and Human Resource

Management) dealt with the same resource (people) [1]. Despite the same focus, the inputs were sufficiently different to warrant individual attention. The inputs are discussed in detail in the follow sub-sections.

People

Humans are actually the heart of what we do here. [P2]

People are the bearers [P2]

I think it's borne by people. It can be described and partitioned in otherwise. You know the morality, societal norms... [P2]

when I think soft capability and, especially ... talking about the capability development process and... In my view anyway, it's fundamentally a human activity. It's about people [P5]

personnel. You can't do anything without people [P5]

They [people] are THE part of it, yes, yes. I can't actually see anything else being part of soft capability originally [P6]

Yeah, I think people is wherein it resides [P6]

so, soft capability to me... It's the, you know, it's the... I suppose, it's the

intangibles. It's not pieces of equipment. It's... although it's human... human centric I suppose [P9]

Soft capabilities require people. At no point did any participant disagree. At some point, every participant remarked on the centrality of people to the concept of soft capability. People were seen to not only carry the capability but also produce much of the capacity within the capability to produce the desired effect. That capacity could be increased through the individual cognitive ability of the person or the larger group's cohesion. The second thread running through the discussion regarding people was that the intangibility of soft capability was generally due to the importance of people. The complexity surrounding people appeared to create confusion and uncertainty as to how the capability could be measured.

Human Resource Management

Training would be a significant one. Which is the ability to deploy them and move them around and give them experiences which increase them [P1]

But they should manage him closely to provide him with the background ... You know it's a bit of a career management thing... [P2]

I think what ... where it needs to be recognised is more in ... organisational development and career development [P3]

On the other hand, as they go on to be leaders of this organisation, they have to make a major transition... a really major transition from this ... execution

... into strategic thinking. And it's a huge transition... [P3]

But the organisation, I think, can get there a lot better by recognising the need to have those skills [P3]

professional mastery of the domain that you could see are we doing. You know, are we doing that? Is our posting cycle antithetical to do that? [P4]

The importance of managing the people within the organisation was recognised by most of the participants. The reference to human resource management generally touched on the development of the individual, not only in their core competencies or skills but also in ensuring they had specific experiences and exposures that allowed a certain attitude to become prevalent. This belief was explicitly expressed in the quote regarding the transition into leaders within the organisation. There also appeared to be a general belief that Defence was not very good at recognising and fostering specific traits within its people. Unfortunately this gap is often missed as there are "enough" people within the system to historically ensure those traits are available. Whether this is intentional, or not, is debatable.

Human Performance

The term *human performance* was raised a number of times by several of the participants. Each of these participants felt strongly that human performance was a critical component of soft capability though it was difficult to align their separate believes. For instance, one participant felt strongly that soft capability resided within the individual and the strength of the capability was determined by their cognitive performance. Another used the term as a reference to the *human*

in the machine or the reliance of the capability's success upon the people in the system.

> *the Personnel FIC implies the individual. Human performance implies what do I want the individual to do.* [P12]
>
> *So I think in many instances what you're talking about in regard to soft capability is human performance. What do we need from an individual or a collective to achieve an outcome that produces that capability?* [P12]
>
> *The money would be ... invested in activities that seek to change the cognitive nature of the individuals in the organisation* [P2]
>
> *what are the ... what are the facets that make up a human? So there are physical human performance, intellectual human performance, emotional stability, resilience from a number of different perspectives including stress and pressure and those sorts of things* [P2]

One of the participants [P12] described Human Performance as that thing that we needed the individual or collective to do. Just having the skills or physical capacity was not enough. There needed to be more. In this case the same participant broke Human Performance down into four components:

- **Mind**. The mind is firstly a simple reference to the knowledge and experiences that the individual and group had access to. It also refers to the cognitive capacity of the individual. For instance a sniper is not just a good shot, they also require a high degree of focus to concentrate for long periods

of time. This is not always taught or recognised as a competency.

- **Body**. The physical capacity of the human or group is obviously an important component to ensure that things were done. Triggers pulled, buttons pushed and obstacles overcome. However this component also covers off on the equipment the body has such as uniforms, weapons or information systems.

- **Skills**. The skills refers to the core competencies available to the individual and group. Does the person have the right education to understand the requirement or the skills to operate a particular piece of machinery? Like the 'body' component, this is normally covered within the Personnel FIC.

- **Social**. The social aspect not only refers to emotional intelligence but also to the social influences placed on the group or individual. As one participant stated, soldiers aren't made from a factory they are recruited from general society and thus are influenced by society.

While participants generally started to talk about human performance as an input, the discussion appeared more to be a capability that comprised of the physical, social and emotional beings with all the associated baggage. In other words the traditional inputs of personnel, collective training, support, supplies, command and management and organisation were required to create this thing called Human Performance.

Major Systems

In the same way you would have to have kit. But it's not the same type. So, you know, if you use public affairs and that kind of stuff ... and we do have little bits of it [P1]

So really the personal part of it is all those other capability... capabilities that we talk about, again those hard capabilities, should actually be a subset of the human capability. [P9]

The idea of major systems was not universally agreed to by the participants. This would appear to result from the people centric perception of a soft capability and, secondly, from a prevalent paradigm within capability that platforms are provided with people to make the *platform* operate. The last quote challenges this paradigm and questions why platforms are not seen as enablers for people. If people are the "bearers" of the capability should not the people then be equipped to produce the appropriate effect? The example used was that a tank is merely a tool used by the human to ensure an appropriate mix of defensive and offensive attributes are available. In this case, the platform (tank) provides the human protection from small to medium calibre weapons; and provides the human the ability to physically disrupt a target out to a set distance; whilst also allowing continuous environmental sensing.

Collective Training

Collective training was only mentioned by a small number (n = 4) of the participants and this appears to reflect the numbers who considered soft capability to exist beyond the individual.

So I think you'd start from FIC and move on. Individual and collective training? Absolutely. That's how people learn and how to interact and how the group runs [P2]

it was a check list given to the patrols ... to identify ... it was really indicators and warnings of ... hostility and unrest. But is very interesting because just having the process of having a check list of things to watch for really educated the ground patrols [P4]

The training side had fallen apart. All the things had coalesced to a disaster. The failure of capability, of hard capability [P8]

It is a common understanding that is reflected in the Defence Capability Development Handbook 2014 that groups of individuals and teams need to conduct a form of collective training in order to effectively provide a capability [38]. The second quote was an example of the utility of collective training in the use of specific check lists that enabled the collection of intelligence. In this context, it was viewed as a soft capability. The final quote refers to the impact of neglecting training in understanding the development of full capabilities in favour of just focusing on the platforms.

Facilities

You would also, in terms of facilities, need somewhere to educate them [P1]

Do you need facilities? Absolutely. And the human ... the biometrics stuff got to be protected and made to feel comfortable or it won't learn, it won't perform. It may need to be augmented too. So facilities is important [P2]

there might be facilities... [P6]

The requirement for facilities were considered a fairly low priority and referred to in an almost dismissive manner. That said, facilities were an important requirement for several specific outcomes: (1) the people needed to be made to feel comfortable while they work and get trained; and (2) education, be it individual development or collective training, needed a space to be conducted in.

Command and Management

The idea that command and management is important to the development and success of any soft capability was supported by all of the participants. There was a clear requirement to ensure that the organisation had sufficient processes and doctrine in place to encourage certain behaviours. The processes could be as simple as the committee decision-making process that is alleged to stall many projects. Or it could be the cross-pollination of ideas across institutionalised boundaries as referred to in the counter-terrorism example above.

Command and control or the ... the approach to managing people, if we expand a little. Absolutely! Fundamental. You know, that's the culture to a degree [P2]

It's the command and management one [P4]

And much of it was common sense and all the rest of it but, you know, part of commanding is to organise everyone to have the same common sense, isn't it? [P6]

You need people. Both who know how to use it and are willing to employ people who know how to use it [P7]

I think a part a soft capability is the willingness of the hierarchy to use soft capabilities to achieve outcomes. So ... it's about ensuring that decision-makers are ... willing to apply the results [P7]

Another key take-away from this discussion is the willingness of the leadership or management levels to support their people. This referred to an individual's appetite for change and also the organisational flexibility. The final quote was particularly enlightening as it showed a certain organisational inertia that frustrated innovators. This resulted in the loss of innovators from the organisation and the strengthening of homogeneity of the population. In this case, it is suggested that a homogeneous population does not allow progress and positive change to occur.

Organisation

Well, I think we can do a lot more to prepare for it. And I think if we did that we'd do a lot more thinking about our organisational structures [P3]

the third is the integration edge. How will all the bits fit together and how we use them effectively [P4]

There are FIC elements that would be useful everywhere, you know, command and control, of organisation, personnel [P2]

But underneath all that is this team or is what is the institutional social aspects. So it's that... the organisation that allows that human to thrive [P9]

It quickly became apparent that not only were individuals and groups required to generate a soft capability but also the organisation was just as important in facilitating or enabling the capability. The common perception was that it was no good having people who were, for instance, strategic thinkers and capable of formulating comprehensive and constructive policy if they were not supported by the organisation. This included the management of people and also ensuring that the organisational processes did not impede progress as the first quote clearly implies.

6.3.6 Examples of Soft Capabilities

Unlike the previous results, the interviews continued to produce new nodes (as illustrated in Figure 6.7 on page 240) until near the end. While the participant population was relatively homogeneous in broad terms (i.e. they were all subject matter experts in capability development and had significant experience within the Defence Environment), the range of Soft Capability examples presented was quite interesting. This is understandable given the depth of their collective experiences

within the Defence environment.

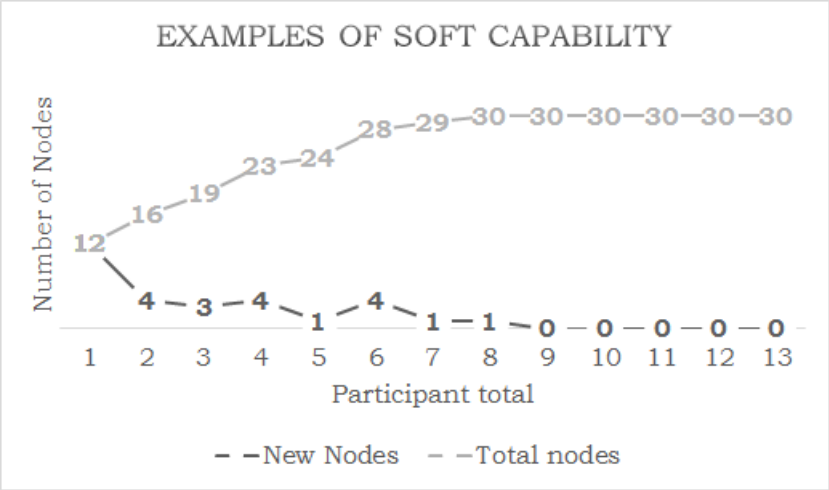


Figure 6.7: Provided Examples of a Soft Capability

A Capability is the ability or capacity to do something. Thus any capability, soft or hard, must be able to affect the environment. This description proved to be a useful way to filter the range of examples provided within the interviews. The examples were analysed for commonality and clustered under a header that portrayed the environmental effect. This reduced the examples down from 30 nodes to a more manageable number of categories: Trust, Shaping the Environment, Culture, and Soft Power. One of those (Trust) stood out alone due to the strength of the example, although it could have conceivably be categorised under "Shaping the Environment". The final split is illustrated in Table 6.8 on page 241. As soft power has already been discussed in Section 2.5.3, it will not be covered further.

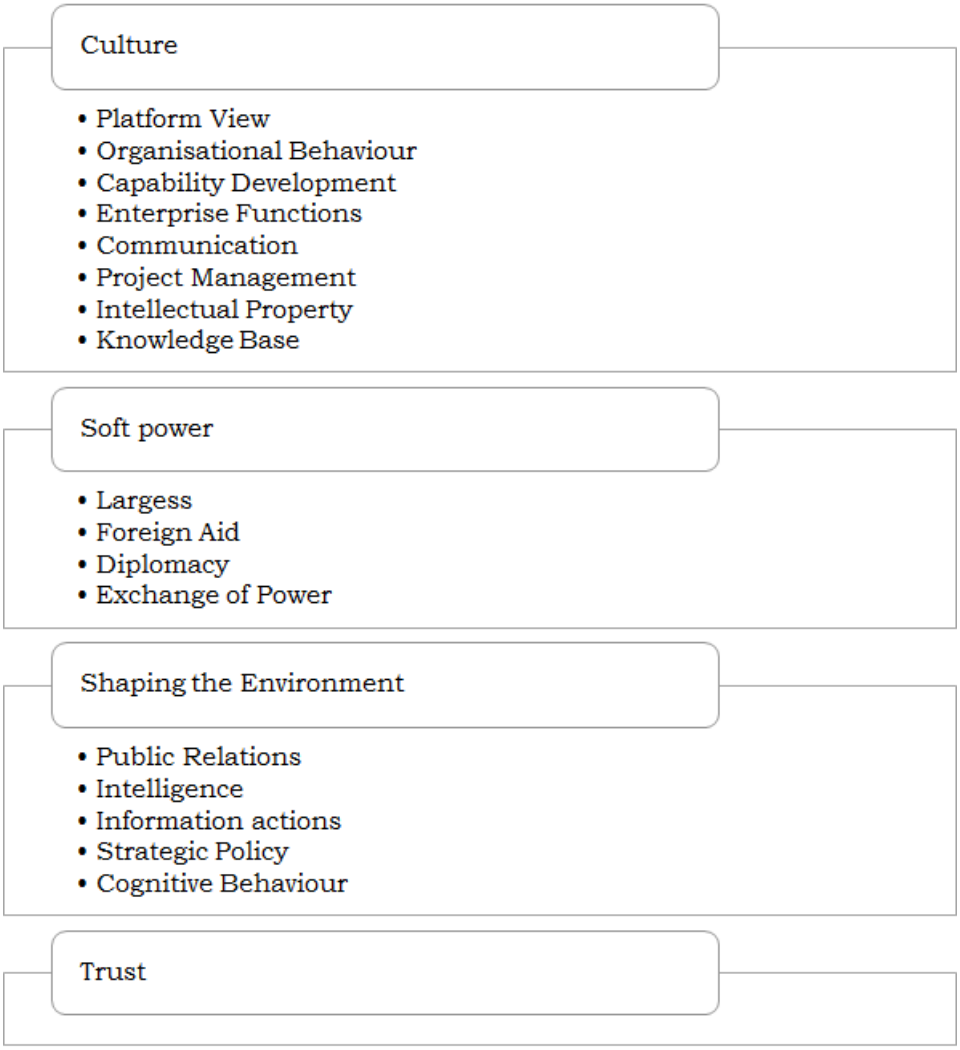


Figure 6.8: Soft Capability examples derived from semi-structured interviews with SME

Culture

Soft capabilities were seen to have both an internal and external effect. The internal organisation effect was often cited to be demonstrated through the organisational culture.

> *I think soft capability is more... It's what military often talk about as their culture* [P6]
>
> *But the other one is that... our military changes as a result of ... of our society* [P12]
>
> *It's sort of knowledge and cultural and all those things ... So it's the... way the organisation deals with problems.* [P8]
>
> *so what I immediately think of when you talk about that is, if you like, the ... embedded knowledge of the organisation, that does reside in people but is never explicitly read out. So that becomes the background and the tacit knowledge that fashions all of the development in the future* [P6]

Culture not only develops the organisation's *modus operandi* it also generated tangible operational effects. These can be as dramatic as the downfall of Napoleon or an Army's approach to foreign cultures within an operational area.

> *It's the eventual surrender and lack of faith of his [Napoleon] Marshals that forces him to abdicate* [P1]

it could be argued that, you know, some of those militaries that have achieved great things because of that level of professionalism and so, that must be a capability [P8]

I'm talking about oral communication skills. Written and oral... interpersonal skills, analytical skills, those sorts of things. In an individual, take it to the next step, those skills will be your soft capability [P8]

The effects are often very visible, however the development of culture was sometimes seen to be a product of the environment or circumstances rather than an explicit and intentional direction.

The scale is different. So we do different things differently. Wouldn't it be wonderful if every capability we could afford to do a comprehensive simulation? But we can't. We don't have the resources. So we do judgement based stuff [P6]

While culture can be a strong empowering capability within an organisation that is able to foster growth, sometimes it can be divisive. In fact, one participant claimed that it is the individual passion that creates friction within the organisation if it is not aligned in a common direction.

Shaping the Environment

The most complex category was "Shaping the Environment". This is partly due to the varied references that were often not explicit and partly due to the scope of the actual example. The following quotes specifically talk about directly shaping and

influencing the operating environment and are a useful measure of the *manipulative* nature of this example.

> *A soft form would be to me in that information environment, in that economics environment, in that diplomacy environment using tools in those areas ... that are manipulative in that sense* [P1]
>
> *It really understands the importance of relationships. The importance of shaping, deterrence well before you actually get to any action* [P4]
>
> *In my view anyway, it's fundamentally a human activity. It's about people. And about influencing and shaping ... You know the technology is almost always the easiest part* [P5]
>
> *not just understand the problem but you get to impact the environment* [P7]
>
> *That we understand the jungle or we understand the culture and symbolism within the environment* [P7]

Clearly soft capabilities can directly affect the environment, however the actual methods or ways are varied. These methods include Public Relations, Information or Intelligence operations, and the development of Strategic Policy. The sub-category 'Cognitive Behaviour' does not directly shape the environment, however it appears to be indicative that the environment is being or is able to be shaped. For this reason it has been included.

- **Public Relations**. Public relations or public affairs was seen as a mi-

nor example of soft capability. Minor in that it was only mentioned by a small number (n=2) of the participants. The use of information to change a paradigm or public perception (as stated in the first and last quotes) was seen as soft capabilities as they did not require a major investment in equipment. Secondly the key to being labelled as soft was the influencing of people, specifically the intentional influence of others.

- **Information Operations**. Information operations really refers to the active use of information to gain an advantage in a contest. This could include active disclosure of information to influence the adversary or the use of information to provide your own organisation time to respond. It is interesting to note the similarity between public affairs (shaping the public perception) and the use of intelligence to shape the enemy response.

- **Strategic Policy**. Strategic Policy was only mentioned explicitly by one participant, however inferred by several. The idea behind this example is that an enforced policy can shape and direct an organisation. Often the outcome is visible through that organisation's culture however it will also manifest in many other enterprise processes and behaviours.

- **Cognitive Behaviour**. The development of cognitive behaviour as an example can be viewed, understandably, as odd. It could quite easily be used to illustrate the specific inputs required to build the human performance of soft capability. It is placed here as most of the participants pointed to cognitive behaviour at least once during their interview as an example of soft capability. Cognitive behaviour was specifically referred as key to soft capability however it was also inferred through discussions on decision making.

It was a common belief that different cognitive behaviours were required at different levels to generate, normally, strategic effect.

Trust

As previously stated, the example of a trust capability could be categorised under "Shaping the Environment", however it provides a rich example of a possible soft capability.

