Rouxelle de Villiers
Editor

The Handbook of Creativity & Innovation in Business

A Comprehensive Toolkit of Theory and Practice for Developing Creative Thinking Skills

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This book is dedicated to Jurie Wynand van Dyk, who taught me the value of dedication, perseverance, open-mindedness, and that eagles don't catch flies. I will miss our long mental sparring sessions.

Preface: Creative Intelligence for Business Executives

The primary goal of this book is to provide students of creativity, and those who wish to improve their own creative abilities (later described as creative intelligence or CiQ), with some insights into the art and science of creativity. We hope to move you, literally and figuratively, to get more of your ideas generated and implemented, thus helping you to thrive and moving society towards a more sustainable, healthy future. Our first suggestion is to treat this book like a visual diary: draw in it; make notes; doodle; capture thoughts in acronyms, mind-maps, visual models, and frameworks of your own; and simply sketch ideas as they come into your mind – personalizing the book to make it your own! This will help to shift your mindset. Also, invest in yourself by keeping a separate daily visual diary. Aim for just 5 minutes every day. Doodle, draw, sketch, or create visuals related to your personal CiQ journey and ideas as they erupt from your daily experiences. You will thank yourself later. Capture and visualize your business ideas and discuss them with your significant other(s).

Flowing from everyday creative activities and pro-active corporate creative endeavours are the fields of invention, intellectual property, and organizational creativity. This book also attempts to provide some insights into how scientific research, theoretical models, tested frameworks, and current knowledge about creativity can help you to develop your creative intelligence and that of others in all your creative pursuits. We hope that while reading the book, you will have many "Aha" moments of illumination, and many moments of "Yeah! I'll try that" to inspire you to build your own creativity and that of your team, as you gain insight into the science of human creativity. We hope this book will not only inspire you but will also provide a unique source of tools, inspiration, and ideas to give you new understanding and personal motivation to help yourself and to help those around you to achieve their best self and strengthen their own creative practices.

As a collection of scholars who dedicate our lives to improving humans' abilities to survive and thrive in a highly volatile environment, we hope to dispel some of the myths that mislead thinkers, designers, and decision-makers, replacing them with "best current knowledge" from a range of sources, including substantive and peer-reviewed academic journals and expert-reviewed insights from various sources.

Although we have made every attempt to produce an easy-to-read, easy-to-apply book, our need to add credibility and reliability to the content has sometimes resulted in overly theoretical explanations or loads of citations that may seem like heavy baggage to drag along with the content. We hope you will be able to discipline your mind to quickly hop-skip-and-jump over sections that are too dry and leap to the next section, rather than leaping right off the page and out of the book. Hundreds of hours went into finding the most relevant, most accurate, and most up-to-date information to bring a body of knowledge to you in an accessible, digestible form. The book integrates thousands of sources in many domains (ranging from neuroscience to psychology, marketing, sociology and art) to expand and enhance readers' knowledge across disciplines. We hope to feed the two main cognitive modalities of your brain: the data/information-hungry side and the impromptu solution-finding side. We also hope that you will be inspired to feed the physical side of your brain with oxygen (through exercise), meta-cognitive practices like meditation and reflection, the right nutrition, brain food (technical fodder for your cognitive library), and ample water. Most importantly, we hope the book will ignite a fire in your heart and mind to keep you developing your own truly amazing, utterly astounding ability to be creative, simply for your own delight!

As editor, I am now going off on a little tangent. In the eighteenth century, the term "genius" was first used to describe creative individuals [1], associating creativity with cognitive processes and rational, conscious deliberation. This term "genius" was used in terms of both arts and science and was thought to be based on imagination, judgement, and memory. Later, in the nineteenth century, the Romantic movement thought that art was more likely created through non-rational processes – even to the point that they believed rational thinking processes were likely to kill creative impulses. The Romantics thought that a heightened state of awareness, where artists are more in sync with their feelings, emotions, instinct, and intuition, would free them from convention and rationality to reach superior levels of creativity. By the twentieth century, we saw a return to rationalism in the form of modernism. Now, in the twenty-first century, we would like to introduce the term "genii." This is a bit of a play on both the idea of "letting the all-powerful inner genie out of the constraining lamp" and "genii as plural for genius." Your inner genii give you that inner ability to combine rational, emotional with a dash of irrational. Moreover, your inner genii can sift through multiple domains, and combine them with the input of other genii in the internal network of ideas. We particularly promote the plural form – even when talking about only one person: you. Also, we hope to recognize, by using this term in its plural form, the movement towards the creative team, or even online crowds. We also use the plural because we subscribe to the notion of multiple intelligences in every individual (forms of general abilities, e.g., ideational fluency, expressional fluency; figural fluency, word fluency; and emotional intelligence (EQ), sensitivity to problems). We hope this book will enable and assist you to release your inner genii. (Also, note that there are two "i"s in genii. You make the leap!)

We truly believe that at least one of our readers will be the next da Vinci or world-famous inventor, who interrupts and disrupts the way we humans think and act. We hope that this book will be one of the many sources of inspiration, intelligence, and ignition (i^3) for your aspirations. Allow yourself to be THE ONE!

YOUR NAME HERE ↘:

In a world increasingly focused on innovation and multiple intelligences, I am releasing my inner genii.

Dear wonderous world, say hello to:

…… Date: ……..

Write your name here and move forward to making your own name the embodiment of creativity and innovation.

Genii, I wish you every success in your pursuit and release of your inner creative genius.

Rouxelle de Villiers
Educator, Enabler and Editor: E^3.

PS: In this book we mainly consider creativity from the perspective of a business manager or entrepreneur. We consider two levels of analysis: individuals (also referred to as **creatives** – as a collective noun also named **genii** – when we talk about creatives' inherent abilities) and teams. Teams of creatives are also called collaborators or co-creators. I want to highlight that we consider all humans creative, and want to particularly point out that highly creative individuals can come from any discipline, field, or domain, not just the fine arts, music, or other domain stereotypes. This is not a book trying to integrate artistic abilities into business enterprises. Despite the dearth of studies considering the creativity of genii and creatives such as engineers, architects, computer programmers, project managers, marketing practitioners, advertising executives, consultants, managers, and students, as authors, we wish to consciously and conspicuously include them all in the valued individuals who create products, services, and solutions to sticky problems in our wonderful world!

Reference

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How to Use This Book

The book is divided into three main sections, covering a revised model of creativity, which expands the original four Ps of Product, Person, Process, and Press to the six Ps of creativity, by including Partnerships and Possibilities. We name this model 6Ps in a Pod, with the pod referring either to the vessel that contains the seeds (of creativity in this case), or a self-contained unit on a spacecraft or vessel that has a particular function. Here, the function is to move from good ideas to viable products in the marketplace, to move novices to CiQ, and lastly to move business executives to creative leadership (Fig. 1).

Fig. 1 Six Ps in a Pod

The first section provides some background on Creativity as a scientific area of study, expanding into the philosophy of creative thinking and delving a little deeper into the psychology and physiology of creativity. In Chapter 1, the authors establish the current state of knowledge about what creative intelligence means in various disciplines, and answer questions about the WHAT, WHO, WHY, and HOW of creative intelligence. Chapters 2, 3, 4, 5, 6, and 7 address the physiological and psychological issues related to the person, their thinking habits, meta-cognitive processes, and some heuristics, biases, and prejudices. Chapter 8 focuses on creative personality styles and characteristics. The second section, consisting of six chapters, deals with the process of creative endeavour and discusses its stages, from problem definition to problem solution, viability testing, idea selection, and the aesthetic expression of ideas. The final section of five chapters covers highly innovative organizations (HIOs) and creative leadership.

The book concludes with a chapter on nurturing creative talent within oneself, and enabling others to release their inner genii's full potential. Similarly, each chapter concludes with a CREATiViTY LABORatory, providing readers with tools to apply some of the models, theories, and frameworks covered in the chapter.

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Part I
The Philosophy, Physiology & Psychology of Creative Intelligence

Chapter 1
A World of Creative Intelligence

Rouxelle de Villiers

Abstract Since this is an introductory chapter, we cover the "**What? Why? Who?** and **How**?" of creative thinking. We introduce some key concepts that will be developed in depth later in the book. Starting with the question of **what** creativity is, we consider the changing historic viewpoints and perspectives. We cover different paradigms proposed by various people as they considered the "What is creativity?" question over the millennia. Next we consider "**How**?". How can creativity and creative intelligence (CiQ) be identified and measured (once we know what it is)? Next you, as reader, might wonder: "Why this is important?", especially to business executives now, and into the future. We aim to answer that from a few business perspectives, including sticky problems, contextual changes and competitive marketspace factors. We start with our best attempt – given the current body of knowledge – to answer the question: "**What** is creativity?" We then progress to various definitions and theoretical frameworks on how creativity is seen from various paradigms, including psychology, physiology and business. This chapter covers the six Ps, an extension of the traditional four Ps of Person, Product, Process and Press, to include Partners, and Possibilities. We then cover the "Who?" Who are considered creatives?, or in the terminology of this book, **Who are creative genii** ? (Throughout this book we refer to **creatives** as a collective noun – also named **genii** – when we refer to creatives' inherent abilities, talents, personality and characteristics or intelligence)

Keywords Associationists · Creativity · Creative intelligence · Genii · Gestalt theory · Multiple intelligences · Six Ps theory · Psychological phenomena

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Learning Objectives
On completion of this chapter, the readers will be able to:

- Consider the impact of historic viewpoints and different paradigms on how creativity is defined and applied by the creatology discipline.
- Recount various definitions of creative intelligence and use a selected definition to judge creative products.
- Understand various theories (e.g. gestalt, threshold, multiple intelligences) and apply these to real-world problems and issues.
- Discuss the 6Ps of Creative Intelligence (CiQ): Person, Partners, Process, Product, Press, Politics and Possibility.
- Evaluate different creative products using the various tools available in this chapter, and create tools relevant to their own products.

1.1 The WHAT of Creative Thinking

1.1.1 The History of Human Creativity and the Context of Creative Progression

Is creativity a biological, sociological, philosophical or psychological phenomenon? Is it genetic? Is creative intelligence part of general intelligence, is it a special way some people's brains work, or does it result from patterns of thought they learn from others? Is it perhaps a God-given talent? Maybe it is a neurological capability; a set of techniques that some, with adequate amounts of time, can develop and hone? Or is it an art form, expressed in the visual arts, the dramatic, liberal or fine arts, or as part of the art of inter-personal expression and doing business? Is creativity a mysterious, even supernatural gift, or merely a highly specific cognitive process that with training, anyone can learn? Perhaps creativity is more nurture than nature? Perhaps it is a compilation and collision of experiences, exposures and deliberate nurturing of talents? Or perhaps it is none of these, but purely a fluke or unusual and unpredictable "collision of thoughts"; a rare moment of madness that leads to unusual insight. An unpredictable "Aha"; a rare moment of insight and inspiration that even the creative cannot quite explain.

Intellectuals and scholars from different eras in history have addressed these questions and given enormously different answers [1]. Until the medieval period, creativity was generally considered a gift from the gods or God (depending on the religion or culture: Egyptian, Greek, Incan, Moslem, Jewish, or Christian). In ancient Greece, it was generally believed that creative thoughts were implanted in the mind either by the gods themselves, or by muses from the gods. Greek history records that supernatural innovations were mediated – "breathed into" – the

receptive mind of the creative individual by particular muses (e.g., Clio for history, Thalia for comedy, Urania for astronomy) ([1], p. 310). During the "Golden Age" (300 years from 500 to 200 B.C.E) the Greeks delivered creative output and innovations that are still found today in Western literary and political forms in the world's colleges, in statues, architecture and in current disciplines like arts, medicine, mathematics and philosophy. The Greeks believed that their pleasure-loving gods would take joy from their creative self-expression. "The breathing of life into a Greek person's creative process may have been influenced by a heavenly source, yet the credit went to the individual responsible for the creation" [2] (p. 313). Hadas [2] suggests that the Greeks' prolific creativity was due to their freedom from the religious restraints that fettered later societies.

In contrast, William James [3] reports on the squelching of free thought as Roman emperors claimed to have become gods and prescribed a "universal code" of behaviour. However, faith in the Roman emperors shattered as the Vandals, the Huns, the Vikings, and the Visigoths pillaged and ransacked the Roman Empire – destroying the artefacts, books and written materials they found. An exception was Alaric who, in 410 attacked Rome, but called for the work of Christians and the monks to be saved – preparing the ground for the rise of Christianity. Christian monks played a vital role in recording, artistically decorating, copying, hiding and fiercely protecting the works of Christians – and surprisingly of pagans as well – from the plundering barbarians over many decades. According to historians [4], the Muslim culture produced vastly superior creative output to that of the Christians. In sharp opposition to Hadas, Dawson blames the agricultural lifestyle caused by the various invasions, and the threat of starvation, for the low level of creativity in the Western world during the fifth century. Further, pious humility demanded little to no credit for individual creativity, but a focus on creating artefacts in worship of and devotion to God. This historic record of creative output links creativity quite closely to the contextual impacts (also called Press later in this book) and the philosophical paradigm of the era.

Historians report that the death of one third of the West's population (the Plague of 1350), the loss of the power of the church, and the rise of powerful, rich monarchies led to the resurgence of creative production. After the dark medieval period, the Renaissance followed, where pious humility was abandoned and artisans began to gain individual acclaim. Guilds of artisans fostered skills and individual artistic styles, and emphasis was placed on a humanistic philosophy, recognizing personal responsibility for one's fate, and the joy of human creation in various creative forms such as poetry, literature, music, philosophy and crafts. The 1500s "was becoming known as one of the great ages of human cultural development, a distinct period signalling the dawn of the modern era." ([5], p. 315). This newfound sense of freedom inspired inquiry into everything; even the most precious beliefs and established ideas, leading to the Age of Enlightenment (eighteenth century).

Marc Runco and Robert Albert [6] suggest that the period from the 1800s advanced modern day thinking about creativity by establishing four foundations. They summarize the contributions of this period as: (i) genius was divorced from the supernatural; (ii) genius, although exceptional, was a potential for each individual; (iii) talent and genius were distinguished from each other; and (iv) creative potential and exercise depend on the political atmosphere at the time (p. 26). The 1900s saw two major conflicting ideas emerge, which led to an intensive debate over how creative geniuses formulate their ideas. First was the idea of associative elemental knowledge (relating parts or elements of the problem to the whole) and gestalt views (from the whole problem to its parts). The gestalt theorists held the view that creative thinking is idea formation and alteration from complex parts that are associated to make the new whole more than the sum of its parts. They believed that creatives do not merely arrange parts into a new whole, but might start with a new perspective on the whole, and work back to arrange the parts to deliver the new whole (e.g. a composer does not merely write a series of notes, but conceives a whole idea, then writes the individual notes to deliver that conception.) For Associationists, orderliness is essential, with the mind essentially an assembly of ideas, with the conscious mind's ability to make the unconscious parts available as thoughts for re-association in the conscious mind.

Freud linked this concept of "threads between the unconscious and conscious mind" in the form of free associations. If asked, Sigmund Freud would have told us (around 1895) that creativity is just a few slips of the unconscious mind, and some "defence mechanisms": unconscious attempts to prevent unpleasant or unacceptable ideas ([5] p. 321). Dacey lists five mechanisms of the unconscious mind from that lead to creative insights: compensation (making up for some unconsciously perceived inadequacy); regression (reverting to previously successful early-stage behaviour – acting childishly, which may lead to insights); displacement (expressing feelings to an inferior person when unable/afraid to express to another person); compartmentalization (simultaneously holding two incompatible ideas: e.g. most kids are smarter than me AND I am above average in my schoolwork); sublimation (unfulfilled sex drive leads to creative outpour; for example, an inability to fulfil one's sex drive leads to becoming a great violinist) [6].

If one asks the general public to identify creatives, they are likely to cite writers, artists, a few scientists, inventors, engineers, movie makers and entertainment celebrities. Scientist, researcher and mathematician Albert Einstein is the person most frequently listed as creative, followed by Edison, da Vinci, Jefferson and Bill Gates (note this was a USA-based study by the University of Virginia [7]). This public perception is of importance, as a few of the more well-known measuring tools applied to assess a person's creativity include a measure of how others, including the general public, regard their work. In the next section, we look at some other tools to measure or assess creative output (product) and creative attributes (person) (Fig. 1.1).

Fig. 1.1 Who are the creative genii?

1.2 The WHO of Creative Thinking

1.2.1 WHO Are Genii? Who Do We Consider Creative?

Laypeople normally list artists, musicians, sculptors, choreographers and movie directors when a top-of-mind list of creative people is requested. In Western society, this list will likely include Michelangelo, Leonardo da Vinci, and Picasso. More recently, film makers such as Walt Disney, Yuko Kondo, Hayao Miyazaki and Tim Burton are likely to be included. So there seems to be a general trend towards seeing artists, writers, dancers, cartoonists and designers as particularly prominent in the 'gifted' domains. However, this is clearly a limited view. As has been pointed out, few are likely to begrudge the likes of architects (say Jørn Utzon, architect of the Sydney Opera House), civil engineers (Irving Morrow, main designer of the Golden Gate Bridge) or NASA scientists the label of being "creative" problem solvers. Or will they? In fact, when asked, most list-makers veer from the arts to include the names of scientists and inventors like Albert Einstein, Steve Jobs and Thomas Edison. So is general intelligence (iQ) perhaps the underlying measure of who makes the list of creative geniuses (termed genii in this book)?

In the not too distant past (1960s) general intelligence (iQ) and creativity, or at least the ability to be creative and problem solve, were seen to be closely related abilities. In 1962 Philip Jackson reported that more intelligent school children were generally more creative. However, many studies since have shown that the early studies lacked discriminant validity. In 1965 Wallach and Kogan [8] did a much-cited, more rigorous study of school children, providing evidence that creativity cannot be predicted from students' achievement scores. More recent studies do, however, find that a minimum level of intelligence is required to support high levels of creativity. This has been described as threshold theory. Threshold theory links intelligence and creativity, by claiming that iQ and creativity are correlated up to an iQ of 120 (the average iQ for the world is 100) but above 120, there is no

relationship. In 2008 Silvia [9] and colleagues analysed the early study by Wallach and Kogan, and confirmed that there are significant correlations between latent originality and fluency variables and intelligence. So, many decades of research indicate that creativity and intelligence are related. Further, stories and biographies of famous creators support the perception that famous creators like Albert Einstein, Leonardo Da Vinci, Mahatma Ghandi, Pablo Picasso, Steve Jobs and Walt Disney also displayed general intelligence (g or iQ) above the population average. "However, intelligence predicts substantially less than half the variance in creativity measures, providing partial evidence for the discriminant validity of creativity tests" [10] (p. 58). According to Howard Gardner [11], iQ measures do not relate strongly to creative achievement or creative intelligence (demonstrated creativity in practical problem solving). Smart individuals are not always able to deliver original or novel contributions, while some less apparently smart individuals are able to excel in their fields, and make useful and novel contributions that have a disruptive impact on society, changing how we think and feel [12–14].

Let's return to threshold theory. Common-sense observation tells us that some minimum level (slightly above average) of intelligence is required to be creative, but above that threshold, additional intelligence does not give you any further increase in creative intelligence. Some scholars [15, 16] suggest that intelligence higher than a certain level might even interfere with creativity, due to overthinking, over-analysing or other fixations with prior solutions that will limit creative, expansive thinking. The majority of recent studies do not find support for threshold theory, but many do find a relation between fluid intelligence[1] and divergent thinking at all levels of intelligence [17, 18]. Sternberg [19] argues that creativity is three-dimensional and requires analysis (selection of ideas worth pursuing), synthesis (seeing problems in new ways), and contextualizing (having the skills to solve problems and persuade users of the value of ideas in different settings.)

The next section of this chapter will illustrate that not only are there many versions of intelligence, in various creative disciplines (e.g. art, science, technology), but that various of these intelligences will be called upon to a greater or lesser degree depending on the nature of the problem.

> Every single one of us is creative, and the greatest companies and the greatest cities are going to stoke that creative furnace burning inside every one of us. – Richard Florida

1.2.2 Defining Creativity Across Multiple Domains and Diverse Individuals

Creative Intelligence (CiQ) has four strands: (i) competencies to think in creative ways and generate further opportunities and ideas from the original idea (generative ideas); (ii) abilities to produce creative output; (iii) abilities to effectively and

[1] **Fluid intelligence** (Gf) is a complex cognitive ability that allows humans to flexibly adapt their thinking to new problems or situations.

elegantly express/communicate an idea to persuade others of its merit or value [19–22]; and (iv) meta-cognitive abilities to monitor and evaluate one's own creative functioning.

John Medina, in his book *Brain Rules*, explains that human survival is predicated on a whole host of competencies and tools, including the brain's phenomenal ability to adapt and evolve. The human brain has evolved to solve problems related to survival and to do so while in constant motion in a very unstable, even life-threatening environment. During millennia of fighting for survival on this hostile planet, instead of building muscles, fangs and fur to overcome the hazards of our environment, humans developed brain connections in the form of a highly developed frontal cortex.

Judy DeLoache studied human cognition and found the main distinctive competence of humans is symbolic reasoning – the ability to ascribe meaning, attributes and characteristics to things. In other words "we are human because we can fantasize". This ability gives us the capacity for mathematics, language, art and ultimately culture. To the best of scientists' knowledge, only a tiny portion of other creatures are to a limited extent capable of symbolic reasoning. An illustrative example of symbolic reasoning is to draw a simple symbol (like l or O) on a piece of paper. Ask yourself what this is? What does this represent? Add another stroke or line (anywhere). What does this changed symbol represent? Add a dot to the line, and it becomes an "i"; add a cross stroke and it represents the cross as religion and conjures up multiple images sacred to a whole host of religions worldwide. Instead, add the small stroke to the bottom if the vertical l and it becomes a number 1. Humans have devised ways to communicate threats and opportunities through stories, drawings, and recordings (on stone, papyrus, paper, and digitally) – thus protecting themselves from threats to their survival. Humans learnt not to fight against changes, but to adapt to variations and changes in the environment. Those who were unable to adapt, died. Those genes were not passed on. This brings us to our current position, where constant change prompts constant creative solutions to old and new problems.

Ambrose and Sternberg [21] ask two pertinent questions in their book *Creative Intelligence in the twenty-first Century*: "How can creative individuals and societies adapt to complex 21st-century conditions? Will civilizations thrive or collapse in the decades to come if they are not creative enough, or if they are too creative?" Richard Potts, [23] director of the Smithsonian National Museum of Natural History, offers one explanation in the form of Variability Selection Theory (VST), which also explains our ancestors' intolerance of stupidity and inflexibility and is closely related to our bipedalism and the increasing size of human's brains. VST offers some admittedly controversial insights into human development and learning, as the process considered to link adaptive change to large degrees of environment variability. VST is based on two distinct and powerful features of the brain, namely (i) a database in which information and knowledge is stored, and (ii) the ability to think creatively using that knowledge base. Both are highly relevant to learning, improvising, solving problems and hence creative intelligence. Creativity diminishes or suffers if both are not developed separately or simultaneously. If focus is only placed

on one of these two components, say rote learning and memorizing of facts, VST predicts that creative intelligence will suffer, as improvisation and problem solving developed over millennia. On the other hand, without storing a vast database of relevant, useful, richly structured knowledge about a range of topics, VST predicts an inability to improvise from that database.

However, according to DeLoache's research [24], this creative intelligence and symbolic reasoning is not fully formed at birth. It must be developed through learning experiences; in particular through physical experiences and sensory stimulation, and only comes to fruition at about 36 months of age. Exhaustive studies show that this all-important and uniquely human survival trait takes at least 3 years to become fully operational. It is important to understand that as humans, we learn to improvise using an existing database of knowledge, in order to survive a challenging and changing world. We need rich, deep knowledge of a range of disciplines, symbolic reasoning and thus creative intelligence to thrive in our fast-changing, hostile environment.

According to research by Robert Sternberg and Melissa Williams [16], creative intelligence (practical ability, referred to as CiQ in this book) requires the ability to apply and balance three abilities, all of which can be developed: synthetic abilities, analytic abilities, and practical abilities. Further, a creative attitude or orientation may be as important as possessing the three abilities. Synthetic abilities represent the standard, somewhat limited view of what creativity is: novel idea generation. People high in creative intelligence make connections between things others don't spontaneously see. Analytical abilities are often associated with critical thinking skills, and creatives need the ability to critically analyse and evaluate ideas. Appropriate, valid, useful and viable ideas need to be pursued and "bad" ideas rejected or further developed. Creatives need to be able to consider ideas and test them. That leads to practical intelligence. This ability enables creatives to take abstract ideas and turn them into practical, executable ideas and eventually into accomplishments. Creatives further need the ability to convince others of the value of the idea; of the merit of changing the status quo to something new. Later in this book, we obtain further advice from Sternberg and Williams on how to develop these abilities. See Chapters 12 and 13.

Paul Torrance [25] suggests that creativity involves (i) *connectedness*: the use of existing elements not created by the genii to apply to new ideas; (ii) *originality*: the uniqueness, novelty and unpredictability in an idea; (iii) *non-rationality*: the unconscious processes that are responsible for joining images into creations; (iv) *self-actualization*: motivation as a source of energy for change and psychological growth; and (v) *openness:* the characteristics of spontaneity and sensitivity, which enable the shaping of new ideas. In a study of more than a decade of publications on creativity, Johnson [26] identified the main dimensions of creative achievement as: intellectual leadership; sensitivity to problems; originality; ingenuity; unusualness; usefulness; appropriateness; and breadth. These elements contain a mixture of

output criteria and personal factors. Similarly, Theresa Amabile [27] conceived of different components of creativity (cited in [28]), including creative potential, expertise, relevant personality traits, and creative behaviour and actual creative product (or output). We consider these elements and dive a little deeper into how one determines, measures or assesses creativity in the next sections, in an attempt to answer the "HOW" question of measurement/assessment. [The HOW question in terms of tools, processes and various problem-solving techniques is dealt with in Part II of this book, in Chapters 9, 10 and 11.] Readers will already see that creative intelligence is not one single thing or form of intelligence, but it plays a role in all that is human, so we look to the studies by Howard Gardner on multiple intelligences to inform readers' thinking.

1.2.3 Eight Intelligences

Howard Gardner is one of many scientists [29] who consider the brain to have "many categories of intelligence" (p. 64). World-renowned neurosurgeon George Ojemann is an expert at a neuro-scientific technique called electrical stimulation mapping (ESM). After treating literally hundreds of epilepsy patients by removing badly-behaving cells from their brains, he maintains that no two brains are the same. "Ojemann cannot predict the function of very precise areas in advance of surgery because no two brains are wired identically" (p. 65). He once combined the brain maps of 117 patients he had operated on over many years [29]. Only in one region did he find a spot where most people had a critical language area or CLA (79% of patients). Ojemann also found that brain maps establish early in life and remain stable throughout one's life (as re-measured with later-in-life ESM studies). This information from ESM and brain mapping gives the most credible and dramatic evidence of each brain's individuality – particularly providing evidence that no two people's brains store the same information in the same way and in the same place. (Read Chapter 2 to understand our creative physiology and neurology better.)

As early as 1993, Howard Gardner [30] rejected the tenet that there is only one type of intelligence for all, and that it can be measured using iQ tests. Gardner is considered the father of the Multiple Intelligences (MI) movement. Gardner's theory of multiple intelligences identifies eight distinct intellectual strengths. His eight intelligence (G8i) areas are: bodily kinaesthetic, interpersonal, intrapersonal, language, logical-mathematical, musical, naturalistic, and spatial. Gardner also considers the human mind as too complex to be represented by a simplistic numerical measure. (For a visual overview, you can access the video where Howard Gardner talks about the 8 intelligences [31]; for a personal test, you can access the MI test metrics by Kerstens [32]).

It is important to note that various educators, and Gardner himself, warn against mis-interpretations and misunderstandings about how to use the MI theory (and G8i) in learner/teacher environments. A particular warning that we want to underscore in this book is to refrain from labelling people (learners/students) with a particular type of intelligence: "By pigeonholing students, we deny them opportunities to learn at a deeper, richer level. Labels – such as 'book smart' or 'visual learner' – can be harmful when they discourage students from exploring other ways of thinking and learning, or from developing their weaker skills" [33]. Gardner is also famous for his statement about one intelligence being representative of or predictive of performance in other intelligences: "If I know you are very good in music, I can predict with just about zero accuracy whether you're going to be good or bad in other things" ([29], p. 64) (Table 1.1).

Table 1.1 Eight intelligences and core operations in learners

Intelligence	Core operations
Verbal linguistic	Syntax, semantics, phonology, pragmatics:
	Have well-developed verbal skills and sensitivity to the sounds, meanings and rhythms of words
Musical	Pitch, rhyme, timbre:
	Have the ability to produce and appreciate rhythm, pitch and timbre
Logical-mathematical	Patterns, number, relations, calculations:
	Have the ability to think conceptually and abstractly, and the capacity to discern logical and numerical patterns
Spatial	Mental visualization, mental manipulation, transformation of images:
	Have the ability to think in pictures; visualize abstractly and accurately
Bodily-kinaesthetic	Control of bodily motions, skilful handling of objects:
	Have a preference to control one's body movements and to handle objects skilfully
Inter-personal	Awareness of feelings, moods, motivations and desires of others and work best in a crowd:
	Have an external focus and good people skills
Intra-personal	Awareness of one's own feelings, desires and capacities:
	Have a capacity to be self-aware and in tune with one's inner feelings, values, beliefs and thinking processes.
Naturalist	Recognition and classification of plants, animals, weather, sea, earthly events and objects in nature:
	Have the ability to recognize and categorize plants, animals and other objects in nature.

1.2.4 Definitions of Creativity

Given the complexity identified by G8i, the vast number of possible perspectives to consider (for example, from psychologists, physiologists, sociologists, neurologists, linguists and business executives) and the vast range of contexts within which the concept is applied, composing a single, common definition of creativity, the "creative individual" or even creative intelligence is almost impossible. "Creatology" as the "cross-disciplinary science of creativity, emphasizing the fact that creativity cannot be reduced to psychological phenomena" is an inter-disciplinary concept coined by István Magyari-Beck ([34], p. 433).

The fact is that creativity remains a poorly defined construct and definitions are likely to be context-related. Read Chapters 2, 9 and 18 for several attempts by various scholars to tightly define creativity and creative genii (those displaying creative attributes and personality traits). Educator Anna Craft [35] reminds us that although some humans may aspire to be exceptional genii, all humans are endowed with a natural ability to solve problems in novel ways and show a more ordinary, less celebrated form of everyday (also called little-c) creativity [35, 36]. Bergson (as cited in [37]) regarded creativity as "the primary marker of humanity" (p. 104). In the *International Handbook of Creativity*, Mouchiroud and Lubart [37] translate the work of Bergson as follows (p. 24):

> Human life finds its essential meaning in a creation that can, contrary to those of artists or scientists, be pursued at every moment in every man: the creation of the self by the self, the growth of personality through an effort that draws a lot from a little, something from nothing, and adds continually to the wealth of the world. [38]

An Encompassing Definition of Creative Intelligence (CiQ).

For the purposes of business readers and executive genii, we propose a more comprehensive definition that particularly focuses on functional creativity. Throughout the book we define creativity and creative intelligence (CiQ as opposed to creativity as a product) as the ability to produce something that is new or original, and valuable or useful within a particular domain [38–41] by an individual, a team or a crowd; and the novel ideas needed to persuade social groupings of its merit and be generative in its contribution to society and/or the firm.

In the next section we consider how all these aspects come together to deliver creativity.

1.3 The HOW of Creative Thinking

1.3.1 How Do Humans Think Creatively?

A theoretical framework to aid students' and scholars' understanding of the complex and multi-faceted phenomenon of creativity was proposed by Mel Rhodes in 1961. At the time he investigated ingenuity, originality and imagination, and found

a complicated treasure trove of 40 overlapping and inter-twined definitions. These definitions had four strands of creativity in common, and resulted in his theoretical framework of the 4Ps of Creativity [42]: (1) Person, (2) Process, (3) Press, and (4) Products. The term Person covers "personality, intellect, temperament, physique, traits, habits, attitudes, self-concept, value systems, defence mechanisms and behaviour" ([42], p. 307). The second P, Process, applies to motivation, perception, learning, stages of the problem-solving and thinking processes, and communication. Press refers to the relationship between the person and their environment (p. 308). Ideas are formed as a result of the sensations, perceptions and imagination of the creative person. Sensations and perceptions come from both internal and external sources and develop using stored memories, multi-factorial intellect, and the ability to recall and synthesize ideas. "Each idea that emerges reflects uniquely upon the originator's self, his [sic] sensory equipment, his mentality, his value systems, and his conditioning to the everyday experiences of life" ([42], p. 308) The fourth strand pertains to ideas. When an idea becomes embodied in tangible form such as paint, clay, words, metal, paper, fabric or other perceivable form (including videos, blogs, and other digital formats) it is called a product. In short, Product is the way the idea is communicated to other people ([42], p. 309).

After studying more than 800 contemporary source documents about creativity and innovation, we concluded that modern business creativity needs an additional three constructs (Ps) to reflect small, but very significant shifts over the last six decades. The new 6Ps model expands Person to add Partnerships, expands Press and elevate the role of Politics/Philosophy, and this model further adds Possibilities to the original 4Ps model. The strand of Partnerships emphasizes the roles of teams and large groups, as well as contributions such as crowd-sourcing and incremental advancements by compilations of a host of earlier creative leaps (e.g. see the example of how Microsoft Windows™ created new software; and Disney Imagineers as an example in Chapter 18). The P of Politics/Philosophy addresses the willingness of organizations to embrace (or resist) an innovative culture conducive to creativity; governments' appreciation and support of creative endeavours (e.g., entrepreneurial spirit, innovation and cross-pollination over national boundaries); and government departments' direct support for developing creative competencies through formal education, informal developmental channels and not-for-profit forums. The sixth P, Possibilities, relates to the vast array of diverse configurations and combinations of cultures, nationalities, people, materials, belief and ideas, thus celebrating the vast array of variables in the universe. Possibilities include the constancy of change and what changes in narrative, dictum, philosophy and epistemology may bring in terms of the union of the unlikely and unusual. Possibilities as the sixth P relates to human brain plasticity, our infinite ability to adapt and grow, and our aim to build on and exceed the achievements of the past, through new combinations that create meaning, value, well-being and beauty (Fig. 1.2).

Fig. 1.2 6Ps Model for Business Creativity and CiQ Development

1.3.2 The Heart and Mind of Creativity

Although the rest of the book will cover these 6Ps in far more depth than one chapter can achieve, we consider it foundational to the rest of the book to illuminate the overall model, and divergent thinking (as a Person skill) in particular, before we venture more deeply into investigating each of the 6Ps.

1.3.3 Divergent Thinking

Divergent thinking abilities are closely linked to creative intelligence and the ability to solve problems in unique and novel ways. According to many scholars in the area of psychometric assessment of creativity, divergent thinking abilities are the most likely candidates for determining creative potential [9, 43–47]. Divergent thinking (DT) skills are often assessed through thinking tasks, using visual (figural) and verbal prompts to initiate idea generation [8, 43]. Examples of figural prompts are pictures of everyday items (e.g., bricks, paper clips, balls). In typical verbal tasks to test or stimulate divergent thinking [9] respondents are asked to generate unusual uses for everyday objects (e.g., bricks, knives, newspapers), or imagine instances of common actions, objects or sensory experiences (e.g., instances of things that are round, strong, or loud), the consequences of hypothetical events (e.g., what would happen if people no longer need sleep, shrank to 30 cm tall, or the sun becomes too

harsh to be outside), or similarities between common concepts (e.g., ways in which milk and meat are similar). "Divergent thinking tasks are thus a kind of fluency task: they assess production ability in response to a constraint. But unlike letter fluency tasks (e.g., list as many words that start with M as you can) and semantic fluency tasks (e.g., list as many cities as you can), divergent thinking tasks intend to capture the creative quality of the responses, not merely the number of responses"([9], p. 69).

Not all scholars agree that divergent thinking skills should be used as a predictor of creative ability. In fact, in most recent studies divergent thinking ability is quite clearly warned against as an assessment of creativity, but it is seen as or often used to estimate meaningful creative potential [48, 49]. Some scholars suggest that the underpinning of DT might be what is assessed or predicted by high achievement in DT assignments. Fundamentally, DT rests on thinkers' abilities to judge relatedness between concepts. Creativity scholars [50] suggest that creative people need to be faster at judging the relatedness of concepts, as this is likely to improve their judgement of promising ideas and ideal pathways to problem solving. Their studies assert that creative people are faster at processing information under conditions of low ambiguity.

1.4 The WHY of Creative Thinking?

1.4.1 The Value and Purpose of Creative Thinking

In his best-selling book, *A Whole New Mind: Why Right-Brainers Will Rule the Future*, Daniel Pink [51] predicts that "[t]he future belongs to a different kind of person with a different kind of mind: artists, inventors, storytellers – creative and holistic "right-brain"[2] thinkers whose abilities mark the fault line between who gets ahead and who doesn't." Later Pink writes that art is the single most important class students can take, because this course is one of the few places in school where creativity is taught. Business executives and other more technical disciplines might ask: So what? The chapters that follow focus on the current trends and capability needs of modern society and what creative thinking skills and habits bring to the table, or in the case of business, to the bank. Various authors illuminate the many benefits of having creative thinking habits and developing the skills that are part and parcel of intelligence. We will break them down into three main sub-sections: Personal benefits, corporate benefits and societal benefits.

[2] Please note that the notion of "left-brain, right-brain thinkers" has been dispelled and is merely used as an analogy for the preference for analytical and creative thinking.

1.4.2 Personal Benefits

As early as 1900, the French psychologist and scholar Ribot showed interest in the art and science of creativity in everyday life. His translated work (as cited in [37]) declares: "Every person creates a lot or a little. One can, out of ignorance, invent what has been invented a thousand times; if it is not a creation for the species, it remains so for the individual. It has been wrongly said that an invention is "a novel and important idea": only novelty is essential, it is the psychological mark… thus invention has been mistakenly restricted to famous inventors."

Change is the only constant – a well-known and commonly used adage that describes every generation's seemingly endless exposure to re-engineering, re-imagining, re-designing, and incremental and radical innovation. So, no matter how many changes we have experienced, how smart we are, how competent we have become, we must be able to be resilient in the face of adversity, adapt to change and evolve with the changing context of the world we live in. Unfortunately, although things around us are dynamic and keep evolving, as Dan Ariely writes, many humans' thinking stagnates or becomes set in predictably irrational patterns [52, 53]. Our behaviour isn't random. In fact, we make the same mistakes repeatedly. As employees we are paid to make sound, effective and efficient decisions. To do this, we learn standardized strategies to see us through and use our experiences to carefully hone patterns and belief systems, habits and norms that help us to quickly respond to challenges. But this is based on our own past experiences, prior learning, erroneous thinking patterns, biases, and even unconscious incompetence [54, 55]. Unfortunately, the tried and tested solutions and thinking skills of the past will not solve future challenges. Knowledge is no longer enough. Where in the past your accumulated knowledge, experience and training gave you the edge, it will not necessarily do so now and into the future. Creative intelligence and access to a host of creative competencies and tools will make you a desirable, employable talent [50].

Most people are born with the ability to be creative (just watch 2- to 4-year-olds play). By age 10, or even at an earlier age, the education system has knocked some of the creativity out of kids (see the NASA report over a 15-year period; [56], p. 6), to ensure development of the analytical and critical thinking skills that were required for the industrial and knowledge economies of the past. These skills are no longer enough. Creative insights will be necessary to solve new, unpredictable, and unexpected problems. Various authorities such as the World Economic Forum and other professional bodies (AFANZ, WFA) predict that complex problem-solving skills, critical thinking, and creativity are the top three workplace skills needed for employees to thrive in the 2020s and beyond. In 2012, a study by Adobe found that 9 out of 10 individual workers saw creativity as required for economic growth and 96% believed creativity to be valuable for society as a whole. Sadly, in the same study only 11% of respondents agreed that their current practices were aligned with creative working. In its report "The Creativity Dividend" [57]. Adobe also reported that 82% of companies see a strong connection between creativity and business results, but in sharp contrast to the strategic imperative, 61% of senior management did not

see their companies as creative [57]. This brings us to the corporate benefits of creativity, creative intelligence, and innovation.

As society realizes the costs of being unhealthy and not caring for one's body, more messages from various authorities urge people to eat healthily and exercise. Just as humans lose the ability to run fast, jump high, and live healthily by allowing their muscles to wither and be less useful, so does neglect allow creative intelligence to decline, weaken and eventually die. Just as an exercise regime can help people recover a level of fitness and over time acquire fitter, healthier bodies, so can earlier creative capacity be regained. By re-engaging our creative minds, relearning to play and explore ideas, rekindling our curiosity, and improving our minds, *Homo sapiens* (knowing, discerning, wise man) can survive and thrive. Imagine what we could achieve if we allowed ourselves the creative freedom of children? Without the self-inflicted and education-enhanced mental restrictions, we might quote the Spanish artist Pablo Picasso, who said: "It took me four years to paint like Raphael, but a lifetime to paint like a child".

1.4.3 Corporate Benefits

Daniel Pink [51] writes that we have moved from being a society of farmers to a society of factory workers and now to a society of knowledge workers (p. 50). We are yet again to move, into a new era of "a society of creators and empathizers" ([51], p. 50). He adds later that "we've moved from an economy built on people's backs, to an economy built on people's left brains, to what is emerging today: an economy and society built more and more on people's right brains… R-directed Thinking" (pp. 50–51). Pink suggests that businesses will have to supplement highly technical and high-tech abilities with "high concept and high touch" ([47], p. 51). "High concept involves the ability to create artistic and emotional beauty to detect patterns and opportunities, to craft a satisfying narrative and to combine seemingly unrelated ideas into a novel invention. High touch involves the ability to emphasize, to understand the subtleties of human interaction, to find joy in one's self and to elicit it in others and to stretch beyond the quotidian, in pursuit of purpose and meaning" (p. 52).

Creativity is linked to openness, playfulness and the willingness to see alternative viewpoints and perspectives. These attributes and personal characteristics are of value to businesses, as they bring diversity of outlook and insight into teams, foster collaboration (as opposed to "my way is the only way"), and bring a willingness to offer and accept dissent. According to NASA, willingness to adopt a devil's advocate's viewpoint is of great value to ensure careful deliberation over fast and rational decisions and to consider alternative views to the "standard" traditional or normal ways things are done "around here", bringing different conceptual perspectives into consideration.

Anthony Lutz is a Swiss American automotive executive who served as a leader at Ford Motor Company, as president of Chrysler Corporation, and acted as vice chairman of General Motors. When taking over as GM's vice chairman, Lutz was asked how he would approach business differently from his predecessors. His response was: "It's more right brain… I see us being in the art business." This not only demonstrates the importance of art in business, but acknowledges that art is business. Business executives realize that it is easy to replicate logical, analytical thinking (left-dominant or L-directed thinking), but that the high concept, high empathy and high design skills of creatives are not just harder to build into machines [58], but are often more valuable to the development of innovations. John Hawkins [59] estimated that this move towards more creative works (including design, arts, video production and gaming, among others) would take the worth of the creative industry in the UK from its $230 bn (in 2005) in value, to $6.1 trillion over a period of 15 years.

The empires of the future are empires of the mind. – Sir Winston Churchill

1.4.4 Societal Benefits

Developing creative intelligence helps learners of all ages to think in new and different ways. In the words of Albert Einstein, "we cannot solve problems that were created with one type of thinking, with the same type of thinking". So, in a complex, dynamic and tumultuous world, having thinkers with a host of thinking tools, and the ability to select the most appropriate tool at the right time, and equally importantly to know when to use fast and frugal thinking, when to use slow, elaborate, highly rational thinking [60–62] and when to "drop your tools" (in this case normal thinking habits and tools) [63] will be of great benefit in solving sticky societal problems.

Even at school level, "the kinds of thinking developed by the arts are important in and among themselves; as important as the thinking developed in more traditionally academic subjects." [64]. In their book *Studio thinking: The real benefits of visual arts education*, Lois Hetland and co-authors [65] emphasize the key benefits learners gain from studio art training, including the ability to engage and persist with problem identification and solution finding; envision possible outcomes and "what if" scenarios, visually and verbally convey ideas; observe self and others and social interactions; critique self and others in a community of learners; and engage in reflection and forward thinking. Lacking in amplitude but important in value are the two associated learning outcomes of disciplined and collaborative thinking. One of the myths relating to creative thinking is that creative ideas and creative products emerge as a flash of brilliance or instantly. Although a moment of clarity of insight (see "the Aha! Moment" in Chapter 12) is a rare occurrence, very often creatives spend hundreds of hours developing expertise and skills, and numerous hours crafting, honing and improving their idea, artefact or innovation.

The reason to develop CiQ is best captured by this statement from Richard Florida:

> Every single one of us is creative, and the greatest companies and the greatest cities are going to stoke that creative furnace burning inside every one of us. – Richard Florida

1.5 Conclusion

As a society and as enterprises we need creative thinkers from a vast range of disciplines to deal with our ever-growing population's sticky problems. As business executives we need to hone and continually nurture creative intelligence in all its complex and diverse forms, across multiple disciplines within our organizations and for all the genii and teams in our organizations. Perhaps our resources are best spent on finding out how to optimize and multiply creative competencies in the service of societal benefits and well-being. The rest of the book is our attempt to add a host of hints, tips, theories, models and frameworks to your cache of creativity tools. We urge you to skip the sections you find irrelevant or out of sync with your personal journey, and return to them later on. Please do not exit prematurely from your personal journey of discovery and growth.

CREATiViTY LABORatory

Activity I: Eight Intelligences

Eight intelligences	**Think of a time you used this intelligence to solve a problem**. Record the importance to you[a] to develop this further (as a rating out of 10). What could you do to develop this intelligence?
Verbal linguistic	☐
Syntax, semantics, phonology, pragmatics	
Have well-developed verbal skills and sensitivity to the sounds, meanings and rhythms of words	
Musical	☐
Pitch, rhyme, timbre	
Have the ability to produce and appreciate rhythm, pitch and timbre	
Logical-mathematical	☐
Patterns, number, relations, calculations	
Have the ability to think conceptually and abstractly, and capacity to discern logical and numerical patterns	
Spatial	☐
Mental visualization, mental manipulation, transformation of images	
Have the ability to think in pictures; visualize abstractly and accurately	
Bodily-kinaesthetic	☐
Control of bodily motions, skilful handling of objects	
Have a preference to control one's body movements and to handle objects skilful	
Inter-personal	☐
Awareness of feelings, moods, motivations and desires of others and work best in a crowd	
Have an external focus and good people skills	
Intra-personal	☐
Awareness of one's own feelings, desires and capacities	
Have a capacity to be self-aware and in tune with one's inner feelings, values, beliefs and thinking processes.	
Naturalist	☐
Recognition and classification of plants, animals, weather, sea, earthly events and objects in nature	
Have the ability to recognize and categorize plants, animals and other objects in nature.	

[a]This is a personal viewpoint or ranking. It should not be seen as a goal or purpose statement, but merely a way to consider whether this is something (an intelligence) you wish to spend time and other resources on. And if so, how high does it rank and what could you do to improve this competence?

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Chapter 2
The Human Brain – Cortex, Lobes, Neural Networks and Problem Solved!

Rouxelle de Villiers

Abstract The human brain is a fascinating and fabulous thinking machine. Although scientists understand a lot about how the brain works, not all is revealed yet. But between neuroscientists and psychologists the world of the mind is slowly becoming clearer and less mysterious. The way the human brain processes information has a huge range, including sensory reception, affective perception, memory, multiple intelligences (e.g., musical, logical-mathematical, spatial and linguistic intelligence), thinking, learning, intuition, decision-making, problem-solving, and creativity. The chapter focuses on the biological, genetic, neuroanatomical, and physiological perspectives of creativity. The most important finding is that creativity involves the whole brain. The chapter will answer, to the best of our current knowledge, questions such as: Which parts of the brain associate with what type of thinking? Which parts of the brain are involved in creative thinking and problem solving? And can we improve our creative intelligence, or is it genetically endowed, given our brain structure? Can we enhance our creative capabilities given the human brain's capacity to adapt and learn?

Keywords Brain structures · Central brain functions · Genetic theory · Hemispheric specialization · Hereditary abilities · Prefrontal cortex · Working memory

Learning Objectives
On completion of this chapter, the readers will be able to:

- Describe the basic brain functions and which areas of the brain control those functions.
- Justify their viewpoints and orientation regarding the role of nature versus nurture in developing individuals' creative competencies.
- Relate diet and other choices to mental health and the brain's well-being.
- Formulate a plan to improve their working memory and associative abilities.

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2.1 Introduction

For a great many years creativity and its relationship to the brain remained a mystery, due to a lack of tools to study anything but the "dead" brain of a deceased person. Over the last 50 years or so new technologies providing functional brain imaging, such as Magnetic Resonance Imaging (MRI) and Positron Emission Topography (PET), have been used extensively to map regional changes in brain activity. MRI and PET scanning have led to new insights into the brain's functions and specializations; specifically, the relationship between creativity and the actual mechanisms underlying it. In 1964 Roger Sperry [1] published his foundational work about the specialization of the two hemispheres of the brain. This early research provided evidence that the two hemispheres communicated via the corpus callosum (a bundle of nerves linking the two brain halves). This research launched a great many studies on hemispheric processes and led to the current understanding that sequential, logical, analytical verbal and propositional processes are dominant hemispheric processes, whereas non-dominant hemisphere processes include simultaneous, holistic, visuospatial, synthesis, pattern-recognition and holistic thinking [2].

We want to immediately and emphatically urge readers not to fall into the misguided view of "split brain" thinking or hemispheric dominance, although there are dominant hemispheric processes [2–4], which have been linked to the dominant brain functions (normally left brain for right-handed people and sometimes right brain for left-handed people). Notably, creativity requires both dominant and non-dominant thinking processes, and recent laboratory research confirms that brain scans during all types of thinking indicate that multiple areas on both sides of the brain are active, "firing" electromagnetic pulses. "The myth that creative thinking is located in the right hemisphere should be dispelled at once" [5].

2.2 The (Creative) Brain

The central nervous system (CNS) consists of the spinal cord, the brain stem, the cerebellum, and the cerebrum. The peripheral nervous system includes the nerves that lead to and from the different parts of the body, including all senses and muscles. The brain is the most important organ in the human body as it controls thought, memory, emotion, touch, motor skills, vision, breathing, temperature, hunger, and every process that regulates the body. Some connections within the brain translate to individual traits and characteristics, including our personalities, emotions, and memories. Understanding the intricacies of our most complicated organ is a work in progress, but there is some consensus on how the brain tackles problems, memory (of facts) and emotions.

The brain is divided into four main sections, namely the cerebrum, brainstem, cerebellum, and the linking structures (thalamus, hypothalamus, and limbic

systems). The largest part of the brain is the cerebrum (front of brain), which scientists subdivide into the left and right hemispheres, joined by the corpus callosum. Functions of the cerebrum include initiation and coordination of movement, temperature regulation, touch, vision, hearing, judgement, reasoning, problem solving, emotions, and learning. The brainstem (middle of brain) includes the midbrain, the pons, and the medulla [6]. Functions of this area include movement of the eyes and mouth, relaying sensory messages (such as heat, pain, and volume of sounds), respiration, consciousness, cardiac function, involuntary muscle movements, sneezing, coughing, vomiting, and swallowing. The cerebellum, at the back of the head, coordinates voluntary muscle movements, and maintains posture, balance, and equilibrium. Between the cerebrum and the lower parts are the thalami and the limbic system, which control general emotions, fears, basic drives and urges such as hunger, thirst, and sexual desire. They are also involved in learning and memory formation.

Since the early 1960s scientists have understood the different and specific foci of the hemispheres of the brain. Scientists agree on hemispheric specialization – i.e. the two spheres have different hemispheric processes: the dominant hemispheric processes, associated with the left hemisphere (for most people and if right-handed) are sequential, logical, analytical, verbal and propositional processes – therefore this hemisphere is normally dominant for language, logic and mathematical ability [3, 7–9]. The non-dominant hemisphere processes (right hemisphere for right-handed people) deal with simultaneous, holistic, visuospatial and propositional thinking, pattern-recognition and synthesis – therefore this hemisphere is dominant for emotions, art, and spatial reasoning [7, 8, 10]. Also, each hemisphere controls the sensory and motor functions of the opposite side of the body. Most people are left-hemisphere dominant for motor control, making them right-handed. Unfortunately, research into hemispheric specialization has been misunderstood and generalized to the point of erroneous claims such as “the right hemisphere is where creativity resides”. As early as 1997, Katz noted that “[the] tendency to treat the functions of the cerebral hemispheres in an overly simplified fashion without recognizing that, even with a highly lateralized function such as language, one can find evidence that both hemispheres are engaged at some level” ([7], p. 127). It is therefore prudent to recognize that most cognitive and emotive activities engage in inter-hemispheric communication and, that although some hemispheric specialization is evident, processes are distributed across both brain hemispheres.

It is likely that the “right brain creativity” label may have been popularized due to the dominant left hemisphere’s logical and analytical processing. In contrast, creativity is seen as involving the somewhat non-logical, non-traditional, non-conforming traits required for many arts (fine and visual arts, drama, and poetry). Therefore (so it has been argued) creativity must reside in the processes of the non-dominant hemisphere where synthesis, visuospatial and holistic processes are assigned. In contrast to this argument, language underpins a number of creative arts (art, drama, music, stories, poetry). Moreover, to communicate and influence audiences, to provide meaning and persuade, is to use language or at least some form of encoded transmission. Therefore, this “laterization model applies poorly to

language-based innovation. This is a significant defect, since symbolic verbal communication underlies most creative thought and its culture transmission and may have driven the evolutionary increase in the size of the human brain" ([11], p.147). So, in the words and sentiment of Edwards [12] and Hendron [13], the belief of Alice Flaherty [11] and for the sake of good science, please immediately dispel the notion that creativity resides in the "right side of the brain". Runco states very succinctly: "[T]he whole idea [of right-brained creativity and] of one responsible area or locus of the brain [for creativity] is inaccurate. Creativity epitomizes adaptability and must be viewed as complex. No wonder it would be enormously unreasonable to expect any one (circuit, hemisphere, lobe) brain locus to be responsible. It must be a collaborative effect and controlled by different brain structures and processes" ([5], p.108) (Fig. 2.1).

2.2.1 The Split Brain: – Hemispheric Specialization

The human brain is a complex and intricate organ and for centuries, geneticists, neuroanatomists and other related neurological experts found it hard to view creativity as a legitimate topic for empirical study, other than as a neuroanatomical (physiological) study of the two hemispheres of the brain. In 1964 Roger Sperry studied the separation of the two hemispheres, and although not directly related to creativity, his foundational studies informed the work of scholars like Bogen et al., Hoppe and Kyle, and Ten Houten [9, 15, 16]. With the aid of Sperry's theories and hypotheses, latter-day scholars developed research targets and hypotheses to aid the modern understanding of creativity and how the brain functions. Fortunately (for the field of creative science), technological advancements over the last 40 years have led to vast improvements in research on the brain, and creative thinking in particular. The development of functional Magnetic Resonance Imaging (fMRI[1]) and Positron Emission Topography (PET) [17] scans have improved scientific studies, and have taken our understanding from weak inferences from preserved (but dead) brains (like that of Albert Einstein) to trustworthy, rigorous biological

[1] Modern brain scanning technology – such as functional magnetic resonance imaging (fMRI) – allows scientists to watch brain activity in real time. Increased brain activity requires increased amounts of oxygen. Because the haemoglobin in red blood cells that carries oxygen also contains iron, magnetic imaging can track those cells, showing how brain activity changes as the subject engages in creative and non-creative tasks. There are, however, some issues with this method. Practically, fMRI scanning requires the subject to be completely immobile inside a constricting tube, limiting the activities they can undertake, and how they can communicate their thoughts. Tests also require the subject to be 'creative' on cue while in a large, noisy, sterile machine – hardly the ideal creative environment! Multiple tests, involving regular switching between creative and non-creative thinking tasks, are needed to give comprehensive data for accurate conclusions. Researchers need to be creative themselves to design experiments that work within these constraints. Retrieved from: http://www.creativethinkingproject.org/creativity-and-the-brain/ on 12 March 2020.

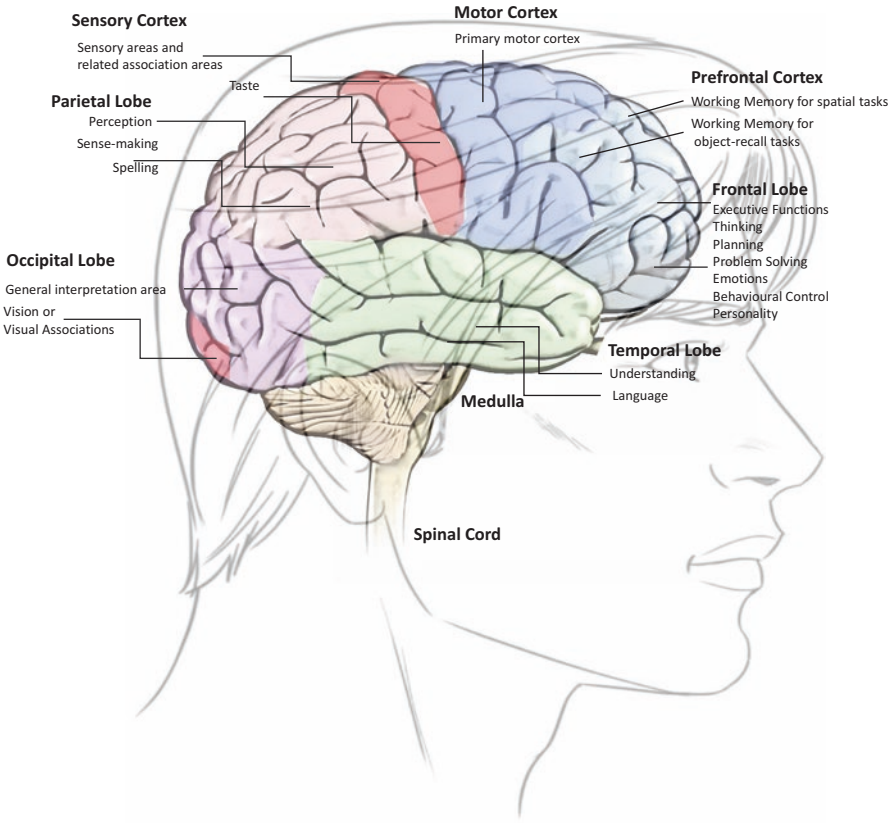

Fig. 2.1 Brain biology and central functions of the brain (person facing right) [14]

research that is as credible and valid as any other field of study [5]. Relevant studies are wide in range and deep in analysis and include biological, genetic and physiological processes such as the impact of stress and exercise on creative thinking and creative processes.

2.2.2 Prefrontal Cortex and Hippocampus

The prefrontal cortex has received a great deal of attention in studies of neuroanatomical research and in recent studies of creativity. It is the part of the brain located at the front of the frontal lobe. Scientific studies indicate that the prefrontal cortex may be the very seat of consciousness itself, dealing with working memory and the cognitive basis of conscious thought (Dietrich [18], Runco [5]). The prefrontal cortex is further primarily responsible for higher cognitive functions and complex behaviours, including memory, arousal, attention, perception and self-reflection,

and planning. Damasio [19] reports that the prefrontal cortex may play a significant role in temporal integration, abstract thinking, personality development and moderating social decisions and behaviour. The most typical psychological term for functions carried out by the prefrontal cortex area is executive function – denoting the brain's abilities to differentiate among conflicting thoughts; determine good and bad; contrast better and best, same and different, and consider the long-term and future consequences of current activities; work toward a defined goal; predict outcomes; derive expectations based on actions; and exercise social "control" (the ability to suppress urges that might otherwise lead to socially unacceptable outcomes). According to studies in psychology, feeling guilt or remorse, and the ability to interpret reality, may also be dependent on a well-functioning prefrontal cortex. Scientific studies in neuroscience and psychology indicate that the left and right halves of the prefrontal cortex appear to become more interconnected in response to consistent aerobic exercise. Practicing mindfulness appears to enhance prefrontal activation, which is correlated with increased well-being and reduced anxiety.

The last focus area (for students of creativity rather than psychology, neuroscience, or medicine) is the hippocampus, which is important in regulating motivation, emotion, learning, and memory. [In Fig. 2.2, the hippocampus is the brain structure embedded deep in the temporal lobe of each cerebral cortex]. The two temporal hippocampi play an important role in piecing together details of experiences – people, places, objects, actions – to accurately re-construct past events and to accurately forecast and vividly construct possible future events. Further, in creative intelligence the hippocampus is part of the limbic system, and plays a vital role in the consolidation of information from short-term memory to long-term memory. [Later in this book we will discuss the importance of working memory and intrinsic motivation on creativity as well as its role in judgement of the value and appropriateness of creative ideas.] Both memory and imagination use multiple areas of the brain. Memory is a constructive process. Past experiences and events are stored in different parts of the brain – across what is termed the 'default network'. The hippocampus, one part of the default network, stores 'episodic memory' of experienced events. Recalling past events, information, sensory experiences, emotions, or actions involves accessing different pieces of information, reintegrating them into a coherent memory and returning them into the short-term or working memory. fMRI illustrates that 'projections' of future events involve activity in these same parts of the brain. In other words, imagining the future relies on accessing information stored about the past.