> *... the hearts and minds. Intuitively almost. But we never capture the effect. Because you look at ... why we do hearts and minds? We want a docile population effectively. One that is not aggressive to us. And the follow-on effect to that it is, in fact, you have a reduced threat environment that you're operating in.* [P4]
>
> *Whereas the soft capability would be a hearts and minds approach employed by the force on the ground* [P7]

The two previous quotes were suggested as an example by the interviewer as a prompter and strongly supported by the participants in both cases. The contention was that a soft capability could produce an equitable effect on the environment as a hard capability. For instance consider two capabilities used by the friendly force (Blue Force) in a hostile environment with an active adversary (Red Force). The first is a classic hard capability in the form of an early warning system that allows the Blue Force sufficient time to protect themselves in the advent of indirect fire (i.e. rockets from outside the perimeter). The second is the implementation of a strong *hearts and minds* campaign in the local area. Hearts and Minds campaigns

are designed to 'win' over the emotional (heart) and conscious (mind) support of the local or native population within the environment. This is not a new concept having been popularised in the Vietnam War [87] and used recently when referring to the fighting in Iraq [9] or Afghanistan [127]. Some argue that it is another application of power akin to the Nye's concept of soft power however in a more localised setting [144].

A successful Hearts and Minds campaign should increase the local support for the Blue Force and reduce the support for the Red Force. Theoretically this would reduce the ability of the Red Force to operate in the area and thus reduce the effectiveness of indirect fire attacks on Blue Force. The result of both capabilities would be to reduce the threat to the Blue Force and thus reduce the overall casualties. Note that the capabilities utilised by Blue Force are very different however the resultant effect upon the environment is comparable.

6.4 Discussion

The interviews proved to be a rich resource of data on the prevalent attitudes and perception of capability within the Department of Defence. This is specifically true to those capabilities that appear to be intangible or not directly linked to a major platform. The participants were varied, however, all had a deep understanding of the capability development field within Defence. The majority of participants were Army with only a few from Navy and Air Force (n=3) however, as most of the Army participants had served in or were currently serving in joint organisations, this was not felt to overly bias the results. It is unlikely that increased participa-

tion from the other two services would have significantly changed the results. The inclusion of a number of public servants reinforced the results.

Despite having a homogeneous population, comparative to a random sample, there still existed a broad and sometimes contrary opinion on the concept of soft capabilities. Soft capability was however regarded by all participants as a true capability. The different perspectives or lenses through which soft capability was regarded is not, in retrospect, surprising. It reflects the broad utility of the concept and a lack of discussion in the field. As previously discussed, there are no published documents that specifically deal with the concept of soft capability yet there appeared to be an almost intuitive understanding of the concept. This understanding seemed to stem from people's exposure to other *soft-hard* dichotomies such as soft and hard power or soft and hard operations research. These examples provided the participants with an example to anchor their ideas to.

Given that the "experts" had a divided opinion on Soft Capability, it is also not surprising that there was general agreement that the importance of Soft Capabilities was not appreciated within wider Defence. Capability development within the Department of Defence is focused on several high level documents, the Defence Capability Plan (DCP) and the White Paper [39]. The DCP contains only those projects that require first and second pass approval through Government. The recent First Principles Review 2015 recommended that any project over $20m required at least one minister's approval [197]. Already it can be seen that the primary condition to be considered as a developable capability is the cost of the project rather than the producible effect.

The perceived indifference to the development of soft capability is not unique and was recently remarked upon in an Australian Army discussion paper on Officer development. While the comment was specifically regarding strategic "nous", it highlighted a prevalent attitude to allow serendipitous rather than deliberate development of capabilities that were of much less importance [14, p.8].

It is clear that people are central to the concept of soft capability and additionally its intangibility was commented upon by almost all of the participants. There appeared to be confusion over firstly the use of the terminology "people"; and secondly whether it was just a characteristic or an input to the capability. "People" were referred by the participants alternatively as a discrete input, a bearer of the capability, the defining characteristic and also the source of the intangibility for soft capabilities. The centrality of people is akin to the understanding in Soft OR that people are an integral part of the process [108, p. 4].

The discussion of inputs lead to two trains of thought. Most of the participants regarded the contemporary FIC model espoused in the Defence Capability Development Handbook and the Preparedness and Mobilisation manual as relevant [38, 37]. There was general agreement that while soft capabilities did not use the same inputs (such as Major Systems) to the same degree as hard capabilities, the compartmentalisation of resources provided by the FIC model was sufficient.

The second train of thought was that the FIC model was insufficient to deal with the perceived complexity of soft capability. In other words the FICs used as

building blocks for traditional capability did not adequately capture the cognitive behaviours required to produce soft capability. The *Personnel* FIC did not fully capture the social influences and emotional "intelligence" required from the operators. It only describes the core competencies and physical attributes required of the "human". This lead the research down the *Human Performance* path.

The Australian Army recently recognised the importance of human performance and have created an "Army Modernisation Line of Effort" (AMLE) specifically for this field [13, p.7]. The Army Research and Development Plan describes AMLEs as required "to coordinate actions necessary to ensure the Army is fit to prevail in current operations, as well as prepare for an uncertain future" [13, p.4]. Reinforcing the value of the Human Performance AMLE, Lieutenant General Morrison, AO, the then Chief of Army, stated in an address to the Land Forum 2014 that "we require a revolution in the training and education of the Army. After all, building and sustaining advantage based on the capabilities of Army's people - a cognitive edge - is where the Army is most likely to gain a competitive advantage" [173].

The term *Human Performance* has received some coverage in academic literature and has covered areas such as individual load carriage and individual response to high stress, complex environment [19]. The common denominator has been the focus on the individual. These interviews showed that perhaps the term should encompass more than the individual and include the collective. Human Performance can be viewed as that thing that we needed the individual or collective to do. Just having the individual skills or physical capacity was not enough. There

needed to complementary and positive team systems.

While two characteristics (people and intangible) dominated the discussions, this appeared to reflect the reality of the environment these capabilities are expected to operate in. Specifically a complex environment where the agents are not acting in a rational and pre-determined manner. People may be a defining characteristic but that is because they are the major system within the capability.

The discussion regarding the complexity of the environment in which soft capabilities operated was interesting. Certainly it followed the dominant thought that people were an essential requirement of soft capability and, as systems that include fluctuating societal norms could be classified as complex, this made sense [132]. The problem is that the complex environment is not really unique to soft capabilities, particularly in a Defence context. As one of the participants stated the "nature of war ... is enduring. It is basically a clash of wills." Thus any capability (hard or soft) used to pursue war-like goals would, in this context, be involved in a clash of wills. This means humans, or at least until fully capable and wilful Artificial Intelligence is developed. Hence it would be fair to say that all capabilities generate an effect within a complex environment.

It does appear though that the level of complexity is different when comparing hard and soft capability. In that it seemed many of the participants inferred that soft capabilities operated in and affected an adversary in much more complex systems and environments than hard capabilities. Certainly this would be an interesting avenue to pursue though, at this stage, slightly outside the scope of this

work.

The range of examples provided throughout the interviews was interesting for two reasons. Firstly, it demonstrated that there did not seem to be a consensus on the concept of soft capability and this research hopes to resolve at least part of that problem. The second being that soft capabilities appear to have a broad applicability within the Defence environment. This ranges from the delivery of soft power effects to strengthening an organisation's culture to developing a trust capability.

6.4.1 Modelling Soft Capability

The research has demonstrated that soft capability is perceived as different to hard capability [230]. This perception is based on the idea that soft capability is intangible however the intangibility does not prevent soft capabilities from affecting the environment. It appears that the intangibility nature of soft capability is really a reflection of the (1) complexity of the capability and (2) the inability to quantify the capability using existing tool sets.

Soft capabilities were perceived to be complex and, as previously stated, is consistent with of the *Cynefin* Framework developed by Kurtz and Snowden (2003) in which they describe the complex domain [132]. The complexity is merely a perception that reflects the difficulties in modelling the environment and the agents operating within that environment. The reliance upon people though is a constant and should be acknowledged within the any soft capability modelling.

We know that hard capabilities can create an effect in the environment. We also know that soft capabilities can create an effect. This effect could be the same or different, however, it is measurable. We have seen that both soft and hard capabilities work together. While a capability is defined by the ability or capacity to produce an effect, it is not useful unless that effect is desired. Hence it requires purpose. Finally we have seen that the fundamental inputs to capability are effectively the same for both hard and soft capabilities. Figure 6.9 on page 256 models this behaviour.

Model Description

The model attempts to describe not only the effect that a soft capability has on the environment but also the relationship it has with hard capabilities. There are four capabilities represented in this model: *Platform 1*, *Platform 2*, *Soft Capability* and *Hard Capability*. The four capabilities share the same FIC base. This is to illustrate that the current FIC models utilised within Defence and elsewhere are still sufficiently correct. The extent to which each capability requires specific input will obviously differ.

Platform 1 is unable to purposely affect the environment without soft capability. The reliance upon people to purposely affect the environment was enunciated many times throughout the interviews and this connection represents that view. The combination of both Platform 1 and Human Performance creates the traditional hard capability that is generally observed and reported on.

Platform 2 can not purposely affect the environment however it can affect soft capability. An example would be the use of training system to enhance or develop human performance. In this case the training system (this could be a simulator or even a learning institution) is Platform 2. Soft Capability though does not require either Platform to purposely affect the environment.

Effect A and Effect B are the measurable effects within the environment. Effect A is caused by the traditional hard capability while Effect B is caused by what is perceived to be a soft capability. It is a this point that the role of perception should be noted. Both effect A and B are measurable. The tangible hard capability contains Soft Capability and Platform 1. As the capability is tangible then soft capability must also be tangible. Thus, it should be observed that Soft Capabilities are measurable.

6.5 Contribution

Strategic thinking did not appear to fit within the traditional capability construct as it was not immediately obvious or tangible. Conceptually, if strategic thinking was a capability, it would be a soft capability. This chapter sought to elicit a common understanding of a soft capability. This was desirable as the traditional capability paradigms did not appear to encapsulate strategic thinking. To derive the conclusions a number of subject matter experts in capability development, within the Australian Defence Organisation, were consulted. Using a semi-structured interview method, with a short feedback loop, participants were questioned about their views on capability development and the term soft capability.

The results were interesting and clustered to provide meaningful conclusion. It was found that consensus on soft capability was achieved after very few interviews with 12 characteristics identified. Of these characteristics, the centrality of people and the perceived intangibility of the capability were the most significant. Hard capability though appeared to be platform-centric - an example would include a long-distance strike ability based on a specific aircraft type.

However, to answer research question 4a, soft capability appears to be people-centric. The humans in the system are the bearers of this capability. Examples included the ability to shape the environment or to create a trusting relationship. The biggest concern regarding soft capabilities is their ability to be directly measured. How do you measure trust? This inherent intangibility appeared to be one of the defining characteristics of a soft capability.

Addressing research question 4b, it appears possible to develop soft capabilities using the same capability development framework as hard capabilities. The foundational resources and FIC models are the same however the focus is, as already discussed, upon people. Soft capabilities appear to rely on, and enhance, human capacity to affect the environment. Finally, in answering question 4c, strategic thinking can be developed as a soft capability when there is an obvious connection to the effect. In most cases, organisations should expect that developing strategic thinking should allow the organisation to become more robust in the face of uncertainty and more proactive in influencing the operating environment.

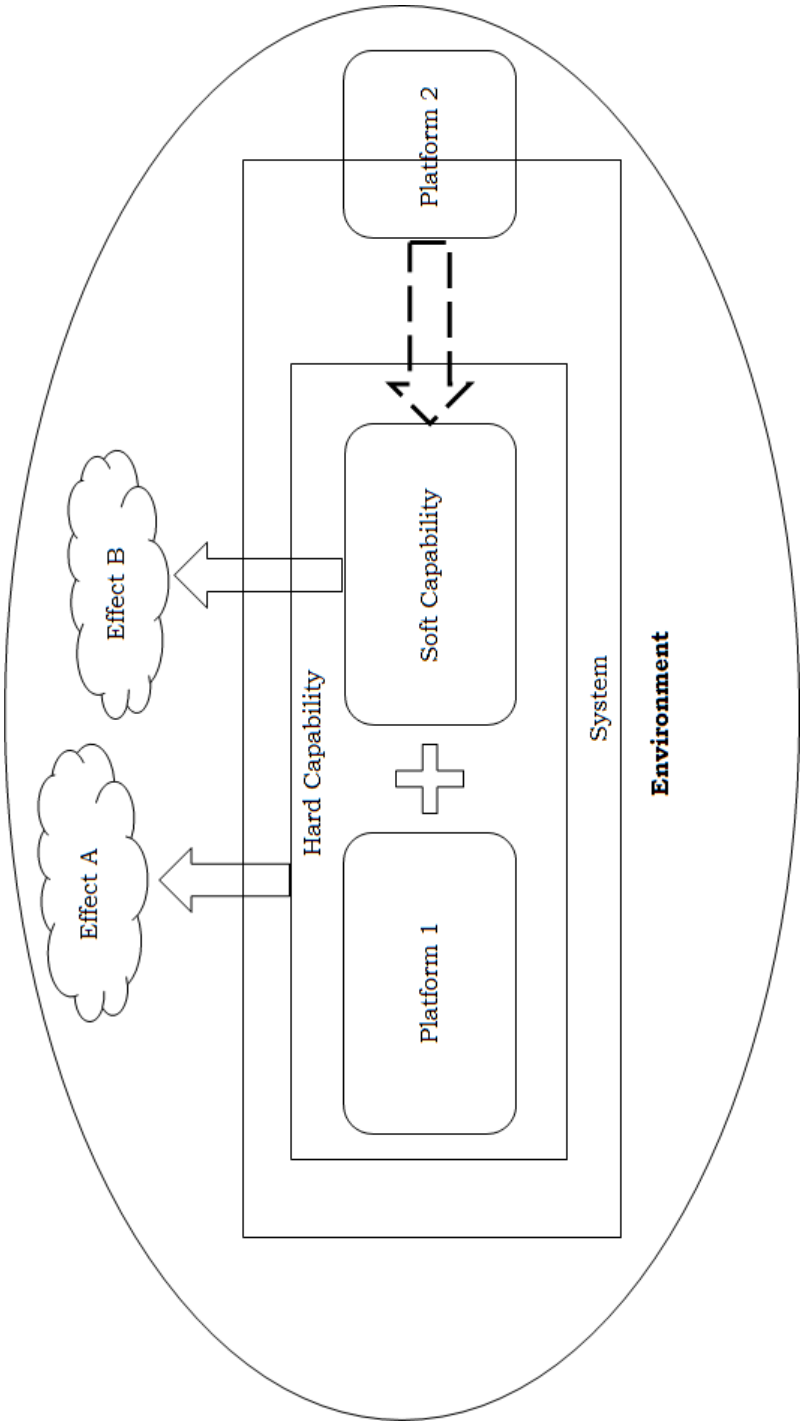


Figure 6.9: Modelling Soft and Hard Capability interacting with the environment

Chapter 7

Conclusion

The need for good strategy is evident and continues to attract strong attention within public and academic discussions. It feels that every day brings a new concern with not only the perceived lack of good, synchronised strategy but also the apparent lack of strategic thinking at all levels. There is concern in the national security apparatuses, government departments, non-profit organisations and businesses of varying sizes that strategic thinking is under-developed and difficult to address.

7.1 How should a strategic thinking framework be designed?

This thesis sought to understand how a strategic thinking framework should be designed. As a framework, it was important to clarify the foundational concepts before building a frame that could not only describe strategic thinking but also how strategic thinking could be developed. To build the framework, four research

questions were asked. These questions have been addressed and will now be summarised and concluded.

7.1.1 What is strategic thinking?

This research quickly established that there was a lack of consensus on strategic thinking and that consensus was appeared to be challenged by the misuse of, ultimately, poorly understood terminology. The foundational concepts of strategy and strategic thinking are contested. Due to the quantity and quality of literature regarding strategic thinkers, a meta-analysis approach was used to synthesis the various results. This research was able to establish definitions for strategy and strategic thinking derived from a longitudinal literature review. Strategy is a "future-orientated intent by an independent actor that connects capability with effect and seeks to create competitive advantage". The outcome of a strategy is a future competitive advantage. Strategic thinking is defined as "a means-ends way of thinking that is future orientated and seeks to create value or an advantage for the system".

The research into the definitions revealed four significant gaps in the literature. These gaps guided the work in this thesis and are:

- **Requirements for strategic thinking.** Understanding the concept of strategic thinking is only part of the problem. What is apparently missing is the requirements for strategic thinking. In this case, the requirements of a strategic thinker are used as a proxy for the agent of strategic thinking. Simply - what makes someone a strategic thinker?

- **Assessing strategic thinking.** The next step, after understanding what the requirements are, is to ascertain how strategic thinking could be assessed. How do we know that strategic thinking could take place, or has taken place? What are the practical tools that could be used to measure strategic thinking capacity?

- **Developing strategic thinking.** After designing indicators for strategic thinking, it would be logical to understand how to improve, or develop, that ability. There appears to be very little quantitative evidence on the potential influencers of strategic thinkers.

- **Responsibility for strategic thinking development.** Finally who is responsible for the development of strategic thinking within an organisation? Traditionally, strategic thinking has been seen as the providence of the individual, but is it possible for the organisation to treat strategic thinking as a developable capability?

7.1.2 What are the requirements for strategic thinking?

Like strategy, strategic thinking is an oft-confused term that suffers from overuse. To reconcile the volume of research and diversity of ideas, and to understand the contemporary understanding of strategic thinking, a cluster analysis was conducted. This analysis revealed a set of domains that are common within literature when defining strategic thinking. The domains (create-value, means-ends thinking, future orientation and way of thinking) were then synthesised to define strategic thinking as *a means-ends way of thinking that is future orientated and seeks to create value or an advantage for the system.*

This definition allows strategic thinking to be viewed as a capability with the capacity (way of thinking) to generate an effect (create value and future orientation). A capability lens then proves useful to understanding the agents of strategic thinking, the strategic thinkers. Again the cluster analysis method proved useful in developing a meaningful understanding of the contemporary research into strategic thinkers. The initial analysis revealed 19 different characteristics of a strategic thinker. While all of these were supportable, 19 characteristics presented an unwieldy set and were further reduced through synthesis. What emerged were three strong characteristics (systems thinking, creative thinking and visionary thinking) and one unifying characteristic (intuition).

7.1.3 How can strategic thinking be assessed?

Having identified that there are very few measures of strategic thinking, this chapter took the approach to evaluate the potential capacity of strategic thinking through the assessment of the underlying cognitive characteristics. These characteristics were previously identified as visionary thinking, intuition, creative thinking and systems thinking. Prior to investigating these characteristics, several variables were identified as being strong indicators of strategic thinking: cognitive ability and accumulated work experience.

While creative thinking, systems thinking and intuition had a selection of existing assessment tools, this chapter identified a gap in the assessment of visionary thinking. A unique assessment tool was created through an understanding of the

original terminology found in the literature review. This assessment tool, while qualitative, was pilot tested with a small population and found to be broadly accurate. It is recognised that the visionary thinking item would need some refinement.

Understanding that each of the cognitive characteristics were measurable allowed the development of a strategic thinker model. The four characteristics are normalised on a four-axis spider graph that allows for an illustration that is quickly understood and compared. This model, and the associated strategic thinking assessment, was then pilot tested using two small groups: one using ADF participants and the other comprised of civilian executives. This pilot test found that the assessment tool was broadly accurate and easy to use. Further it identified that experience was likely to be strongly correlated with strategic thinking.