2.2.3 The Long and the Short of Memory

The prefrontal cortex serves three functions related to facts and memory, as part of the creative thinking processes. According to Arne Dietrich [18] the first role of short-term memory (STM) is to create conscious awareness of an idea (in the working memory) in order to then judge an idea or solution. The second role is to assist

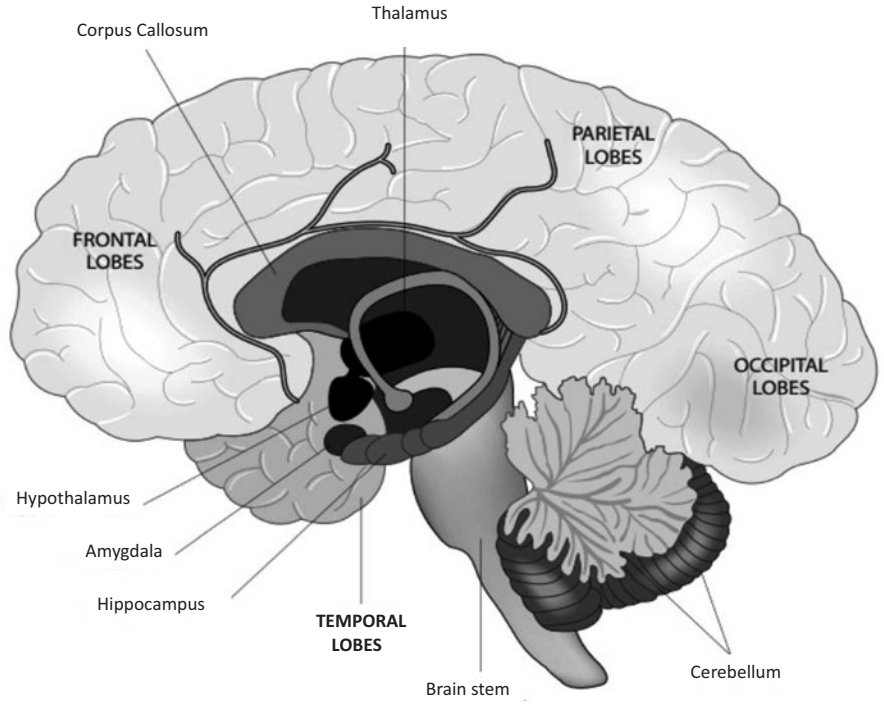

Fig. 2.2 Major brain structures (person facing left)

with integrations – to bring associative ideas into consciousness. Mark Runco emphasizes that the processing of ideas to lead to insight (the so-called "Aha!" moment) takes place elsewhere, and may not depend on the prefrontal cortex ([5], p. 83). The third role is the prefrontal cortex's role in idea implementation. For businesspeople and creative professionals, taking the insight onward to goals and subgoals and a viable plan is vital in successful ideation and implementation. Neuroscientists emphasize idea retrieval and idea suppression (evaluative processes). It is as important for decision-makers and creatives to suppress or constrain irrelevant memories and information as it is to retrieve what is pertinent to the problem, because evaluative processes are inherent in good decisions and appropriate idea generation [5, 19]. According to Edward Nęcka, "memory is a psychological structure that… takes part in the cognitive mechanisms of insight in creative problem solving and determines the specificity of information processing observed among creative individuals … creativity cannot occur without the participation of memory processes and structures" ([20], p. 193).

Let us return to the concept of "working memory". For any active, mindful cognitive processing (conscious thinking) the information needs to be present in the working memory, also referred to as short-term memory (STM). The sensory memory is the first to receive information from the external environment and holds stimuli for less than 1 s in storage. There is no research to indicate that the sensory

memory is connected to creativity. On the other hand, the STM is called the working memory, because it holds up to nine pieces of information at one time, performs basic manipulations with symbols (words, numbers, icons, pictures and signs) and is commonly seen as the central processing unit of the human brain. Mark Runco [5] reports on the working memory as the "cognitive basis of conscious thought" (p. 82). When people actively, mindfully consider any idea or thought, the information is taken from the working memory. Runco suggests an analogy of two working employees for the STM. One employee is the slave that allows conscious retrieval and manipulation of information, and the other is the executive that directs and focus attentional resources. The STM aids in making important choices, decisions, and novel combinations of entities as images that are involved in creative thinking and ideation.

Due to the neurological inability of even the best STM to retain more than 10 ideas, the main memory to focus our study of creativity on is the long-term memory system (LTM) of the human brain. The LTM, in contrast to the STM, can store an unlimited amount of information for an unlimited time. It is most often not the capacity of the LTM that limits our retrieval or recall and leads to imperfections in memory, but either interference (caused by noise or poor observation skills) or inefficient strategies for remembering. Efficient LTM strategies rely on three phases: (i) encoding, (ii) storage, and (iii) retrieval. Since complex, ill-defined or sticky problems often need hundreds of items of information to be considered simultaneously, solution-finding needs metacognitive strategies or specific problem-solving strategies using inventive manipulations of both the problem definition and the ideation techniques to offer a divergent range of options. "[P]roblem finding and problem definition constitute the vital part of creative processes in real life. Finding, definition, redefinition and solution of such problems usually take a lot of time, effort and motivation but they do not seem to rely on the extended capacity of short-term memory" ([20], p. 194).

2.2.4 Neurons and How Ideas Jump Between Neural Pathways

The brain is a highly complex and specialized organ with different structures, substructures and regions [21]. These substructures play specialized roles in various brain processes. When studying creativity, it is useful to understand the flexibility, adaptability and huge number of permutations delivered by the circuits, systems and networks within the brain that aid creativity. Runco [5] describes the brain as "humungous", consisting of "grey matter", with the most basic building blocks being the neurons, dendrites, and synapses (see Fig. 2.3 below). At the microscopic cellular level, the brain looks like a complex web of stretched out octopi, or an extremely complex web of electrical fibres floating [22] in liquid. In the nervous system, a synapse is a structure that permits a neuron (or nerve cell) to pass an electrical or chemical signal to another neuron or to a target effector cell. A neuron has long projections that lead out from the cell body. These long projections, called

dendrites, split into smaller branches. This results in one neuron being in contact with up to 50,000 other neurons through their respective dendrites. In simple terms, neurotransmission is the way brain cells communicate, with most of the communication occurring at the synapse level. If considered on a micro level, there are literally trillions of neurons, synapses, and dendrites. A single neuron may have thousands of synapses.[2] According to Herculano-Houzel ([23], p. 31) the cerebral cortex consists of approximately 100 billion neurons (10^{11}), the cortex approximately a trillion (10^{12}) and the thalmus and other grey matter another billion or more neurons. Given the pathways formed by billions of neurons, circuits and interactions between cells and regions of the brain, the combinations of pathways and interactions are almost unimaginable, with over a quadrillion cells and synapses.

2.3 Creative Intelligence vs Expertise

We have discussed the role of expertise in creativity in Chapter 1, but it is important to contrast expertise and creative intelligence as far as brain functions and systems go. Arne Dietrich [18] stresses the differences, concluding that knowledge and creativity involve different neural circuits. Knowledge is largely a function of the temporal occipital parietal (TOP) regions, but creativity resides mainly in the dorsolateral prefrontal cortex. "One could imagine than an uncreative expert would have an 'endowed' TOP, but a less-remarkable prefrontal cortex" (p. 1020). A highly original but not very effective individual would have the opposite constitution. The

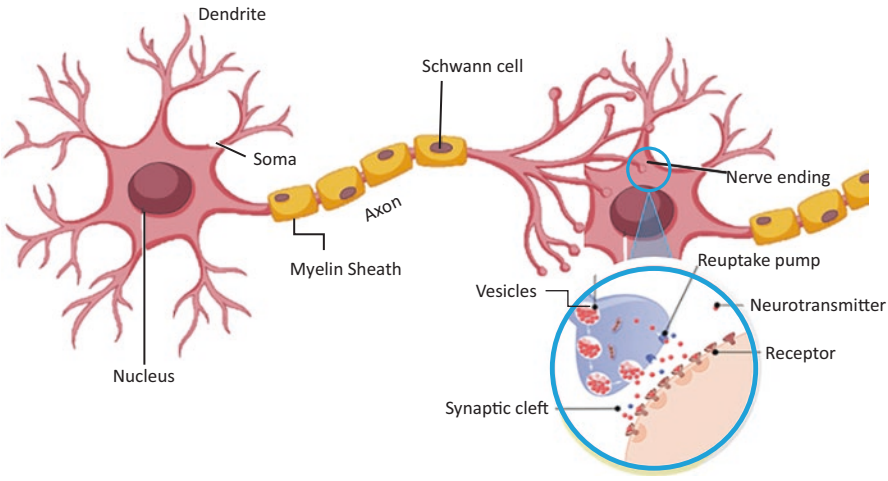

Fig. 2.3 Structure of a neuron and details of neurotransmitters in nerve endings

[2] The current estimation of brain synapses lists around 0.15 quadrillion (or 150,000,000,000,000) synapses.

creatively intelligent person, of course, would have both. Not surprisingly, this view acknowledges domain differences. The artistically inclined individual "possesses a finely honed emotional brain" (p. 1021). This last statement is quite important as creativity does not result from logical, analytical thinking and cognition alone.

This book covers the importance of motivation (intrinsic drive), interest, curiosity, attitude, and personality (and will expand on these in Chapters 3, 4 and 5) in the extra-cognitive processes of creatives. These non-cognitive traits at the very least determine what the creative person considers worthy of attention and thus the application of their cognitive resources. Damasio [19] reports that courage, motivation, and the ability to bring images and combination of images into the working memory, are abilities at the top of the list of extra-cognitive processes associated with creativity.

Other researchers also highlight internal drive [11, 24] – a kind of mania or passionate interest – as being associated with creativity. Alice Flaherty [11] investigated and found evidence for a three-factor anatomical model of human idea generation and creative drive. This model links the interactions between the temporal lobe, frontal lobe, and limbic system to creativity. According to her study, mesolimbic dopamine[3] (thought to be especially important in mediating pleasure and rewarding experiences) influences creative drive and novelty-seeking behaviour substantially. According to her 2005 study, creative drive associates highly with successful creative output; more so than skill. This may be because dopamine and internal drive may facilitate creativity by driving goal-directed behaviour and decreasing latent inhibition. Other studies align well with this study and confirm the role of the limbic (reward and pleasure stimuli) system.

Arne Dietrich [18] composed a framework of four creative thinking types, related to the neuro-anatomical [25–28] bases of thinking: (i) emotional and spontaneous; (ii) emotional and deliberate; (iii) cognitive and spontaneous; and (iv) cognitive and deliberate – each representing specific circuitry in the brain, but all dependent upon the prefrontal cortex. After billions of possible interactions between quadrillions of different neurons and synapses, a unique pathway may deliver a novel combination, but finally the prefrontal cortex will consider the value of the idea. Dietrich theorizes that these four creative processes follow different circuits in the brain. However, all four creative types of thinking share a common creative pathway through the prefrontal cortex, "regardless of the circuit that generated the novelty." (Dietrich, [18]). This study stressed the pathways of ideas, rather than brain structures.

[3] This pathway is highly involved in dopamine's most widely-known function: pleasure and reward. Whenever a person encounters rewarding or pleasurable stimuli (e.g., food, sex, or drugs) dopamine is released and sends signals from the ventral tegmental area (VTA) in the midbrain to another area of the brain called the nucleus accumbens (NAc), which creates positive feelings that reinforce the behaviour.

2.3.1 *Brain Foods for Cognitive Health*

Foods rich in omega-3 fats (found in fish oil, nuts, and seeds) are neuro-protective and can boost the brain chemicals that are needed to form new neurons. The brain needs water, oxygen, and glucose (as fuel) to function properly. However, too much of any of these can be harmful. Even oxygen in the form of so-called free radicals – "highly reactive oxygen molecules that lack an electron" – can be damaging to healthy tissue ([29], p. 120). To correct the problem of free radicals, antioxidants in the form of fruits, vegetables, nuts and chocolate (in moderation) will donate electrons and neutralize the free radicals' impact. Vitamins C and E are indicated to have antioxidant powers. Vitamin C is best extracted from foods like papaya, pineapple, strawberries, watermelon and guavas, and Vitamin E from avocado, mango, kiwifruit, almonds, peanuts, hazelnuts, and broccoli. A number of scientists have called fish and shellfish "brain food", due to their high level of healthy (good) fatty acids [30–32]. sources warn that further research is required, and that initial positive results in tests on animals, need further confirmation in human patients [32].

A study published by Harvard Health [33], links five foods to better brainpower: Green vegetables (e.g. kale, spinach, broccoli), fatty fish (e.g. salmon, tuna and shellfish), coffee and tea (caffeine products), a range of berries (blueberries, strawberries and grapes to improve memory) and nuts (e.g. walnuts for memory health). In his book *Brain Power,* Joel Levy [34] suggests memory-boosting nutritional sources such as beta-carotene (found in green vegies, spinach, apricots and pumpkin), B vitamins (found in pork, liver, yeast, soy beans, peanuts, egg yolks and dried beans), magnesium (found in dark green leafy vegetables, brown rice, sunflower seeds, peas and beans), zinc (nuts, beans, seeds and wheatgerm, miso), iron (found in sardines, spinach, kale, organ meats and egg yolks) and minerals that might assist in fighting free radicals that damage nerve cells in the brain, including folic acid (folate), calcium and potassium.

Research studies [35, 36] confirm that creativity is a life-affirming activity, and may even improve mental health. Engaging in creative activities leads creative people [37], who start out with the same psychological health as the average person, to greater health and psychological freedom than the average person (p. 46–47). This finding, however, is more closely associated with individualistic cultures[4] than collectivist cultures. It is important to note here that the misconception that creative people are more likely to suffer from mental illness is not based on any solid evidence. Although it is true that creatives might be more eccentric due to the personality traits of being open-minded and non-conformist, more-creative people are no more often diagnosed with full-blown mental illness than less-creative people. The reality is that "normal, well-balanced people are more likely to make creative contributions" ([35], p. 409).

[4] Individualism stresses individual goals and the rights of the individual person. Collectivism focuses on group goals; what is best for the collective group, and personal relationships. An individualist is motivated by personal rewards and benefits. The collectivist is motivated by group goals.

2.3.2 *Memory Mental Exercises: Perception & Perspectives*

The most common interpretation of creativity is the ability to make new or unique associations between ideas. This ability could be termed the creative "strategy of combination" as practiced by many genii, including Leonardo Da Vinci. Da Vinci named himself "a disciple of experience", using various experiences of universal forms and natural structures to provide insight into new solutions to old problems. Even as a child Da Vinci is reported to have made wings for lizards from the scales of other lizards, then added horns and a beard, using his strategy of combination, to entertain his friends and design a new creature.

Having and recalling experiences and information is the energy source for creative associations. But, unfortunately our ability to recall experiences is also "one of our most perishable powers"([38], p.71). So, to optimize associative powers, creatives need to optimize memory capacity and the ability to retrieve information into their working memory.

Let's make a quick trip through the brain to follow a memory. Sensory information is received via the skin, eyes, ears, nose, and tongue. Deep in the temporal lobe is a cashew-shaped lump of brain tissue, the hippocampus. The hippocampus is the sensory gatekeeper through which the smell of your freshly washed baby, the feeling of the smooth finish on your car, and the PIN number you need to recall to unlock your phone must pass. The information passes through the hippocampus to the prefrontal cortex, where the working memory holds it briefly. When you only briefly use a number or name, use it, and then forget it, the process is a combined effort between the prefrontal cortex and your hippocampus. If you wish to retain the number or name, the information needs to be placed in your long-term memory. For this to happen, a chemical process called long-term potentiation (LTP) is needed. LTP takes place in the hippocampus. According to memory researcher Scott Small [38], there are a few physiological reasons why our brains suffer memory loss – especially after the age of 60. Normal aging deteriorates the links between the hippocampus and the prefrontal cortex, fewer neurons are made by the brain, and the prefrontal cortex – which facilitates paying attention – diminishes in size.

Fortunately, studies by psychologist Richard Sloan of Columbia University, indicate that exercise substantially increases cerebral blood volume – a proxy for more blood vessels and more neurons. The participants, previously inactive men and women aged 21–45, also did better in memory tests, after a mere 12 weeks of treadmill running (4 × 1 h per week for 12 weeks). It seems that "keeping your brain sharp, is similar to keeping your body fit. The mind can be strengthened just like muscles – with regular training and rigorous practice" [](p.74). Researchers at The Karolinska Institute in Stockholm found a significantly lower rate of dementia in those participants who exercised. But, as covered earlier, several foods, such as blueberries, walnuts and food sources rich in omega-3 fatty acids, can aid neuron growth. In contrast, a study involving 6500 adults, published in Neurology, reports that people who are overweight – in particular with large bellies – are 2.3 times more likely to develop dementia as those with normal weight and belly size. The

good news is that you can improve your memory and reduce memory failure with relatively straightforward activities, including exercise, eating the right nutrients, and investing in hours of reading, brain teasers and cognitive drills – just as you would if you tried to improve your physical health. Learning a new language or skill, repeating patterns like in knitting, sailing, playing golf and other hobbies, and playing board games, have great benefits for memory gain and retention. In the next sections we cover a few memory improvement techniques that can help your hippocampus and prefrontal cortex.

2.4 Memory Improvements

There are thousands of books and even more websites, blogs, vlogs and YouTube videos on techniques to improve your memory. One thing they all have in common is the unwavering belief that one can, with some dedication and using a variety of techniques, improve one's memory.

2.4.1 Memory Games and Vocabulary

One of the skills we are losing, partly due to the memory functions on our mobile devices, is recalling numbers as they link to specific names. Memory games and deliberate efforts to expand this mental function can improve your long-term memory and the ability to recall information for useful associations during creative endeavours. Learning poetry, acquiring vocabulary in a new language, or expanding your word power in your own mother tongue will build this capability. Word power and mental power seem to go hand in hand. Make conscious and deliberate efforts to improve your vocabulary – you will not just strengthen your mental power but will also improve your personal magnetism and social iQ (EQ). Play word games when you sit in waiting rooms, wait in lines or sit idle on a bus. One game is to use the first three letters of a car license plate to make up a word, in which these letters appear in sequence (e.g., LTR = letter, LaTeRal, or LoTteRy). The more the better. The longer the word, the better. If it seems impossible another approach is to use the letters, but not in sequence (e.g., UQS = QUeSt or QUeStion, SeQUential). Another game to play in similar situations is to observe and list 20 items you notice. Write them down on a list. Memorize them for 2 min. When you get to the office, or sit in another meeting later the day, see how many of the words you can recall without referring to the list (only use the original list to check your accuracy). If you master memorizing this length of list, expand it to 30 or 50 words, and so on (Fig. 2.4).

Several books, videos and guides covering a whole host of techniques on how to build this memory retention and retrieval capacity have been published. Most of these techniques are linked to mental images that either form mental hooks (on

which to hang new ideas), or sequential lists (using phenomics, acronyms or numbered lists) to recall new or fairly unknown concepts.

(Also see the CREATiViTY LABORatory Activities at the end of this chapter.)

2.4.2 Trudeau's Mega Memory Techniques

Kevin Trudeau offers several techniques to "release your superpower memory" [39]. We cover three widely known techniques here: Tree lists, vivid images, and Peg lists. These are merely tasters to whet your appetite to find alternative tools that might be better aligned with your own preferences for learning and recall. According to memory scientists, your memory is like a filing cabinet with folders that are categories of things to remember. Memories of what you have experienced (via your senses) are like new pages, jumbled together on the table of experiences. By making associations with prior experiences (knowledge or information already in your long-term memory, e.g. the alphabet, sequential numbers, well-known words or the rooms in your house), you are likely to be able to file memories where you can retrieve them. Introducing order to your memory bank helps you to get rid of jumbled concepts and organize them in associative patterns. A simple example is recalling the five personality traits of people by using the acronym OCEAN (Openness to experiences, Conscientiousness, Extraversion, Agreeableness, Neuroticism). For longer lists, Trudeau [41] suggests using a Tree List.

2.4.3 Tree Lists

Trudeau offers the example of a list of 20 concepts to try to submit to memory: Tree, light switch, stool, car, glove, gun, dice, skate, cat, bowling ball, goalpost, eggs, witch, ring, pay-check, candy, magazine, voting booth, golf club, and cigarette. For most people this is fairly hard to recall. But using a tree list, similar to the one set out in the Table 2.1, will make it much easier – especially if you try to visualize each association in vivid images (discussed in the next section) as you make the links. Now that the sheets of paper (new concepts) are no longer jumbled in your mind, you are likely to recall them for a very long time. Try it for yourself with your bus list (from the previous paragraph.)

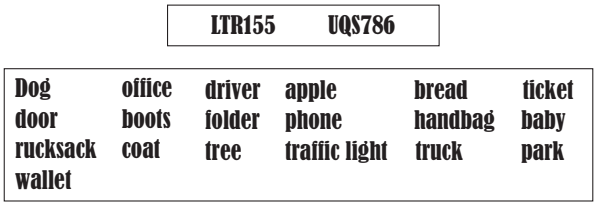

Fig. 2.4 Word games to improve memory, retention and vocabulary

2.4.4 *Vivid Images Using Chaining*

Your mind is quite adept at storing, retrieving, and associating ideas and concepts with images. Using vivid images, filled with colour and action, will enhance your memory and likely retrieval. By linking one picture to another in a weird, uncommon, even nonsensical way, you are more likely to recall them. It is different from word trees, in that you link two new concepts, both not in your memory bank as a category or "normally associated". The picture must be active, unusual, and not typical or realistic. Say for example you are trying to recall a shopping list containing popcorn, eggs, sausages, bananas, and tomato sauce. Picture a large glass pot of red sauce bubbling and splattering on the stove. From the wide brim flies red sauce with boiled eggs and popped corn in all directions – left, right and centre. As the sauce leaks onto the floor, eggs pop open and little sausages run around with banana peels as hats. This nonsensical picture with lots of action will be retained in your memory. (See if you can remember this shopping list as you go to bed tonight.)

Table 2.1 Example of a tree list

Number	Association	Word to recall
1	Looks like the trunk of a tree	Tree
2	Up/down; light/dark, two words	Light switch
3	Three legs	Stool
4	Four wheels, four doors, 4 × 4	Car
5	Five fingers	Glove
6	Six shooter, six feet under	Gun
7	Lucky number seven, seven come eleven	Dice
8	Rhymes with eight	Skate
9	Nine lives, cat-o'-nine tails	Cat
10	Ten pins, ten frames	Bowling ball
11	Looks like 11	Goal posts
12	One dozen	Eggs
13	Unlucky, Friday thirteenth	Witch
14	14 carat ring, 14th Feb Valentines' day	Ring
15	Payday, 15th of month	Pay cheque
16	Sweet sixteen,	Candy
17	Seventeen (a magazine with his name)	Magazine
18	Old enough to do this (voting)	Voting booth
19	Nineteenth hole	Golf
20	Twenty in a pack	Cigarettes

2.4.5 *Peg Lists (Aka House & Body Pegs)*

Before you can use peg lists, you need to create sequenced lists referring to very well-known areas such as your body, your house, or your bedroom. This is useful as your long-term memory already contains easy-to-recall long lists of information (e.g., the layout of your living room, lounge, corridor, bedroom, and other areas of the house.) Kevin Trudeau suggests two lists (body peg list and house peg list), as set out in Table 2.2 below, but we suggest that you make your own, to reflect your own house, office, yard or other are you can easily recall. As indicated, the sequence and being able to time and time again recall the same sequence of items or words, is critical to the successful application of peg lists.

Let's apply the room pegs to an example that is business-related. Let us imagine you are making a speech about the way forward for your company. Imagine the first point is moving to new headquarters. To recall this point, you can use the house list and imagine stuffing all the people, computers, and furniture into the fridge. This might not be a vivid enough picture. To make it more memorable, add colour, activity and weirdness. Imagine employees dancing all in fluorescent blue costumes with icicles dangling from their noses. The next point might be to employ new talent in IT. Imagine the little people from your fridge, running to the stove with their computers under their arms, icicles melting and blue costumes turning bright pink on the stove – perhaps they all smell like cinnamon and coffee and as they reach the sink they tumble down into the coffee pot. This falling and turning brown reminds you of the third point, i.e., zero waste (the trash can), reducing overheads and bringing

Table 2.2 Example of two peg lists

#	Body peg list	Word to recall
1	Toes	Sausages
2	Knees	Popcorn
3	Muscle	Tomato sauce
4	Rear	Eggs
5	Love handles	Bananas
6	Shoulders	
7	Collar	
8	Face	
9	Point (top of head)	
10	Ceiling	
	House Peg List	Sequential list of items or objects to use in associative recall lists
1–5	Room 1: Kitchen	Fridge > stove > sink > coffee pot > trash can
6–10	Room 2: Lounge	Organ > chair > lamp > fireplace > coach
11–16	Room 3: Bathroom	Shower > hand tub > medicine cabinet > towels > toilet> bath
17–22	Room 4: Bedroom	Nightstand > bed > drawers > mirror > vanity > closet

new alliances into play to reduce overheads. Continue for all ten or more items. You should be able to recall the 10 key points of your speech quite easily – using the house peg list. Try the other lists – perhaps they feel more logical or easy to record and recall those ludicrous links in your mind. Remember, the more bizarre, wacky, or extraordinary the associations and more vivid the mental image, the more likely you are to recall these associations for a long time.

2.4.6 Da Vinci's Three-View Technique

Leonardo Da Vinci's notebooks are filled with drawings of anatomy, machines, and new ideas for machines and paintings. It is noticeable that these drawings, especially those of the human anatomy, include at least three different perspectives of the object. Perspectives include views from above, below and the side(s). According to Da Vinci "true and complete knowledge" comes from synthesizing these perspectives into a whole [40]. Not only do these 3-view perspectives improve one's analysis and synthesis of an object or issue, recording it several times helps with retention and recall. For Leonardo, the access point to new ideas is "knowing how to see" as the first part of the process. So, creatives might find it useful to imagine a problem or an issue from three perspectives. These perspectives may be spatial (above, below, at an angle), functional (what this can do in various situations), or personal (how a dreamer, a realist or a person in a specific job function might see this issue). Barry Mattimore suggests that "at the very least, you'll learn to identify and possibly appreciate another point of view; at the best you attain a level of understanding and appreciation of your problem that will lead to a truly innovative solution" (p. 69). This knowing and recall is only a means to an end. For da Vinci, capturing the deepest essence of a phenomenon helped with internalizing the object/idea. In this way one can access it at any time and mentally experiment with combinations of other internalized ideas. Some people may not agree, but for Leonardo the only way to learn something and fix it his mind was to draw it accurately – first with the model (several times) and then without the model.

2.4.7 Auto-Suggestion

The term auto-suggestion means to suggest something specific to oneself. You might think that this is useless and counter-intuitive, as your brain is smart enough to know that it is a mere statement to oneself, and therefore not necessarily true. In the book *The Power of Your Subconscious Mind*, Joseph Murphy [43] reminds readers that unlike the conscious mind, the subconscious mind cannot argue or dispute information it is given. If you give it wrong information, it will accept it and work to make it true (p.19) "…habitual thinking of your conscious mind establishes deep grooves in your subconscious mind" (p.20). An entrenched belief that you might

have an inability to remember names, or that age might be affecting your memory, can be improved through auto-suggestion. Joseph tells the story of a 75-year-old woman who always prided herself on her memory. Just like everybody else she would forget things but maintained her self-image of a good memory. As she got older, she started noticing and worrying more about the occasions when she did forget something. Her negative self-talk was something like: "I must be losing my memory because of my age." This auto-suggestion resulted in more slips. As soon as she realized what she was doing, she invested in positive auto-suggestion to reverse the process. Dr. Joseph Murphy [41] records her auto-suggestion, which restored her memory within 3 weeks to its normal, robust self:

> From today onward, my memory is improving in every way. I will always remember whatever I need to know at every moment in time and point of space. I will retain them automatically and easily. Whatever I want to recall will immediately present itself in the correct form in my mind. I am improving rapidly every day. Very soon my memory will be better than it has ever been before (p.24)

Perhaps the place for you to start is to ask whether some of your limitations may start with your self-talk (or even explicit statements to others). How do you verbalize your beliefs about your memory, creative intelligence, and brain power? What do you say when you are making suggestions to your own creative subconscious? Do you believe that you can use your experiences and knowledge to create novel, unique, valuable ideas, or do you fall prey to your own negative indoctrination? (See Activity I at the end of this chapter to invest in your own healing self-talk.)

2.5 Nature vs Nurture (Genetics vs Upbringing/ Environment)

It is not uncommon, given the close links between neurological composition, brain structures, and the neurochemical effects of genes, to jump to the conclusion that creativity might be hereditary and variable; due mostly, or even solely, to genetic factors [42]. Trying to find a conclusive or insightful, simple answer to this question is impossible. Unfortunately, very little discussion of the nature-nurture topic has appeared in peer-reviewed scientific literature, mainly because of the complexities of the problem and the difficulties of collecting objective evidence, controlling for various factors such as language and cultural differences and the complexity of the brain structure and underlying chemical genetic functions. To consider the two impacting factors of nature and nurture as separate and opposing, oversimplifies reality [44]. Vernon expands on this complex genetic theory by explaining that although genes "indeed provide transmission of hereditary qualities, they do not determine an individual's height, or intelligence, or creativity. They are predispositions, whose effects develop differently in different environments, i.e., they interact with environmental conditions or experiences and produce not a fixed effect, but a certain 'range of reaction'" (p. 93). Vernon provides an example where genes could

modify the environment, citing an intelligent child who chooses which books to read or activities to participate in (consider chess or mechatronics projects). Similarly, a child growing up in an environment where families discuss books, poetry, art, and science, may develop quite different predispositions to those children who are not exposed to these environments, which might impact certain habits of the mind. Scholars have studied specific cases such as Shakespeare (from an illiterate family), Picasso and others to find supporting or contrary evidence to genealogy theory. These studies are problematic as the family histories of eminent creatives are easily retrievable, whereas lesser-known creatives' family histories are not – leading to selection bias, which weakens generalizability and the predictive value of studies.

Studies of the genetic basis of creative abilities investigate a range of possible explanations. One hypothesis is that some phenotypes (traits or capacities) can be inherited genetically. Another is that specific genes such as the DRD2 dopamine receptor or TPH1 influence neural transmission and thus creativity may be inherited. Although studies by Reuter et al. [43] found that DRD2 is associated with verbal creativity and TPH is significantly related to numeric and figural creativity, none of the genes were related to traditional intelligence or the total creativity index. In addition, studies of identical twins raised in different circumstances (e.g. by foster or adoptive parents in diverse environments) investigated the impact of genes compared with environments. A whole host of complex studies, demanding a solid foundational knowledge of psychology, physiology, psychiatric studies and ethnography have been published and may be insightful via details clear to experts [44, 45].

Given the target audience and specific purpose of this book, we will use the satisficing heuristic to summarize these studies by concluding with the statement that "the best conclusion [from these studies] is that both nature and nurture play a role" [5] in creative potential and make notable contributions to creativity, and specifically to the creative person (p. 105).

2.6 Conclusion

Much of the content of this chapter revolves around the brain as the centre that provides thinkers and decision-makers with a constructive, adaptable, and generative mind. The human mind is capable of sensing, inferring, interpreting, and reassociating. This is best captured and elaborated in the definition of creativity offered by Sternberg [46], as "a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies: testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results."

The brain even has the capacity to anticipate, predict and fill in gaps (Chapters 3 and 4 will expand on these abilities) – extracting memories from past experiences and information recorded in the LTM. Although there is still some uncertainty about

the exact biological processes in general creativity, most psychologists and cognitive biologists agree that combinational processes are necessary for creativity. Novel ideas demand divergent thinking resulting from the combination, recombination and reassortment of ideas. There is general consensus that the prefrontal cortex and STM play key roles in the retrieval and combinational efforts of the brain. For this reason, the working memory is important to the development of creative intelligence.

There is only one answer to the question: Where is creativity situated or controlled in the brain? The answer is: creativity involves the whole brain. Today psychologists [35]and neurologists agree that the functional split of the brain into the creative right and logical, analytical left hemispheres is a dangerous oversimplification. Current thinking is that "Each hemisphere makes a different, but essential contribution" (p. 162). There is significant evidence that there is no specific location in the brain for creativity, and only by using the whole brain can a person think creatively. The popular belief that "right brain"-dominant people are creative thinkers and "left brain-dominant people are analytical thinkers" is a false, ill-informed, but widely held notion. As you are reading this page, your right hemisphere is reading metaphor and structure, while your left hemisphere is deriving meaning from words. As the different parts of the brain make sense of the sensory input, signals are passed between the different structures in the brain. Researchers now belief that creative people are likely to have heightened communication and interaction between the two hemispheres of the brain [47, 48], but much research needs to be done in terms of brain specialization.