7.1.4 How could strategic thinking be developed?

Using the strategic thinking assessment, this research took on an organisational focus and investigated the development of strategic thinking in the Australian Defence Force. The research managed to secure a large number of participants that was representative of the broader population. The results of the assessment allowed the development of strategic thinking development models for that organisation. The resultant models are organisational (service and ADF) specific however, given the nature and size of the organisation, these strategic thinking development models are useful frameworks for other organisations.

The demographic variation within the participant body ensured that the results

were statistically representational of the organisational headquarters. Furthermore the results provide a strong indication of the strategic thinking development within the broader organisations. Figure 7.1 illustrates the strategic thinking development model for the Australian Defence Force and the research suggests that the model can be applied across multiple organisations and domains.

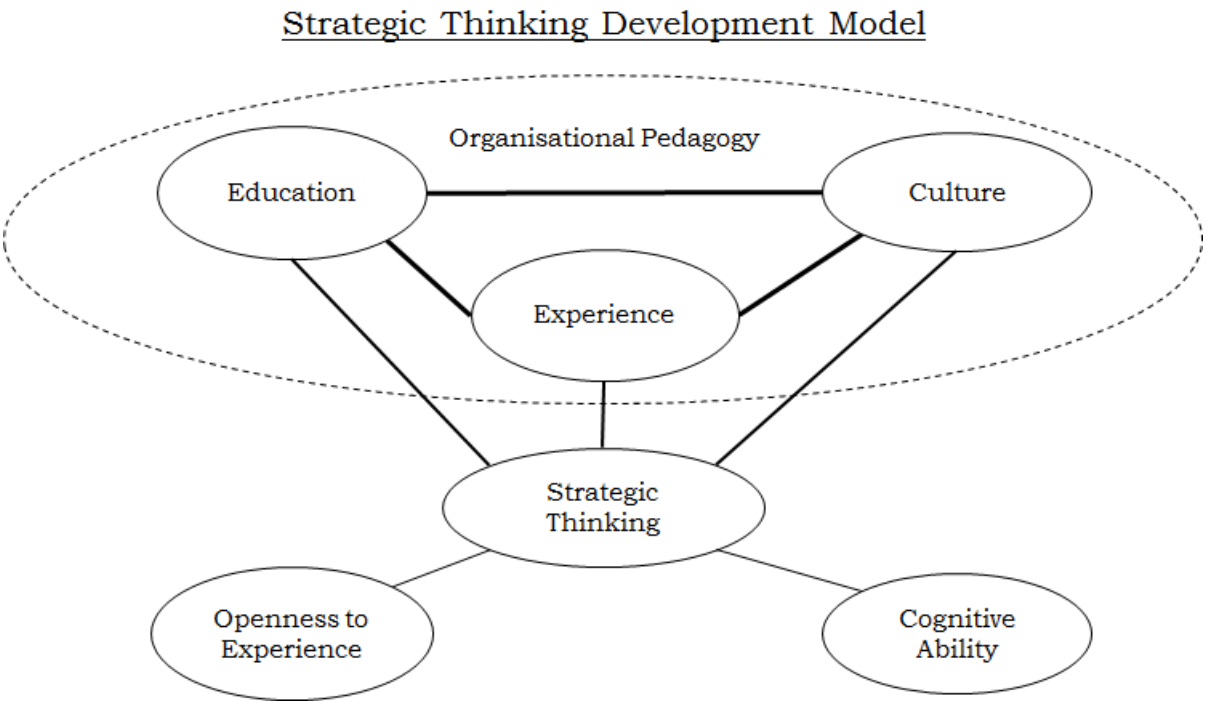


Figure 7.1: Strategic Thinking Development Model

The model shows that strategic thinking is influenced by both natural and nurtured phenomena. For instance, the individual's natural cognitive intelligence and openness to experiences positively influences their capacity for strategic thinking. Additionally organisational pedagogy also influences the development of strategic thinking capacity. It is clear from this research that there are educational programs, experiences and cultures (including performance management and pro-

motion) that influence the development of strategic thinking. This conclusion is supported through regression analysis and illustrated by the differences between the individual service models.

7.1.5 Who owns strategic thinking?

Finally this research investigated at what level strategic thinking should be owned, and thus developed. Taking the view that strategic thinking should be an organisational capability, this research investigated and validated the concept of soft capabilities. It is this framework that allows strategic thinking to be described and developed in much the same way as any other operational capability.

Firstly, soft capability appears to be people-centric. The humans in the system are the bearers of this capability. Examples included the ability to shape the environment or to create a trusting relationship. The biggest concern regarding soft capabilities though is the difficulty in applying quantifiable metrics. How do you measure trust? For that matter, how do you measure a strategic thinking capability. This inherent intangibility also appeared to be one of the defining characteristics of a soft capability.

Secondly, it appears possible to develop soft capabilities using the same capability development framework as hard capabilities. The foundational resources and FIC models are the same however the focus is, as already discussed, upon people. Soft capabilities appear to rely on, and enhance, human capacity to affect the environment. Thus, we can conclude that strategic thinking can be developed as

a soft capability when there is an obvious connection to the effect. In most cases, organisations should expect that developing strategic thinking should allow the organisation to become more robust in the face of uncertainty and more proactive in influencing the operating environment.

7.2 Contribution

This thesis asserts that strategic thinking can be assessed and quantified. Furthermore, strategic thinking can be engineered within an accepted framework. This thesis proposes that an interdisciplinary approach can be used to investigate strategic thinking. This approach potentially provides a significant contribution to the field of strategy. The first contribution of this thesis is the proposition of original definitions for strategy and strategic thinking founded on a contemporary historical literature review.

Additionally, due to the lack of assessment tools for quantifying strategic thinking capacity, the second contribution of this thesis is the proposal of a new strategic thinking assessment instrument. The results also potentially provide a wealth of data on the development of strategic thinking in organisations. The assessment tool is developed using qualitative research methods based on identified cognitive characteristics of strategic thinking. These characteristics are targeted and measured in an original self-reported assessment instrument.

After being pilot tested for validity, the assessment instrument was then used to investigate the strategic thinking capacity of over 600 executives in a major or-

ganisation. The results provided significant quantities of data and new information on the development of strategic thinking within a large and complex organisation. The results were synthesised and then translated into an organisational strategic thinking model that, in turn, provides strong indications of how strategic thinking could be engineered at the organisational level. The resultant strategic thinking models identify significant variations in development between strategic headquarters. This variation allows the thesis to make a third contribution where the proposition that organisational pedagogy has a significant impact on the development of strategic thinking is supported.

Finally, as strategic thinking could be argued as either the responsibility of the individual or the organisation, the fourth contribution of this thesis is the development of a framework that allows organisations to own the strategic thinking development process. Using semi-structured interviews, nodal analysis and thesis validation, this research was able to propose that strategic thinking can be engineered as a capability and thus should be the responsibility of the organisation.

7.3 Future Work

Despite the advances made by this thesis, there are still a large number of research questions that could be pursued. The following list is just an example:

- *How could individual organisations develop strategic thinking based upon the known correlations?* This thesis identified significant correlations between strategic thinking and other variables - specifically within the pedagogy domain. This question looks to expand upon the identified correlations and

attempt to understand the *levers* within an organisation. The significance of this question is the resultant ability of organisations to specifically modify their pedagogy to develop an organic strategic thinking capability. The two biggest levers appear to be the cultural preference for broad generalists with a good systems understanding and the encouragement of post-graduate education.

- *Is the development of strategic thinking population dependent?* This thesis derived its conclusions from a large investigation into a fairly homogeneous population - the Australian Defence Force. While it could be argued that this population is fairly representative of the Australian population, this argument is not conclusive nor supported by the author. Additionally, the tested population is not representative of an international population. This question could be addressed through a comparative study using a population from societies with similar cognitive biases (such as the United Kingdom or the United States of America) and with fundamentally different world views (such as a South-East Asian or Middle Eastern country). Answering this question will allow understanding of variation required in strategic thinking development models.

- *Are the strategic thinking development models military specific or are they applicable to the business (for-profit) environment?* This question is very similar to the previous, however, looks to really understand the difference in cultures. Military populations are thought to have a very different culture than business. This question will hopefully demonstrate that the development of strategic thinking is achieved through the same levers independent

of the population type.

- *Can visionary thinking be assessed using a more quantitative method and remove assessor bias?* The current instrument used for measuring Visionary Thinking was developed as part of this thesis. The resultant instrument relies on assessor judgement and, as such, is inherently biased. The ability to remove subjective bias from this instrument greatly increases the reliability of the result and should also enable greater automation of the assessment. The benefits then are in time and quality.

- *Is there a better system thinking assessment that allows greater fidelity of grading?* The instrument used for measuring systems thinking is fairly coarse. The original measure initially had three levels of systems thinking. This was modified to five levels for this thesis. Being able to develop a more refined systems thinking instrument would provide greater accuracy in developing strategic thinking models. There would be an additional utility to the field of systems engineering where there appears to be a lack of consistent, non-biased measures of systems thinking. Research identified that there are upwards of seven different attributes of a systems thinker that may either be cumulative or sequential. This thesis indicates that these seven levels would perhaps be a more accurate way of designing indicators for strategic thinking capacity.

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Appendix A

Strategic Thinking Literature Review

Item	Author	Key concept of strategic thinking
1	Ohmae (1978)[186]	Strategic thinking is defined as a combination of analytical method and mental elasticity **used to gain competitive advantage** (cited by Pellegrino and Carbo, 2001)
2	Das (1987)[64]	Strategic decision making is the **process** by which top management makes its most fundamental decisions
3	Howard (1989)[113]	Strategic thinking is ... **a state of mind rather than a simple process** ... about breaking away from the strictures of conventional wisdom
4	Stumpf (1989)[215]	Strategic thinking involves **identifying different ways for people to attain their chosen objectives** and determining what actions are needed to get them into the position they want to be in.
5	Nasi (1991)[141]	Strategic thinking extends both to the **formulation and execution of strategies** by business leaders and to the strategic performance of the total enterprise. It includes strategic analysis, strategic planning, organization and control and even strategic leadership. Therefore, strategic thinking basically covers all those attributes which can be labelled "strategic". (cited by Liedtka, 1998)
6	Zabriskie and Huellmantel (1991)[233]	Strategic thinking is the **prelude to designing** an organization's future. Strategic leaders cannot lead intelligently unless they have **a mental blueprint** of where they want to go, and how they will get there
7	Thakur and Calingo (1992)[218]	Strategic thinking, then, **represents the conceptual glue that holds the organization together** in its pursuit of value creation

Item	Author	Key concept of strategic thinking
8	Stacy (1993)[124]	**Planning based on learning** (cited by Kamangar, 2012)
9	Mintzberg (1994)[164]	Applying creativity for **creating new values**
10	Mintzberg (1994)[167]	**Prelude for future designs**
11	Mintzberg (1994)[124]	**Integrative view of trade** in mind (cited by Kamangar, 2012)
12	Hamel (1994)[124]	**Artistic architecture of strategy** based on creativity and understanding (cited by Kamangar, 2012)
13	Chilcoat (1995)[50]	**Strategic art is the skilful formulation, coordination, and application of ends (objectives), ways (courses of action), and means (supporting resources)** to promote and defend the national interests. It includes mastery of other instruments of power.
14	Porter (1996)[193]	Strategy is **the creation of a unique and valuable position**, involving a different set of activities
15	Builder (1997)[32]	Strategic thinking **focuses on the 'ends'**, is transformatory in nature and represents 'check and mate' moves in chess.
16	Heracleous (1998)[106]	The purpose of strategic thinking is to **discover novel, imaginative strategies** which can re-write the rules of the competitive game; and envision potential futures significantly different from the present. (Thought process: Synthetic, divergent, creative)
17	Liedtka (1998)[141]	Strategic thinking is **a way of thinking** that involves system perspective, intent focussed, thinking in time, intelligent opportunism and hypothesis-driven
18	Mintzberg (1998) [124]	An **approach for appropriate manner** of organization (cited by Kamangar, 2012)
19	Mintzberg (1998) [124]	Approach for **discovering of unanswered needs** to market and costumer (cited by Kamangar, 2012)
20	Bain and Mabey (1999)[17]	strategic management thinking focuses on **delivering long-term value to an enterprise** while at the same time **ensuring that predetermined short-term goals are met**

Item	Author	Key concept of strategic thinking
21	Zahn (1999)[234]	strategic thinking is **a process of discovering insights**, strategic planning is the process of turning that insights into action. Strategic thinking is about synthesis and results in an integrated perspective, a not-too-precisely articulated vision of direction...
22	Bonn (2001)[27]	Strategic thinking **develops new ideas and provides a vision**. It takes place before planning.
23	Dickson, Farris and Verbeke (2001)[72]	Strategic management is the investment, redeployment and restructuring of financial, human, organizational, and intellectual capital that **create flows of revenues and cash beyond the short-term horizon**
24	Pellegrino and Carbo (2001)[186]	Strategic thinking becomes a function of how much the individual strategist's **personal cognition style** mandates a reliance on cognitive simplification tools
25	Graetz (2002)[94]	The role of strategic thinking is "to **seek innovation** and **imagine new and very different futures** that may **lead a company to redefine its core strategies** and even its industry".
26	Masifern (2002)[153]	strategic thinking as a set of ideas, principles, policies, concrete rules and operational procedures that shape the way managers think about their role and that guide their daily actions... In this sense, therefore, strategic thinking can be thought of as **a state of mind** ... If strategic thinking contributes to a common language, a shared understanding and organizational learning, it may become an important ingredient of **the glue that will hold together the organizations of the future**.
27	O'Shannassy (2003)[185]	strategic thinking is **a particular way of solving strategic problems** at the individual and institutional level combining rational and generative thought processes
28	Henden (2004)[105]	Strategic thinking is often defined as **a coherent, unified perception** that reveals a unique and consistent set of patterns and activities, **propelling the company into what it is to be**
29	Bonn (2005)[28]	strategic thinking as **a way of solving strategic problems** that combines a rational and convergent approach with creative and divergent thought processes

Item	Author	Key concept of strategic thinking
30	Abraham (2005)[2]	The challenge in strategic thinking is to **find innovative ways of co-creating value** with customers, a technique for **finding unique competitive advantage**
31	Goldman (2005)[90]	the essence of thinking strategically means understanding the implications of a situation and possible alternatives, and, **identifying and executing a direction that is orientated to achieving a position different from the present** ... means constantly questioning and evaluating
32	Larson and Hansen (2005) [135]	Strategic thinking is to **pursue a goal** or carry out a plan that involves human systems requires pragmatic, **means-ends thinking** that takes into account these properties
33	Tavakoli and Lawton (2005)[216]	Strategic thinking is **the cognitive process** that can and should precede strategic decisions and actions, whether arrived at through planning or emergent action. Strategic thinking occurs when a person **contemplates the future** of an organisation taking into consideration its environmental and competence variables. A widespread and integrated capability in strategic thinking within the organisation can **create a core competency that can enhance and sustain its competitive advantage**.
34	Eicher (2006)[77]	Strategic thought refers to the ideas, reasons and processes for **changing the future state of your organization**. It require 3 elements Vision (where), Intent (why) and Planning (how)
35	Sloan (2006)[210]	Strategic thinking is an **intent-driven approach** to strategy based on critical theory and **supported by a complex cluster of cognitive capabilities** that are distinct and different from strategic planning
36	Yarger (2006)[227]	Strategic thinking is difficult. It is best viewed as both an art and a science. The framework of theory provides a methodological basis for a disciplined thought process to **assist the strategist in developing strategy**, and it also serves as a guide for others to follow in comprehending, evaluating, and critiquing the merits of a particular strategy
37	Nag et al (2007)[180]	Strategic management is defined as a process of building "capabilities" that allows a firm to **create value** (cited by Nuntamanop, Kauranen and Igel, 2013)

Item	Author	Key concept of strategic thinking
38	Kluyver and Pearce (2009)[157]	Senior leaders use strategic thinking to **create an organizational long-term vision that maintains flexibility** (cited by McCauley, 2012)
39	Malan (2009)[150]	When "strategy" is connected to "thinking" within the context of organisations, strategic thinking is defined as "**a particular way of solving strategic problems** at the individual and institutional level combining rational and generative thought processes. Strategic thinking entails the process of **finding alternative ways of competing and providing customer value** through a process of creative, intuitive, dynamic and responsive thinking combined with rational, analytical and convergent approaches to problem solving
40	Jelenc and Swiercz (2011)[121]	Strategic thinking **is a process** in which a person is perceiving, reflecting, feeling, realizing and acknowledging signs that **impact the future of the firm**, giving them meaning and acting upon them by shaping the impressions, perspective and behaviour accordingly
41	Goldman (2012)[91]	Strategic thinking is conceptual, systems-oriented, directional, and **opportunistic thinking leading to the discovery of novel, imaginative organizational strategies**
42	Kamangar (2012)[124]	Strategic thinking is about to **developing unique opportunities to create value**
43	Jans (2013)[120]	Strategy is fundamentally about **making decisions** and establishing policies and capabilities ***today*** **with the clear intention** of their being the instruments **of performance *tomorrow***
44	Moghaddam and Amirkamali (2013)[168]	Strategic thinking is referred to **the process of creative and divergent thinking** and it plays an essential role in major issues of countries and organizations as well as personal decision making and planning
45	Grundy (2014)[100]	Strategic thinking is iterative and **unpredictable**; inductive and intuitive; **creative**; **ambiguous** and fuzzy boundaries; and anxiety provoking.

Table A.1: A chronological list of key quotes from the literature on strategic thinking and closely related topics that we used as the backbone for the literature review in this thesis.