CREATiViTY LABORatory

Activity I: Auto-suggestions

Your mind is your most precious asset. Think carefully and write down the auto-suggestions you habitually use. These could be statements about your knowledge, your inter-personal skills, or your fears. Now consider hetero-suggestions (suggestions by another person). Which of these suggestions limit your creative competencies? Can you re-write or re-word them (using the example in this chapter as guide) as positive auto-suggestions? (These new auto-suggestions will rewire your subconscious mind and create new positive beliefs that can drive your CiQ towards a better, more productive and happier you) Phrase the auto-suggestions as positive, definite and specific positives in the here-and-now tense and active voice (see the section on memory improvement above.)

Activity II: Story-Telling & Visualization

Story-telling and visualization can help with memory and exercising memory. This story is told by Jackie Guthrie and Tim Preston in their book *Improve your Brain Power* [49]. Read the story and see how many of the questions you can answer, without returning to the story. Focus on registering important details.

Brock Lovett, a treasure hunter, is hunting a famous diamond that went down with the ill-fated ship, Titanic. The stunning diamond once belonged to Louis XVI. What Lovett actually discovers, however is a sketch of a young woman wearing the diamond on a necklace. Before long, the sketch appears in the media and an old lady called Rose Dawson comes forward, claiming to be the woman in the drawing. She doesn't know what happened to the jewel, but much to the fascination of Brock and his companions, she tells her own story of the fateful trip.

At the time she was a rich and miserable 17-year-old girl sailing to the US with her fiancé, Cal Hockley. She planned to commit suicide, but was talked out of it by a third-class passenger called Jack Dawson, who had won his ticket on the Titanic in a pub.

The two were passionately in love when the "unsinkable" ship hit an iceberg, Rose jumped out of her lifeboat and vowed to stay with Jack. They were together in the freezing water when the ship sank. Jack perished but Rose was rescued. In his memory she gave her name as Dawson and set out to start a new life.

1. What was the name of the treasure hunter?
2. Who was Rose's fiancé?
3. How old was Rose when the Titanic sank?
4. What did Rose say happened to the diamond?
5. How did young Dawson obtain his ticket?

Activity III: Mental Categories

Create mental categories to help yourself to remember the pictures in this activity.

Do not read the questions below. Study the picture for no more than 30 s. Study the pictures first. DO NOT READ THE QUESTIONS before you have studied the images. Cover the picture with a piece of paper and try to answer the questions below without looking at it again (Fig. 2.5).

- How many fruits and nuts are in the picture?
- How many objects are not living creatures?
- What is the biggest object (in life size) depicted in Activity III?
- How many mammals can you name (depicted here)?
- How many spiders are pictured here?
- How many creatures are kept as pets? Which living creature is unlike to be kept as a pet?
- There are a few items that you might find in a school. Name them.

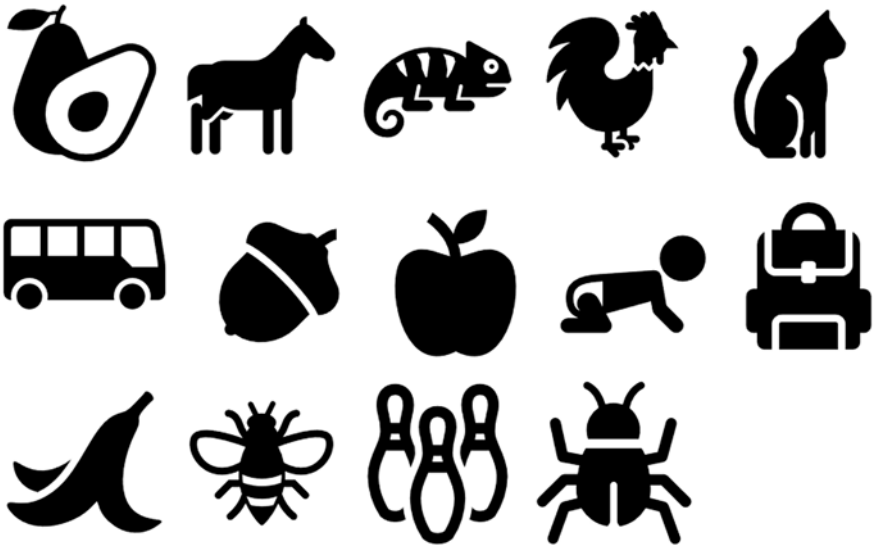

Fig. 2.5 Visual memory aid

Activity IV: Subconscious Trigger Technique

UsingLeonardo da Vinci's Subconscious Trigger Technique
To make invention a mental habit, and to make subconscious connections come to mind more and more easily, implement various mental exercises such as "internalizing" features of objects by regularly drawing and redrawing them. Do this with great regularity. Combine essential key features of various objects into new objects, either mentally or in drawings. Use Leonardo da Vinci's trigger technique, which is to see vague shapes in everyday objects such as clouds, cracks in the pavement, spots on the walls. Squint your eyes at things and try to imagine that other things are residing within them. For example, look at a fish and see how its shape could by used to design a new car, or pen, or a new elegant font. Squint at an everyday object and see what sort of animal might spring forth from it.

Activity V: Focus and Memory

Complete the 10 simple mathematical equations in less than 20 s:

7X7 15-6 9+8 16/4 27-6 13+5 $\sqrt{9}$
4*9 11-9 2+3+0

Now close the book. See how many of the equations you can recall? (not the answer but the actual numbers and their numerical equation, i.e., the symbols used to express the equation).

Activity VI: How the brain works

See this video to understand more about the brain's workings: https://www.youtube.com/watch?v=ZNTW5sIx9gw; and TED-X re brain SEPCT scans by Daniel Amen.

Activity VII: Memory Gym

Look at the pictures below. Try to recall the pictures in Activity III. Which of the objects from the picture in Activity III are missing here, and what items have replaced them? (Fig. 2.6)

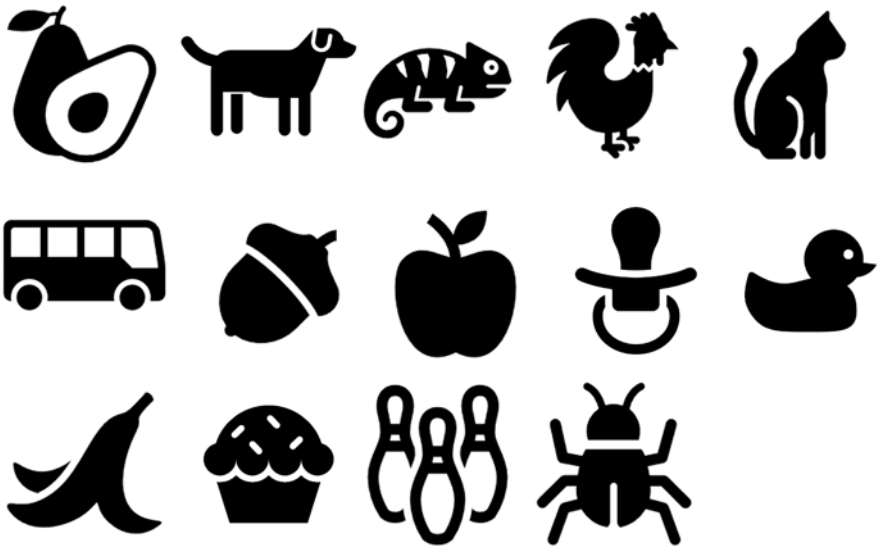

Fig. 2.6 Memory gym

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Chapter 3
Creative Genii: Creative Intelligence, Insight and the Six Ps

Rouxelle de Villiers

Abstract The brain is the central engine in the creativity machine. It drives all the competencies necessary for creative intelligence (CiQ). Different brains lead to different forms of creativity, and creativity is central to human life. Although CiQ is closely linked to general intelligence, imagination, adaptability, empathy and innovation, creativity is quite distinct from these intelligences. This chapter discusses the various types of minds or intelligences, and how decisions to be creative can offer incremental and disruptive contributions to innovation.

Keywords 4P-theory · Creative intelligence (CiQ) · Decision stages · Domain expertise · Focus · General intelligence (*g* or IQ) · Insight · Six Ps · Theory of cognition · Threshold theory

Learning Objectives
On completion of this chapter, the readers will be able to:

- Record the role of various neurological processes in convergent and divergent thinking.
- Describe the various attributes of creative persons.
- List and contrast the factors used to describe and assess creative output/product.
- Describe how deep knowledge reservoirs can be accessed to ignite insight.
- Apply propulsion theory and suggest ways to implement its eight different contributions to the Creativity Space.

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3.1 Introduction

The brain provides the competencies required to be creative, and to exhibit creative intelligence (CiQ). Although there is much debate amongst scholars and scientists about the role of consciousness, unconsciousness, emotion and neuroanatomical differences in creative brains, research supports two tenets: (1) "the human brain supports different kinds of creativity, and (2) different human brains lead to different kinds of creativity" ([1], p. 113).

The theory of cognition postulates that being creative is an essential part of human life. Creativity is as much a part of being a human being as thinking [2], observing, analysing, sensing, judging and feeling. Along with the evolution of *Homo sapiens* as thinking creatures, a distinct capability called creativity has also developed. Just as actions, thoughts and feelings are the products of our brains, so is creativity. Therefore, an important question about thinking capabilities arises: Is creative intelligence different from traditional cognitive intelligence (iQ)? Originally (before 1950) scholars, educators and psychologists considered iQ and creativity as the same ability. Guilford [3] is credited for distinguishing creative intelligence as a natural resource, separate from general intelligence or intellect. Guildford [4, 5] studied both the general intellect (g, IQ or iQ or *g* in various sources) and the creative intelligence (CiQ) of individuals, and conceptualized distinctly different thinking styles: convergent (finding or remembering one correct answer) and divergent (generating many alternative answers).

Later, rigorous research by Wallach and Kogan [6] indicated that divergent thinking (numerous ideas and a wide range of responses, rather than one correct answer) within a permissive environment (involving thinking games or play, where new connections, divergent thinking and original answers are encouraged), cannot be predicted from traditional measures of intelligence (IQ). Researchers of creative capabilities and competencies have found predictive validity in divergent thinking tests, meaning that such tests can provide information about future behaviour. Researchers can thus predict how creative individuals are likely to be, based on students' extracurricular activities and achievements. In contrast, traditional IQ measures have little predictive value. This implies that "creative thinking, as estimated from tests of divergent thinking, is more important in the natural environment than tests of IQ or academic tests" ([1], p. 5). As an entrepreneur, employer or designer, would you not like to perform better in the real world than in GPA tests or formal examinations? This important finding, repeated in several disciplines, indicates that when we invest in developing convergent thinking and IQ (recall, memorizing, linear thinking) we may not be improving our creative intelligence. Creative intelligence is labelled CiQ from here on: it represents an ideation and innovation coefficient, indicating divergent thinking, the ability to make connections and engage in lateral thinking. It must be noted that creativity tests are mere indicators of potential, and do not indicate how motivated or interested an individual is, or how much the individual intends to apply him/herself in the real world (Fig. 3.1).

Fig. 3.1 Five minds for the future

Although closely linked to intelligence, imagination, adaptability, empathy and innovation, creativity is quite distinct from these intelligences. In his book *5 Minds for the Future*, Howard Gardner [7] describes five "minds" or futureproof intelligences, that humans will need to navigate turbulent times, a complex and unpredictable environment, and the ever-increasing speed of change. He summarizes these five minds as follows:

> *In the future, individuals who wish to thrive will need to be experts in a least one area – they will need a discipline… mastery of major schools of thought (including science, mathematics and history) and at least one professional craft.*
>
> *As synthesizers, they will need to be able to gather together information from disparate sources and put it together in ways that work for themselves and can be communicated to other persons. …[synthesis] gains power when it provides a sense of meaning, significance and connectedness that so many seek today (p. xix). …The ability to integrate ideas from different disciplines and spheres into a coherent whole and to communicate that integration to others.*
>
> *Because almost anything that can be formulated as rules will be done well by computers, rewards will go to creators – those who have constructed a box but can think outside it. Creative minds have the capacity to uncover and clarify new problems, questions and phenomena.*
>
> *The world of today and tomorrow is becoming increasingly diverse, and there is no way to cordon oneself off from diversity. Accordingly, we must respect those who differ from us as well as those with whom we have similarities. The respectful mind has an awareness of and appreciation for the differences among human beings and human groups.*
>
> *Finally, as workers and as citizens, we need to be able to act ethically – to think beyond our own self-interest and to do what is right under the circumstances ([7], p.xiii). Ethical minds fulfil their responsibilities as workers and citizens* [8].

From the field of cognition and learning, Malcolm Gladwell [9] reports that it takes roughly 10,000 hours (20 hours per week for 10 years) to become an expert in a field. Although this long period of mastery has been questioned by later studies, Howard Gardner points out that this long journey not likely to allow multiple areas of mastery in one's lifetime. Given the proliferation of online courses and technology aided forms of learning (e.g., DuoLingo and YouTube tutorials), it is likely that

learners can attain a respectable level of expertise in a shorter, more contracted period of time. In addition, the guidance of mentors and other forms of developmental support may allow those who are competent, but perhaps not yet fully masterful, to excel and participate in creating the future of mankind.

Creativity is difficult to define, due to its diverse forms over various disciplines and diverse expressions over decades, over different cultures and over multiple subject domains. But, although difficult to define, Marc Runco [1] states that creativity is "a vital form of human capital, [it] both contributes to the information explosion and helps each of us to copy and adapt to it" ([1], p. ix).

There are many published definitions for creativity, both in academic and popular literature. Since the focus of this book is on business creativity and innovation, we apply the definition offered by De Jager [37], who describes creativity in the business context as: "the accomplishment of new developments as a result of the interaction between the individual and his/her environment or groups and their environment, with commercial intent".

3.2 Focused and Unfocused Minds

3.2.1 Too Much Focus Is Not Always a Good Thing

"Our addiction to the familiar makes it hard to break habits of action, thinking and feeling"

You must have heard the shouts and urges of eager, pushy coaches: "Focus!" It seems to be the war cry of a multitude of sales managers, sports coaches and entrepreneurs. Similarly, a chorus of laments rises up from businesspeople: "What I need more of is some focused time"; "If only I had more time to focus on my job and fewer distractions from home, family and the internet"; "I want to focus on my marriage, but I am constantly distracted by work obligations and crises". As humans and business people we get stuck in ruts of our own making – eating too much, doing too little exercise, wasting time by binge-watching Netflix or playing computer games; going down the rabbit hole of social media; and generally making poor lifestyle and time management choices. People often try refocusing by making concerted efforts to escape this "stuckness". These efforts might include changing jobs, introducing date nights at home, taking up a hobby to create variety, or limiting overtime. Sometimes these attempts work, but often only for a short time, since humans easily fall back into well-set habits or get mentally and psychologically exhausted from constant attempts to (re)focus. According to Srini Pillay [10] "attempts at steadfast focus usually don't last..[as] you're trying to change using conscious strategies against a far stronger unconscious pull."(p. 124). In his book *Unlock the power of the unfocused mind*, Pillay explains how changes might not bring lasting changes due to mental baggage that may mean static solutions (like recalibrating duties, hunkering down or reprioritizing) for ever-changing problems simply cause mental exhaustion and a return to easy-to-follow habits. Small but

impactful psychological and neurological shifts are needed to empower your mind so you can get unstuck. A Chinese proverb illustrates this particular mental habit and human's addiction to the familiar and habits of action and feeling that are hard to break: "Last night I thought over a thousand plans, but this morning I went my old way".

It is very common to experience a sense of 'mind-freeze'. Almost everyone is familiar with the inability to remember a name when introducing someone or running into someone unexpectedly. Another common experience is being unable to find a word, which seems right there on the tip of your tongue, but in the moment, mid-sentence, you are unable to bring it to the forefront of your mind. Trying desperately to focus on retrieving the name or word seems to push it further out of reach. Then, minutes later, unasked, the word jumps to mind! Your brain unconsciously made the necessary psychological and neurological shifts to unlock the vault of vocabulary and prior learning. The key to this vault is un-focusing your mental process. To un-focus the mind, we need to remove the anxiety, anger, sadness, fatigue and other emotional barriers, blocks and limitations, to get to a point of neutral emotion. This allows a shift from what seems impossible to "a possibility mindset" ([10], p. 125). As you enter the realm of possibilities, you allow the brain to release opioids that relax and reward the brain, making it possible to retrieve information, make new connections and jump the twin hurdles of resistance and impossibility. This "defocus" serves a "sophisticated purpose: it is effective at putting up a barrier between your brain's anxiety center, the amygdala, and your thinking brain, the prefrontal cortex" ([10], p. 127).

Dr. Srini Pillay [10] suggests a range of formal and informal tools to defocus the mind. The informal, somewhat relaxed states include taking time to do less cognitively demanding activities such as fishing, relaxing in a hammock, gardening, knitting or generally finding joyful activities that defocus and relax the mind. Some more formal and useful ways to achieve defocus are reverie (speaking freely about fantasies, imaginary or hypothetical ideas), mind-wandering (allowing your mind to wander with no particular focus), using the imagination (visualize the "what-if's" of the future), daydreaming (stress-less and effortless tasks that you can do on autopilot like driving), self-talk (speaking to yourself in the second person), and meditation in many forms.

An early study by McKinnon [11] (1965) reports on the ability of highly talented architects to turn their attention, at least for a period of time, to another creative outlet when they are seriously blocked – returning to the problem later, when they are refreshed and reinvigorated. Less talented architects more often report stubbornly focusing on a problem when blocked in their attempts to reach solutions (p. 262). In McKinnon's own words: "endurance as tested in the Adjective Check List involves working uninterruptedly at a task until finished, sticking to a problem even though one is not making progress, and working steadily at a single job before undertaking others…"(p. 262). In more recent studies [1] the ability to work on several things at once is called the network of enterprise, or the systems approach to creative work [12].

Pillay [10] writes about conjuring creativity and advises detaching from the external world in order to "turn to your internal stream of attention" (p. 38). Inspiration can come from anywhere, so if we shut our minds by relentless pursuit of meaning and understanding, we might miss opportunities that would be, at another point, useful to the creative process. Motivation, or the desire to act on an inspiration, is an essential part of being inspired – the desire to make it real or make it happen. This is where ideas, mental pictures and dreams are combined with common sense, practical understanding and knowledge.

The Art of Creative Thinking, by Rod Judkins [13] cites the examples of stories by Hans Christian Andersen. Andersen took exotic, weird, mind-wandering, stream-of consciousness stories from the wacky narrations of lunatics in an asylum, along with long-standing folk tales, combined them with his knowledge of plot writing, and turned them into world-famous stories still told and re-told (by Disney amongst others) today. Stories like "The Ugly Duckling" and "Princess and the Pea", based on the improvised tales of mad women in the local lunatic asylum, became magical and palatable through Andersen's structured plots, by the linguistic talents and literary skills. Similarly, the imagineers© at Disney™ take musical scores (e.g. a Mozart Symphony) and well-known story lines (Hansel & Gretel, Tarzan, The Jungle Book) and turn them into magical, novel experiences for viewers all over the world, using a combination of visual experiences and engaging storylines to enthral young and old, worldwide. This brings us quite logically to the concept of insight.

3.3 Insight

This section addresses the role of "insight" (known colloquially as the "Aha moment") in the creative thinking process. Insight is an interesting phenomenon that almost everyone experiences at some point or another in their lives: you suddenly come up with a seemingly brilliant idea, only to wonder where it came from. Sternberg reports that "[an] understanding of insight helps provide a key to the gateway of imagination, fantasy, and creativity" ([14], p. 59). Sternberg [15, 16] defines insight as "a distinctive and apparently sudden realization of a strategy that aids in solving a problem, which is usually preceded by a great deal of prior thought and hard work; often involves reconceptualizing a problem or a strategy for its solution in a totally new way; frequently emerges by detecting and combining relevant old and new information to gain a novel view of the problem or of its solution; often associated with finding solutions to ill-structured problems" [i.e. problems for which a clear path to a solution is not known].

Howard E. Gruber [17], as early as 1981, indicated that unfocused thought and incubation are frequently mental processes that precede insight and require preconscious activity, indicating that creatives benefit from a process that allows uncensored thought and periods of incubation. Incubation allows ideas to percolate below

the level of active, engaged consciousness. Gruber saw this as a prolonged process, preceding conscious creative cognitive processing. Dietrich [18] sees unconscious and conscious creative processing as occurring in parallel over some processing stages, but agrees with Gruber that some unconscious processing occurs before conscious processes. According to Dietrich [18] the very definition of creative insight indicates that the Aha moment occurs in consciousness. "Creativity results from the factorial combination of four kinds of mechanisms. Neural computations that generate novelty can occur during two modes of thought (deliberate and spontaneous) and for two types of information (emotional and cognitive). Regardless of how novelty is generated initially, circuits in the prefrontal cortex perform the computation that transforms the novelty into creative behaviour. To that end, circuits are involved in making novelty fully conscious, evaluating its appropriateness, and ultimately implementing its creative expression" ([18], p. 1023). So, there is no insight unless an idea makes it all the way into consciousness. Davidson and Sternberg [19] describe six different views of insight: the mystical view, the nothing-special view; the evolutionary view, the opportunistic assimilation view; the three-process view; and the special-process view. Table 3.1 provides a summary of each view.

Table 3.1 Six different views on insight

Type of view on insight	Brief explanation to allow implementation	Examples to demonstrate
Mystical view	People are inspired by a "muse" or mystical force to create. It's also called the wizard Merlin perspective. Scientists dismiss this view as it provides no guidelines or clear understanding of the phenomenon.	Plato & Greek mythology The wizard Merlin A demon that lives in writers' pens
Nothing-special view	We learn things by associating new ideas with old ideas or by re-associating ideas that might not have been associated formerly.	A child sees an unknown animal in the woods and because of her experience with fierce dogs, deems the animal (later identified as a wolf) dangerous, thereby saving herself from harm.
Special-process view	Insights are derived from special extended unconscious leaps in thinking or from greatly accelerated leaps in thinking or mental processes. Sternberg and Davidson [18] suggest that insight happens when the mind finds a gap in a schema and fills the gap by reorganizing the visual or other information.	Using x-rays to treat cancer meant oncologists had to find a way to irradiate a tumour, but not the healthy tissue around it. Doctors had to reformulate the problem and the goal to focusing many weak rays on one point, so that healthy tissue only receives low doses, while the converging rays focus primarily on diseased tissue.

(continued)

Table 3.1 (continued)

Type of view on insight	Brief explanation to allow implementation	Examples to demonstrate
Three-process view	Theorists suggest three distinct processes that lead to insight: Selective encoding (sifting relevant from irrelevant information); selective combination (combining seemingly isolated pieces into a whole) and selective comparison (relating new and past information).	What is the shortest time to grill 3 steaks, when it takes 2 minutes per side to grill a steak and the grill takes only 2 steaks at a time? How many creatures are there if there are giraffes and ostriches and there is a total of 44 legs and 32 eyes?* **Answer below
Opportunistic assimilation view	Problem solvers recognize a new problem as unsolved and go into incubation mode when their memory marks the problem as unsolved. During unconscious thinking, the mind highlights special areas in the contextual environment that were not noticed before. Features that are relevant will highlight a possible path to a likely solution as thinkers return to active thinking and hone in on specific elements of the environment.	Seifert et al. [20] offer the example of two travellers who find a dead man in the desert with untouched food and water in his backpack, and a large ring on his index finger. They could not explain his death, until later, one traveller dropped his handkerchief, only to have the insight that the dead man's parachute had become detached.
Evolution view	This view applies the theory of evolution of organisms to the evolution of ideas – Claiming that ideas undergo haphazard recombination in the mind, called "blind variation", much like the mutation of genes in different species. Blind variations are then passed through a selective filter: Cognitive processing retains some and rejects others. The selective retention of ideas is later recognized as "insight".	Writers often listen to bits of conversation and make no special connections, or they fail to conjure up special stories. However, in the case of Henry James, one chance comment by a dinner guest led to an insight, which resulted in his story *The Spoils of Poynton*. **Answer to BBQ problem: 8 min Answer to creatures: 32/2 = 16 pairs of eyes so 16 animals.

Adapted from [14]

According to Metcalfe [21]: "The persistent lack of a mechanism for insight, linked with the charge that the notion of insight is somehow supernatural, has shackled researchers who would explore this most important of cognitive processes....We do not yet understand insight." Melissa Schilling considers this age-old quest to understand insight, and uses the concept of "small world networks in the brain" to illuminate this peculiar moment of insight, normally accompanied by the affective "Aha!" experience ([22], p. 5). Schilling integrates graph theory, cognition and prior research on neural networks to build a theory that explains how insight occurs. The small world neural network theory (SWoNN) links with the work of Gick and Lockard [23] who propose that the "Aha!" is an affective response that arises because the solution not only appears quickly and unexpectedly, but also appears disconnected from previous solutions and representation attempts [24].

Sternberg [25] proposes the propulsion theory of creative contributions and metaphorically compares creative insights to trajectories in space: "theories in

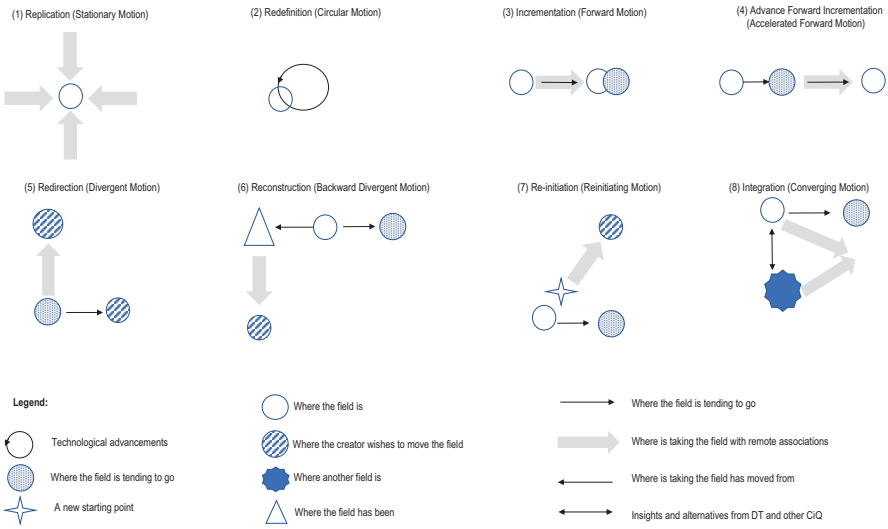

Fig. 3.2 Eight contributions to the creativity space (propulsion theory) [25]

creativity are searching space"([25], pp. 90–91). Sternberg offers eight ways to achieve insight, when creativity is considered "a decision to be creative".

As shown in Fig. 3.2 Sternberg graphically demonstrates the eight contributions of insight to progress and innovation. The eight contributions are:

Replication: Confirms, solidifies, keep the field where it is;

Redefinition: Changes perceptions about where the field is and redefines it from a new vantage point;

Incrementation: Small forward movement in the same direction as it is already moving;

Advance Forward Incrementation: The idea is ahead of its time and moves the field rapidly forward (higher rate than expected, but same direction);

Redirection: Moves the field forward but in a different direction than it is currently moving;

Reconstruction: Moves the field back to a past state (real or imagined), with the intention to move it in another direction from where it currently finds itself;

Re-initiation: Starts from scratch (moves the field or sub-field in another direction either due to exhaustion of that direction or having reached an undesired point in the development of the field);

Integration: Combines ideas from formerly distinct or unrelated ways of thinking ([25], pp. 90–91).

One of the key findings of Schilling's investigation into insight confirms the benefit and cost of "deep knowledge reservoirs ", as identified by scholarly studies by the work of Simonton [26], and, Gladwell [9] and Gardner [9]. Both Gardner and Simonton [9] argue that insight first requires preparation within a discipline, so as a first step, insightful people build huge reservoirs of discipline-relevant information

[26]. In contrast, various research authors report on the limitations that years of experience in a discipline might have due to mental set fixation, functional fixedness,[1] mechanized problem-solving using existing paradigms, and institutional pressures to conform. We can go as far as reporting that both Einstein and Piaget claimed that formal schooling detracted from their intellectual development, impeding their cognitive insight [27]. Various scholars report than marginal intellectuals (who are not central to a particular domain but participate in multiple disciplines) are more likely to introduce creative breakthrough insights than well-established domain experts. So, we can deduce that there is a curvilinear relationship between experience (problem-solvingexpertise in a domain) and creativity. A tendency to rely on one's prior experience(s) is likely the cause of this curvilinear relationship (e.g., [28, 29]). The inverted U-shape of a curvilinear graph (see Fig. 3.3), indicates that up a certain point, an increase in experience leads to an increase in creativity or creative output, but after a certain point, a further increase in experience within a domain/discipline will lead to a decline in the level of creativity. Scholars attribute the early creativity to people's natural tendency to seek solutions to problems, and blame mental set or functional fixation for the decline in creativity of highly focused experts.

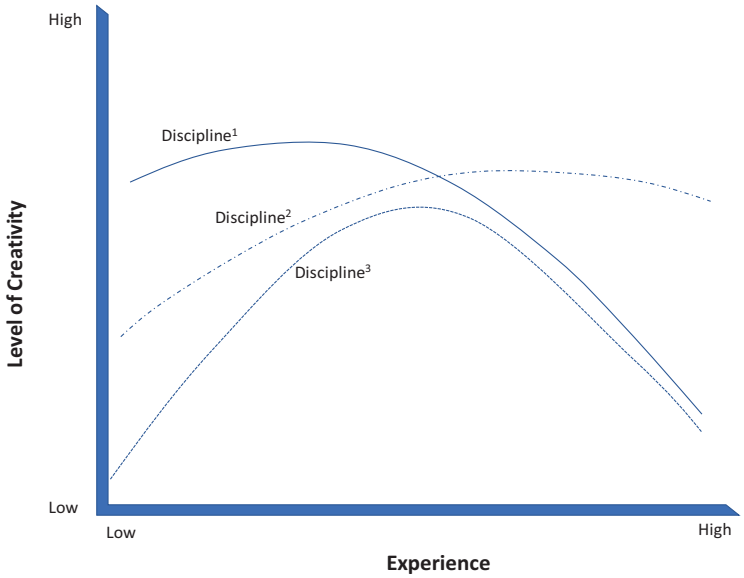

Fig. 3.3 Curvilinear relationship between experience and insight

[1] "Functional fixedness" refers to a situation whereby an individual can only think of using an object for its most common use; e.g., a paper clip can only be used to keep papers together.

It is clear that scientists from various disciplines agree that creative thinking does not result from cognitive thinking alone. Creativity is complex; dependent upon IQ (also called *g or iQ)* and emotional components like interest and attitude. The emotional components of creativity have received attention over many decades from both neuroscientists and in non-biological studies of creativity. Studies report that affect or emotion not only regulates thinking preferences and cognitive demands, but affect also acts as a source of drive, motivation, persistence and energy, courage and interest to explore, wonder and curiosity and finally, as an interpreter of logical facts, information and knowledge [1, 18, 30–32]. Mark Runco [1] points out that readers must keep in mind that it is thinking style dominance, not left vs right hemisphericity, that is important. "The dominant hemisphere …houses the interpreter and the non-dominant hemisphere deals with problem in a simple, uncomplicated fashion" ([1], p. 91).