Appendix B

Strategic Thinking Domains

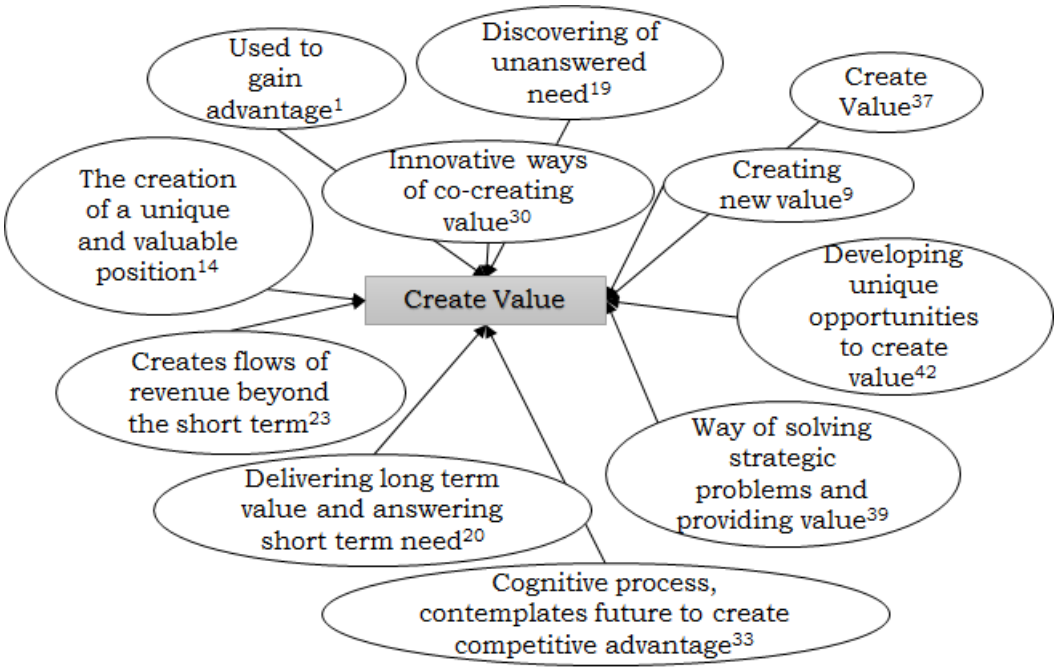


Figure B.1: Create Value Domain

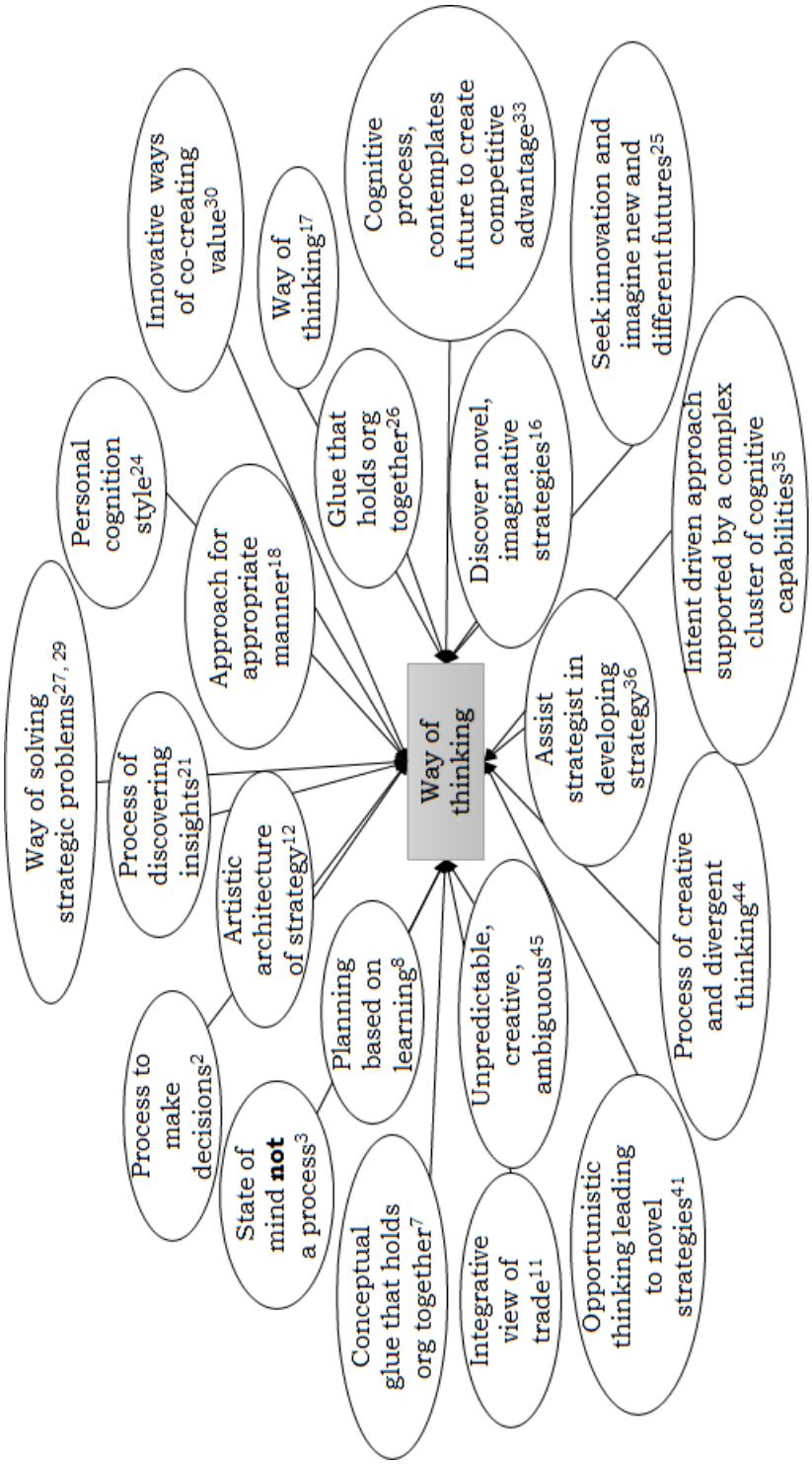


Figure B.2: Way of Thinking Domain

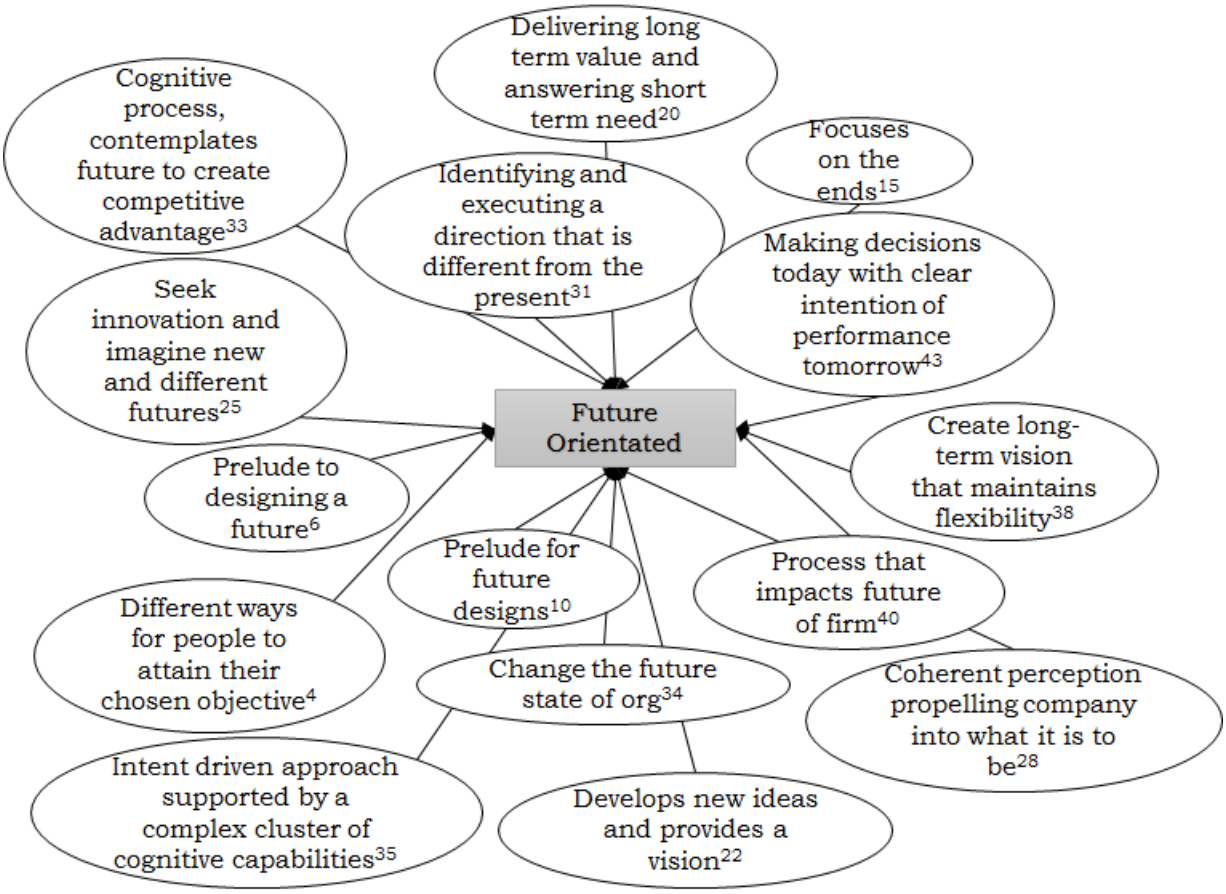


Figure B.3: Future Orientated Domain

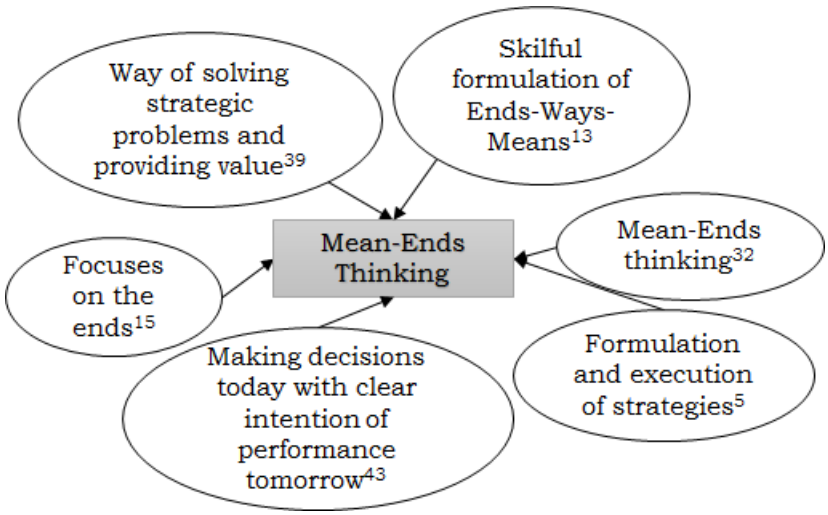


Figure B.4: Means-Ends Thinking Domain

Appendix C

Strategic Thinker Characteristics Literature Review

Author	Key Characteristics				
1 Easterby-Smith and Davies (1983)	Aware of broader contexts	Longer time-horizons		Individual initiative	
2 Mason (1985)	Holistic Abstract or symbolic view				
3 Das (1989)		Future time perspective			
4 Howard (1989)		Vision	Creativity		Curiosity Wisdom
5 Stumpf (1989)	Ability for complex thinking Ability to diagnose threats	Ability to envision		Ability to optimise benefits from competing goals	Ability to focus Ability to accommodate adversity

Author	Key Characteristics					
6 Hallinger and McCary (1990)	Consider interplay between actions and responses Overarching awareness of relation between needs and capacity	Characterised by clear vision				
7 Napier and Albert (1990) (cited by Monavvarian, 2014)	System thinking Identifying repetitive patterns	Thinking about long-term profits Thinking in time				
8 Zabriskie and Huellmantel (1991)	Assess risks, revenues and costs of alternatives	Visualise future	Reposition resources	Think about and identify questions they want strategic plan to answer	Think logically and systematically	
9 Thakur and Calingo (1992)						Pro-active / risk-taking Locus of control Power relationships

Author	Key Characteristics					
10 Bates and Dillard (1993)		Tolerance of ambiguity	Mental elasticity Abstract thinking	Intuition		Tolerance of risk
11 Jacobs (1994) (Cited by Jelenc and Swiercz, 2011)	Complex understanding	Long-term perspective	Conceptual flexibility			Political sensitivity Quick-study / perspective
12 Mintzberg (1994)	Integrated perspective of enterprise	Articulated vision of direction	Creativity	Intuition		
13 Mintzberg (1994)	Synthesis	Visionary	Creative	Intuitive		
14 Foster (1996)	Critical Grasp the big picture Discern important relationships	Broad-gauged visionaries	Creative Generate imaginative possibilities	Operate in conceptual realm		
15 Liedtka (1998)	Systems Perspective	Thinking in time	Hypothesis driven	Intelligent opportunism	Intent Focused	

Author	Key Characteristics					
16 Bonn (2001)	Holistic understanding of organisation and environment	Vision for the future of the organisation	Creativity			
17 Boal and Hooijberg (2001)	Managerial wisdom (systems thinking)	Absorptive capacity (ability to learn, sense making, vision and tolerance)		Adaptive capacity (ability to change, innovate and respond)		
18 Chilcoat (2001)	Think holistically Understand cause-and-effect relationships	Think normatively	Be creative Think conceptually	Think in abstractions		
19 Dickson et al (2001)	Ability to understand and anticipate effects of complex, often chaotic, dynamic interactions					
20 O'Shannassy (2001)	Flexible inputs	Thinking in time	Problem solving		Strategic intent	Participation of stakeholders
21 Graetz (2002)	Synthetic		Creative	Intuitive		

Author	Key Characteristics					
			Innovative Divergent			
22 Keelin and Arnold (2002)	Broad view with zoom-in	Important, non-intuitive, framework-breaking ideas	Abstract with powerful engage-ment of imagina-tion Embrace alterna-tives and uncertain-ties	Abstraction illustrated with con-crete examples	Aims to achieve an over-arching goal	
23 Masifern and Vilà (2002)	Synthesis Integrated perspec-tive of the enterprise		Creativity	Intuition		
24 O'Shannassy (2003)	Clear mental picture of complete system of value creation	Clear, direct, intuitive under-standing of future direction Thinking in time	Problem solving			Encourage partici-pation of stakehold-ers
25 Henden (2004)	Synthesis Integrated perspec-tive of enterprise	Foresight	New ideas	Intuition		Sense of right and wrong

Author	Key Characteristics					
26 Abraham (2005)		Being future orientated	Finding new opportunities			Being successfully different Emulating entrepreneurs Being collaborative
27 Bonn (2005)	Systems Thinking	Vision	Creativity			
28 Goldman (2005)	Systems-orientated	Directional	Conceptual	Opportunistic		
29 Acure and Englyst (2006) (cited by Monavvarian, 2014)	Awareness about industry and rivals;				Considering strategic priorities of top manager;	
	Understanding strengths and opportunities;				Decision making by making use of flexible and effective processes	
	Awareness about strategic problems of organization;					
30 Eicher (2006)		Vision (where)	Planning (how)		Intent (why)	
31 Sloan (2006)	Panoramic	Forward looking	Creative and Generative	Intuitive	Critical	

Author	Key Characteristics					
		Reflective and Non-linear	Divergent and Abstract			
32 Yarger (2006)	Comprehend relationships Holistic	Vision		Direction	Inspiration	Organisation skills Personal impetus
33 Behm (2007)	Comprehend synergies	Understand long-term				
34 Babbage (2008)		Far-sighted perspective	Alternate futures		Focused	
35 El-Farra (2008)	Understand internal and external environment Systems perspective	Thinking in time	Hypothesis / assumption driven	Intelligent opportunity	Intent focused	
36 Fontaine (2008)	Systems perspective	Thinking in time	Hypothesis driven	Intelligent opportunism	Intent focused	
37 Costa-Gomes et al (2009)		Behaviours that are temporal	Rely on some degree of prediction			
38 Gray (2009)	To think strategically is to reason ends-ways-means		Conceive, invent or discover the master idea Shape and draft the strategies	Theorize abstractly	Command and control the implementation	Sceptical, though not cynical, mindset

Author	Key Characteristics					
			Creative thinker			
39 Malan (2009)	Thinking holistically	Thinking long-term about the future	Thinking analytically and creatively		Thinking about sustainable competitive advantage	
40 Kennedy (2010)	Rational and methodical analysis	Nonlinear and multidimensional thinking	Creative			
41 Malan (2010)	Thinking holistically	Thinking long-term about the future	Thinking creatively		Thinking about sustainable competitive advantage	
42 Heracleous and Jacobs (2011)	Synthetic		Creative and Divergent			
43 Jelenc and Swiercz (2011)	Systems theory approach	Time Future vision	Hypothesis generation and testing	Intuition	Focused intent	Professional capabilities Conceptual flexibility Political sensitivity Uncertainty / paradox / disequilibrium
44 Goldman (2012)	Systems-orientated	Directional	Conceptual	Opportunistic thinking		

Author	Key Characteristics					
45 Kamangar (2012)	Systems thinking	Thinking in time	Hypothesis driven	Intelligent opportunism	Intent focus	
46 Kunc (2012)	Understand causal relationships					
47 McCauley (2012)	Systems thinking Scanning the environment	Visioning	Scenario planning			
48 Kaplan and Orlikowski (2013)		Temporal	Multiple alternatives			
49 Mellon and Kroth (2013)	Systems orientated	Directional	Conceptual - reflecting ideas, models and hypothesis	Opportunistic		
50 Moghaddam and Amirkamali (2013)	Systems perspective	Thinking in time	Hypothesis driven	Intelligent opportunism	Intent focused	
51 Nuntamanop et al (2013)	Synthesizing ability	Visionary thinking	Conceptual thinking ability Creativity	Analytical thinking ability	Objectivity	Learning ability
52 Monavvarian (2014)	Systems thinking	Goal-orientated vision	Creativity	Analytical ability	Insight and foresight	Learning Familiarity with modern science

Author	Key Characteristics			
53 Goldman et al (2015)	Systems-orientated	Directional	Conceptual	Opportunistic thinking
54 Gross (2015)	Systems thinking	Vision	Creativity	
55 Mandejin and Siahpoosh (2015)	Systemic Thinking	Vision	Creativity	

Table C.1: Historical review of strategic thinker characteristics

Appendix D

Strategic Thinker Characteristics Report Reference Guide

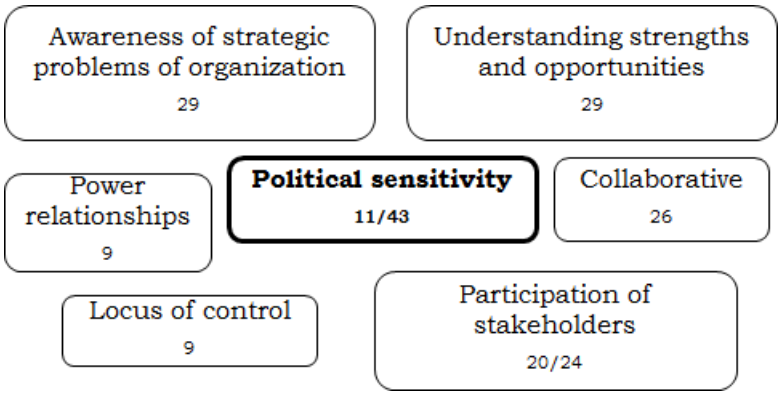


Figure D.1: Strategic Thinking Characteristic - Political Sensitivity

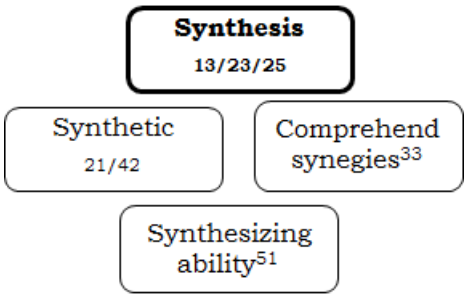


Figure D.2: Strategic Thinking Characteristic - Synthesis

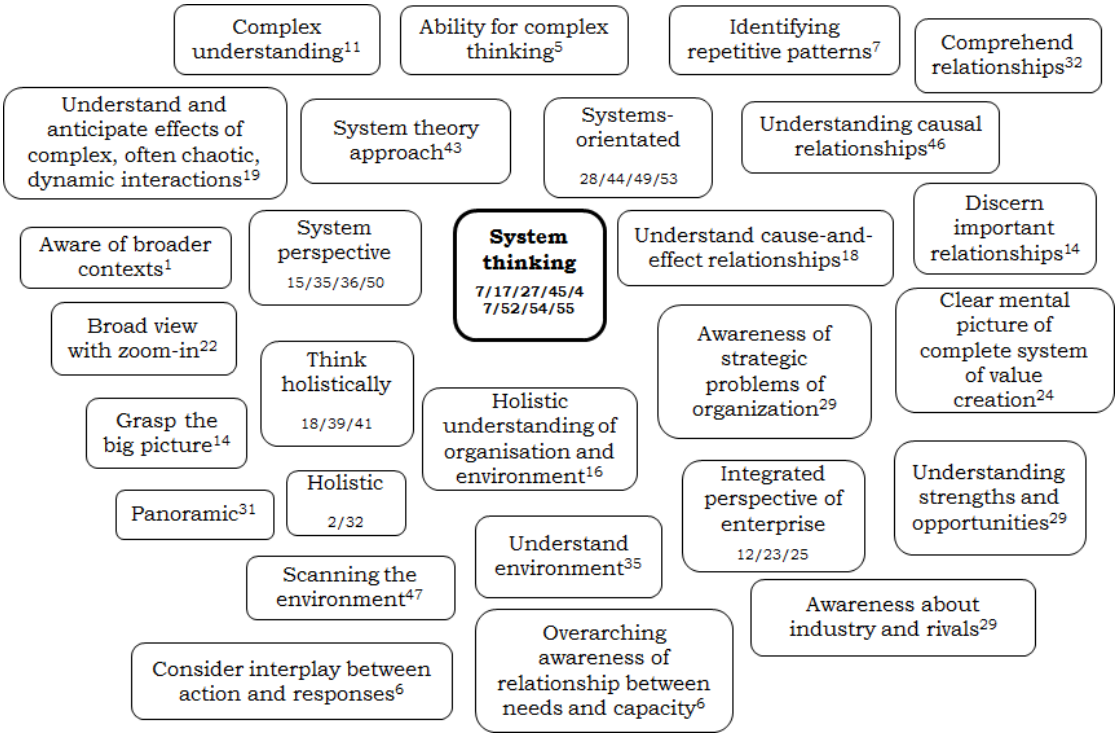


Figure D.3: Strategic Thinking Characteristic - Systems Thinking

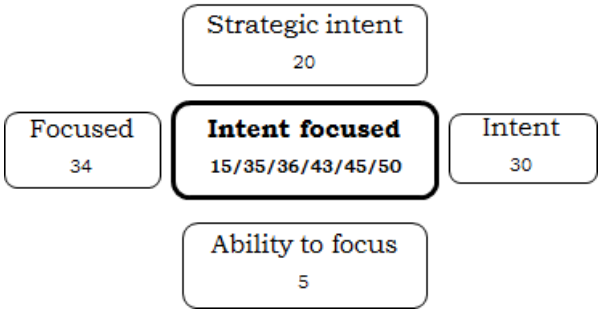


Figure D.4: Strategic Thinking Characteristic - Intent Focussed

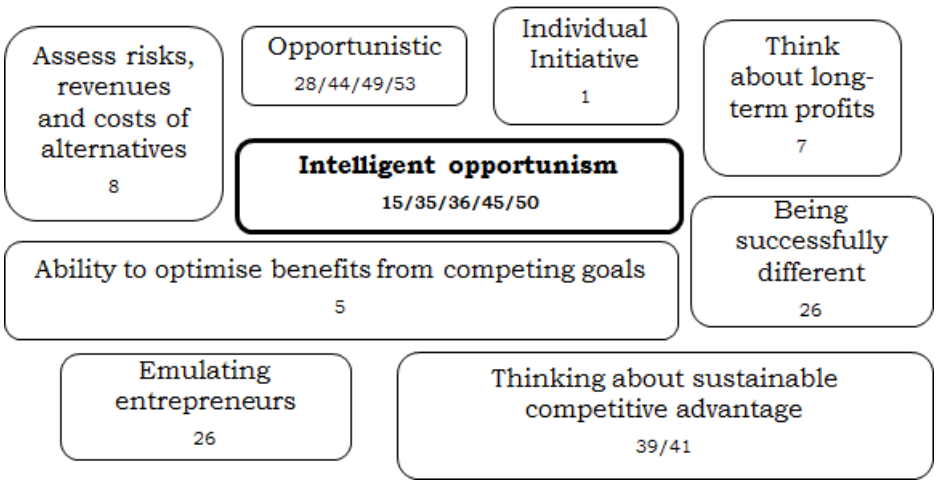


Figure D.5: Strategic Thinking Characteristic - Intelligent Opportunism

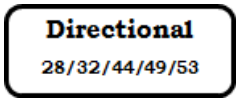


Figure D.6: Strategic Thinking Characteristic - Directional

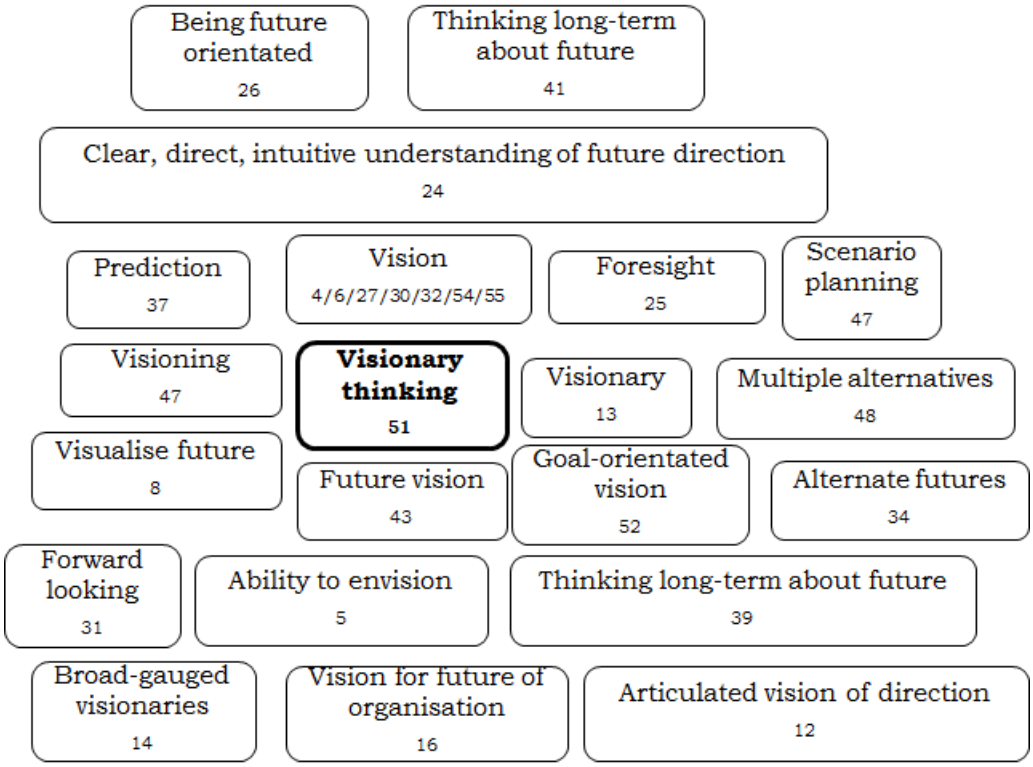


Figure D.7: Strategic Thinking Characteristic - Visionary Thinking

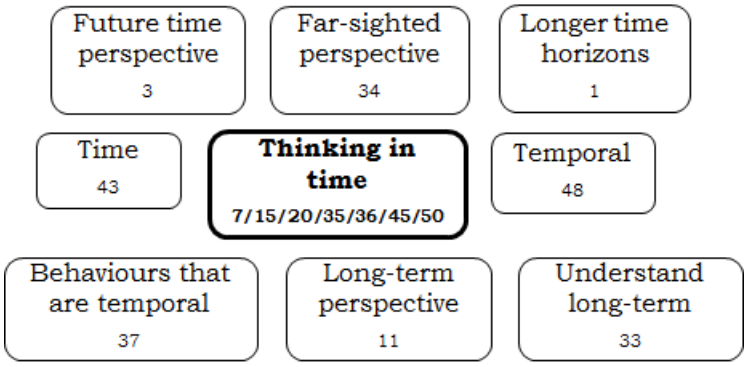


Figure D.8: Strategic Thinking Characteristic - Thinking in Time

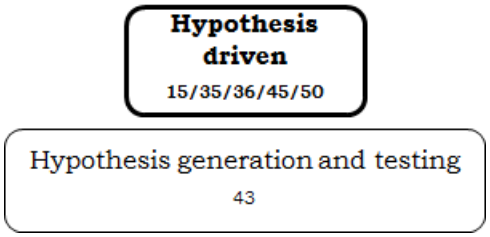


Figure D.9: Strategic Thinking Characteristic - Hypothesis Driven

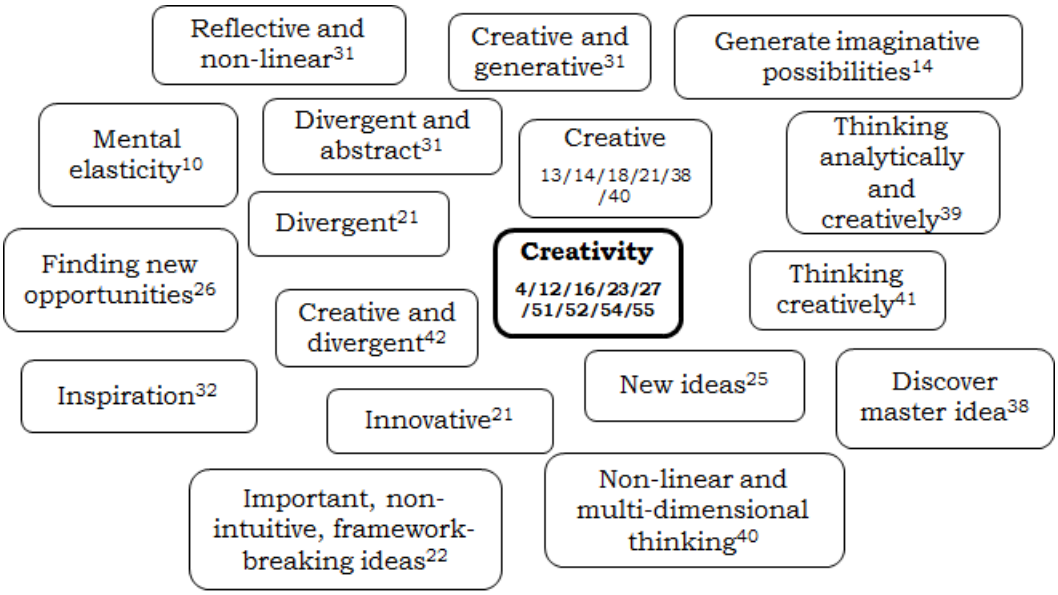


Figure D.10: Strategic Thinking Characteristic - Creativity

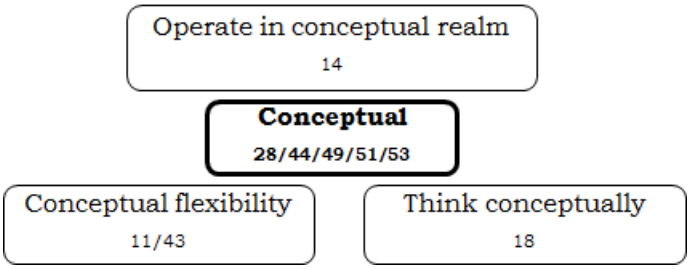


Figure D.11: Strategic Thinking Characteristic - Conceptual

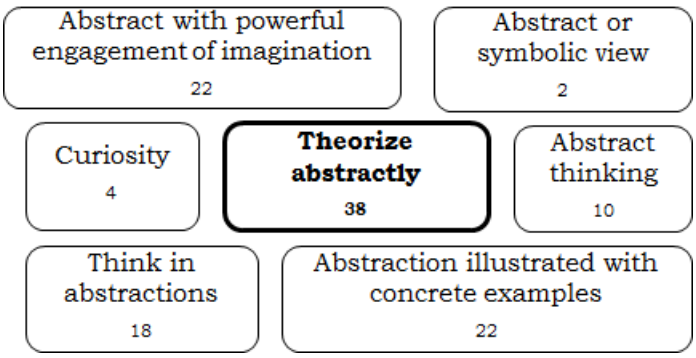


Figure D.12: Strategic Thinking Characteristic - Theorize Abstractly

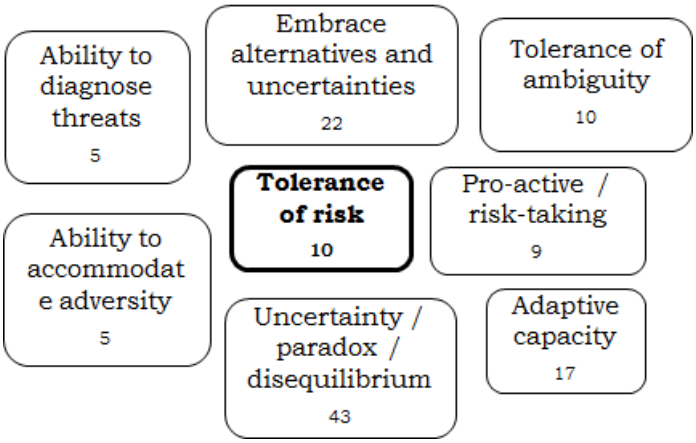


Figure D.13: Strategic Thinking Characteristic - Tolerance of Risk

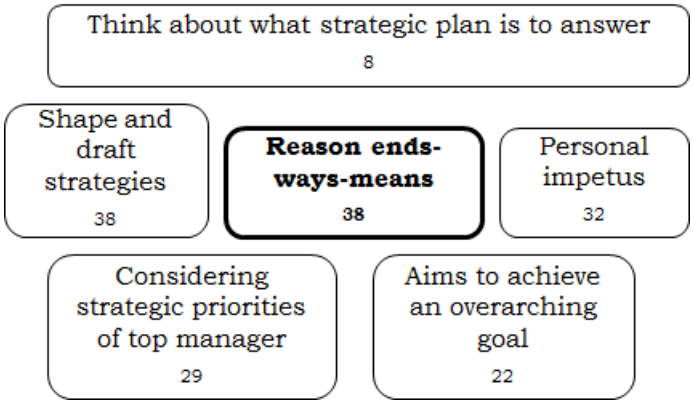


Figure D.14: Strategic Thinking Characteristic - Ends-Ways-Means Thinking

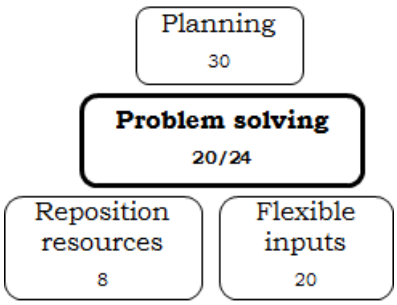


Figure D.15: Strategic Thinking Characteristic - Problem Solving

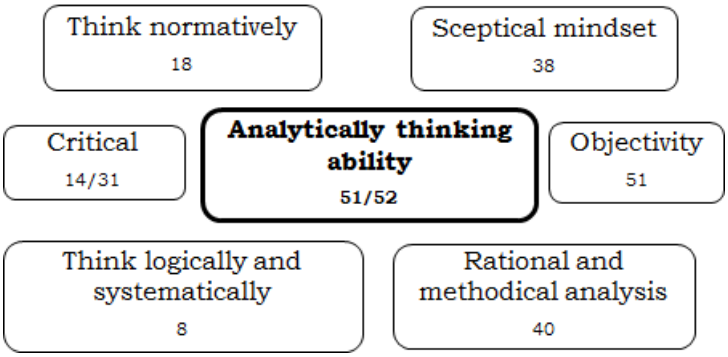


Figure D.16: Strategic Thinking Characteristic - Analytical Thinking Capacity

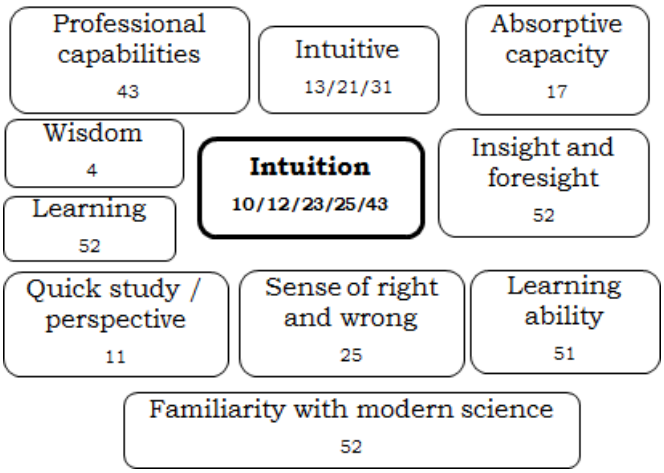


Figure D.17: Strategic Thinking Characteristic - Intutition

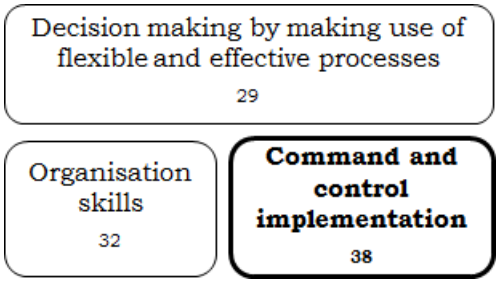


Figure D.18: Strategic Thinking Characteristic - Command and Control Implementation

Appendix E

Types of Intuition Scale (TIntS) items by Pretz et al, 2014

We are interested in how you make decisions and solve problems in your life. Read each of the following statements and rate the extent to which you would agree that that statement is true of you using the scale below. These items have no right or wrong answers; just respond based on what is true for you.

1	2	3	4	5
Definitely false	Mostly false	Undecided (neither true nor false)	Mostly true	Definitely true

_____1. When tackling a new project, I concentrate on big ideas rather than the details. (HB)
_____2. I trust my intuitions, especially in familiar situations. (I)
_____3. I prefer to use my emotional hunches to deal with a problem, rather than thinking about it. (A)
_____4. Familiar problems can often be solved intuitively. (I)
_____5. There is a logical justification for most of my intuitive judgments. (I)
_____6. I rarely allow my emotional reactions to override logic. (R) (A)
_____7. I tend to use my heart as a guide for my actions. (A)
_____8. My intuitions come to me very quickly. (I)
_____9. I would rather think in terms of theories than facts. (HA)
_____10. My intuitions are based on my experience. (I)
_____11. I often make decisions based on my gut feelings, even when the decision is contrary to objective information. (A)
_____12. When working on a complex problem or decision I tend to focus on the details and lose sight of the big picture. (R) (HB)
_____13. I believe in trusting my hunches. (A)
_____14. I prefer concrete facts over abstract theories. (R) (HA)
_____15. When making a quick decision in my area of expertise, I can justify the decision logically. (I)
_____16. I generally don't depend on my feelings to help me make decisions. (R) (A)
_____17. If I have to, I can usually give reasons for my intuitions. (I)

_____18. I prefer to follow my head rather than my heart. (R) (A)
_____19. I enjoy thinking in abstract terms. (HA)
_____20. I try to keep in mind the big picture when working on a complex problem. (HB)
_____21. When I make intuitive decisions, I can usually explain the logic behind my decision. (I)
_____22. It is foolish to base important decisions on feelings. (R) (A)
_____23. I am a "big picture" person. (HB)

Note: Scores on items followed with an "R" are reversed. HB, Holistic-Big Picture; HA, Holistic-Abstract; I, Inferential; A, Affective.