Damasio [32] offers a list mainly concentrated on affective and extra-cognitive process requirements for creativity, listing courage and motivation at the top of his list. Next on the list is extensive experience in a particular field. Damasio then links emotional elements like insight into one's own mind and the minds of others. He particularly refers to the importance of a large working memory that allows individuals to store and manipulate representations and to recombine and rearrange them to make novel combinations of entities and images. Damasio highlights several emotional/affective requirements for creative intelligence, listing the cognitive abilities of decision-making last. Although the emotional brain plays a significant role in creative efforts, it does its work through interactions and systems among neuroanatomical structures ([1], p. 93).

3.4 Definitions Relating to the 4Ps: Person, Product, Problem, Process

It is not easy to find a comprehensive or single definition of creativity, as there are multiple perspectives: creativity can be seen as a natural talent or skill, a neurological functionality or cognitive ability, a personality type, or the product of an individual's or group's efforts. Further, it is often hard to distinguish creativity from its products, for example in art, craft, dance, poetry, architecture, design, advertising and various other forms of creative output, both formal and informal. Hundreds of definitions exist when all perspectives are considered.

Author Ruth Richards [33] views the 4 P Framework of Creativity (originally proposed by Mel Rhodes in 1961) as Person, Process, Product and Press. This book expands this model to six Ps, to include Possibilities and Partnerships (see the six Ps in Fig. 3.4). Since this is a new model that will be further elucidated in this book, in this section we will focus on the definitions from extant literature that cover the 4 Ps.

While 'Person' captures the state and traits characteristics of the creative individual, including cognitive style, attitudes, intentions, values and other aspects

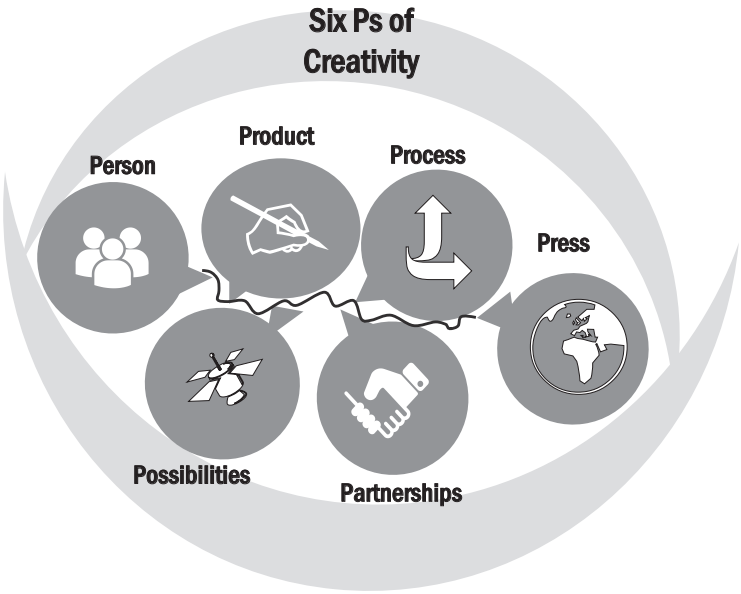

Fig. 3.4 Extended multi-factor model of creativity: 6Ps

discussed in more detail in following sections, the 'Process' factors consider the ways in which creatives think, feel, experience, motivate and direct themselves and others. This includes developing continuous learning strategies to adapt to the changing world. 'Product' is concerned with the outcome or result of creative efforts and may range from pure ideas to tangible products and inventions. The final of the 4Ps, 'Press' refers to the creative environment around creative individuals and groups that either facilitates or restrains creators' capabilities. Within organizations the creative environment includes the culture and subcultures that shape and reward (or punish) the creative person's attributes, perceptions and attitudes (see Chapter 13 for additional details.)

3.4.1 Definitions Related to the Person (Genii)

According to Mihaly Csikszentmihalyi [34] and Dean Keith Simonton [26] creativity happens when a problem solver, creator, innovator, inventor or ideator does something novel or unexpected that solves a problem, leads to other solutions and changes how people think or behave. Stokes ([35], p. 1) provides an example to illustrate the influential and generative nature of creativity in the form of Pablo Picasso's art (in the early 1900s). The new artform was called cubism [36], which provided artists with new ideas on seeing and representing the world. Cubism was useful in generating other variations of the solution it provided. Picasso's art was

highly influential as it changed the way others saw and produced paintings, and how artists interpreted their realities.

Dean Simonton [26] claims that creativity is best understood by considering a Darwinian process of variation and selection. In his book, *Origins of Genius*, Simonton argues convincingly that creative artists and scientists create a wealth of ideas, later subjected to judgement—whether aesthetic or scientific. Only the best few are eventually selected to further develop, reproduce or expand. This is quite similar to the process described by Charles Darwin [37] in *On The Origin of Species by Means of Natural Selection*.

Let us, as students of creativity and expansive thinking, consider Plato's question: "From what sources do excellence in human thought, action, or performance arise?" Aristotle's answer to this fundamental, defining question offers three distinct kinds of human activity, each requiring some form of intelligence, each with its own characteristics. These activities and their distinctive varieties of intelligence may be defined in terms of their ends or aims: (a) understanding or "knowing", (b) action or "doing," and (c) production or "making", giving us the designations of theoretical, practical, and productive intelligence. In 1984, Arthur Sternberg developed the Triarchic Theory of Human Intelligence [38]. Sternberg's triarchy in its most recent manifestation has three general headings: analytical, practical, and creative intelligence.

Sternberg's creative intelligence is important both when humans encounter novel situations and when we deal with recurring circumstances. Novel situations require skills that may be only loosely based on past experience, and some people are more skilled than others at this kind of coping. Recurring situations, on the other hand, benefit from automatization that frees up attention for use elsewhere. Creative intelligence is thus closely linked to the experience of the individual.

"People with creative intelligence are able to produce novel and interesting ideas and are willing to develop these ideas in the face of widespread resistance that often accompanies innovation. Successful inventors and designers must possess this type of ability. Unlike analytical and practical intelligence, creative intelligence is best expressed in situations with minimal structure or constraint." ([39], p. 176) Both Sternberg and Aristotle confirm that creative intelligence can be learnt by observing others, learning risk-tolerance and risk-taking from peers and mentors and educators who tolerate, allow and pursue mistakes to learn from [39].

In her book *Creative Intelligence: CQ@Play,* Cherylene de Jager [40] defines creative intelligence as the ability to be creative. But this ability goes beyond cognitive processes such as thinking, knowing, remembering, judging, solving problems, and includes psychological factors such as willingness to take risks, intrinsic motivation, open-mindedness and willingness to be in touch with one's own and other people's feelings. Other authors highlight a constellation of personality traits such as flexibility, ego-strength, empathetic sensitivity to others, and a high level of intuition. Psychology researcher Mark Runco ([41], p. 521) highlights the paradoxical nature of creatives' personalities by summarizing a wide range of studies of creative intelligence:

> Creativity requires possession of…openness combined with a drive to close incomplete gestalts; acceptance of fantasy combined with maintenance of a strong sense of reality; critical and destructive attitudes together with constructive problem solving; cool neutrality combined with passionate engagement; self-centeredness coexisting with altruism; self-criticism and self-doubt together with self-confidence; and tension and concentration side by side with relaxedness.

For more detailed discussions about the psychological aspects of creatives, such as drive, characteristics, traits and thinking habits, see Chapter 8 of this book.)

A study by scholars from the University of Vienna and the Max Planck Institute for Human Development in Berlin asked 111 creatives (64 creatives, graphic designers and "fine" artists, and 47 psychology and art students) to provide personal definitions of creativity and list the attributes of creative persons [42]. In Table 3.2 the salient factors to identify creative persons are listed, but are neither ranked, nor address the differences in opinion between the different groups (identified as "free" artists, "constrained" artists and "psychology" students in the study). This study shows that although may be some differences in ranking between practitioner experts' and students' opinions (as lay-people) about what creativity is and how it should be defined, they all agreed on richness of ideas (inventiveness). Although artists assigned great importance to assertiveness and cultural competence, students did not. These differences may be attributed to differences not only in experience, but also in age and life experience.

Creativity is also a social phenomenon, as creatives normally defy rules in pursuit of novel, unusual results, defying the norms of society and sometimes engaging in contrarianism. Mark Runco ([41], p. 518) sees creativity in part as "the failure to confirm to norms of society". As humans grow up, societal norms narrow, defining acceptable and expected behaviours and choices. These restrictions narrow the range of options for solving problems, teaching young learners to try to find "the one right answer" or "the single and only acceptable answer" to satisfy societal expectations. These societal rules discourage the rare, the unique, the unusual. Obviously, societies tolerate small deviations from the rules, but if the deviation goes beyond acceptable limits, rule breakers are regarded as eccentric, weird, immoral, criminal or mentally disturbed. Different societies and cultures have

Table 3.2 Five factors of person attributes (Definitions of Creativity Questionnaire by Glück, Ernst and Unger, [42], p. 60)

Factor 1 Assertiveness	Factor 2 Cultural competencies	Factor 3 Richness of ideas
Assertiveness Self-confidence Ability to decide Self-control	Intelligence Knowledge Taste/style	Inventiveness Imagination
Factor 4 Intrinsic motivation	Factor 5 Artistic personality	
Tolerance of frustration Diligence Love of one's work	Artistic talent Unconventionality Readiness to take risks	

Fig. 3.5 Graffiti: art or contrarianism? (Photo taken by the author in June 2019, in Verona, Italy)

different rules about the acceptable limits for breaking the rules. A modern example is graffiti. Is it art or some type of creative output; perhaps even a service to society to brighten drab concrete walls? Or is it merely self-expression or even vandalism and criminal damage to public or private property? (See Fig. 3.5 for an Italian artist's graffiti.) We cover the issue of "Press" (conditions within which creativity blooms) in Chapters 15 and 17 and corporate culture (how organizations can establish innovative cultures) in Chapter 16.

3.4.2 Creativity as It Relates to the Problem

When considering the first part of the definition by Simonton – solving a problem – one has to look into the types of problems, to determine whether the solution is creative or not. If it is a well-defined problem, where all information is known or given and the sequences to move from the problem to the solution (or goal state) are fairly structured, then a creative solution is unlikely. An example provided by Stokes ([35], p. 4) is the "paint-by-numbers" canvas set. Here the canvas has a pre-printed picture, the paint box has numbered colour blocks and the desired goal is printed on the box as a completed painting. This entire problem statement precludes creativity. Learning and development is possible, but according to the definition of creativity, the very well-defined problem makes creativity not only unlikely, but even somewhat undesirable for such projects. In contrast, ill-structured problems prompt creativity. The very nature of ill-defined problems allows for various ways to redefine the problem, consider and pursue alternative goal states, and restructure the problem space to preclude or limit the familiar and promote novel, unique, unusual solutions and solution processes (paths to possibly surprising new solutions). Creative problems tend to be ill-defined and at least somewhat poorly structured. In addition, the

problem is normally a novel one, for which rote extrapolation from past experiences is not likely to result in useful, appropriate or effective solutions ([43], p. 807). Lastly, these creativity-generating problems require thinkers to "reshape or reform existing knowledge to generate the new ideas and new approaches" ([43], p. 808).

Returning to the issues of the solution to a problem, societal tolerance of rule-breaking and novelty, true creativity – not to be confused with pseudo-creativity, blind rule-breaking and rejection of societal norms – requires an element of relevance, usefulness or efficacy. It must offer some kind of genuine solution to a problem. Arthur Cropley [44] defines creativity as the production of relevant and effective novelty. The product or output must therefore not be preposterous, far-fetched, outrageous or incomprehensible. More recent work by Mark Kilgour and Scott Koslow [45] highlights the "appropriate" novelty of creative solutions, referring to the alignment with the creative brief, problem statement, or clients' need for worth and value in creative solutions. The words appropriate and effective will have different meanings in different contexts, such as arts and business. In arts the measure of effectiveness might be whether something is aesthetically pleasing, entertaining or affectively engaging. But in business the alignment with goals may vary from being profitable, to being aligned with the corporate strategy and advertising brief, to preventing competitive take-overs for the survival of the firm. Perhaps an important note here, which will be discussed in more depth in Chapter 19, is the ethical considerations of appropriate solutions. Creatives will be asked to solve more far-reaching, wicked problems like the health of the planet, the well-being of at-risk societies and the impact of robots and AI on human life, considerations regarding the impact of inventions, particularly in science (such as cloning humans, genetic engineering of flora and fauna; bionics and augmented limbs) and technological advancements (weaponry; environmental implications). Wicked social problems are those related to the human condition (e.g., poverty, inequality); they are difficult to solve because of incomplete, contradictory and changing requirements that may be difficult to recognize and complex to address. These wicked problems are normally inter-connected at various levels of society, are ambiguous in their aims and solutions, and often carry high risk in even attempting to solve them.

3.4.3 Definitions Related to the Process of Creative Thinking

A different perspective considers the interacting components that come together to produce original and productive outcomes ([46], p. 20), called the "componential framework" [47]. The components of Theresa Amabile's framework are: (a) task motivation; (b) domain-relevant skills; and (c) creativity-relevant skills. This confluence model emphasizes abilities that collide in unique ways. Gruber and Wallace [48] proposed a different confluence model that highlights the unique ways in which ideas, knowledge, and goals interact over time to develop ideas. An example is Darwin's theory of natural selection [49], exemplifying a chain of steps, goals, interests and unique domain knowledge colliding to create Darwin's theory of

natural selection and a new evolutionary science. Another confluence model, by Sternberg and Lubart [50], proposes six interrelated factors essential to creativity: intellectual abilities, knowledge, styles of thinking, personality, motivation and environment. Sternberg and colleagues [45] call this the investment theory of creativity.

Edward de Bono and other researchers [51, 52]concentrate on thinking processes as the basis for creativity. Many terms have been coined to indicate creatives' ability to use divergent thinking, which is a capacity to think broadly and expand beyond the obvious; "lateral thinking" (taking unique perspectives on a problem); "Janusian thinking" (looking forward and backward to consider ideas); bi-phasic thinking (two phases, first free unjudged thinking, then organized and judged); "homospatial" (bringing ideas together from different domains) and "tertiary thinking" (combining primary and secondary processes).

Other theories emphasize links between domains and the process of associating ideas from a diverse range of disciplines (see Chapter 9 for further discussions about domain and discipline relevance). These are called associational theories. In the scope of normal life, people learn to make hierarchical associations between ideas, objects and actions, and these links rise in the hierarchy when they happen over and over (e.g. animals have legs, a face with two eyes and a mouth). Less likely or less common associations are described as "remote". A person who makes remote associations is seen as creative, as they make unusual or unexpected associations between domains (e.g. the shopping trolley started out as a chair on wheels, and VELCRO™ was discovered by George de Mistral in 1948, who observed leaves sticking to his dog's fur, and made the association with one piece of fabric sticking to another.)

Creativity is seen as a problem-solving process. Problem solving may involve creative thinking, but creativity is not necessarily an element of all problem solving actions/decision or activities. For example, deciding which movie to see, or which dress to buy may require almost no creative input, and the same applies to some routine problems. In contrast, intractable problems (e.g. how to escape a building where the stairs are on fire; erecting a tent in the wild when the tent pens were left at home), are likely to make creative thinking necessary. To assess the degree of creativity in problem solving, one has to divide the problem into three distinct but inter-related parts: (i) the degree of well- or ill-defined problem definition; (ii) the solvers' familiarity with the domain and problem and means of solving it; and (iii) the clarity of the criteria for measuring the effectiveness/appropriateness of the solution [44, 53, 54].

Referring to the first component, researchers think of "problem recognition", also called "problem framing", problem definition and problem finding as a major first step in creative problem solving (see Chapter 9) on the stages and importance of problem definition and redefinition). A vital step in scientific research is finding a gap in the available knowledge, and defining the research problem. In brief, the process is ordinarily described as *eight distinct activities* (not to be confused with the *4 stages*): (1) problem definition or construction; (2) information gathering and coding; (3) category selection (organizing information into concepts that might be

useful to the solution; (4) category combination or reorganizing; (5) Ideation or idea generation; (6) idea evaluation, in terms of workability, viability and effectiveness; (7) implementation planning (piloting); and (8) monitoring implementations, to improve, adjust and refine [43].

More recently in business studies, social marketing, advertising and product development, scholars have focused on the way we view the output of the creative process – the creative product – which in this case is creative ideas. Definitions of creative ideas proposed by Scott Koslow, Mark Kilgour (see Chapter 9), Michael Mumford and Dean Simonton and their colleagues [45, 55] emphasize two key aspects: novelty and appropriateness. More recent improvements add artistry or expression of the idea(s)– which link back to Mihalyi Csikszentmihalyi's [34] and Dean Simonton's [26] concepts of influence. For ideas to be considered creative, they must be both original and appropriate. Being only original may mean the idea is too weird to be useful, while too appropriate will mean that it has little novelty and is thus commonplace or unoriginal.

3.4.4 Definitions Related to the Outcome or Product of Creativity

Many authors expose their bias in their definitions of creativity as a product-producing process by defining creativity as essentially the behaviour, actions, and thinking related to an observable result. In the words of educator Reynold Bean [56] "even though creativity begins as an inner process – a feeling or idea– it must also produce an observable result… just being oneself is not being creative (p. 3).. there must be a product that expresses those thoughts and feelings" (p. 3). A succinct definition by Solomon, Powell and Gardner [57] declares that "creativity involves an original approach to a problem or product within a given domain of study", thereby focusing both on process (approach) and outcome (solution/product) (p. 273). Some scholars are far less broad-minded in their approach to defining creativity and hone in on the product or outcome of creative endeavours. Bailin [58] declares that "the only coherent way in which to view creativity is in terms of the production of valuable products"; here creativity is determined solely by its end product.

Mumford expresses this objective, observable, tangible outcome interpretation of creativity in the following way: "over the course of the last decade, we have seemed to reach a general agreement that creativity involves the production of novel, useful products" [59] In various fields (e.g., performing arts vs science), disciplines (such as business, engineering, or medicine) and even in activities within disciplines (business: advertising vs accounting) the outputs/products vary substantially both in terms of how the quality is measured (e.g., by public opinion vs expert opinion) and the tools necessary to produce a creative product (e.g. musical instruments vs test tubes vs surveys). The specific knowledge required to achieve content variability will also differ (e.g., engineering creativity might demand mastery of the laws of physics and the use of IT, whereas creative writing demands mastery of linguistic symbolism) [42].

Table 3.3 Three product factors ([42], p. 59)

Factor 1 Functioning	Factor 2 Originality	Factor 3 Impression
Technically correct	Unusual	Elegant
Useful	Radical	Understandable
Well-crafted	Surprising	Aesthetic
Functioning	Original	Logical
Fulfilling its purpose	Funny	
Elaborate	Showing individual style	

A comprehensive study of various definitions of the creative product, which involved 111 creative artists and students [42], found three sets (called factors in Table 3.3) of product attributes. These three categories of product attributes align well with the definitions offered by many researchers [60] and elsewhere in this book. The three factors are described as follows: "Functioning refers to all "technical aspects of the creative product. Persons with high scores on this factor think it is important that a creative product works and fulfils its purpose; that it is elaborate and well-crafted. Originality comprises aspects of unusualness. A high originality score indicates that a creative product must be unusual and original, perhaps also surprising, funny, radically new, and reflect the producer's individual style. In this study "Impression" refers to the view of the others who are confronted with or exposed to the creative product. The product is expected to have aesthetic qualities, and to be understandable or logical" ([42] p. 59).

In summary, the creative output space can be illustrated as a three-dimensional space with products ranging in quality from low to high. The three-dimensional space is illustrated (as well as a two-dimensional printed copy will allow) in Fig. 3.6. Imagine the axis of Impression/Artistry protruding straight up out of the page. The XY-plane (the flat area that is highlighted in grey) illustrates the novelty:usefulness* space. Products can range from low in both usefulness and novelty (useless), to a mixture of those aspects (making the products little-c outcomes), to high in novelty and high in usefulness, making the product a Big-C outcome. The mid-range outcomes are either bizarre when the product is very novel but has low usefulness ratings, or simply commonplace if the output is very useful, but lacks novelty. (See Chapter 9 for further expansion on little-c and Big-C products.)

In the next section we will move from the person, the process and the product, to definitions of CiQ – the development of creative capabilities (Fig. 3.6).

3.5 Conclusions About Creative Intelligence (CiQ)

It is not surprising that people consider creative intelligence (CiQ) to be simply another form of conventional human intelligence (labelled iQ). In the *Encyclopaedia of Creativity*, Arthur Cropley [44] reports on "six facets of creativity": knowledge, insight, intrinsic motivation, the courage of one's conviction, flexibility, a willingness to take risks, and relevance (p. 516). It is noticeable that some facets overlap

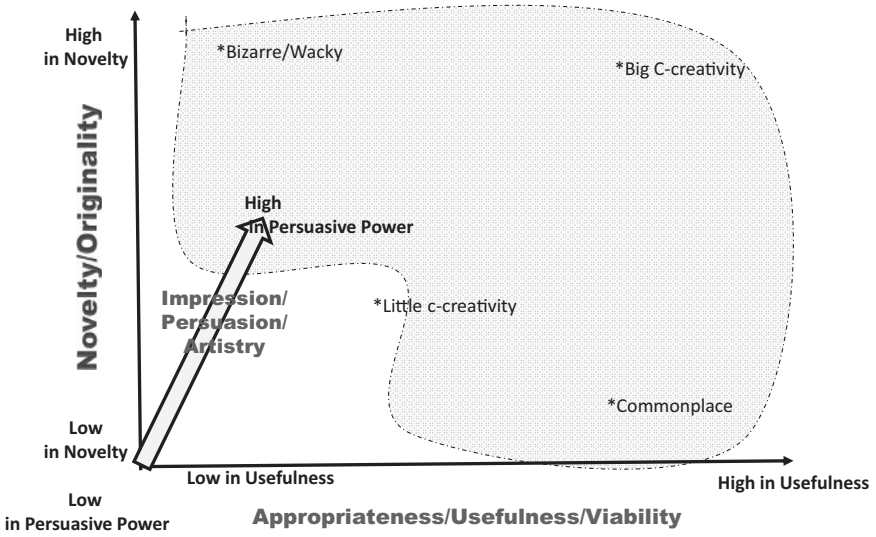

Fig. 3.6 The creative product output space: commonplace, little-c, Big-C and Bizarre Products

with intelligence, as knowledge retention and recall are essential to achieve high iQ scores. Cropley [44] summarizes his findings by reporting that "creativity and intelligence are neither identical nor completely different, but are interacting aspects of intellectual ability"(p. 516). The APA Dictionary definition of CiQ is as follows: "creative intelligence in the triarchic theory of intelligence, the set of skills used to create, invent, discover, explore, imagine, and suppose (p. 516). This set of skills is alleged to be relatively (although not wholly) distinctive with respect to analytical and practical skills" [61–63].

Once one understands that creative thinking demands the production of novel, unusual output, often associated with departing from established facts and standard thinking to new ways of inventing solutions by connecting unusual domains and acquiring insights from unexpected sources, it is clear that specialized competencies are required. Conventional intelligence (measured as iQ) is closely dependent on substantial knowledge and recall of facts, and knowledge (e.g. of language, numbers and general social knowledge). Scholars conceptualize creative intelligence, in contrast, as a set of attributes and skills and approaches to problem solving, rather than a particular level of iQ. Interestingly though, the threshold theory of creativity explains that some minimum threshold of iQ is necessary before creativity is possible. Above a particular iQ, the possibility of creativity arises. Psychologists and research academics found that humans with high iQs (above this threshold of 120) show the possibility, but not necessarily the propensity to be creative. Interestingly, creativity is not correlated above this threshold, indicating that a minimum threshold level of iQ is necessary to retain the necessary information to be creative, but does not indicate the use of this latent ability. From the above definition of

attributes, skills and problem-solving approaches, it is clear that CiQ can be developed.

Multiple books, websites, online courses and papers (at primary, secondary and tertiary education levels) not only confirm that the requisite skills and thinking habits can be developed, but offer tools, frameworks, models and advice on how to increase CiQ [64, 65].

In Chapters 5 and 6, David Kayrouz establishes the importance of metacognitive skills, not only for thinking generally, but specifically for creative thinkers and problem solvers. Metacognitive skills are a conscious understanding of 'knowing how we know' that facilitate the transfer of training and established perceptions (as well as insights from those perceptions) to new situations. Pattern recognition is also important, as skill in pattern recognition enables individuals to form an appropriate representation of the problem situation.

CREATiViTY LABORatory

Activity I: Divergent Thinking

Divergent thinking questions from Wallach & Kogan [6]:

List strong things
List square things
List uses for a coat hanger
List functions for a brick

Activity II: Domain Intelligence

Compose a list of at least five domains in which you consider yourself to have an adequate or a high level of knowledge to act as valuable team member, when those domains come into play during creative thinking activities. Think back on some brainstorming and other creativity think tanks you were a member of over the past year. Are there any other (subject/discipline) domains you would like to develop your expertise of knowledge in? Look online for some free sources or resources (see YouTube™, TedX™ talks or visit universities to peruse online courses). Look into free community colleges or interest groups that might assist you in this quest.

Activity III: Personal Development Plan

The set of skills that the American Psychological Association (APA) set out for CiQ incorporates skills to create, invent, discover, explore, imagine, and suppose. Consider the five factors in Table 3.2 and several synonyms for each of these words,

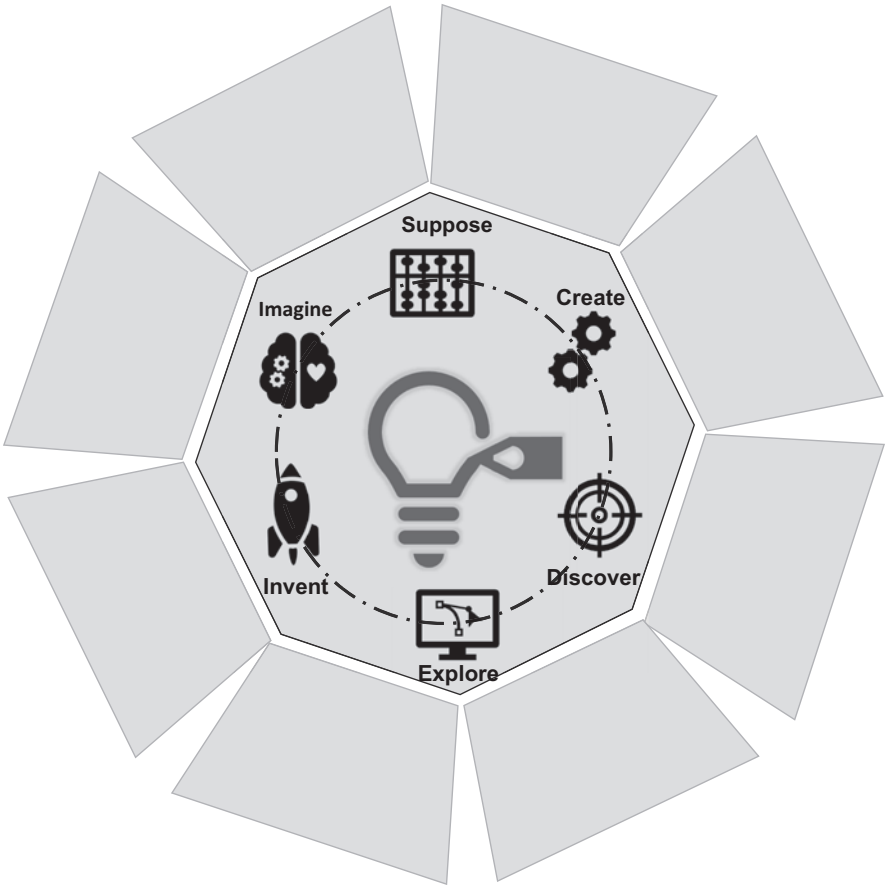

Fig. 3.7 Coaching for CiQ

as provided by online dictionaries of your choice. (e.g., the MSWord dictionary provides synonyms for suppose as: think, guess, believe, pretend, understand). Look up some words using several online sources. If you were asked to coach someone, what might you suggest as activities or tasks to develop CiQ skills. (Perhaps after reading the entire book, you might have new ideas to update/upgrade this model.) Use the figure below to design a personal development plan for your coachee or yourself (Fig. 3.7).

Activity IV: Little and Big C Idea Generation Tool

Imagine you are the creative brains of a consulting firm. You have been approached by a client to suggest new uses for two products he has found to be stuck on the shelves in his warehouse. He has millions of rolls of plastic straws (in 200 m rolls

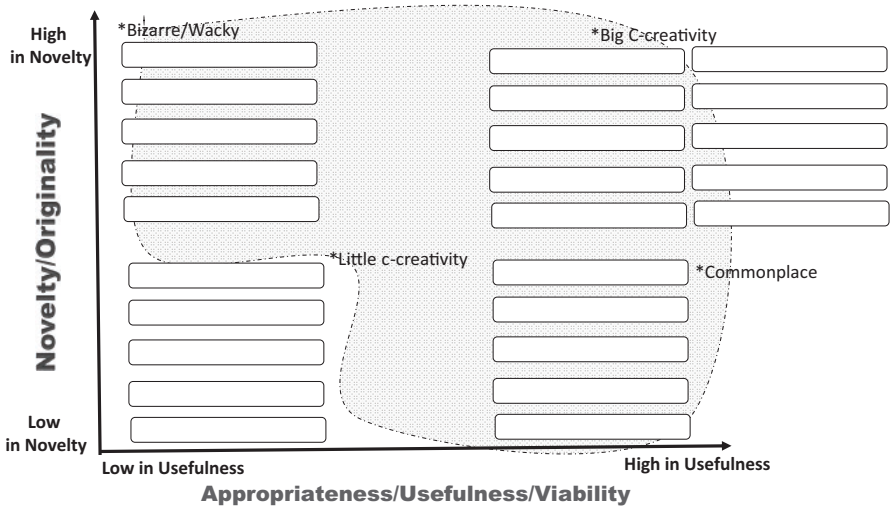

Fig. 3.8 The Creative Product Output Space: Big-C, Commonplace, Little-c, and Wacky Products

of uncut straws of 10 mm diameter) and about five million red stress balls, about the size of a cricket ball. The stress balls are not branded in any way and are soft, durable and made of memory foam – indicating that once a ball has been released from pressure, it will jump back to its original form. This will last for about 300 compressions, after which it will remain flattened, or in the form of the impression that has been made on it.

Use the Creativity Product Output Space below, to list at least 25 uses for these items (Fig. 3.8).

Activity V: Tinkertables

Dr. Pillay [10, p. 23] contrasts a timetable of frantic wall-to-wall appointments with a *tinkertable*. This tinkertable is your own self-created and self-managed series of timeslots that are off limits to any daily, compulsory, or routine tasks. These are non-negotiable slots in which to reflect, think, meditate and un-focus the mind. Find regular slots – he suggests 15 minutes – to do something that is undemanding to YOU. Something like doing a crossword, a Sudoko™ number puzzle, listening to music or taking a walk without your phone. Set aside bigger timeslots for once a week and longer time slots like a vacation or "staycation" (no travel, but no work either).