Appendix F

Pilot Test Assessment Guide

Base Line Test

The Strategic Thinking Base Line Test is designed to provide a coarse grain assessment of an agent's strategic thinking ability. The test is based on four domains: Visionary thinking (Vt); Intuition (I); Creativity Thinking (Ct) and Systems thinking (St).

Item 1 – Discriminators

In which service have you receive the most training? *(RAN, Army, RAAF, APS, Foreign military, Public sector)*

For the service type previously selected, how many years have you served (rounded up to the nearest whole number)?

Please select your age bracket. *(18-21, 22-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-60)*

What is your gender? *(Male, Female)* *not mandatory

Which best describes your current year of study? *(undergraduate year 1, undergraduate year 2, undergraduate year 3, undergraduate year 4, postgraduate year 1, postgraduate year 2, postgraduate year 3, postgraduate year 4)*

Please select the best description of your study program. *(Arts, Business, Science, Engineering)*

Please write a list of significant education (i.e. courses) or training (i.e. job) experiences that you have had in the last ten years.

Item 2 – Systems Thinking

1. QUESTION

"The pattern of consumption of oil as a main source of energy is unsustainable in the long-term (Mexico's oil reserves are expected to be depleted in ten years). There are alternative sources of energy such as solar, wind, sea currents, nuclear, fuel cells, etc.; nevertheless each of them presents disadvantages. We may even consider energy sources not yet developed. A sustainable decision consists on selecting a path to substitute finite energy sources with renewable sources". Please, answer the following questions. All may be considered correct, we ask you to choose the one that you consider most appropriate.

- Choose only one of the following actions to address this global problem:
  a. I propose to analyse and combine energy sources according to the goal of replacing finite energy sources as well as strategies for their diffusion and correct use.
  b. I would first identify the pros and cons of each alternative, study their implications and relevance of each factor in our context, as well as their implementation effects.
  c. I would analyse all the variables that determine the advantages and disadvantages of each energy source.
- Please explain your choice in a paragraph.

2. ASSESSMENT METHODOLOGY

Answers to the multiple choice indicate level of systems thinking:

a – mid-level systems thinking

b – high level systems thinking

c – low level systems thinking

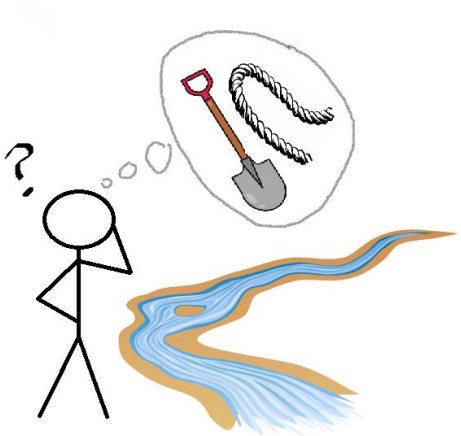
Answers to the explanatory paragraph are assessed against the following framework by two blind reviewers.

Table 1: Students open responses categorized in low-level (SL), mid-level (SM) and high-level (SH) systemic thinking categories, based on framework

S_L	S_M	S_H
Analyse all advantages and disadvantages in order to make a decision	Relativistic understanding depending on context, needs, priorities, applicability. Find appropriate solutions for every case	Consider time: choose the best moment to act; understand the stages of the energy cycle from generation to use and disposal
Compare, implement, optimize, integrate, improve, increase efficiency; as soon as possible.	Consider the effects, particularly those that may turn into bigger problems in the future.	Design new strategies; focus on new knowledge and evidence; simulate future scenarios; consider 'plan-B'
Analyse all the variables or features of the alternatives, and design the best solution for all.	Build and reinforce a culture of saving, help people realize how they consume and waste energy.	The curriculum of Engineering schools should integrate these issues as interdisciplinary courses.

Item 3 – Creative Thinking

3. QUESTION



While travelling overland, you encounter a flooded pass. You have a shovel and a length of rope. You have to physically cross the water. Describe the different ways you could cross.

4. ASSESSMENT METHODOLOGY

Each participant's answer will be assessed by two blind reviewers using a scoring system (based on Shah et al, 2012) below. The combined scores will be averaged for each participant.

Subskill	**Definition**	**Metric**
Fluency (flu)	Ability to generate many solutions consistently	Quantity of ideas generated

Flexibility (flx)	Ability to explore design space in many directions	Variety of ideas generated
Originality (org)	Ability to generate unexpected solutions	Originality of ideas generated
Quality (qlty)	Ability to consider feasibility, value and appropriateness	Closeness of fit with goals, tech and economic feasibility, and potential value

Item 4 – Intuition

5. **QUESTION**

Please complete the following table.

We are interested in how you make decisions and solve problems in your life. Read each of the following statements and rate the extent to which you would agree that that statement is true of you using the scale below. These items have no right or wrong answers; just respond based on what is true for you.

1	2	3	4	5
Definitely False	Mostly False	Undecided (neither true nor false)	Mostly true	Definitely true

_____ 1 When tackling a new project, I concentrate on big ideas rather than the details. (HB)

_____ 2 I trust my intuitions, especially in familiar situations. (I)

_____ 3 I prefer to use my emotional hunches to deal with a problem, rather than thinking about it. (A)

_____ 4 Familiar problems can often be solved intuitively. (I)

_____ 5 There is a logical justification for most of my intuitive judgments. (I)

_____ 6 I rarely allow my emotional reactions to override logic. (R) (A)

_____ 7 I tend to use my heart as a guide for my actions. (A)

_____ 8 My intuitions come to me very quickly. (I)

_____ 9 I would rather think in terms of theories than facts. (HA)

_____ 10 My intuitions are based on my experience. (I)

_____ 11 I often make decisions based on my gut feelings, even when the decision is contrary to objective information. (A)

_____ 12 When working on a complex problem or decision I tend to focus on the details and lose sight of the big picture. (R) (HB)

_____ 13 I believe in trusting my hunches. (A)

_____ 14 I prefer concrete facts over abstract theories. (R) (HA)

_____ 15 When making a quick decision in my area of expertise, I can justify the decision logically. (I)

_____	16	I generally don't depend on my feelings to help me make decisions. (R) (A)
_____	17	If I have to, I can usually give reasons for my intuitions. (I)
_____	18	I prefer to follow my head rather than my heart. (R) (A)
_____	19	I enjoy thinking in abstract terms. (HA)
_____	20	I try to keep in mind the big picture when working on a complex problem. (HB)
_____	21	When I make intuitive decisions, I can usually explain the logic behind my decision. (I)
_____	22	It is foolish to base important decisions on feelings. (R) (A)
	23	I am a “big picture" person. (HB)

Note: Scores on items followed with an “R" are reversed. HB, Holistic/Big Picture; HA, Holistic/Abstract; I, Inferential; A, Affective.

6. ASSESSMENT METHODOLOGY

The participant scores are summed using the code provided at the bottom of the table. (This code is not available to participants). The final score will be split into four (HB, HA, I and A), with HA and HB most likely more relevant to strategic thinking.

Item 5 – Visionary Thinking

7. QUESTION

Write a ‘vision statement’ of where you would like to be in the future. Provide a timescale, be descriptive and provide justification, where possible, for your decisions.

8. ASSESSMENT METHODOLOGY

Each vision will be assessed by two blind reviewers using the scoring system below. The scores will be averaged for each participant.

Participant N

Articulate _____

Plausible _____

Desirable _____

Actionable _____

Attributes	**Indicators**	**Example measures**		
Articulate (0-5)		**Direction**	**Goals**	**Market**
	Is able to provide a sense of direction	Direction is not clear (0)	Goal(s) not clearly expressed (0)	Unfocussed attention across a range of areas (0)
	Sets out goals	Direction is weak (1)	Weakly expressed (1)	Focussed attention on a specific area (1)
	Focuses on a particular ‘market’	Direction is clear (2)	Clearly expressed (2)	
Plausible (0-5)	Long time horizon	**Ambitious**	**Time Horizon**	**Broad View**
	Open to new strategies	Extremely unrealistic and definitely unachievable (0)	Short term (<2yrs) (0)	Does not take into account or leverage other fields / industries / areas (0)

	Misfit between resources and ambition	Easily achievable (1)	Medium term (<5yrs) (1)	Accounts for and/or leverages other fields (1)
	Look far and wide	Possibly achievable (2)	Long term (>5yrs) (2)	
Desirable (0-5)	Reason for action	**Purpose**	**Long term value (5+yrs)**	**Risk**
	Sense of purpose	Reason for action is unclear (0)	Less valuable in the long term (0)	Risk is not accounted for (0)
	Long term value	Reason for action is weak (1)	No change in value in the long term (1)	
	Long term profits			Risk is accounted for (1)
	Enhance competitive advantage	Reason for action is strong and clear (2)	More valuable in the long term (2)	
	Assess risk, reward and cost			
Actionable (0-5)	Pro-active not reactive	**Resource**	**Strengths**	**Pro-active**
	Capitalise on current strengths	Do not have resources or unable to reposition resources to compete (0)	Goal(s) not aligned with strengths (0)	Reacting to current threat (0)
	Links past, present and future	Have resources and able to reposition to compete (1)	Goal(s) weakly aligned with strengths (1)	Reacting to future threat (1)
	Able to reposition resources / forces to compete in future		Goal(s) strongly aligned with strengths (2)	Not a reaction to current or future threat (2)

Appendix G

Stave and Hopper - Proposed Assessment Measures by Levels of Systems Thinking

Systems Thinking Levels	**Indicators of Achievement. A person thinking at this level should be able to:**	**Product, Assessment Tests**
Recognizing Interconnections	- Identify parts of a system - Identify causal connections among parts - Recognize that the system is made up of the parts and their connections - Recognize emergent properties of the system	- List of systems parts - Connections represented in words or diagrams - Description of the systems in terms of its parts and connections - Definition of emergent properties - Description of properties the system has that the components alone do not
Identifying Feedback	- Recognize chains of causal links - Identify closed loops - Describe polarity of a link - Determine the polarity of a loop	- Representation of causality and loops in words or diagrams - Diagram indicating polarity
Understanding Dynamic Behaviour	- Describe problems in terms of behaviour over time - Understand that behaviour is a function of structure - Explain the behaviour of a particular causal relationship or feedback loop - Explain the behaviour of linked feedback loops - Explain the effect of delays - Infer basic structure from behaviour	- Representation of a problematic trend in words or graphs - Story of how problematic behaviour arises from interactions among system components - Story about what will happen when one piece of the system changes - Story of the causal structure likely generating a given behaviour
Differentiating types of variables	- Classify parts of the system according to their functions - Distinguish accumulations from rates	- Table of system variables by type and flows - Types of variables with units

	- Distinguish material from information flows - Identify units of measure for variables and flows	
Using conceptual models	- Use a conceptual model of system structure to suggest potential solutions to a problem	- Story of the expected effect of an action on a given problem - Justification of why a given action is expected to solve a problem
Creating simulation models	- Represent relationships between variables in mathematical terms - Build a functioning model - Operate the model - Validate the model	- Model equations - Simulation model - Model run - Compare model output to observed behaviour
Testing policies within the system	- Identify places to intervene - Hypothesize the effect of changes - Use model to test the effect of changes - Interpret model output with respect to problem - Design policies based on model analysis	- List of policy levers - Description of expected output for given change - Model output - Comparison of output from different hypothesis tests - Policy design

Appendix H

Pilot Test Results

Group	Member	Age Group	Experience	Systems thinking	Intuition	Creativity	Visionary Thinking
1	1	5	20	30	78	19.9	16
1	2	2	10	20	72	22.96	0
1	3	1	1	20	76	0	0
1	4	5	20	30	81	4	18
1	5	5	20	20	81	18.5	14
1	6	4	15	20	59	25	10
2	1	3	7	20	67	14.3	9
2	2	5	15	30	87	24.4	18
2	3	6	12	10	74	16.78	10
2	4	7	20	10	75	17.82	8
2	5	4	12	30	76	32.83	11
2	6	8	35	20	88	16.7	16
2	7	4	6	20	79	31.5	18

Appendix I

Plate and Monroe's Structure for Assessing Systems Thinking

Skill 1: Recognising Interconnections	
Below Basic Systems Literacy	Recognizes only linear connections; does not look for connections not included in prior beliefs
Basic Systems Literacy	Includes some non-linear connections in understanding of causal structure of a system; can understand an explanation of a system's behavior in terms of non-linear causal structures
Intermediate Systems Literacy	Includes many non-linear connections in one's understanding of the causal structure of a system; actively looks for connections beyond prior beliefs; can explain a system's behavior in terms of non-linear causal structures
Advanced Systems Literacy	Can develop a quantitative model of complex systems that provides insights into how impacts will ripple across a system
Skill 2: Identifying Feedback	
Below Basic Systems Literacy	Little or no understanding of the role that feedback plays in a system
Basic Systems Literacy	Understands the basic role of feedback in a system; can understand an explanation of a system's behavior in terms of feedback
Intermediate Systems Literacy	Can identify feedback loops in complex systems and explain a system's behavior in the context of those feedback loops
Advanced Systems Literacy	Can incorporate multiple feedback loops in quantitative models to predict the varying influence of such feedback at different points in time
Skill 3: Understanding Systems at Different Scales	
Below Basic Systems Literacy	Tends to interpret system behavior on a single scale (typically individual and short-term)
Basic Systems Literacy	Understands that the behavior observed at any specific scale of a system is affected by broader and narrower levels of scale
Intermediate Systems Literacy	Can explain the behavior of a system in terms of interconnections between variables at multiple scales
Advanced Systems Literacy	Can incorporate behavioral interactions at multiple scales into a quantitative mode
Skill 4: Differentiating Types of Stocks and Flows	
Below Basic Systems Literacy	Little or no understanding of the relationship between stocks and flows

Basic Systems Literacy	Has a conceptual understanding of the distinction between stocks and flows and can follow an explanation of a systems behavior in the context of the interactions between multiple stocks
Intermediate Systems Literacy	Has a conceptual and practical understanding of stocks and flows and can interpret the behavior of a system based on this understanding
Advanced Systems Literacy	Can develop a model with multiple stocks and flows and use that model to make valid inferences about the behavior of the system
Skill 5: Understanding Dynamic Behavior	
Below Basic Systems Literacy	Has a static mental model of a system; does not incorporate the idea of change over time
Basic Systems Literacy	Has a basic conceptual understanding that systems change over time; can understand explanations of a system's behavior in terms of nonlinear causal structures, feedback, and stocks and flows
Intermediate Systems Literacy	Has a thorough understanding of how systems change over time, which includes fast- and slowly-changing variables and delayed feedback; can develop reasonable hypotheses about a system's behavior in the context of non-linear causal structures, feedback, and stocks and flows
Advanced Systems Literacy	Can develop quantitative models to test hypotheses and explore scenarios regarding how a system may change over time
Skill 6: Creating Simulation Models	
Below Basic Systems Literacy	Cannot interpret behavior in a simulated computer model; cannot represent complex systems in a diagram
Basic Systems Literacy	Can interpret the behavior of a basic pre-packaged simulation and describe how the structure of the system contributes to that behavior; can create simple simulation models involving a handful of stocks and flows and use the model to explain the system's behavior
Intermediate Systems Literacy	Can interpret the behavior of more sophisticated pre-packaged simulations in the context of system structure; can create simulation models of systems that are sufficiently complex to make computer simulations required for making reasonable projections regarding how the system will behave over time; can use the computer model to test hypotheses and glean insights about the behavior of the system
Advanced Systems Literacy	Can observe a system and collect the data needed to create a simulation model of highly complex systems with numerous stocks and flows; can use the model to test hypotheses and glean insights about the behavior of the system
Skill 7: Incorporating Systems Thinking into Policies	
Below Basic Systems Literacy	Does not apply understanding of the complexity of a system when making decisions
Basic Systems Literacy	Applies systems thinking to personal decisions and can discern the likely effects of policies at multiple scales
Intermediate Systems Literacy	Applies systems thinking to personal decisions and uses systems concepts to assess broader policies; Can understand explanations of policies in terms of results from quantitative models
Advanced Systems Literacy	Can develop quantitative models of complex systems and use them as tools to make valid inferences about various competing policies

Appendix J

ANOVA results from Strategic Thinking Experiment

Description

Groups	Count	Sum	Mean	Variance	SS	SE
RAN	104	386	3.71	6.5322	679.3462	0.251
Army	228	893.5	3.92	10.6664	2431.9489	0.216
RAAF	161	480	2.98	6.4624	1040.4441	0.200
RANO1	37	68	1.84	0.9872	36.5270	0.163
ArmyO1	116	137.5	1.19	0.4161	48.2651	0.060
RAAFO1	82	102.5	1.25	0.6845	56.1250	0.091
RANO4	31	156	5.03	5.5151	170.9677	0.422
ArmyO4	63	395.7	6.28	5.0000	314.9971	0.282
RAAFO4	30	132.5	4.42	6.9514	208.5417	0.481

ANOVA Alpha 0.001

Sources	SS	df	MS	F	P Value	F Crit
Between Groups	1749.756	8	218.719	36.971	2.012E-50	3.305
Within Groups	4987.163	843.000	5.916			
Total	6736.919	851.000	7.916			

Table J.1: One-way ANOVA on Education by Rank and Service

Description

Groups	Count	Sum	Mean	Variance	SS	SE
RAN	124	932.7	7.52	43.674	5415.591	0.593
Army	244	1435.6	5.88	42.320	10326.114	0.416
RAAF	194	1119.3	5.77	44.690	8669.791	0.480
RANO1	37	26.4	0.7	0.120	4.423	0.057
ArmyO1	116	42.7	0.37	0.050	5.812	0.021
RAAFO1	82	31.8	0.39	0.045	3.708	0.023
RANO4	31	342.5	11.05	28.925	896.677	0.966
ArmyO4	63	617.3	9.80	19.137	1205.630	0.551
RAAFO4	30	339.7	11.32	33.872	1016.174	1.063

ANOVA Alpha 0.001

Sources	SS	df	MS	F	P Value	F Crit
Between Groups	19631.322	8	2453.915	81.251	3.1934E-101	3.302
Within Groups	27543.920	912	30.202			
Total	47175.242	920	51.277			

Table J.2: One-way ANOVA on Accumulated Work Experience by Rank and Service

Description

Groups	Count	Sum	Mean	Variance	SS	SE
RAN	104	1063	10.22	14.86	1545.91	0.378
Army	228	2264	9.93	14.00	3190.88	0.248
RAAF	161	1634	10.15	12.23	1968.42	0.276
RANO1	37	335	9.05	14.11	521.89	0.617
ArmyO1	116	1081	9.32	11.01	1277.20	0.308
RAAFO1	82	829	10.11	9.46	776.01	0.340
RANO4	31	335	10.81	18.48	572.84	0.772
ArmyO4	63	635	10.08	18.80	1184.60	0.546
RAAFO4	30	289	9.63	17.70	530.97	0.768

ANOVA Alpha 0.05

Sources	SS	df	MS	F	P Value	F Crit
Between Groups	118.73	8	14.84	1.081	0.374	1.949
Within Groups	11568.72	843	13.72			
Total	11687.45	851	13.73			