Your only two tasks right now are to (i) block out a slot of 2 hours a week for the next 10 weeks, where you can do exactly what YOU want to do: work, play, sit, think, relax, work hard, read, prepare. This can be ANYTHING YOU want and have utter control over. (ii) Find a pet name for this block like MYTIME or TRU2ME,

and select a symbol or icon to help you recall that this is not-negotiable. My symbol is α [66]. What is yours?

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Chapter 4
Thinking Modes and Techniques

Mark Kilgour

Abstract To develop creative ideas, we first need to understand what they are. Creative ideas contain three core elements. They must be original, appropriate, but also artistic. The development of these ideas requires an understanding of divergent and convergent thinking processes and how they are used to generate creative ideas. These creative ideas must then make it through challenging evaluation processes.

Keywords Appropriateness · Artistry · Creative frontier model · Domains · Originality · The creative thinking processes · The domain continuum model

Learning Objectives
On completion of this chapter, the readers will be able to:

- Demonstrate an understanding of the three core components of a creative idea – originality, appropriateness, and artistry.
- Illustrate an understanding of convergent and divergent thinking processes and their role in creative idea generation processes.
- Begin to develop an organizational-based process that assists in the generation of highly creative Big-C ideas, or incremental, small-c creative ideas.

4.1 Introduction

Interest in creativity has been around for centuries. However, in recent years the level of interest in creative thinking processes and how they can be improved has increased. In a world of volatility, uncertainty, complexity, and ambiguity (VUCA),

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there is an increasing focus on how we develop new solutions. Climate change, growing inequality, fake news, and a growing social and technological divide are all driving the search for creative ideas. We need creativity. Creative thinkers are broad thinkers who are open to new ideas, listen to constructive criticism, and can adapt and change. Arguably the father of modern creativity research (along with Torrence), Guilford notes in his description of a creative person:

> "Because he is confident, he is also tolerant where there should be tolerance. A world of tolerant people would be peaceful and co-operative people. Thus, creativity is the key to education in its fullest sense and to the solution of mankind's most serious problems" ([1], p.147).

While we have learnt a lot about creativity and creative thinking processes, there are still many areas that need further research. Developing creative ideas is a complex process. The birth of an idea is just the start of a long journey toward that idea being implemented. A wide range of individual and environmental factors influences the creative process. The focus of this chapter is on understanding what a creative idea is, and the mental processes required to enable people to develop and evaluate creative ideas. Researchers are continually improving our understanding of how creative thinking processes work in individuals and teams [2].

4.2 The Importance of Creative Thinking

Academics, business leaders and politicians worldwide have long acknowledged the need for a more creative workforce. Facing rapid change from multiple global sources of competition, organizations and even entire economies are realizing the importance of innovation and adaptability. The increased rate of change, due to global shocks such as the Covid-19 pandemic, as well as increasing competitive pressures, means that environments are dynamic and new solutions are required. In this dynamic world the development of creative individuals is essential.

Unfortunately, progress around developing creative individuals has been slow. The need has been with us for some time, and the issues have not changed. At the turn of the century the Singaporean Education Minister Teo Chee Hean noted the need for education systems to achieve a good balance between content knowledge and creative thinking skills. Yet today the United Nations still calls for more creative solutions to solve humanity's problems and recreate a better post-Covid world.

Central to the development of creative individuals are our training and educational systems. The need for both content knowledge and creative thinking skills identified by Teo Chee Hean is crucial, as both are essential components in creative thinking processes. As the world becomes more connected and automated, education must shift its emphasis away from previous techniques and systems that focus on teaching how to solve the problems of the past.

4.2.1 Standardized Education Versus Nurturing Creativity

While training systems need to focus more on creativity, most modern-day education systems are still too focused on standardization and conformity. These standardized systems allow for economies of scale, ease of assessment, and cost savings, but do not allow students to develop their creative personality and creative intelligence (CiQ).

Unfortunately, many of our training systems are becoming even more standardized, not less [3–7]. The following factors are becoming increasingly common to many education systems:

- large classrooms, both on and offline
- interaction with the expert being replaced by standardized online materials,
- the drive for economies of scale and profits over a variety of different learning outcomes,
- an increased focus on selling training courses that benefit the education provider, rather than providing education that befits the needs of society.

These factors are moving educational institutions away from the type of environment where creativity is nurtured and encouraged. This does not mean that basic knowledge, standardized tests, and blended learning are not required, but if they are poorly applied, or are used to replace interaction and engagement with knowledgeable experts, then we will not achieve enquiring minds. This results in a paradoxical problem. The world requires more creative thought, yet many education systems are encouraging processes that result in less creative graduates. Much of this problem is due to our lack of understanding of the creative thinking process itself.

While we need to understand the creative thinking process to improve our training systems, this is not a simple task. Creative thinking processes are highly complex. The one thing that creativity experts agreed upon is that creativity is multifaceted [8]. While there are numerous models of the creative thinking process, and an improving understanding of the underlying processes, there is no still no agreement on all aspects of its definition.

4.3 Defining Creativity

While not all creativity researchers agree on all the components that make up a creative idea, since Guilford's seminal work on divergent and convergent thinking there has been a consensus on two of the core components. Most researchers define a creative idea as containing:

(i) originality, or novelty, and
(ii) appropriateness, or relevance.

4.3.1 The Originality Component

If you ask people on the street to define the word 'creative', most of them respond that it is a new or novel idea. As noted by two leading creativity researchers,

> "Of the various facets of creativity, originality is probably the most widely recognized" ([8], p.537).

Originality is the core of a creative idea. A creative idea is something that presents a different view, a different interpretation of the world. It is a new combination. However, originality is not enough. A creative idea must contain at least one other component: appropriateness. Appropriateness is important because if we only focus on originality, any idea, no matter how bizarre or outlandish, would be included.

4.3.2 The Appropriateness Component

The appropriateness component relates to the extent to which other people view the idea as relevant to them, or appropriate to the situation they are facing. A giant vacuum tube being used to transport people around a city may be appropriate for a futuristic cartoon, but it is currently not an appropriate idea for a public transportation company. Most definitions of creativity therefore include the two components – originality and appropriateness, although often using different terms, such as new and valuable, or novel and relevant [9, 10].

These two components are only part of the discussion on creativity's definition. The next question relates to how to measure these elements. Both originality and appropriateness are relative, not absolutes. How original does an idea have to be before it is creative? How appropriate does it have to be? This then requires consideration of who does the evaluation and what is the context? If a person develops an idea that they personally view as a new and appropriate concept, is that a creative idea, even if it is already well understood at a societal level? This requires us to separate out the concept of creative ideas from that of creative thinking processes. It also requires us to consider how we evaluate creative ideas.

There are different types of ideas from a societal perspective. Ideas that are highly original, but low in appropriateness, are viewed as bizarre ideas, as they are currently unworkable or fictitious. Ideas that are highly appropriate, but are not new, are routine ideas.

Then there are varying degrees of creative ideas. There are ideas that are small incremental developments, perhaps taking an existing idea and expanding it slightly, such as making a machine faster or more efficient. Then there are the rare, Big-C, paradigm-shifting or breakthrough ideas. These Big-C ideas are highly original but are also viewed as highly appropriate. However, the Creativity Frontier diagram leaves two important questions unanswered,

(i) How do you develop creative ideas? and
(ii) Who determines whether an idea is original and appropriate?

4.4 Developing Creative Ideas

It is generally accepted that generating creative ideas involves combination processes [2, 11, 13, 20]. A person takes two ideas and combines them in a way that is both new and appropriate. For example, a person could take two unique cooking styles and blend them into new and exciting recipes, or adapt drones for a new purpose. This process involves combining ideas from within our mind's memory categories. Our mind consists of almost countless memories and acts like a giant database where we store related information in folders, or categories. Putting relevant information together in folders makes it is easier to quickly retrieve the information we need. When we require information about politics, we open our politics memory category and access the information stored there. If we need information on pets, a different category is accessed.

4.4.1 The Domain Continuum

These categories will overlap with other categories to a larger or lesser extent, depending upon our experiences and knowledge of those areas. We link nutrients more strongly with cooking than we would with economics, as there is more overlap between those categories. As concept links are naturally occurring (i.e., flowers are all more closely related to branches than to automobiles), an individual's internal memory categories will tend to be broadly similar (just much smaller) to that of society's *domain level* categories. Societal domain level categories refer to the sum of a society's knowledge in an area (Figs. 4.1 and 4.2).

Therefore, for most individuals, cooking and gardening will be more strongly linked than cooking and economics, and individual knowledge categories will

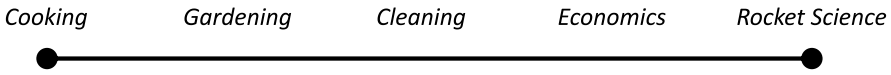

Fig. 4.1 The domain continuum model. (Reproduced from Kilgour [11])

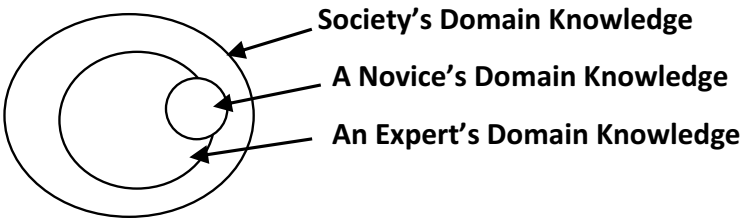

Fig. 4.2 Domain knowledge boundaries. (Reproduced from Kilgour [11])

broadly resemble those of society (just much smaller). Of course, the more expertise a person has in an area, the larger their individual memory category will be. As a person becomes more knowledgeable in an area, the more closely their knowledge will resemble that of society's domain knowledge. In addition, as everything is related to some degree, the larger a person's knowledge in an area, the more it will connect to ideas that different people may not have linked together as strongly. For example, Leonardo da Vinci linked his knowledge of machinery to the human body and proposed many types of automation that other people of that era did not consider.

When generating creative ideas, we use ideas from our individual memory categories to make the new combination. We will view that idea as creative. If the resultant idea also consists of new and appropriate combinations from a domain- or society-level perspective, then it will be a Big-C creative idea. While the idea is a Big-C idea, it will still often involve a very long difficult process to get others to see it as such.

As creative combinations are dependent upon the category knowledge each individual possesses in relation to a particular topic area, it is the internal knowledge of the person generating the idea that provides the basis for creative combination processes. As we all have different experiences in life, our knowledge categories will all be at least slightly different. Also, because we tend to work and specialize in certain industries that focus on certain areas of knowledge, we tend to develop category knowledge that is similar to that of other people in our areas of expertise.

If we combine ideas that are more distant from each other at a societal level, those ideas will be viewed as more original. Whether that new idea is viewed as creative or not will then depend upon whether we can convince other people of the appropriateness of the idea. Unfortunately, as those ideas are from very different domains, it will be difficult for other people to see them as appropriate, at least without significant refinement of those ideas. This is one of the big difficulties with highly creative ideas - other people (even the best minds), often cannot see the potential of Big-C ideas, only seeing them as bizarre; original but not appropriate.

> "There is not the slightest indication that [nuclear energy] will ever be obtainable. It would mean that the atom would have to be shattered at will." Albert Einstein Pittsburgh Post-Gazette 1934 [12].

In contrast, small-c, or incremental ideas, involve combining ideas from areas, or domains, that are more closely related. These ideas will be viewed as less original than Big-C unusual domain combinations. However, they are more likely to be viewed as appropriate, as unless the idea generator is an expert in an entirely new field or domain, it is likely that other people will have at least some similar category knowledge with which to evaluate that small-c idea.

It is important to point out the difference between creative thinking processes and creative ideas. As an individual you may combine unusual ideas, which you then refine within your own mind to make appropriate. You are undertaking creative thinking processes. However, if those ideas are not new and appropriate combinations at a society level, then they are not creative ideas. You see them as creative, but other people may have heard of those ideas already and hence will view them as

routine ideas. Given the difference between these two concepts the next questions are then:

(i) How do we encourage the development of creative ideas? and,
(ii) What are the requirements for creative thinking?

4.4.2 The Creative Thinking Process

Most activities in our day-to-day lives do not require us to undertake extensive creative thinking processes. One of the most complex tasks we undertake every day – walking – is so well ingrained that we do not even think about the process; it is automatic. Of course, as children we had to develop this ability, just like eating, adding up, singing, cooking, driving, and all the other complex activities that we now do automatically. On occasion we expand our knowledge in these areas, such as when we try a new recipe or we drive a racecar on a track, but most of the time the requirement for us to develop and expand our memory categories is limited. This is just as well, as developing new mental combinations is a highly taxing task. As noted by Henry Ford -.

> "Thinking is the hardest work there is, which is probably why so few engage in it."
> Henry Ford

Creative thinking involves combining memory categories that we have not combined before. The more novel the idea we are trying to generate, the more unusual the combination of domains we need to connect. If we are a novice in a domain then we are likely to generate creative ideas at an individual level, but those areas are less likely to be creative at a societal level - either small-c or Big-C. This is because our category knowledge is limited.

Experts, on the other hand, have extensive category knowledge to use in generating ideas, but as Big-C creative ideas involve combining knowledge from one domain with knowledge from another distant domain, they are more likely to instead create incremental or small-c ideas. This is because their specialization means they have a strong understanding of one particular area, but this specialization may mean they do not know a lot about other areas. This means these experts have the basis to develop small incremental steps that extend out from their current area of expertise but may lack knowledge of other areas to make distant leaps. Therefore, specialization can work against us. If we want to generate Big-C ideas, then ideally, we would have in-depth knowledge of many very different domains to use in creative combination processes. Of course, having in-depth knowledge of multiple domains is difficult; there are only so many hours in the day.

If a person is able to develop extensive expertise in two or more domains that are not closely related, this will provide the knowledge base to make divergent combinations. While it is difficult to develop such expertise, these new combinations are likely to be viewed as novel. These are the break-through ideas, such as microwave

ovens, digital cameras, solar-powered cars, and many more disruptive inventions. Of course, having in-depth knowledge of multiple domains is difficult, as we share the common limitation of just 24 h in a day. However, both novices and experts will generate more original ideas if they apply what are referred to as divergent thinking techniques.

4.4.3 Divergent thinking Techniques

Divergent thinking techniques are techniques that encourage us to open unusual memory categories to use as the basis for developing new idea combinations. When generating a creative idea, we can start by making combinations of highly unusual ideas – what is referred to as divergent thinking. The concept of divergent thinking has a long history in creativity research. Divergent thinking is a concept that was first introduced by Guilford in 1968. In relation to the domain continuum, divergent thinking processes involve merging previously unconnected domains, changing the parameters of the field and how those domains are subsequently viewed.

Given that it is hard for other people to see the value of highly unusual combinations, Guildford also discussed the need for convergent thinking. Convergent thinking involves taking those new, unusual combinations and refining the ideas to make them more appropriate. Therefore, creative thinking is initially a process of divergent thinking, and subsequently, of idea evaluation, refinement, (convergent thinking processes) and finally expression.

Other researchers have continued this line of thinking and incorporated the concepts of divergent and convergent thinking into their studies. In a study of creativity in the workplace, two types of problem-solving styles were identified: associative and *bisociative* [13]. Associative thinking involves routine, habit, or rule-based thinking while bisociative thinking involves more intuitive leaps of thought that combines separate areas of thought without the use of rules or apparent logic. The authors state that each type of thinking is required, depending upon the situation, and this mirrors the requirements of creative thinking processes where unusual creative leaps are required to generate original ideas (divergent thinking), which then must be refined and made appropriate (convergent thinking) to pass through evaluative processes.

Similarity, creativity researchers Finke, Ward and Smith proposed the *Geneplore model* [14]. This model of creative thinking starts with divergent thinking processes followed by evaluative processes that work to screen and/or refine those initial ideas. These two-stage models are common both in the academic literature and in practitioner-based creative thinking techniques. Probably the most widely known creativity technique, brainstorming, uses a process where initially participants are encouraged to think freely in an unhindered way; subsequently, time is spent in evaluation and refinement processes [15].

4.4.4 CreativeIdea Generation Processes: Summary

Divergent thinking processes can be stimulated using a variety of techniques such as the use of metaphors, analogies or other techniques that encourage distant combination processes. It is important that this stage is free from evaluative pressures that can stifle these processes. It has long been argued that early-stage evaluation can be destructive to creative thinking processes [16], either due to an information effect, which locks people into a way of thinking, or due to evaluation limiting people's motivation [17]. However, irrespective of the reason, it is clear that creative thinking processes should start with divergent thinking processes, prior to the use of convergent thinking, evaluation, and refinement processes.

It must also be noted that making connections within a domain can still result in creative ideas, as long as those connections are new. These small-c ideas have a key advantage over Big-C ideas. Small-c ideas are more likely to be viewed as appropriate because they are easier to explain. The evaluation of small-c creative ideas is easier than the evaluation of Big-C ideas because creative ideas are based upon our category knowledge. If someone presents us with an idea that is a combination of two very unusual domains of knowledge, we are unlikely to have the knowledge of both of those domains with which to make sense of the idea. The process of divergent thinking can be viewed as a process of encouraging the opening up of distant domains for use. The more distant the domains that are combined, the more likely the resultant idea will be original, but the more difficult it will be to get others to see the idea's appropriateness.

4.5 Evaluating Creative Ideas or Individual Product(s)

Creative ideas are assessed by other people. As each person's knowledge will differ from the next person's, and creative ideas are new, unusual combinations that do not have set criteria for the evaluation (unlike a mathematical equation), each judge will need to use their own knowledge of those two distant domains to evaluate the idea. As Big-C ideas are combinations of highly unusual domains, it is unlikely that judges will have the strong knowledge of both divergent domains with which to make an accurate assessment [18]. This difficulty in assessing the appropriateness of a highly creative idea has been shown in research [2, 19]. So, while external assessments of originality are relatively easy and consistent (as the judge only needs to determine that it is an unusual combination), judgements of the appropriateness of highly divergent combinations are much less consistent.

In an ideal world we could assess a creative idea based upon the knowledge of society in relation to both of the combined domains. However, this is purely theoretical as it is people who assess ideas. Individuals use their own category knowledge to undertake evaluations.

4.5.1 The Difficulty in Evaluating Appropriateness

When we evaluate creative ideas, we do so based upon our existing knowledge of the domain. As Big-C ideas involve combining more than one domain, even an expert judge who has strong knowledge of one of the combined domains is unlikely to also have a strong understanding of the other combination domain. So, for Big-C creative ideas, it will be easy to see that the idea is an unusual combination and thus original, but difficult to see how that unusual combination makes sense. Therefore, highly creative ideas must be able to make connections between those two ideas that others are both willing to listen to and can follow.

When evaluating creative ideas, we therefore need to consider the issue that an idea could be viewed as inappropriate merely because the judges do not have the appropriate alternative domain knowledge with which to evaluate that new idea. This highlights the importance of what are referred to as gatekeepers. Gatekeepers are those people in organizations that assess and either allow creative ideas to progress or stop that progression.

> "Everyone is familiar with the case of a creative idea being ignored because the knowledge of the field lags behind that of the creator." [1] Joy Paul Guilford

Another issue when trying to develop creative ideas is that domain boundaries are constantly changing. It is an unfortunate fact that the second person to develop the time machine will not be viewed as being as creative as the first person, even if they develop the idea completely independently of each other. Indeed, trying to develop highly creative ideas is high risk: often multiple researchers will be working on similar ideas at the same time. As noted by Simonton [20], multiple discoveries are not uncommon and there are many examples where two or more scientists came up with the same concept simultaneously.

All these findings have several implications for developing creativity in ourselves and our organizations. First, the processes that result in paradigm-shifting, Big-C creativity are different from those that result in incremental, small-c creativity. The former requires encouraging highly divergent associative combination processes, taking ideas and combining them from very different domains. From there an extensive process of evaluation and refinement is required. For incrementalcreative ideas, the focus is on knowing a particular domain very well and making new links between ideas within that domain, or from similar domains of thought. These ideas are much easier for others to see as appropriate although they will still also require refinement processes, just to a lesser extent.

It is also important to be aware that there is a difference between creative thinking processes and creative ideas. If we want to encourage creativity in our organization then we need to be aware that a person may be undertaking creative thinking processes but that those processes will not always result in creative ideas – either Big or small. Developing creative ideas requires a combination of both divergent thinking and convergent thinking. Divergent thinking can be encouraged through learnt techniques, while convergent thinking usually requires strong domain

knowledge. This is the necessary balance of creative thinking skills and content knowledge.

Finally, if we are to identify creative thinking, we must consider the limitations of assessment and acknowledge: external judges may not have the knowledge to judge creative ideas effectively, especially highly creative combinations.

The process of generating ideas involve combining either distant or close domains of knowledge. Depending upon how distant or unusual the domains that are combined, as well as the extent to which those combination processes result in new ideas, the resultant ideas will either be habitual, small-c, bizarre or Big-C ideas. Remember that domains are not set but are continuums of related knowledge. If a person combines two ideas within a domain and it is a new combination, then this will result in a small-c idea. If a person combines two distant domains, then this will result in a novel idea, and whether it is viewed as Big-C or just bizarre will depend upon whether they are able to refine it and convince others to see the appropriateness of that idea.

However, unusual combinations are difficult to make sense of and hence it is important that the idea is presented in a way that is simple to follow and increases the chances of a positive evaluation. This leads to the third component of a creative idea – artistry.

4.6 Artistry

The creative process has been described as a never-ending struggle between the person developing the creative idea and those evaluating it. Creative thinking involves connecting distant domains. Rather than a linear approach, this process of generating Big-C ideas involves leaps of insight [21], and means external judges who only see the idea, and not the process, have trouble following along. The difficulty in external evaluation is not the recognition of originality but recognizing appropriateness when that idea is also highly original.

Good ideas do not speak for themselves. Gaining acceptance of a creative idea requires that the person evaluating the idea perceives it as both original and appropriate. For people to be able to make sense of unusual combinations requires time and effort and hence the idea itself must be presented in a way that eases the evaluation process for the viewer. This has led several researchers to add a third component to the definition of creativity – artistry.

Artistry refers to the fact that if an idea is poorly expressed, it will be harder for external judges to make sense of it. We all know the difference when we see a well formatted and structured document versus a poor one. The words of both documents may be the same, but the first one is easier to read and make sense of. This issue is compounded for highly creative ideas, as an idea that is a highly unusual combination means that most people will not have the internal knowledge of how those two unusual combinations work together. If the idea is poorly expressed and the ideas do not flow together to make a coherent story, it is unlikely that external judges will be

motivated to try to make sense of that idea. Artistry therefore refers to aspects of the presentation and messaging that make it easier for others to see the appropriateness of the idea.

Execution quality, or artistry, is therefore a reflection of the need for creative ideas to be well presented, to flow, and to be coherent. These aspects help to elicit attention and ease the processing requirements of the audience [22–25]. Evaluating your own creative ideas is difficult. It is important that you make it as easy as possible for the people doing that evaluation. Developing the artistry related to your creative idea therefore usually involves an extensive process.

This process should begin with an understanding of the people evaluating the idea so that the appropriate terminology, message elements, and media are used. This also requires the development of expertise, in interpersonal and selling skills, along with knowledge and expertise in the common media by which ideas are presented in the area, be they audio, video, or face to face. Most importantly it requires the person presenting the idea to be a good storyteller, able to capture and hold the attention of the audience. In summary, artistry, or being able to present complex ideas simply, is not itself a simple process. This reflects the 1% inspiration, 99% perspiration saying in relation to the development of creative ideas.

4.7 Summary

Originality is the most widely recognized component of creativity. Creative ideas are combinations of unusual domains. The more unusual the domains that are combined, the more original the idea. Evaluation of the originality of a creative idea is relatively straightforward and consistent across groups of external judges. It is relatively easy to see that an idea is an unusual combination.

Appropriateness is the other widely accepted component of a creative idea. Appropriateness means that other people can see how an idea makes sense and is relevant. The more unusual the domains that are combined to generate a creative idea, the more difficult it usually is for external judges to be able to see the relevance of the idea. This is because it is unlikely that other people have knowledge of those unusual domains with which to make an evaluation of its appropriateness.

Given the difficulty in assessing highly unusual domain combinations, several researchers have emphasized a third component of creative ideas – artistry. Artistry refers to how well refined and presented a creative idea is. The artistry component involves simplifying an unusual connection and presenting it in a way that both motivates the audience to look at the idea and makes it easy for them to see how the idea makes sense. All of these components are central to the success of creative ideas, and processes and techniques to improve them are discussed in subsequent chapters.

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Chapter 5
Using a Metacognitive Model for Creative Work

David Kayrouz

Abstract A good understanding of how we think and how we know, or 'knowing how you know', termed metacognition, is foundational to success in understanding creative endeavours and developing creative intelligence. This chapter presents a simple metacognitive model that will guide creative endeavours towards optimal outcomes and help readers to consider their own way of learning and knowing. Its purpose is to bring attention to an awareness that can overcome perceptual limitations and encourage richer creative outcomes. An exercise called *The Scumble* is offered to provide a practical grounding to what is expressed through the model.

Keywords Metacognition · Perception · Self-awareness · Senses · Thinking

Learning Objectives
On completion of this chapter, the readers will be able to:

- Interpret and apply the metacognitive model to develop personal CiQ.
- Develop vocabulary for capturing, mapping and sharing creative experiences.
- Apply this learning to critically use a wide range of processes requiring creative capability.

5.1 Metacognition and Its Relevance to Successful Creative Practice

Developing creative outcomes requires consciously understanding the part perception plays in '*how* and *why'* we recognize and deliver the novel outcomes of the ideation process, and further adapt and refine them. This is the essence of a

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metacognitive approach and is critical because our perceptions profoundly affect the assumptions made that lead to new ways of seeing and new ways of doing things.

Human creativity is enhanced by developing the ability to consciously recognize, choose and use the various ways in which we are able to perceive. Choosing alternative ways of perceiving will bring different results to those we obtain during undeliberate thinking events or take for granted as unconscious actions.

Our perceptions of the world inform the assumptions we hold and directly affect our viewpoints and thus our actions. For example, if we were to paint a room, depending on the person's perspective, one person might ask "How much paint will we need? How long will it take? What will it cost?" In contrast, the immediate response of another person might be "What colour shall we paint it? Will it make the room feel nice? Will the paint fumes affect us while it's drying?" One person here is quantifying the options and decisions rationally, while the other person is qualifying emotionally. While these views are both valid, neither of them is complete – but both these ways of perceiving and knowing are valid parts of creating a new look or feel, or merely improving the current look of the room.

The world around us is constantly changing – both through natural events and through the inventions and radical changes humans bring about. Any response to the changes demanded by these shifts can act to challenge fixed or habitual ways of seeing things. Removing the limitations that often challenge us requires continuous vigilance and pursuit of new ways in which we can see and respond to contextual changes. A key driver of creative intelligence (CiQ) is moving beyond what we presently know and do, to problem solve, transform practices and procedures, change methods and systems by continually reviewing and revising. With a perceptive awareness of *why* and *how* we are working, a metacognitive understanding of these situations can sharpen the creative process we engage in, potentially turning it from a blunt tool to an effective instrument, skilfully used and expertly employed for the well-being of humans and the planet at large. The effectiveness of any creative methodology will always remain dependent on our individual and collective understandings, perceptions, and actions, to produce optimal outcomes.

5.2 What Is Metacognition?

Metacognition is the broad study of how we recognize, understand and respond to our worlds, including the interactions we have with each other. In layman's terms, it is thinking about our thinking. Collaborative connection between people is particularly relevant to sharing a metacognitive understanding, as our own individual approaches are often only revealed when they are seen in the context of others. Marcel Proust, the French writer, put it this way: "The real voyage of discovery consists not in seeking new landscapes, but in having new eyes" [1].

Most of us recognize three ways of seeing, knowing and relating to things that make up the field of metacognition (see Fig. 5.1). These are: first, knowing through *thinking* and forming concepts and ideas about things. This is a selective form of reasoning and logic which we will call the HEAD modality (also called cognitive

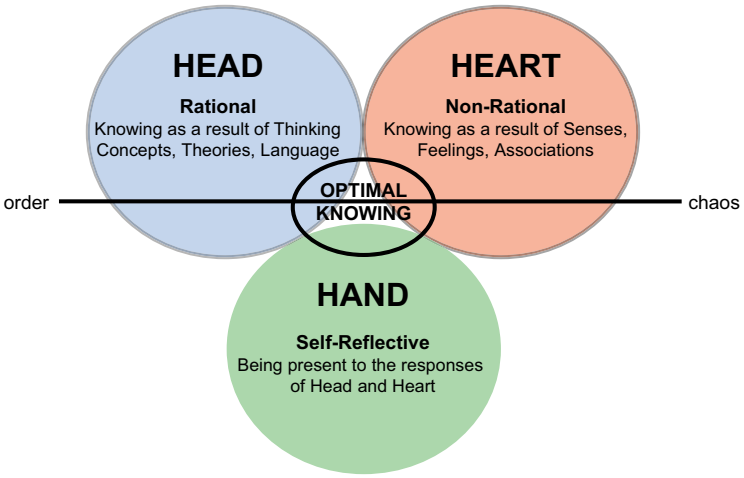

Fig. 5.1 Metacognition: three ways of knowing

knowledge). This modality ensures we can know the same things and describe them coherently. Second, those sensations that result in knowing via our feelings and emotions we will call the HEART modality (also called affective knowledge). They allow us to know more and differently as we engage through the perception of the body's *felt senses*. Third is *self-reflection*, which is a detached, subjective awareness of all these responses, which leads to our ability to change them. This modality we will call HAND (commonly termed self-knowledge).

While each modality can be recognized as a different way of knowing, they work together to offer us different perspectives on the same issue, problem or stimulus. Although the contribution of each modality varies, depending on our needs, experiences and values, they should *all be* involved when seeking optimal outcomes. However, these modality differences can also be perceived as conflicting; limiting our repertoire of alternate possibilities and undermining our capacity for optimal knowing. Understanding these conflicts is part of the metacognitive appreciation that should help readers to avoid creative blocks when engaged in creative processes. Silvano Arieti [2] confirms this enlargement of our capabilities in his studies of creativity. "Creativity is one of the major means by which the human being liberates himself from the fetters of not only his conditioned responses but also of his usual choices" (p. 4).

5.3 Autopilot and Awareness

Performing the mundane duties like dressing, driving, or making a coffee, which make up a good part of our lives, is easily done unconsciously. As humans we often perform various habits (e.g., driving, morning routines) on the autopilot of habit – without much conscious thought or active cognitive engagement. In other situations

(like the workplace), we may find ourselves inclined or even compelled to follow the views, habits, norms and decisions of others. Both habitual autopilot thinking and slavishly following others or conforming, share a metacognitive unawareness. These situations draw us into responding from previous knowledge, familiar routines, and without critically engaging the three modalities – we are effectively lulled into a complacency that smothers curiosity and dulls our awareness. This "unthinking" habit is fatal to a conscious capacity for improvisation and adaption.

Taking an active role in any task provides thinkers with opportunities to develop creative intelligence (CiQ) by consciously understanding how we engage with various modes of perception. For example, how often have you picked up the phone, heard the first words of a friend or partner and could tell by the tone of their voice what sort of mood they were in? People may claim to be tone deaf when it comes to talking about music, but in these moments most of us are able to use the same perceptual senses that rapidly discern tone. Instantly we know how to respond or feel whether this is the right time to ask for that favour! This kind of knowing is led by the senses, the HEART modality.