Table J.3: One-way ANOVA on Visionary Thinking by Rank and Service

Description

Groups	Count	Sum	Mean	Variance	SS	SE
RAN	104	2448	23.54	14.38	1495.85	0.372
Army	228	5269	23.11	12.22	2786.26	0.232
RAAF	161	3572	22.19	14.09	2268.41	0.296
RANO1	37	820	22.16	13.22	489.03	0.598
ArmyO1	116	2564	22.10	10.13	1174.76	0.295
RAAFO1	82	1758	21.44	11.71	960.20	0.378
RANO4	31	757	24.42	14.50	449.55	0.684
ArmyO4	63	1511	23.98	14.11	888.98	0.473
RAAFO4	30	684	22.80	13.29	398.80	0.666

ANOVA Alpha 0.001

Sources	SS	df	MS	F	P Value	F Crit
Between Groups	529.92	8	66.24	5.117	3.04562E-06	3.305
Within Groups	10911.83	843	12.94			
Total	11441.75	851	13.45			

Table J.4: One-way ANOVA on Intuition (HA+HB) by Rank and Service

Description

Groups	Count	Sum	Mean	Variance	SS	SE
RAN	101	1907.03	18.88	13.95	1408.91	0.372
Army	224	4198.30	18.74	19.35	4333.50	0.294
RAAF	157	2904.15	18.50	16.01	2514.06	0.319
RANO1	37	591.97	16.00	15.30	565.96	0.643
ArmyO1	113	1928.26	17.06	13.54	1529.92	0.346
RAAFO1	82	1399.52	17.07	8.91	730.90	0.330
RANO4	31	638.60	20.60	13.85	429.37	0.668
ArmyO4	62	1279.44	20.64	22.66	1405.09	0.605
RAAFO4	29	597.94	20.62	20.48	593.94	0.840

ANOVA Alpha 0.001

Sources	SS	df	MS	F	P Value	F Crit
Between Groups	1209.75	8	151.22	9.256	2.8731E-12	3.306
Within Groups	13511.64	827	16.34			
Total	14721.39	835	17.63			

Table J.5: One-way ANOVA on Creative Thinking by Rank and Service

Description

Groups	Count	Sum	Mean	Variance	SS	SE
RAN	104	354	3.40	1.36	141.04	0.114
Army	228	812	3.58	0.97	221.58	0.065
RAAF	161	552	3.43	1.03	165.43	0.080
RANO1	37	132	3.57	1.22	45.08	0.181
ArmyO1	115	399	3.47	1.07	122.64	0.096
RAAFO1	82	291	3.55	0.88	72.30	0.104
RANO4	31	92	2.97	1.32	40.97	0.206
ArmyO4	63	229	3.63	0.96	60.60	0.124
RAAFO4	30	104	3.47	0.85	25.47	0.168

ANOVA Alpha | 0.05

Sources	SS	df	MS	F	P Value	F Crit
Between Groups	13.45	8	1.69	1.591	0.12342938	1.949
Within Groups	894.93	841	1.06			
Total	908.38	849	1.07			

Table J.6: One-way ANOVA on Systems Thinking by Rank and Service

Description

Groups	Count	Sum	Mean	Variance	SS	SE
RAN	104	250.631	2.41	0.14	14.54	0.037
Army	228	551.052	2.42	0.14	32.26	0.025
RAAF	161	380.562	2.36	0.13	20.96	0.028
RANO1	37	84.191	2.28	0.16	5.75	0.065
ArmyO1	115	264.477	2.28	0.14	16.16	0.035
RAAFO1	82	191.517	2.34	0.09	7.78	0.034
RANO4	31	75.778	2.44	0.11	3.48	0.060
ArmyO4	63	158.788	2.52	0.13	8.35	0.046
RAAFO4	30	72.583	2.42	0.15	4.42	0.070

ANOVA Alpha | 0.05

Sources	SS	df	MS	F	P Value	F Crit
Between Groups	3.59	8	0.45	3.324	0.00094241	3.305
Within Groups	113.71	843	0.13			
Total	117.30	851	0.14			

Table J.7: One-way ANOVA on Strategic Thinking by Rank and Service

Description

Groups	Count	Sum	Mean	Variance	SS
Male	448	1,070.76	2.39	0.145	64.854
Female	150	346.96	2.31	1.456	21.860
Male 01	183	421.33	2.30	0.138	25.229
Male 04	165	411.31	2.49	0.146	24.066
Female 01	66	150.14	2.27	0.115	7.605
Female 04	51	125.34	2.46	0.120	6.133

ANOVA Alpha 0.001

Sources	SS	df	MS	F	P Value	F Crit
Between Groups	4.940	5	0.988	6.974	2.02176E-06	4.137
Within Groups	149.748	1057	0.142			
Total	154.688	1062	0.146			

Table J.8: One-way ANOVA on Normalised Strategic Thinking Scores by Gender

Appendix K

RAN Results

Participant	Gender	Service	Rank	Experience	Education	Extraversion	Openness	Factor β	ST normed
6	1	1	3	5.2	3.5	6	8	14	3.23
7	1	1	5	3.6	7.5	4	6	10	2.15
9	1	1	3	1.8	0.5	5	6	11	2.28
10	1	1	5	15	6	6	7	13	2.29
12	1	1	4	5.5	4	5	6	11	1.78
14	1	1	5	16	5	6	7	13	3.14
24	1	1	4	4	3.5	6	10	16	1.72
40	1	1	6	13.2	0.5	8	10	18	2.00
46	1	1	5	2.2	8	7	8	15	2.12
56	1	1	4	12.6	8	7	6	13	2.47
60	2	1	5	13	6	6	8	14	2.41
64	1	1	5	16.5	11.5	7	10	17	2.90
72	1	1	4	12.6	8.5	6	7	13	2.33
84	1	1	3	5.4	3	4	10	14	2.35
85	2	1	4	17.5	2.5	7	7	14	2.91
86	1	1	6	22.2	2	6	7	13	1.94
95	1	1	4	14.4	2.5	6	8	14	2.35
99	1	1	4	15.6	7	10	5	15	2.49
101	1	1	4	8.8	2.5	10	7	17	2.27
110	2	1	5	12	8	4	7	11	2.68
114	1	1	4	1	3	4	5	9	2.16
118	1	1	5	17.5	3	6	6	12	2.68
122	1	1	4	13.6	3	10	8	18	2.67
124	1	1	3	4	5.5	6	4	10	2.27
131	1	1	4	19.2	7.5	6	9	15	3.23
132	1	1	4	13	7	8	9	17	2.42
135	2	1	4	6	5.5	6	5	11	2.46
141	2	1	3	4	5.5	7	8	15	1.69
145	1	1	4	14	8.5	5	7	12	2.49
157	1	1	5	20.3	5.5	9	6	15	2.71
167	2	1	5	16.8	3	9	6	15	2.83
180	0	1	4	6.8	10	5	10	15	2.30
189	2	1	5	4	4.5	6	6	12	2.76
198	1	1	4	18	4.5	8	9	17	2.18
211	1	1	3	6	0	6	7	13	1.99
212	1	1	4	17	0	6	9	15	2.63
213	1	1	4	16	7.5	7	7	14	2.10
216	1	1	5	7.5	5	7	7	14	2.53
221	2	1	4	18	3	8	5	13	2.56
224	2	1	5	9	7	9	4	13	2.77
226	2	1	4	4.8	7	7	6	13	2.18
230	1	1	4	9	4	6	8	14	2.45
236	2	1	4	2.4	5	8	9	17	2.19
240	1	1	6	14	6	5	7	12	2.24
247	1	1	5	12.8	7.5	4	10	14	2.68
249	2	1	3	13.2	0.5	10	6	16	2.55
253	2	1	4	8.4	4	7	5	12	2.15
261	1	1	4	11.5	1.5	9	7	16	2.46
271	1	1	3	3	4.5	7	7	14	2.77
274	1	1	4	8	7.5	3	8	11	2.99
287	2	1	5	28	2	10	9	19	2.70
292	1	1	5	11.7	3	7	5	12	2.76
296	1	1	4	4.8	4.5	7	8	15	2.78
298	1	1	3	8	0	6	7	13	2.50
302	2	1	3	4.8	0.5	10	6	16	2.33
309	1	1	6	19.2	7	5	9	14	2.74
311	1	1	4	12	7	9	9	18	2.20
326	2	1	1	0.1	1.5	6	9	15	1.88

327	2	1	1	0.6	1.5	5	6	11	2.48
330	1	1	1	0.6	1	6	5	11	1.65
333	1	1	5	17.4	6	5	7	12	2.71
335	2	1	1	0.8	2	8	6	14	2.35
337	1	1	1	1.2	3.5	9	6	15	2.37
340	1	1	1	0.9	1	3	9	12	2.88
348	1	1	1	0.9	2	9	6	15	2.14
357	2	1	4	13.2	4	8	8	16	3.04
363	1	1	1	1.2	3.5	8	6	14	2.10
374	2	1	4	2.8	5.5	8	6	14	2.66
380	1	1	5	15.5	6	5	6	11	2.58
382	1	1	5	7.8	6	6	7	13	3.02
388	1	1	1	0.6	1	3	7	10	2.37
389	2	1	1	1	2	5	8	13	2.31
392	1	1	1	0.8	2	6	4	10	2.12
398	1	1	1	0.8	3	8	8	16	1.69
410	2	1	1	0.8	2	6	6	12	2.47
417	2	1	1	0.6	1	6	6	12	2.32
428	2	1	1	0.4	4.5	5	10	15	2.59
433	1	1	7	17.4	7.5	4	4	8	2.46
438	1	1	4	21	3.5	6	5	11	2.39
444	2	1	1	0.4	1	10	9	19	1.83
464	2	1	1	0.3	2.5	8	9	17	2.33
468	1	1	1	0.9	1	6	6	12	2.71
475	1	1	1	0.2	1	7	6	13	2.29
476	2	1	1	1.2	2	9	7	16	2.45
478	1	1	4	11	4.5	9	10	19	2.80
482	1	1	1	1.2	4.5	4	7	11	1.79
488	2	1	1	0.4	1	8	6	14	2.34
510	1	1	1	0.6	2.5	6	8	14	2.51
511	1	1	1	1.6	2	5	8	13	2.35
512	1	1	6	13.5	2	5	6	11	2.21
516	2	1	1	1.2	2	9	2	11	2.54
531	1	1	1	0.6	1	6	8	14	2.17
532	2	1	1	0.2	1	9	5	14	0.80
542	1	1	1	0.4	1.5	8	6	14	2.26
545	2	1	1	0.4	1	10	5	15	2.88
550	2	1	1	0.6	2.5	7	9	16	2.36
552	1	1	1	0.2	1.5	6	7	13	2.35
556	1	1	1	0.6	1	6	7	13	2.38
561	1	1	1	0.8	1.5	4	6	10	2.14
578	1	1	1	0.9	2.5	7	7	14	2.80
588	1	1	1	1.2	1	7	7	14	2.94
597	2	1	3	2.7	3	6	5	11	2.71
600	1	1	1	0.6	0	8	7	15	1.97
604	2	1	1	0.6	2.5	9	7	16	2.28

Appendix L

Army Results

Participant	Gender	Service	Rank	Experience	Education	Extraversion	Openness	Factor β	ST normed
1	1	2	4	14	9.6	6	7	13	3.76
13	1	2	4	2.7	0.5	3	6	9	2.53
15	2	2	4	8.4	7.5	6	10	16	2.47
18	2	2	4	0.9	7.5	5	9	14	2.12
19	1	2	5	19.2	5.5	6	7	13	2.17
20	1	2	4	10	8.5	9	10	19	3.16
21	1	2	3	6.6	5.5	6	10	16	2.70
26	1	2	4	8.5	8.6	7	10	17	2.58
28	1	2	4	3.6	6	8	10	18	2.40
29	2	2	4	1.7	5.5	9	6	15	2.27
35	1	2	4	8.4	10.5	3	6	9	2.82
37	2	2	4	11.2	5.5	4	10	14	2.81
42	1	2	4	7.8	2.5	8	7	15	2.24
44	1	2	4	10	4.5	5	9	14	2.70
47	1	2	5	12.6	6.5	7	5	12	2.73
50	1	2	7	15.5	9.5	7	7	14	2.89
57	2	2	4	6.8	8.5	4	4	8	2.52
63	1	2	4	20.3	1	8	5	13	2.74
65	1	2	4	12	5.5	9	10	19	2.52
67	1	2	5	8.4	8.5	9	9	18	2.36
69	2	2	4	10.8	8.5	5	5	10	2.80
70	1	2	4	21	5.5	4	9	13	2.67
74	1	2	4	15	3.5	6	7	13	2.25
77	2	2	4	9	6	5	10	15	1.90
82	1	2	4	11	6.5	7	7	14	2.91
88	1	2	5	6.3	3	10	7	17	2.58
92	1	2	4	15	5.5	8	7	15	2.45
93	1	2	5	18	8.5	6	7	13	2.83
107	1	2	4	12.6	8.5	7	6	13	2.11
108	1	2	4	6.4	8.5	9	7	16	3.36
109	1	2	6	10.4	8.5	6	6	12	2.59
112	1	2	4	18.8	5.5	7	6	13	2.33
120	1	2	5	8	9.5	6	8	14	2.29
121	1	2	6	15.6	8.5	5	8	13	2.53
125	2	2	3	10	2	9	10	19	2.68
129	1	2	3	6.5	10	8	6	14	2.98
140	1	2	4	6	4	8	8	16	1.94
143	2	2	4	15	5.5	8	7	15	2.58
147	1	2	7	14	6.5	10	3	13	2.43
150	1	2	4	18.4	8.5	6	5	11	2.60
151	1	2	5	14.7	5.5	4	5	9	2.60
159	1	2	6	16.8	3.5	8	10	18	2.78
160	1	2	5	13	8.5	3	10	13	2.34
161	1	2	5	10.8	5.5	10	9	19	2.58
162	1	2	4	10	5.5	4	10	14	2.47
166	1	2	4	5.7	7.5	8	7	15	2.53
169	1	2	4	8.8	8.5	10	6	16	2.11
174	2	2	5	12.6	6.6	4	7	11	2.35
176	1	2	5	13.2	0.5	5	8	13	2.41
179	1	2	4	9.5	6.5	8	7	15	2.67
181	1	2	4	20	1	6	9	15	2.53
190	1	2	4	7.2	6.5	4	9	13	2.50
191	1	2	5	8.4	9.6	9	8	17	2.92
192	1	2	5	17.5	9.5	8	9	17	2.79
196	1	2	6	20.4	8.5	8	8	16	2.35
201	2	2	5	10.8	7	10	7	17	2.61
204	2	2	5	8.5	8.5	7	9	16	2.71
205	1	2	4	7	6	9	9	18	1.54

206	1	2	6	15	7	6	8	14	2.56
210	1	2	4	14.7	4.5	8	6	14	3.06
215	1	2	4	8.4	9.5	4	10	14	2.39
222	1	2	4	6.4	6.5	6	10	16	2.69
223	1	2	4	7	2.5	6	5	11	2.17
225	0	2	4	1.6	2.5	6	6	12	2.33
228	1	2	5	8.5	6.5	7	7	14	2.63
232	2	2	5	12	6.5	8	5	13	2.43
234	1	2	5	15.4	8.5	5	5	10	2.74
239	1	2	5	20.3	6.5	6	6	12	2.79
242	2	2	5	10.8	6.5	4	8	12	2.68
243	1	2	4	9.9	4.5	3	6	9	2.91
244	1	2	5	10	8.1	3	6	9	2.84
246	1	2	4	9.1	4.5	8	7	15	2.69
248	1	2	4	10.5	9.5	6	8	14	2.32
252	1	2	5	13	8.5	7	5	12	2.47
255	1	2	4	9	9.5	8	7	15	2.88
259	1	2	4	6.5	5.5	3	4	7	1.79
260	1	2	4	12	8.5	9	9	18	2.27
262	1	2	4	14	8.5	10	6	16	2.39
263	1	2	5	9.2	9.5	8	8	16	2.67
264	1	2	4	10.2	5.5	6	10	16	2.56
272	1	2	5	17.5	8.5	4	7	11	3.14
279	1	2	4	13.2	5.5	8	5	13	2.76
281	1	2	4	9	5	8	5	13	2.39
284	1	2	6	16.8	9.5	6	10	16	2.91
285	1	2	3	2	2	9	7	16	2.85
286	1	2	4	5.7	7.5	8	5	13	1.85
288	1	2	5	14.7	6	7	3	10	2.13
290	1	2	4	10.4	4	8	6	14	2.64
293	2	2	4	12.4	5.5	9	8	17	2.76
299	1	2	5	13.2	12.5	6	7	13	1.86
300	1	2	4	8	6.5	10	5	15	2.39
304	1	2	4	10	8.5	4	6	10	2.72
307	2	2	4	5.6	5.5	5	10	15	2.49
308	2	2	4	10.2	4.5	6	9	15	2.58
313	1	2	5	14.7	8.5	5	6	11	2.66
315	1	2	4	9.6	6.5	5	6	11	2.42
319	1	2	1	0.2	1	7	5	12	2.05
323	2	2	1	0.2	1	8	8	16	2.26
325	1	2	1	0.2	0	6	7	13	2.48
328	1	2	1	0.2	1	6	5	11	2.63
332	1	2	1	0.2	0	7	8	15	2.01
334	1	2	1	0.1	1	6	5	11	2.36
338	1	2	1	0.6	2	6	6	12	2.46
342	1	2	5	9.5	8.5	8	9	17	2.56
343	1	2	1	0.4	1	6	5	11	2.31
344	1	2	1	0.4	2	7	6	13	2.70
345	2	2	1	0.2	1	6	6	12	2.51
351	1	2	4	10.2	8.5	7	9	16	2.79
353	1	2	1	0.2	1	5	8	13	2.19
354	2	2	1	0	1	8	10	18	2.65
356	2	2	1	0.2	0	10	5	15	2.16
358	1	2	1	0.2	0	6	6	12	1.64
360	2	2	1	0.3	2	6	5	11	1.83
361	2	2	1	0.2	1	8	6	14	2.49
368	1	2	1	0.2	1	7	6	13	1.74
369	1	2	1	0.2	1	10	8	18	2.39
370	2	2	1	0.6	2	7	7	14	2.10