Consciousness of our felt senses can instantly decipher complex and nuanced information through a recognition of heuristics.[1]Unlike the facts that cognitive critical analysis depends on and works with, recognition in the HEART modality of knowing is based on a collection of signals that we relate to contextually by knowing them together through the six senses.

In a similar way Daniel Kahneman [3] in his book Thinking, Fast and Slow refers to this way of knowing as 'System 1.' (p 13). Though he describes people as having two operating systems, the qualities of his System 1 fit the HEART description here, mainly as unconscious, reactive and dominated by the heuristics of signs and biases. (We cover System 2 in the next section.)

5.4 Conscious Knowing and a Metacognitive Model

Daniel Kahneman's "System 2" (p. 13) aligns with the HEAD modality of metacognition, as it is described as slow, effortful, conscious thinking and reasoning.

Paying deliberate attention through self-reflection to our own thoughts and actions using the Metacognitive model (Fig. 5.1) leads us to develop an increased awareness of how we are perceiving an object or event. While the HEART modality can deliver some of the information, we can be confused by the tension between HEAD and HEART offering conflicting notions. These tensions, which result from contradicting perceptual assumptions, like the desire to overeat while knowing it is

[1] Heuristics are rules of thumb that can be applied to guide decision-making based on a more limited subset of the available information. Because they rely on less information, heuristics are assumed to facilitate faster decision-making than strategies that require more information.
https://www.apa.org/pubs/highlights/peeps/issue-105

not good for your health, contribute to blind spots that diminish alternative choices. So how can this conflict be managed?

Consciously being aware of how our assumptions are created provides some freedom to choose other ways of seeing things that produce new insights. The HEART modality of knowing is particularly adept at making these connections, though it works best when it is operating in the moment – free from the past or predictive judgements of the HEAD's knowledge. Developing an emphasis on a metacognitive understanding enhances our ability to look into the present, knowing how we are being informed now as well as comparing with how we chose to be informed in the past. It can determine what we may consciously do in the moment that might provide new choices for perceiving more and differently.

This choice is the work of HAND as a self-reflective awareness. To explore this idea further let us consider what can be understood through experience.

5.5 Establishing the Model

In this section you will find instructions for the Scumble exercise. Be sure to have a quiet moment where you can dedicate the time to be consciously aware of the whole experience while doing this exercise. The key learning comes from an awareness of and reflection on your *actions* rather than whether you are pleased or disappointed with the end results of this exercise. Before you attempt this work, for optimal results, it is best to arrange to have up to 3 other people on hand to do this activity with. After doing this exercise we will then align your experience with an explanation that maps it in relation to the metacognitive model in this chapter.

5.6 The Scumble Exercise

Preparation
You will need to have the following equipment ready:

- An A4-size photocopy of a Scumble. Provide a different sheet for each participant from one of the Figs. 5.2, 5.3, 5.4 or 5.5
- A pen and blank A4-sheet (to make lists, one per person)
- Thick black marker pen(s) to realize final images
- Time-keeping device to keep track of the stages

STEP 1: Taking 5 minutes to work alone, each participant uses pen and paper jot down some of the things they can find in the shapes and spaces of their specific version of one of the 4 Scumble illustrations found as Figs. 5.2-A, 5.3-B, 5.4-C and 5.5-D. Participants do not consult with each other – they quietly, without interference, consider the figure. Look at it from an overall point of view as well

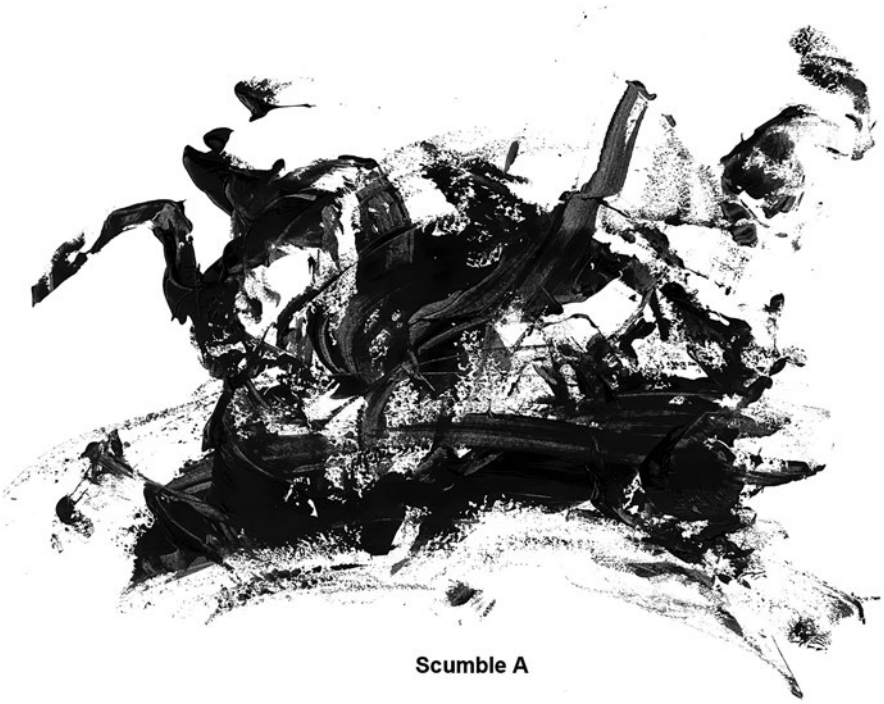

Fig. 5.2 Scumble A

Fig. 5.3 Scumble B

Fig. 5.4 Scumble C

Fig. 5.5 Scumble D

as examining sections close-up. Inspect the negative spaces; they are those spaces that lie between the ink/black marks. Turn the image round and look at it from different directions. Make a list of what you find on your blank A4 page.

STEP 2: Now work for 5 minutes as a group on all of the figures, taking them in turns. Using the same directions as step 1 for looking. Each person whose copied figure you are searching should act as the scribe to make a fresh list of what you find together. The list-maker as owner and scribe will only write down those things that they and at least one other can recognize during the turn with their figure. NOTE: Don't get stuck trying to get ideas across. When another person can't easily see what you are seeing, just move on. You don't need to repeat what you have already seen in the first 5 minutes on your own.

STEP 3: When you have finished, having all made lists this way, return to working on your own figure with your list. Choose one item from it that most appeals to you. It can be from either of the lists you made, alone or together as a group. When you have chosen, realize your choice by drawing on your own photocopied version of the Fig. 5.2, using the thick pen. NOTE: For best results avoid adding a lot of details. Rather indicate or suggest what it is you have discovered that is already there. Best results come from just *highlighting with a few marks* or indicating where it is, possibly with a frame or title. Excellent results can be achieved by just adding some significant feature that completes the image to make it obvious, like drawing a straight line underneath an object to give it a ground to relate to.

STEP 4: Share the finished results of your work with the others.

STEP 5: After you have done this, write down some of the things you noticed while doing this exercise. Repeat this step with the others you invited, building on and sharing together the diverse range of interactions, feelings and outcomes this experience produced. List them.

Questions you could consider

- What changed over time? Difficulty, number of results, relationships….?
- What feelings did you notice and when? Serious, frustrated, lighthearted, relief….?
- What surprised you? Other's views, yourself, what was found…?
- What were the qualities of interactions with the others? Curiosity, empathy, listening…?

5.6.1 Caution!

Reading and thinking about the experience here and imagining its possibilities for yourself is a possible trap. Without completing the exercise, you are likely to retain the same way of thinking and feeling, as you will default to experiences you already know. To quote David Kolb [4], a Harvard professor of organizational development,

"Experience is the process whereby knowledge is created through the transformation of experience" [p. 38].

Skipping the steps of the scumble exercise confirms a path to relying on your own past experiences over that of new ones. Such an approach to creative learning cannot capture the unique embodied reality of new experiences, especially when they are shared simultaneously with others.

Honing your creative intelligence (CiQ) and personal metacognitive abilities starts with experiencing the richness of knowing your own experiences in the context of others.

Please don't read past this point until you have stopped and completed this exercise.

5.6.2 After the Exercise: Reflections of Others

Given your practical, personal experience in completing the Scumble Exercise, you have the experience and perspective to consider, with practical integrity, your own experience and that offered by other participants, to align them with the discussion that follows.

Scholars posit that the image you have created and then interpreted has emerged as a result of using various ways of knowing in a particular way and in a particular order. Once you know and understand your unique order and way of knowing, it can be recognized, shared and developed. So, let's reflect on what could have happened during your experience, then apply your findings to this conceptual model and consider with careful deliberation, aided by the discussion below, how these metacognitive perspectives align.

In this exercise you were creatively engaged: both as individuals and as part of a group. Some process structure was given to you, but no rules. By creating your image out of the scumble, the artefact you created resulted from finding some structure or at least observation out of the chaos of random marks. The process of creating your own interpretation of that reality is likely to have resulted in some enjoyment of the process and the level of everyone's engagement in producing the varying outcomes might have surprised you. Further, you were most likely aware of an increased level of curiosity as you all wondered what the others observed, interpreted and created. This heightened curiosity may have been comparable to that experienced when first meeting someone and wanting to learn about them. Minds are open to new discoveries and the narratives lead from one topic or construct to the next. In your keenness to find things you may have noticed yourself (or did not notice as the others did), that listening became more acute and careful, and quite probably less judgemental. Possibly when you first started this exercise, particularly on your own, you may have found it hard to see anything all, but as time went on you began to see more.

Slow starts are often the shift from the HEAD modality of thinking about the exercise's instructions to just perceiving the space playfully in a relational way. This

engaged sensual knowing of the HEART modality feels quite different to the qualities of knowing through the HEAD. This shift can take a little time if it has not been practiced before. You might recognize this difficulty in other situations; like being engrossed in a great story and being interrupted and asked to confirm some bill amounts, calendar dates or similar factual information.

The diversity of people's narratives prompted reactions from you. When you worked with others your attention may have followed the suggestions of others. Somebody saw a face, a bird or a fish and you found yourself seeing more of them. An awareness of this form of selective attention through suggestion can also be helpful in preventing our own initial blindness to alternate possibilities or expanding our own initial biases for noticing particular types of images. On the other hand, you may have been surprised by the variety of ideas that others offered, which in turn sparked more alternate ideas of your own.

As personal interpretations are relinquished in favour of discussion, the scumble figure may open to wider meanings that engage more personal nuances of our sensual perceptions, which in turn generate further relationships and interpretations.

This type of open-minded exchange between group members allows for trust building – by accepting the diverse experiences of others that inform our common humanity.

If this happened in your experience of the scumble exercise, chances are that the spontaneous and improvisational nature of the interpretation of the scumble grew, producing a growing sense of freedom where play and humour prevailed. Studies indicate that this type of play and humour allow and encourage more novel connections to be made. Laughter and good humour are clear signs that improvisation and a safe environment are present and past studies indicate that this supports open-minded collaboration and sparks creative, interpretive outcomes.

5.7 Metacognitive Model

The process of producing your image from the chaos of the figure may have seemed quite random, yet you dipped in and out of the different modalities of knowing in quite specific ways to arrive at your result.

Figure 5.6 lists the qualities of engagement needed for each way of knowing. The horizontal lines indicate continuums that connect paradoxical qualities of the HEAD and HEART. In fact, modalities from *both* enabled this exercise to be completed.

On the left are the requirements of rationality and reason; i.e., how one understands instructions, recognizes and names objects or things in the scumble. Listed on the right of the bubble in Fig. 5.6 are the prerequisites for engaging in the creative behaviour that prompts the generative HEART modality of knowing.

The fact that you could capture a sense of the whole experience and recall it was the work of HAND connecting HEAD and HEART in an overview that informed your conclusions.

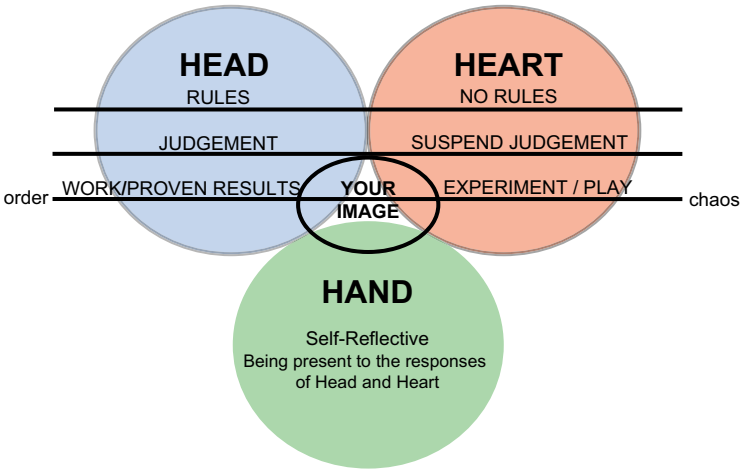

Fig. 5.6 Qualities of engagement

The image you created was the result of the optimal knowing that emerged from complete engagement in all three modalities of knowing. The model also serves to establish a benchmark for further consideration of the way these forms of knowing relate to each other. The HEAD modality often dominates understanding, particularly in the business world, so we need to pay additional attention to the HEART modality to enable it. And we must often consciously engage in the three modalities to break out of the certainty that results from an organizational rationale dominated by a HEAD modality.

Scholars suggest that safe spaces for experimentation when engaging the HEART modality are critical to effective outcomes. Creative work is uncertain, and participating thinkers can feel stressed and vulnerable when the three prerequisites of the HEART, (see Fig. 5.6: no rules, suspended or delayed judgement and serious play or experimentation) are requisite states of behaviour. High levels of personal stress discourage the risk-taking responses that are necessary to act differently.

In the scumble artefact provided, the shapes and spaces were not presented in any way as absolute. This helped participants to mitigate this risk (of being "wrong") and encouraged participants to abandon the judgemental state of the HEAD with little effort. Normally it may require some courage to stay with the stimulus of the HEART mode that keeps us with this generative form of knowing, continually triggered by the whims of felt senses. It's primarily our senses that prompt us to see possible relationships between things to create novel connections, so the goal is to stay with them [5]. Like creating art, beyond the limits of technique, it is a state of continuously communicating with and through the materials to experience our sensual responses.

In moments when we are completely engaged in creative tasks, all modalities are contributing towards a state of Optimal Knowing (see centre of Fig. 5.4). The

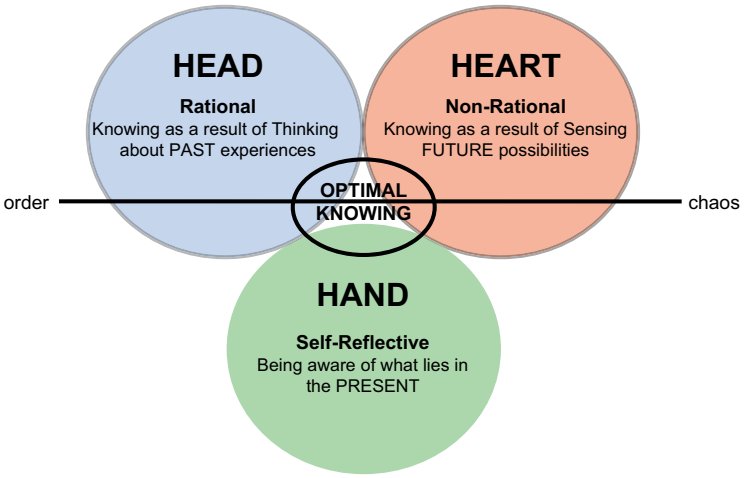

Fig. 5.7 Temporal qualities

knowledge of past experiences, previously experienced and captured in one's mind as concepts and facts, contributes to the senses' constant delivery of possibilities in the present, as triggered by new issues or stimuli. A state of optimal knowing can evoke a sense of "flow" (p. 71), a term used by Mihaly Csikszentmihalyi [6] in his work on the principles of creativity. This state produces a sense of timelessness as we become at one with the task in a state of optimal experience. This may have been experienced as part of your own experience with the Scumble exercise (Fig. 5.7).

When understanding, through multiple ways of knowing, is led through our constant sensual contact with the world, we are leaning into the future of what might be possible. It's the stimulus of our *felt senses* as they *imply* [7] that our surroundings *now* are always offering something more and different than we can know from what has passed. Maurice Merleau-Ponty [8], in his *Phenomenology of Perception* points out that "our body is the primary site of perception". The takeaway here for creative work is that we cannot afford to ignore *immediate possibilities* that are being freshly offered as perceptions entering through the bodily senses. From this position we can always be looking to 'make sense' of experience. Whether we are gathering ideas and reviewing them or refining those we have chosen to prototype and adopt, each step on the way continues to unfold further possibilities when we are sensually open to them. Developing a disposition of pervasive curiosity [9], even when things might appear paradoxical, involves maintaining the same curiosity and empathy for ourselves as it does for others which includes the materials and experiences, we encounter.

Examining the nuances of our perceptive qualities in relation to life experiences is an ongoing enquiry that aids our individual awareness and builds creative capability. Table 5.1 presents some of these qualities and indicates how they might be related.

Table 5.1 Qualities of the three modalities of knowing

Cognitive/rational	Reflective/intentional	Sensual/relational
Detail oriented	Purpose oriented	Context oriented
Facts/rules dominate	Agency to choose	Values/intensity dominate
Words and language	Imaginal options	Symbols and images
Identifies objects – names	Connects in timely manner	Knows object function
Knows – past dominates	Acts – present dominates	Believes – future dominates
Order/pattern recognition	Poses the right questions	Spatial perception
Acknowledges	Values	Appreciates
Concrete/reality based	Predictive	Relationally based
Forms strategies	Determines actions	Presents possibilities
Laboured	Proactive	Reactive
Planned/certain	Considered	Uncertain/risk-taking
Subjective, logical, analytical, objective	Mindful, present, aware, attentive, conscious	Generative, sensual, random, wholistic, subjective

5.8 Summary

Our discussion has centred on "knowing how you know", as the basis for metacognitive understanding. All of these knowing states start with your own experiences. Using a metacognitive model forms a cognitive map to enable you to understand and share the complexities of experience. A metacognitive focus reaches to the *how* and *why* we produce the *what* we are seeking when we are engaged in doing creative work. The exercise demonstrates that creative work is a result of incorporating all our perceptive faculties. Trying to produce results by seeing them as separate ways of knowing is unproductive and leads to creative blocks. One consideration is to pay greater attention to the bodily forms of awareness that inform our thinking.

Using a model allows us to capture, map and analyse our perceptions so that we can share discoveries and keep track of our progress. The model presented in this article provides a simple way to begin this process.

A metacognitive approach underpins CiQ through its focus on a full awareness of all our six senses. Mental short cuts, often called intuitions, gut feelings, or heuristics, are a result of these felt ways of knowing. Malcolm Gladwell's book *Blink* [10] provides many examples, among them the story of a practised art restorer who knew in an instant – at first sight – that a highly valuable and newly acquired museum painting was a fake, despite its provenance. Following this immediate gut response, he invested time and resources to confirm that his intuition (based on years of experience) was right.

Alan Hajek [11] writes in a recent essay on heuristics and creativity that building our implicit ability to judge through a felt sense – i.e., relying on past experiences and the ability to perceive heuristically – can form the mental shortcuts that enable creative insights. Anyone with a desire to develop this ability can do so by mindfully internalizing useful heuristics as rules of thumb. Contrary to common assumptions,

rules of thumb, as heuristic judgements, recast the idea of what is logical in producing counter-arguments that show something else is also relationally possible. CiQ that uses heuristics capably come from understanding the makeup and importance of intuitive decisions, which we discuss in depth in Chapter 7.

We are capable of consciously understanding the sources of many of the conclusions that lead to our assumptions guiding actions. Although we might always feel like beginners on our CiQ journey, a metacognitive understanding is one way of working towards actualizing our greatest potentials through continuous, ongoing learning.

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Instead of a few extra exercises here, we have added an extra chapter (see Chapter 6) to provide ample opportunities for readers to apply the concepts and skills encapsulated in this chapter, to their own life, paradigms and learning experiences. Please move directly to Chapter 6.

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Chapter 6
Metacognitive Exercises That Develop Creative Intelligence

David Kayrouz

Abstract This chapter offers four metacognitive exercises to illustrate forms of perceptual awareness. They demonstrate how CiQ can develop from a conscious meta-cognitive awareness of our responses to daily life as we live it. How personal actions, directed by felt senses as response to stimuli, can be an immediate source of information. When carefully observed and mindfully recognized, these responses as insights contribute to the development of a critical self-reflective awareness. From the exercises and examples presented, readers should consider the richness of their responses, as indicative of possibilities to further develop their CiQ.

Keywords Attention · Behaviour · Felt senses · Felt shifts · Metacognition · Self-awareness

Learning Objectives
On completion of this chapter, the readers will be able to:

- Know how to invest in personal development through reflection on experience to develop CiQ.
- Recognize qualities of felt sense that support creative outcomes.
- Be able to develop a self-awareness of personal responses that lead to creative choice.

6.1 Introduction to Self-Reflection and Choice

Using creative intelligence (CiQ) ensures that we humans can select options and choose from an array of alternative responses available to us. The majority of humans' daily responses to stimuli from the environment, are guided by knowledge, which results from past experiences. We know what time it is; we can name things;

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we are able to share instructions of work tasks or the latest news. With instant and wide-ranging access to unlimited data and information, objective knowledge continues to expand as does the speed of its delivery. This vast and fast growth in accessible knowledge also taxes our sensory responses to increasingly discern what is relevant to our lives. Is this or that piece of information worthy of response?

The effect of this growing knowledge phenomenon can be sensed in the subjective stream of our changing feelings. Antonio Damasio [1] in The Feeling of What Happens, refers to the sensory stream of consciousness as *coreconsciousness* providing us "with a sense of self about one moment – now – and about one place – here" (p16.) its simplicity "is not dependent on conventional memory, reasoning or language." This stream of consciousness leads to a sense of self in an *extendedconsciousness* where "both the past and the anticipated future *are sensed* along with the here and now" (p17. *authors italics*).

Humans' ability to direct attention to incoming information allows for a critical *self-reflection* where checking-in on our habitual and conditioned assumptions determine if we direct or are being directed by the influences of the knowledge and stimuli we are exposed too [2].

Herein lies a key quality for the development of CiQ provided we carefully tune into the nuances of *How we are perceiving things in the moment.*

6.2 Choice and Metacognition

Taking a metacognitive approach to developing CiQ (see the Metacognitive Model for Creative Work in Chapter 2) ensures that we do not only define available choices better, but also ensures that we are working from a stronger sense of our ownership over the resulting conclusions. This can be achieved if we are aware of those personal qualities of perception that indicate, connect, or signal whether we are currently on the right track with our responses and actions that resulting from various stimuli. Such a journey includes acknowledging and including the unique personal ways we might consider our own experiences. "Knowing thyself' [3] as extolled since the Greek oracles of Delphi, ensures finding the truths within our own experience that mitigate the risk of blindly accepting everyone else's truth as always having greater veracity than our own.

Self-reflection plays an important and valuable part in CiQ development. The following sections offer four practical exercises that demonstrate how metacognitive awareness and being in tune with one's own inner senses and self-awareness may contribute to CiQ. These exercises are intended to expose some gaps in the process of knowing – attesting to the integrity of how we are informed. As self-discovery exercises, they hold a spotlight to the finer points of perception that are directed in the moment by *felt senses* rather than logical thinking. The exercises cover:

- Qualities of attention.
- Knowing more and differently.

- Effects of behavioural extinction; and
- Sensing felt shifts.

Each exercise is prefaced with its purpose and followed by comments reviewing some common experiences and conclusions.

6.3 Qualities of Attention

We are all endowed with an ability to voluntarily focus our attention on what matters to us. Still much of the time we don't take this option. In fact, the states of our attention vary greatly from totally distracted, to fixed, and from extrinsic to intrinsic concerns. Our attention has enormous scope that is often overlooked and underdeveloped. Why are we aware of some things and not others? What is the state of our attention and what determines it? How much attention can we make available to ourselves? The following exercise will bring some of these qualities to your attention and provide some answers.

6.3.1 Intersection Exercise

Preparation: Go to a busy intersection at a peak time of activity with a notebook and record your responses to the following instructions. Have a timepiece with you and allow up to 30 min to complete this exercise.

1. *Order*: Follow the order below doing each step for a full 5 mins. Allow a brief break as needed between the four instructions to capture any immediate thoughts or questions that arise
2. *Count* the number of red cars that pass through the intersection. Record how many of these red cars have more than one person in them. For each car whisper "Yes" to yourself and take one step forward or back.
3. *Identify* and record incidents that indicate that drivers or pedestrians at the intersection were in moments of uncertainty about what they are to do next. For each incident whisper "whoa" and taking one step sideways.
4. *Pick out* specific vehicles or people and imagine what they might be involved in. No accompanying action is required.
5. Lastly, purely *sense* being there without judging or writing anything. Be present to all sounds, movement, colour, temperature. After the 5 min are up, record your impressions, the overall sense of the place, and anything that surprises you.

NOTE: Honing your creative intelligence (CiQ) and personal metacognitive abilities starts with experiencing the richness of knowing your own experiences.

Please don't read past this point until you have stopped and completed this exercise.

6.3.2 Analysis of Attention

1. **Order.** generally, the tasks moved from the results of cognitive rational thinking (1) to the use of the imagination and the senses (4). During this shift in the foci of attention we can observe both common effects we all share as human beings and those individual affects that will be conditioned by personal responses. The most significant are outlined below with each part of the task.
2. **Count the number of red cars that pass through the intersection.** Doing this task you were instructed to direct your attention in a very narrow way. Complying commonly demonstrates because we are focused on the red cars we may fail to see anything else. Additionally saying "yes" and performing movement is often forgotten. This effect can be attributed to the amount of effort needed for our attention to be focused on reasoning as we lose attention to memory and focus on logic to count the cars. A significant outcome of this type of instruction typically induces *blind spots* [4]. Participants will make comments like*"* If someone asked me if I saw a blue car, but I can't say, because I was so focused on the red ones."

   Other effects on our attention through specific instruction can induce forms of *selective attention* [5] where the red cars continue to be noticed for the rest of the exercises. This is also a result of preconditioning as we continue to build information from previous experiences. Without clear possibility for focused engagement many people find *distraction* occurs when there is no red car in sight. Alternatively, if highly engaged in the task, personal responses like *frustration* may be experienced when there are too many cars to count at once or a clear view for counting is blocked.
3. **Identify and record incidents that indicate the drivers or pedestrians at the intersection were in moments of uncertainty**. For this part of the instruction our attention has a wider scope. We have been asked to notice what might be different or be a break in continuity. This usually creates higher levels of engagement as the task has greater levels of ownership over determining the results. Because our attention is involved in an interpretation of what is happening we might notice greater levels of curiosity and engagement are involved. Still the cognitive task of counting remained, creating a risk that some of us may still have forgotten to say "whoa" and step sideways, though forgetting becomes less frequent. This effect is reflected in this typical remark "When I moved back from the specific detail to keep an eye out on incidents of uncertainty, it caused me to have a focus on a much larger area. It was easier to pick these up and remember to say 'whoa' and move side to side, because I had time".
4. **Pick out specific vehicles or people and imagine what they might be involved in**. The task now becomes considerably easier, as there are no time constraints, distractions are no longer an issue as everything matters. The object of attention can now be freely informed by past personal experiences. The greater the diversity of past experiences, the greater the scope you have for interpretation. Comments will include (amongst others): "When I picked particular cars and

imagined what was happening, I could do this in my own time, spend as much time as I wanted for each car. There was far less stress in this activity as it was not as rushed as the first couple of activities". This part of the intersection exercise demonstrates the connection between the focus of our attention and our senses, stimulated by what we are seeing, and knowing how to respond to it. If we stay with the cognitive approach that excludes the senses, we will get a response like this: "This was really hard. Unless the vehicle was labelled with the nature of their business, it was hard to tell what they might be involved in." You will understand from this observer's comment that they were unable to make the connection between cognitively knowing what they see and an understanding that let their senses empower them to consider and connect with their past experiences.

5. **Lastly purely sense being there without judging or writing anything.** This exercise required little cognitive effort and focused attention entirely on what was being experienced through the senses. This state of attention is close to the ideas of meditation particularly those promoted by Jon Kabat Zinn where he advocates "the awareness that arises from paying attention, on purpose, in the present moment and non-judgementally" [6]. This form of awareness opens us to an unlimited number of stimuli that broaden our possibility for connections. When applying our attention in this way, we are open to surprise, a sure sign that we are experiencing something new. The effects of applying our attention like this is evidenced in this account: "When there are specific objects of concern, it is easy to ignore the surrounding sounds, colours, dynamics, and so on. I was surprised I sensed more than I thought and realised in the end the intersection felt noisy and confusing. In the previous parts of the exercise, because I concentrated on the vehicle and pedestrian, I didn't notice it and felt at that particular point in time, that the intersection was quite ordinary. This time, I discovered a great many details that I have never noticed, sound and movement of flags in the car yard, familiar smells of KFC, and smells of petrol or diesel, the distant sounds of a train, the traffic controller, and a squeaky wheel. I could have stood there for a long time and felt relaxed. I was now aware of the cold wind; my hand was shivering – I should have worn more clothing".

6.3.3 Summary of Attention Exercise

This exercise illustrates the qualities that attention may have. Understanding these states through constantly reflecting on personal experiences leads to possibilities to improve and guide our attention. CiQ is most effective when we understand how to engage our attention with the varying scope and intensity various tasks demand. There cannot be rules for this, however there are some commonalities. One being an ability to hold attention through the senses if we are to take in all those possibilities available to us.

6.4 Knowing More and Differently

As concluded from the first exercise, it's the senses responses that provide the stimulus for making new connections. Connection and relationships as factors for creative work or ideation are an important focus for practise when coming up with new ideas. In the following exercise we start with those qualities of the senses that connect through evoking empathy not only with other people but with the material world around us. This is relevant to the first stages of *design thinking* [7] where exploration involves empathizing and defining.

6.4.1 'Found Object' Exercise

1. *Preparation*: Do this exercise with 4–6 people. Each person finds a small object to present that evokes strong personal associations or meaning for them. All participants should remain acutely present to their actions, thoughts and feelings for the duration of this exercise.
2. *Presentation*: Bringing your objects, owners should preferably stand in a small circle taking turns to place their objects, one at a time, on the small table or stand placed in the centre where they can be viewed. Placed on sheet of white paper, on an small upturned box in the middle of the small table works well. Each object should be presented individually in its turn and displayed with no adjacent distractions. If possible, owners should conceal their objects presenting them one at a time.

   NOTE*: All participants should accept the following condition. To be open to, and of clear the fact that people's responses are subjective and diverse. While others associations with your object may reinforce your own associations, if they don't, you accept their offering without taking personal offence.*
3. *Reflect in silence*: For each round the group should first spend 1 min in silence focusing on the object presented. The audience should attempt to recall memories, make associations or make new meanings the object evokes in them.
4. This is followed by a round of uninterrupted individual expression *ending with the owner of the studied object.* A brief time limit should be agreed for each respondent to share their thoughts e.g. 1–2 min.
5. *Debrief*: When all the objects have been presented the group should share their overall experiences of the exercise.
6. *Summarize*: On a sheet of paper capturing in list form a summary of the groups experiences.

   Were there surprises, similarities, new perspectives?

   What were the primary ways of relating to the objects? Results or conclusions you came to, or any questions this experience raised?