372	1	2	6	18	8.5	8	9	17	2.56
373	1	2	1	0.6	2	5	8	13	2.18
376	1	2	1	0.6	1	6	6	12	2.33
379	1	2	1	0.8	2	8	6	14	1.73
381	1	2	1	0.2	1	8	10	18	2.40
383	1	2	1	0.6	2	8	7	15	1.41
386	1	2	1	0.3	2	10	7	17	2.36
387	1	2	1	1.2	2	6	9	15	2.74
397	2	2	1	0.6	2	6	8	14	2.34
399	1	2	1	0.6	2	8	8	16	2.15
400	1	2	1	0.3	2	8	5	13	2.11
402	1	2	1	1.5	2	9	10	19	2.33
407	2	2	1	0.4	1	8	6	14	2.56
412	1	2	1	0.2	1	8	9	17	2.58
413	2	2	1	0.4	1	10	7	17	2.15
414	1	2	1	0.3	1	7	7	14	2.61
415	2	2	1	0.9	2	10	8	18	1.93
419	2	2	1	0.4	1	10	4	14	2.62
421	0	2	1	0.6	1	8	8	16	2.33
423	1	2	1	0.4	1	6	5	11	2.47
425	1	2	1	0.6	2	7	7	14	1.70
427	2	2	1	0.6	2	10	6	16	1.42
429	1	2	1	0.6	2	8	7	15	2.18
431	2	2	1	0.6	2	10	10	20	2.32
435	1	2	5	28.7	8	7	6	13	2.14
436	1	2	5	21	10.5	6	7	13	2.92
437	2	2	6	11.2	6.5	9	9	18	2.53
441	1	2	4	7.5	5.5	5	9	14	2.67
442	1	2	1	0.4	1	8	5	13	2.61
447	1	2	1	0.4	2	6	7	13	2.23
451	1	2	1	0.4	2	7	5	12	1.79
454	1	2	1	0.4	1	9	8	17	1.97
458	1	2	1	0.4	0	7	5	12	2.47
459	1	2	1	0.4	2	9	6	15	2.29
460	1	2	1	0.4	1	7	8	15	2.66
461	1	2	1	0.6	2	7	7	14	2.07
462	1	2	6	7.6	8.5	7	5	12	2.93
463	1	2	1	0.2	1	6	7	13	2.18
465	1	2	6	27.2	11.5	5	8	13	2.57
467	2	2	1	0.6	1	5	5	10	2.24
469	1	2	1	0.2	1	4	4	8	2.58
470	1	2	1	0.6	2	9	9	18	2.30
471	1	2	1	0.4	1	6	6	12	2.12
474	1	2	1	0.4	1	6	7	13	2.69
479	1	2	1	0.1	1	7	6	13	2.62
481	1	2	1	0.2	1	6	6	12	0.80
483	1	2	1	0.4	1	6	9	15	2.77
486	1	2	1	0.4	2	8	6	14	2.41
489	1	2	1	0.2	1	9	5	14	2.36
490	0	2	1	0.4	2	7	9	16	2.39
492	1	2	1	0.6	2	8	9	17	2.01
495	2	2	1	0.2	0	5	8	13	2.45
497	1	2	1	0.2	0	4	7	11	2.18
499	1	2	1	0.2	1	6	8	14	2.84
502	1	2	1	0.2	0	4	7	11	2.40
504	2	2	1	0.4	1	7	6	13	2.29
505	1	2	1	0.4	1	4	8	12	2.12
509	1	2	1	0.6	1	7	7	14	2.42
513	1	2	1	0.2	1	9	5	14	2.53

514	1	2	1	0.2	1	9	6	15	2.34
517	2	2	1	0.6	1	9	6	15	1.88
518	1	2	1	0.3	2	6	7	13	2.58
520	1	2	1	0.2	1	5	7	12	2.19
521	2	2	1	0.4	1	6	6	12	2.58
526	1	2	1	0.2	1	9	6	15	2.32
527	1	2	4	9	8.5	10	6	16	2.49
528	1	2	1	0.4	1	9	9	18	2.40
529	2	2	1	0.2	0	6	6	12	2.18
530	1	2	1	0.2	0	2	7	9	1.97
533	1	2	1	0.2	0	7	7	14	2.31
534	2	2	1	0.2	1	4	7	11	2.39
537	1	2	1	0.2	1	6	8	14	1.91
538	1	2	1	0.2	1	6	7	13	1.93
539	1	2	1	0.1	1	6	6	12	1.93
540	1	2	1	0.6	1	8	7	15	2.90
541	1	2	1	0.1	1	6	7	13	2.54
543	1	2	1	0.4	1	6	6	12	2.26
544	0	2	4	1.5	7.5	7	7	14	1.98
546	1	2	1	0.4	1	10	7	17	1.46
547	1	2	1	0.4	2	5	5	10	2.09
553	2	2	1	0.2	1	9	7	16	2.65
554	1	2	1	0.1	1	5	2	7	0.49
557	1	2	1	0.6	1	8	7	15	2.43
558	1	2	1	0.2	0	6	8	14	2.55
559	1	2	1	0.1	1	8	8	16	2.42
560	1	2	1	0.2	0	7	6	13	1.99
563	1	2	1	0.2	1	10	7	17	2.56
565	1	2	1	0.2	1	7	7	14	2.52
566	1	2	1	0.2	0	10	8	18	2.44
567	1	2	1	0.8	2.5	9	8	17	2.79
569	1	2	1	0.2	1	9	6	15	2.15
571	2	2	1	0.6	2	10	8	18	2.46
572	1	2	4	10.8	7.5	6	4	10	2.58
573	1	2	5	20.7	6.5	6	7	13	2.61
575	2	2	1	0.2	1	9	7	16	1.78
576	1	2	5	10	5.5	5	10	15	2.99
579	1	2	1	0.2	1	7	6	13	2.42
580	1	2	1	0.4	1	6	7	13	2.70
581	1	2	1	0.4	1	7	9	16	2.37
583	0	2	1	0.6	3	6	5	11	2.30
585	1	2	1	0.4	1	8	7	15	2.59
592	1	2	1	0.2	1	6	4	10	2.12
593	1	2	1	0.2	1	6	8	14	2.45
594	1	2	1	0.4	1	4	7	11	2.43
595	1	2	4	11.4	8.5	6	9	15	2.92
601	1	2	1	0.6	2	6	7	13	2.52
606	1	2	1	0.2	2	5	10	15	2.64
607	1	2	1	0.4	1	7	5	12	2.73
610	1	2	1	0.2	1	9	7	16	2.77
611	1	2	6	12.5	6.5	5	7	12	2.41
612	1	2	1	0.6	2	6	5	11	2.35

Appendix M

RAAF Results

Participant	Gender	Service	Rank	Experience	Education	Extraversion	Openness	Factor β	ST normed
22	1	3	4	25.2	1	8	6	14	1.97
23	1	3	3	5.5	3.5	6	9	15	2.65
32	1	3	3	3.6	9	5	6	11	2.57
34	1	3	5	11.4	5	5	6	11	3.00
48	1	3	5	14.4	1	9	10	19	1.93
49	1	3	4	7	5.5	9	7	16	2.53
51	1	3	5	2.4	4	10	6	16	2.41
58	1	3	3	10.8	0.5	8	6	14	3.02
59	1	3	5	12.4	2	7	6	13	2.29
61	1	3	4	9	0	2	5	7	2.24
66	1	3	4	17	5.5	10	8	18	2.84
68	1	3	4	15	6	7	5	12	2.28
71	1	3	4	9	5	4	8	12	2.02
75	1	3	4	21.6	9.5	8	9	17	3.06
76	1	3	1	0.2	4.5	4	8	12	2.59
79	1	3	4	13.2	8	4	8	12	2.32
80	2	3	4	19.6	2.5	9	7	16	2.23
81	1	3	4	5.1	3	8	4	12	3.02
83	1	3	6	14.4	5	5	7	12	1.80
87	1	3	3	9	5.5	8	6	14	2.49
89	2	3	4	4.8	2.5	3	4	7	2.44
97	1	3	4	11	2	5	6	11	2.07
100	1	3	6	29.4	5	6	8	14	2.39
106	1	3	4	20.7	0.5	7	8	15	2.54
123	1	3	4	10	1	7	6	13	2.51
130	1	3	5	13.2	4	6	7	13	2.23
137	2	3	4	8.4	7.5	6	8	14	2.22
138	2	3	4	9	5.5	7	4	11	2.62
144	2	3	3	2.7	5.5	9	6	15	2.54
149	1	3	5	12	8.5	6	6	12	2.87
155	1	3	4	11.5	3.5	6	6	12	2.90
156	1	3	3	7.2	5	6	7	13	1.93
164	2	3	3	4.4	10.5	10	8	18	2.72
168	1	3	6	24.5	7	6	5	11	2.53
170	1	3	4	5.6	2.5	8	9	17	2.75
177	1	3	4	21	2	3	7	10	2.52
182	1	3	4	12	5.5	6	8	14	2.80
183	1	3	6	15	6.5	9	7	16	2.40
186	1	3	3	7.5	3.5	6	6	12	2.69
194	1	3	4	18	5.5	7	5	12	2.75
197	1	3	5	16.5	6.5	2	5	7	2.31
199	1	3	4	6	7	6	9	15	2.10
207	1	3	5	10	8.5	6	5	11	2.70
208	1	3	3	9.2	0	6	9	15	3.10
218	1	3	5	11.5	8	7	5	12	2.85
231	1	3	4	10.5	2	6	9	15	2.52
233	1	3	5	10.8	4	7	10	17	2.93
235	1	3	5	9.5	4	7	7	14	1.88
237	1	3	5	12	3	7	7	14	1.23
238	2	3	3	0.6	5	4	6	10	1.75
241	1	3	5	12	3.5	5	7	12	2.79
245	2	3	5	12	7	10	10	20	2.93
250	1	3	4	2.7	3.5	4	4	8	2.62
254	1	3	4	9.3	1.5	8	4	12	1.90
256	1	3	7	19.5	7.5	8	6	14	2.47
258	2	3	3	3.6	5.5	6	5	11	2.07
266	1	3	3	4.2	4	9	4	13	2.50
268	1	3	3	4	5.5	8	9	17	1.93

270	2	3	3	1	5.5	2	10	12	2.23
273	2	3	6	8	7.5	8	4	12	2.33
278	2	3	3	4.4	3.5	8	7	15	1.28
282	1	3	5	22	2	6	7	13	2.03
289	2	3	4	2.7	5.5	4	4	8	1.17
294	2	3	4	7.6	5.5	7	5	12	2.41
297	2	3	4	9.6	5.5	9	7	16	2.04
303	1	3	5	20.4	6	8	7	15	2.61
305	1	3	4	10	8.5	4	4	8	2.54
310	1	3	5	7.5	6.5	9	6	15	2.64
314	2	3	3	2.8	3.5	4	4	8	1.51
320	1	3	1	0.2	1	7	7	14	2.48
321	2	3	1	0.6	2	7	7	14	2.72
329	1	3	7	11.1	5	8	9	17	2.66
331	2	3	5	10.4	5.5	8	6	14	2.36
336	0	3	1	0.6	2	8	7	15	2.06
341	1	3	6	15	5	7	5	12	2.44
346	1	3	1	0.6	2	7	7	14	2.15
347	2	3	1	0.6	2	5	6	11	2.28
349	1	3	1	0.3	2	8	4	12	2.27
350	1	3	1	0.2	1	9	8	17	2.39
359	1	3	1	1.2	1	8	7	15	2.36
364	2	3	1	0.4	1	6	7	13	2.56
366	1	3	6	19.5	6	6	6	12	2.37
367	2	3	1	0.2	1	6	9	15	1.78
371	1	3	1	0.6	1	4	7	11	2.25
375	1	3	3	1.4	4	4	6	10	2.60
384	1	3	1	0.1	2	7	10	17	1.82
385	2	3	1	0.1	0	8	8	16	2.65
390	1	3	1	0.6	1	8	8	16	2.15
393	1	3	1	0.6	2	5	7	12	2.12
394	1	3	1	0.6	2	6	6	12	2.56
395	1	3	1	0.6	2	6	5	11	2.13
396	2	3	1	0.4	1	5	7	12	2.47
401	1	3	1	0.3	1	8	5	13	1.10
403	1	3	1	0.6	2	9	7	16	2.33
404	1	3	1	0.6	1	7	8	15	1.98
405	1	3	1	0.2	1	9	9	18	2.17
406	1	3	1	0.6	2	7	5	12	2.38
408	1	3	1	0.4	1	6	5	11	2.26
409	1	3	1	0.4	1	9	10	19	2.44
411	0	3	1	0.6	0	9	6	15	2.49
418	1	3	1	0.6	3	8	3	11	2.70
420	1	3	1	0.6	2	8	6	14	2.79
422	1	3	6	15.6	6	10	6	16	2.31
426	1	3	1	0.6	1	6	5	11	1.76
430	1	3	3	1.6	5	5	10	15	2.54
432	1	3	1	0.4	2	6	5	11	2.37
439	1	3	3	2.5	0.5	6	8	14	2.21
440	1	3	1	0.4	1	9	8	17	1.92
445	1	3	7	17	9.5	5	4	9	2.28
446	1	3	5	11.6	1	7	6	13	2.20
449	2	3	1	0.4	2	4	10	14	2.49
450	1	3	1	0.2	0	5	7	12	2.78
452	1	3	1	0.2	1	4	6	10	2.20
455	2	3	1	0.2	1	6	8	14	1.99
456	1	3	1	0.4	1	8	9	17	2.46
457	1	3	1	0.2	0	6	6	12	2.67
466	1	3	1	0.4	1	6	7	13	2.42

472	1	3	1	0.6	2	6	5	11	2.55
473	2	3	1	0.6	2	6	9	15	2.33
477	2	3	1	0.6	1	7	6	13	2.36
480	1	3	1	0.4	1	6	6	12	2.72
484	1	3	1	0.2	1	8	6	14	1.93
485	0	3	1	0.4	1	5	8	13	1.94
487	1	3	1	0.2	1	10	6	16	2.40
491	2	3	1	0.4	1	6	6	12	2.43
493	1	3	1	0.2	1	10	7	17	2.71
494	2	3	1	0.2	1	4	8	12	2.15
496	2	3	1	0.4	1	9	3	12	2.45
498	1	3	1	0.4	1	6	8	14	2.46
501	1	3	1	0.2	1	6	4	10	2.24
503	1	3	1	0.2	0	8	7	15	2.47
506	1	3	1	0.4	2	7	6	13	2.47
507	2	3	1	0.2	0	6	6	12	2.44
508	2	3	1	0.2	1	7	9	16	2.52
515	1	3	1	0.6	2	6	8	14	2.38
519	1	3	1	0.4	1	6	6	12	2.52
523	1	3	1	0	0	6	8	14	1.78
524	2	3	1	0.4	2	8	8	16	2.61
525	1	3	1	0.2	0	5	9	14	2.54
535	1	3	1	0.2	0	9	6	15	2.47
536	2	3	1	0	0	8	6	14	2.47
548	1	3	1	0.2	0	6	8	14	2.35
551	1	3	1	0.4	1	8	6	14	2.49
555	2	3	1	0.3	1	4	8	12	2.21
564	1	3	1	0.2	1	6	9	15	2.12
568	1	3	1	0.1	1	5	8	13	2.75
570	1	3	4	7.6	9.5	9	7	16	2.63
577	1	3	1	0.2	0	5	6	11	2.51
582	1	3	1	0.6	2	5	7	12	2.55
584	1	3	1	0.9	2	5	8	13	2.35
586	2	3	1	0.4	2	5	8	13	2.21
587	2	3	1	0.6	2	9	7	16	2.51
589	1	3	1	0.6	3	6	8	14	2.56
590	1	3	1	0.6	2	6	8	14	3.26
591	2	3	1	0.2	0	7	9	16	2.17
598	1	3	1	0.2	1	4	5	9	2.12
602	1	3	1	0.3	2	5	7	12	1.75
603	1	3	1	0.6	2	9	5	14	2.45
605	1	3	1	0	0	5	8	13	2.44
608	1	3	1	0.2	1	6	9	15	2.18
609	2	3	1	0.6	2	9	8	17	1.73

Appendix N

Node list and Mind Map

Name	Sources	References
Inputs	10	49
People	10	37
Organisation	5	6
Major Systems	3	4
Human Resource Management	8	20
Human performance	7	24
Facilities	4	6
Command and Management	9	16
Collective Training	4	6
Examples	10	71
Trust	5	5
Soft Power	8	17
Shaping the environment	6	11
Culture	6	11
Contracting	1	1
Characteristics	11	251
Temporal	3	11
Processes	5	6
People	9	30
Paradigm	4	13
Nested definition	5	6
Multi-level	5	7
Interdependency	8	14
Intangible	11	35
Funding	7	14
Deliver an effect	9	18
Defined by the tool	2	6
Complex System	5	9

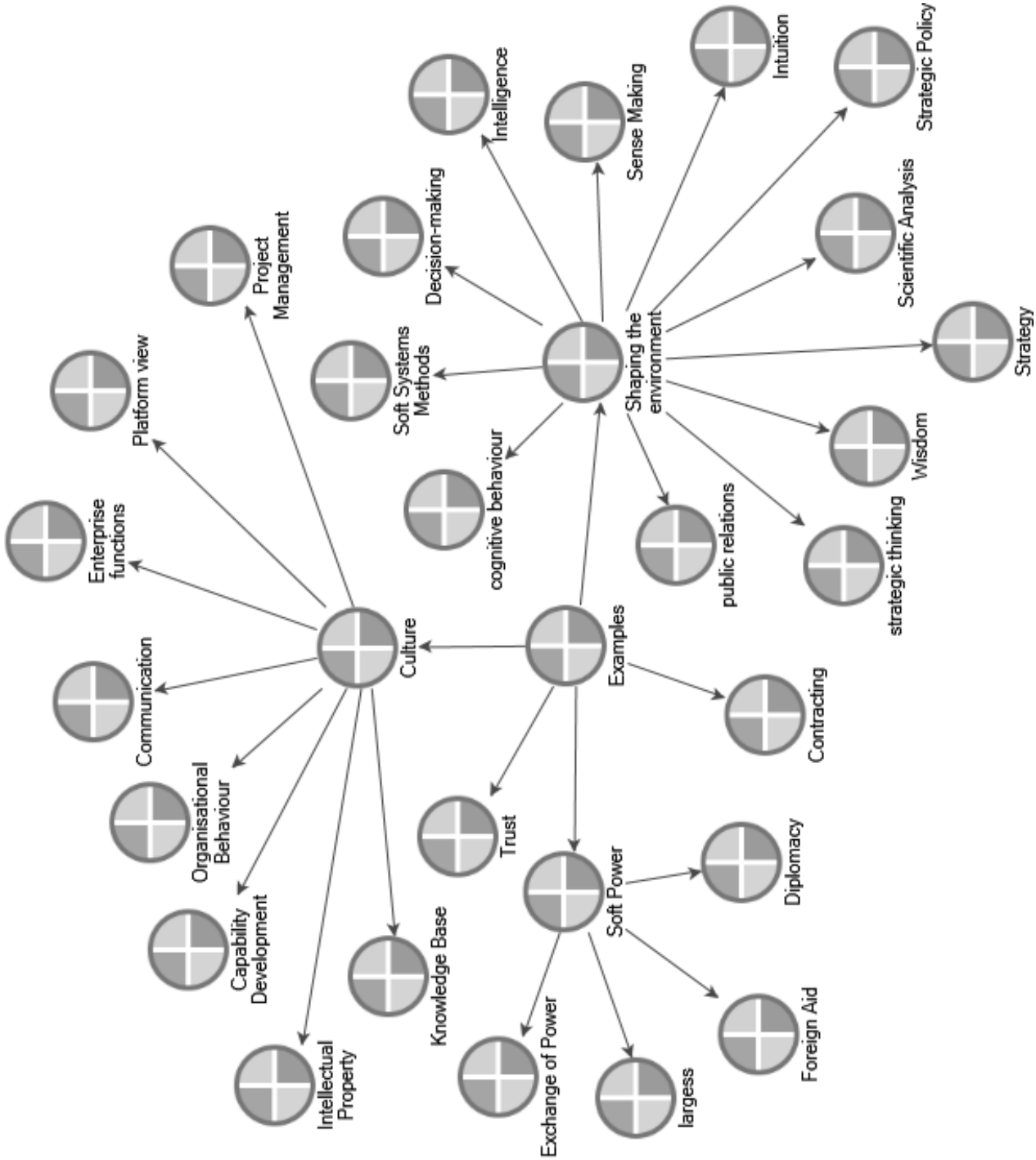


Figure N.1: Example of nodal analysis