REMINDER: Honing your creative intelligence (CiQ) and personal meta-cognitive abilities starts with experiencing the richness of knowing your own experiences and those of others.

Please don't read past this point until you have stopped and completed this exercise.

6.4.2 Analysis of 'Found Object' Exercise

Groups doing this exercise find themselves deeply engaged in other people's stories. This 'connection' is less a rational than one than one that is a sensual connection. The result of this is to produce a strong feeling of empathy between everyone in the group. Both the stories people tell about the objects and the owners connection with their objects are essentially ones based on sensual feelings. When people speak from sensory truths about what they perceive there is an integrity in the communication being shared that defines the space the group holds. Usually participants doing this exercise express this as "Memories were activated, a sense of belonging and overall listening prevailed." This atmosphere results in a general sense of safety that supports free expression, good listening, curiosity, and suspension of early judgements. In turn these qualities amplify the freedom required for wide interpretation of the objects. Exchanging interpretations that have personal integrity lends context and meaning to participants own self understandings. "I learned about personal things we would not have known otherwise and it helped us touch our common humanity." a comment reflecting this effect.

The variety of interpretations in these conditions are regularly quite surprising. Not only does everyone in the group get to hear other's diverse views, the owner of the presented object also expresses the object's personal value or sentiments to them. Therefore, comparisons are inevitable with further surprises when you find other people confirmed you own interpretations or contribute new dimensions of interpretation that add to or shifts your own.

6.4.3 Summary of 'Found Object' Exercise

The outcome of the found object exercise demonstrates when we relate to objects and people, trusting the to the integrity of sensual engagement evokes knowing that is considerably more and different to what we might encounter through attempting to make logical connections.

Sensual experiences offer broad scope for creative connections as foremost they relate through intensity and appreciation rather than simple acknowledgement.

6.5 Behavioural Extinction

On a daily basis we rely on habit to perform many actions that include habitual thinking and behavioural routines. On occasions, like coping with serious injuries, we can find ourselves suddenly unable to behave as we have in the past. When we are faced with new challenges they are often prefaced by a series of negative feelings that can lead to blocks in our creativity. Being aware of the signals that can block adaptive change and knowing how to get through them contributes to our ability to engage new ways of approaching challenges. Completion of this exercise takes the reader through the process of adaptive change to signal some of the crisis points and highlight the sensory connections to perseverance and action.

6.5.1 Behavioural Extinction Exercise

PREPARATION: Remain acutely present to and aware of what you are experiencing for the whole process. Complete this exercise *in two steps*. Move to the instructions of the second step *when you have completed the first*.

STEP ONE. (a) Make a simple dart out of a sheet of A4 paper.

The best flying darts rely on careful and accurate folding and sharp creases. Making a dart is best carried out on a flat hard surface. Any design of paper dart will do, though simple instructions for a good flying dart can be found here; Dart Design https://www.youtube.com/watch?v=d4Qs9hRieI4

(b) Test: Once completed, test your dart a few times. When you have a sense of its flying characteristics, try launching it from the same place to land it consistently on the same spot, say the sofa, or mat, or another place in the room.

(c) Trials: Making and consistently flying your dart with some accuracy is a satisfying endeavour. You may consider making several darts, so that you can improve consistency and select your favourite dart.

(*d) Accomplishment*: Congratulations on your achievement thus far!

STEP TWO Habit: Now that you have settled on your design, chosen suitable launching and landing places and achieved reasonable consistency with results, you will be probably performing this task with some ease.

(a) Extinction: Now taking your chosen dart, and the same launching and landing places as you did in Step One.

(b) Test: Repeat the action of launching and landing your dart, without using either your arms or either of your hands. Don't stop the exercise until you have actually tried *something.* The goal remains the same as *(b) Test.*

(c) Summarize: On a sheet of paper capture in list form a summary of your whole experience. Feelings, results or conclusions you came to, any questions this experience raised?

REMINDER: Honing your creative intelligence (CiQ) and personal meta-cognitive abilities starts with experiencing the richness of knowing your own experiences and those of others.

Please don't read past this point until you have stopped and completed this exercise.

6.5.2 Analysis of Behavioural Extinction Exercise

Step One Many people at some stage of their lives have made darts. The process will feel familiar and with a little practice you had some fun improving your skills of making and landing your dart with some accuracy. Your sense of certainty improved with each iteration as did your satisfaction and confidence.

This exercises follows how habit develops. There is a *trigger* as initiator to all habits, For this exercise, it is the fun of making the dart. Next, some sort of *motivation exist*. For our exercise, the challenge of landing in a set place. Finally, habit is further entrenched due to a *reward*, most often the satisfaction gained from doing something successfully. Having the *ability* to repeat something over and again for the reward supports reinforcement that shapes behaviour. The first part of this exercise emphasized these conditions.

Step Two Then, shock and horror! You're asked to do the same thing without your arms and hands. At this point some of you will have taken on this new challenge as a little fun, possibly even with a bit of excitement as to what could happen. Other reactions at this point can be confusion, disbelief, uncertainty, hopelessness. Either reactions or a mixture of reactions, are normal, yet there will be no way to get the dart flying again or learn something to that end without actually trying to *do* something. There may have been moments of thought "What can I do?" but ultimately to complete the task you had to do something. Now or at a further point of trying a further crisis can occur, that of frustration.

Those that move beyond this state and made some attempt or tried something to deliver on the request, probably found that some of the things they tried worked! If not at first attempt, some might find that a derivative of the trialled actions could be further experimented with. Some strategies involve using feet or mouth, placing the dart on a slide and using a fan.

What first occurred happened is your *ability* to do what you've always done has been taken away. This behavioural extinction, once recognized and excepted, opens to novel behaviour with further attempts.

Trying different things involves more than thoughts. Actions lead to new experiences. *Experience is a form of knowing* that can lead to quite different outcomes. Here is one person's account "Experiencing this is different to me telling you about it. If you are forced into this type of situation, e.g., COVID lockdown, new things

happen. I ended up trying to do a forward roll with the dart in between my toes and launch when my foot was in the air. Made me sit there and appreciate my life and wonder how individuals who unfortunately lost their arms manage their day-to-day activities. There is always an alternate way to *do* things".

6.5.3 Summary of Behavioural Extinction Exercise

Creative intelligence can play out in actions if we understand the process of adaptive change. This process has a structure and by recognizing some of its waypoints we are more likely to get through creative challenges and deal to the blocks that stop us reaching new outcomes. When old behaviours and ways of knowing are challenged or extinguished their resurgence will be our first experience. This waypoint appears as a *resistance* to change reinforced by habit and is signalled by various feelings of frustration etc. It is easy to give up at this point, move to *denying* that there is a possible solution and even *defend* this position.

Recognizing this as 'natural' we can move beyond this point into the chaos of creative action. Without previous experience, for some people this may require considerable courage as we sense uncertainty, vulnerability, risk. Conversely, if we have been this way before it is possible to equally sense excitement, anticipation, and purpose. Blocked by the tension of this paradoxical state can never-the-less be breeched by *action*, by trying something. Staying with this chaos and continuing to act in different ways involves more than reasoning. Including the use of actions and objects involves evoking new and novel insights engaged by sensual means. Introducing 'difference' in this way can confirm creativity is a result of daring to act (engage the senses) without prior knowledge of what will happen.

In this last exercise we will look at ways we can know if we are on a pathway out of this chaos with something worthwhile.

6.6 Felt Sense and Felt Shift

This exercise is to illustrate the different *felt senses* that result as bodily responses to various forms of perception when we are reflecting on experience. Attention to distinct changes in these felt senses, recognized as *felt shifts,* also signal opportunities for specific enquiry. These mostly occur as realizations between different ways of knowing and understanding. Tuning into these bodily feelings, often loosely termed as gut feelings or intuitions, can be indications of whether we are on track with what we are doing or signs that something is changing.

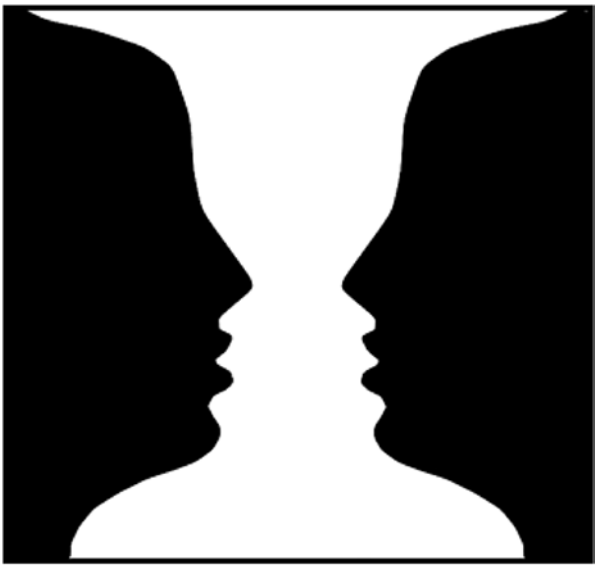

Fig. 6.1 Face/Vase

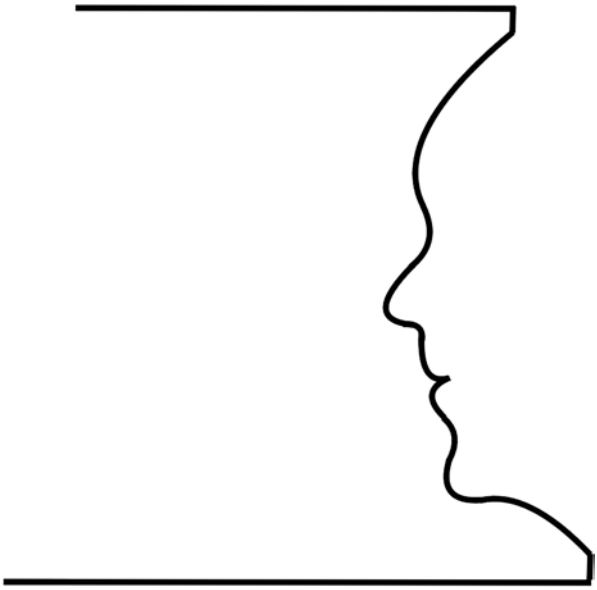

Fig. 6.2 Left-Handed

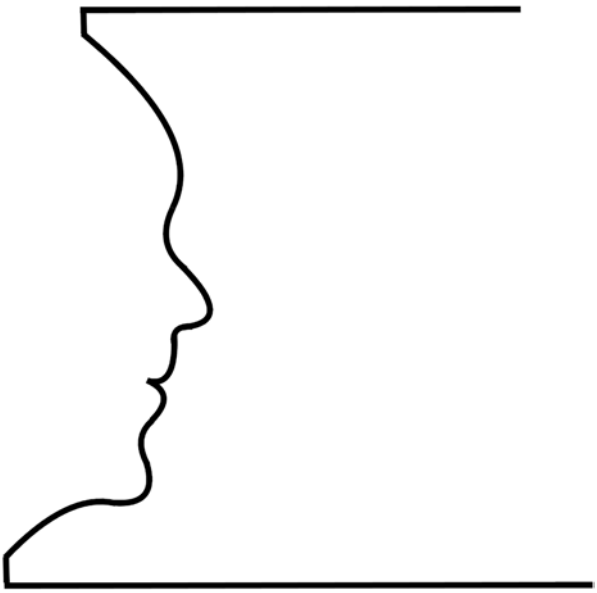

Fig. 6.3 Right-Handed

6.6.1 Face/Vase Exercise

1. *Preparation*: Look at Fig. 6.1. Face /Vase. You have probably seen this image before though you are about to create your own. If you are left-handed print out Fig. 6.2 on an A4 sheet. If you are right-handed, print Fig. 6.3. Have pencil at hand. Remain acutely present to and aware of what you are experiencing for the whole process.
2. *Read* the rest of the entire instructions and understand them completely before you start the exercise. Then complete the task in one sitting.
3. *Instructions*: Continuously trace over on the existing line of the sheet mentally recognizing all the parts of the face as you go. For example, when tracing with your pencil down the face from the top recognize and name: the crown; the forehead; the brow; bridge of nose; tip of the nose; nostril; upper lip; and so on. You can say them quietly to yourself, or out loud, as you please.
4. *Draw*: When you have done this **complete the vase** by drawing **freehand**. ***(Do not fold the page or trace the image to do this)***
5. *Reflect*: Regardless of the end result carefully consider the whole process and your experience of it. Capture in list form the sequence of your thoughts and feelings. Identify particular moments in this sequence and express their felt qualities.

REMINDER: By now you will understand why honing your CiQ and personal metacognitive abilities starts with experiencing the richness of knowing your ownexperiences.

Please do NOT read past this point until you have completed the exercise.

6.6.2 Analysis of Face/Vase Exercise

You probably started this exercise feeling that the task was comfortable and easy. Taking the pencil and tracing the outline, while naming those parts of the face that you are well familiar with, posed no problems. On reflection, the instructions seemed simple and you might have taken some satisfaction from naming each of the features you easily recognized.

Shifting to the next stage, to complete the vase from the half-complete version, was quite a different matter. Some of you might have already anticipated this, as you were completing the first part of this task. Or possibly without anticipating you may have just continued to start drawing and found the lines going a bit haywire at some point as you tried to produce the symmetry of the vase.

Almost without exception, unless you are a practised artist, everybody at some point of the drawing experiences a point of confusion or conflict. You stop drawing for a moment or hesitate. This exercise creates a tension point, resulting in a momentary gap or doubt, that stops you from uninterrupted, free drawing. To overcome this gap, you are likely to have developed a new strategy to complete the vase. When drawing is recommenced, there will be a completely different sense of effort required to complete the exercise. Completed, whether the finished vase is perfect, or looks like it has been hit by a bus, doesn't matter. The point of the exercise is to reflect on the experienced/felt sense during the completion of the drawing.

6.6.3 Summary of Face/Vase Exercise

This exercise, adapted from Betty Edwards approach to drawing [8], involved you in two quite different ways of knowing which were accompanied by their own felt senses. When you had to move from one way of knowing to the other this was accompanied by hesitation or surprise in a felt shift.

The first way of knowing, to draw down the face, was engaged through the dominant use of instructions, naming things, and involving a lot of certainty. This is usually accompanied by felt sense of efficacy and a calm satisfaction. Felt senses are not necessarily specific but general bodily feelings. To complete the vase required the use of spatial or relational judgement and involved some uncertainty in making the line. The felt sense of this would be a general one of effort and possible discomfort.

Moving from one strategy of working to the other was marked by a sudden shift in felt sense. This felt shift signalled the need to reassess the way in which you were working. Being aware of felt senses can usefully challenge held assumptions and sometimes result in clear 'felt shifts' of opening new possibilities. We can experience such shifts in the 'atmosphere' of group discussions like when someone says something that surprises everyone. These 'felt shifts' are signs of a gap to *stop and explore* as something new is available.

Felt senses can imply a sense of direction if we are tuned to them, They may not offer us direct answers but can provide an indication of *away or toward* the objects of our attention. Of attraction or repulsion. Felt senses appear from our generative subconsciousness, which seems quiet but can process a lot simultaneously and relationally. This contrasts with our selective consciousness, which tends to be noisy and obvious but deals to one thing at a time and actually can't handle much.

The quiet subconscious gains our attention through such 'small voices' as are generally termed intuitions, gut or heart feelings, or changes in state [9]. In the general scheme of things sensitivity to these shifts in state need to be cultivated over time through practise but fill an important role in evaluating and providing sensual information.

6.7 Summary

The exercises presented here to assist in developing aspects of your CiQ, emphasize the importance of all six senses, as well as their relation to interpretation, thinking and creativity. Senses are most alive when we are actively engaged in trying things. To be in touch with the fine nuances of our senses when we are doing things, is to be in touch with the unique ways we are knowing about those things. After the *Intersection exercise* the experiences offered here gradually ranged from reflection on various states of attention, to an attention on the senses' ability to flesh out new information.

The *found-object exercise* demonstrated how the senses, rather than knowledge, create prime conditions for new connections between people, objects and phenomena.

However, if we experience *behavioural extinction*, we find the senses again offer us the possibility to be led to new and novel ways of knowing and therefore adapting.

Finally, in the *Face/Vase exercise* we took a closer look at the nature of felt senses not as emotions which are nameable feelings that tend to narrow our awareness but as bodily felt senses that generally widen our contextual awareness and imply new possibilities.

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Chapter 7
How the Brain Creates Problems – Malfunctions, Lapses, Bias and Prejudice

Rouxelle de Villiers

Abstract There is much evidence that humans are incredibly good at solving problems and building inventions to solve a range of human dilemmas. Unfortunately, our thinking patterns and cognitive lapses – including biases, prejudices, fixations, and several incorrectly applied heuristics – sometimes prevent our fallible minds from finding novel, appropriate, valuable solutions. In this chapter we cover the various thinking errors such as those already listed, and assumptive, reactive thinking, and mental set fixations. The last part of the chapter focuses on possible techniques and habits to overcome these cognitive blocks to ensure creative solutions through optimal ideation, idea refinement and decision-making.

Keywords Assumptive thinking · Bias · Conditional knowledge · Declarative knowledge · Empathy gap · Erroneous thinking · Eureka · Incubation · Prejudices · Situational awareness · Thinking outside the box

Learning Objectives
On completion of this chapter, the readers will be able to:

- Understand the role of slow and fast thinking in problem solving.
- Apply the AFT Model to reduce cognitive biases and assumptive thinking.
- Revise their own thinking to identify thinking errors and revise their plan of action.
- Formulate plans to devise daily tactics to limit cognitive errors and their consequences.

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7.1 Introduction

Our minds are powerful thinking machines, but they can also let us down sometimes. Humans are clearly prone to erroneous thinking patterns, poor decisions, and various flaws in our way of thinking. Some of these flaws have been much publicised, for example irrelevant or inappropriate heuristics (mental shortcuts with little information search) applied in wrong contexts; bias towards our own pre-conceived ideas; prejudices towards other groups based on age, gender, cultural norms, political and sexual orientation, religion or spirituality and even simple physical looks; and simply over-hasty conclusions based on assumptions or reactive thinking. Several well-known books and journal articles have been written on the topic [1–7], but possibly the most well-regarded of the recent ones, is *Thinking Fast and Thinking Slow* by Daniel Kahneman [8]. Daniel Kahneman is a Nobel Laurette (2002), for his studies into behavioural economics and the psychology of judgement, sense-and decision-making [8]. Daniel Kahneman [9] covers a whole host of biases, heuristics and irrational thinking patterns. Daniel Kahneman's book also covers loss aversion, the endowment effect, prospect theory and over-estimation of impact [9].

In this chapter we will cover several of the more well-known thinking errors and suggest ways to overcome these cognitive errors.

Possibly one of the of the most important debilitating or restrictive assumptions creatives need to question, is the assumption about the problem we are attempting to solve. Sometimes the way of viewing, also called the framing of the problem places unnecessary restrictions on the development of alternative solutions. By refining the problem, reframing it or simply redefining assumptions about various relevant aspects of the problem (e.g., users' needs and desires, the constraints of the company, and stakeholders' needs or contributions) decision-makers can limit restrictions and constraints and free up new avenues to pursue for alternative solutions. (For further information about refining problems or preventing problem framing issues, see design thinking (DT) in Chapter 12 and refining the problem statement in Chapter 9.)

7.2 Errors in Thinking

7.2.1 Three Basic Thinking Flaws

Assumptive, reactive, and selective thinking are some of the worst barriers to creativity. These flawed thinking habits are not only insidious and more often than not invisible to us, but we are all ruled by them in one situation or another. They hold us back by leading us to think we know the facts when we do not, and being misdirected by assumptions and self-imposed rules that keep us stuck in old thinking habits. There are three basic thinking flaws that cause cognitive errors, introduce erroneous thinking patterns, reduce creativity, limit smart decisions and ultimately prevent us from solving problems. They are now discussed:

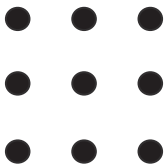


Fig. 7.1 The Nine-Dots Problem

Assumptive Thinking The willingness to accept and idea or social norm or belief as true, without asking for evidence, often accepting conventional wisdom or "common knowledge" without proof. For smart business and confident decision-making, evidence-based decisions are likely to be more effective. A famous example of assumptive thinking is the classic nine dot problem created by Johan Adair (See Fig. 7.1, the solution is at the end of the chapter). Have a quick look and try to solve the next problem:

Add One Line to IX to Make Six

Most people spend much time trying to solve this simple problem because they make needless assumptions. One assumption is that the answer also needs to be Roman numerals. So, thinkers attempt to get from IX to VI (which is possible by simply moving the cross of the X and turning the page around). That is quite creative thinking in itself but ignores the instruction of adding a line). The next assumption is that the addition needs to be one straight line. By adding a curved line, "S", one easily gets to "SIX". This leads to our uncovering of another thinking fallacy. That is thinkers' expectation that the problem must be difficult or tough, otherwise it is unlike to be the right solution. This particular bias (for more see the next section) is named complexity bias, and it is a cognitive error that describes our tendency to expect and prefer complicated solutions and explanations over simple ones.

Let us return to the nine-dot problem. The instruction is to connect the nine dots with four straight lines without lifting your pencil off the paper. Most problem solvers make an unwarranted assumption, i.e., that the four lines should keep within the triangular "box" created by the nine dots.

Thinkers must restructure the problem to consider lines "outside of the box" (origin of the expression to "think outside the box"). Once problem solvers can release that restriction or fixation, and move into a new problem space, the solution becomes obvious, resulting in the "a-ha" moment of insight [10]. We cover insight strategies and fixation later in this chapter.

Selective Thinking The willingness to accept certain ideas and reject others may be based purely on personal likes and dislikes. Humans often validate ideas that align with our "pet" ideas or "pet beliefs" and reject those that do not align with our perception of reality. There are three main types of selective thinking, namely selective attention (focusing on facts that you expect to see), selective recall (recalling only facts that support your own position, ignoring others) and selective observation

(noticing only information that support your own viewpoint and ignoring unpleasant, unsupportive of counter arguments.) The main problem with selective thinking is that people ignore available, even blatant facts. In their search for solutions, selective thinkers stop at the first right answer and therefore eject from the thinking process before finding possible solutions that might be more effective, more efficient, or more appropriate. An impactful problem with selective attention and recall is that important facts that might prevent future threats or highlight opportunities are overlooked. This leads to loss aversion (the fear of losing out is bigger than the likely gains).

Reactive Thinking The willingness to react to existing ideas, influences or influencers, based primarily on personal feelings, perceptions or interpretations. These thinking habits are also called "automatic errors of thinking", because of the associated emotions or feelings. During reactive thinking, decision-makers neglect their responsibilities towards their own well-being and the well-being of others (including society, the natural environment and the future for all creatures' well-being). In the extreme, these thinking patterns lead unethical or unlawful behaviour patterns. A study of criminals by Walters [11, 12] describes eight thinking patterns associated with criminal behaviour that include: (i) cognitive indolence (using mental short cuts instead of more thoughtful mental strategies; (ii) super-optimism (overconfidence in evading typical negative outcomes); (iii) cut-off (disregarding any notions that may deter from committing the crime); (iv) mollification (placing blame on external factors); (v) entitlement (permitting wrongful decisions by a special privileged self-attribution); (vi) power-orientation (the need for total control over others and the environment); (vii) sentimentality (doing good to offset the negative impact of the decision/behaviour); (viii) discontinuity (lack of reliability and perseverance in thinking and behaviour).

Although all three of these thinking habits have a legitimate place among humans' thinking tools, they are only effective when used at the right time and under the right circumstances. For example, to escape a burning building all these thinking types may be required in fast succession, to make effective life-saving decisions. In contrast, for pivotal strategic decisions, or to find a range of likely solutions for sticky problems, or to find an invention with competitive benefits, thinkers must explore options in depth and not be influenced by bias, selective thinking or loss aversion. If those biased thinking habits are employed, thinkers will miss possible opportunities and overlook exciting innovations and novel suggestions.

7.2.2 Bias(es)

Creatives are often on the receiving end of bias, with statements such as "mad genius" or "weirdo" describing their talents and unusual, novel ways of doing things. This kind of judgement results from the dichotomous perspectives held by

those being judged and those who are doing the judging. This judgement (often misjudgement) results from how or where attention is directed. The creator might be focused on the action, the context, whereas the judge/observer is more likely to focus on the action, activities, product and even the personality and abilities of the creator. On a different level, bias is often found in laypeople's definition of creativity that describes artistic talent or the ability to produce art, as creativity. This can be problem for both the general population (not accepting that everyone is and can be creative in a variety of domains e.g., music, mathematics, sport, science) and the creatives, as they are not seen as anything but "arty". Another bias found in creativity literature is "product bias". Here, the assumption is that all creativity and all innovation have a tangible product as outcome (including art and new product development). This bias ignores creative processes that might be novel, unique and appropriate to create new solutions to old problems, or new solutions to new problems.

In his book *The Creative Thinking Handbook*, Chris Griffith ([13], p. 27–33) summarizes five types of bias: ignoring facts (ignoring evidence that is available or even right in front of you); one right answer (stop thinking once one possible solution is found); pet ideas (getting stuck on an old idea you refuse to let go of); duped by expectations (you only see what you expect to see); and loss aversion (people hate losses more than loving gains, this is known as Kahneman and Tversky's Prospect Theory covered later). Liedtka ([14], p. 930) analysed nine biases that plague creative thinkers, in particular in design thinking (DT dealt in Chapter 12 on tools to support ideation) and offers advice on how to remedy these biases to make more effective decisions. We briefly cover them here, as a warning against the debilitating or limiting effect they might have on anyone's creativity – including those on the receiving end of the bias. For a quick summary see Table 7.1 We expand the list here and provide some indication of these biases' implications for creative thinking.

1. *Projection Bias*: This is a type of "present bias" where thinkers have the tendency to project the present into the future [15]. Gilbert, Gill, and Wilson [16] call this "presentism", which is a "tendency to over-estimate the extent to which their future experience of an event will resemble their current experience of an event." This bias impedes the development of unusual, new ideas and hinders accurate assessment correct assessment of their likely success.
2. *Egocentric Empathy Gap*: The "egocentric empathy gap" identified by Van Boven, Dunning, and Loewenstein [17] causes decision-makers to consistently overestimate the similarity between what they value and what others value. This tendency to project one's own preferences and behaviours onto others, is well documented in social psychology as "projection". This bias not only results in the creation of new ideas that the creators find valuable, make the assessment of the likelihood of success of selected alternatives problematic.
3. *Hot/Cold Bias*: Decision-makers' emotional state at any given time, whether hot (emotion-laden) or cold (not "for" the idea), unduly influences thinkers' assessment of the potential value of an idea. This hot-cold state leads to under- or overvaluing new ideas [15]. This bias is quite like the "pet idea" bias recorded by

Table 7.1 Flaws in cognitive processing and consequences for innovative problem solving

Cognitive Bias	Description	Innovation consequence
Projection bias	Projection of past into future	Failure to generate novel ideas
Egocentric empathy	Projection of own preferences onto others	Failure to generate value-creating ideas
Focusing illusion	Overemphasis on particular elements	Failure to generate a broad range of ideas
Hot/cold gap	Current state colours assessment of future state	Undervaluing or overvaluing ideas
Say/do gap	Inability to accurately describe own preferences	Inability to accurately articulate and assess future wants and needs
Planning fallacy	Over-optimism	Overcommitment to inferior ideas
Hypothesis confirmation bias	Look for confirmation of hypothesis	Disconfirming data missed
Endowment effect	Attachment to first solutions	Undervaluing of more novel ideas
Availability bias	Preference for what can be easily imagined	Reduction in options considered

Griffiths, as thinkers' current enthusiasm for a particular idea can affect the accuracy of their prediction of how others (including themselves) will react in the future.

4. *Focusing Illusion*: Loewenstein and Angner [15] describe an illusion of importance, in which decision-makers tend to over-estimate the effect of one factor and ignoring or under-estimating the likely impact of others. This illusion is likely to impact either problem refinement (hypotheses or propositions) or testing (testing only for some factors).
5. *"Say/Do" Gap*: Creatives, inventors and innovators often seek ideas and solutions from the users or beneficiaries of the solution to overcome these biases. Unfortunately, the "say/do" gap cause problems as consumers are often unable to accurately describe their own needs, current behaviour or make likely predictions of what they might find useful. They are even less reliable in predicting their future behaviour [18, 19].
6. *The "Planning Fallacy"*: Ideators, creatives and inventors are often overly optimistic about how well-received these ideas will be. Kahneman and Tversky [20] calls this rosy view of ideas the "planning fallacy." In multiple studies in psychology, marketing, innovation and operations, people routinely describe their past as consisting of both positive and negative events, yet they more often predict their own future as consisting of overwhelmingly positive events [21–23].
7. *Confirmation/favoured solutions bias*: Authors Snyder and Swan [24] coined the phrase "hypothesis confirmation bias", for which decision-makers (un)/consciously seek explanations that align with their preferred alternative. These thinkers search for facts which allow them to build faith in a preferred idea, whereas less favoured ideas will only be considered when the data or facts are overwhelmingly compelling. Decision-makers even go as far as processing information at different intensity levels consistent with their preferences [25]. Their study confirms that people are more likely to scrutinize any information

challenging their perception, and even ignore disconfirming data. Consumers are found to be less critical of information consistent with their own preferences and more critical of than preference-inconsistent information.

8. *The Endowment Effect*: In a similar vein, Kahneman, Knetsch, and Thaler [26] identify an "endowment effect" in which decision-makers' attachment to what they already have causes a loss aversion that makes giving something up (e.g., the solution in hand) more painful than the pleasure of getting something new, in this case a new and improved solution [27].
9. *Availability Bias*: Kahneman and Tversky [20] identify "availability bias", during which decision-makers undervalue options that are harder for them to imagine. Because decision-makers are already familiar with a particular idea or solution, the solution choice is likely to be inversely related to its novelty – leading to a preference for more incremental (vs radical) solutions.

7.2.3 Functional Fixedness (Mental Set Fixation or Impasse)

The number problem (1/2 of 12) indicates how easily thinkers can get stuck in a particular domain (numbers, music, mathematics, mechanics, etc.) and attempt to solve the problem with solutions that originate from that domain. (Often this assumption is an unwarranted self-inflicted restriction). For example, if one is asked "What is half of twelve?", the answer one is mostly likely to seek (calculate in this case) is also a numerical answer. So, there is one only solution, namely six (Note that even that single answer could be recorded as: 6, SIX, VI, 12/2, 2*3 and various other notations within numeric notations.) To expand beyond that single solution, one must transform the problem space [10], or move to a completely different problem space. In the art space, using an eraser, removing half of the written word in the instruction "twelve" will leave you with "twe" or "lve". By taking away three of the six letters one, might end with "tee" (you have now moved from numerals, to art, to golfing.) By ignoring that twelve is a meaningful word, reframing it as simply a collection of symbols, one might use artful erasing, remove half of the symbols and end with some new symbols or if viewed differently as a set of shapes for further exploration. Fun? Sure! (Fig. 7.2).

As discussed in Chapters 2 and 4, to solve problems one needs at least a basic level of knowledge and past experiences to build upon, as "people tend to generate new things that are similar to what they already know" ([28], p. 111). Experimental studies show that people tend to fixate on examples or on past experiences and once they make the first connection they tend to fixate on that domain (e.g., numbers, technology, music, sport) and the imagined solution interferes with their ability to generate other novel, unusual solutions. For example, when asked what half of 12 is, people might find several solutions related to six (as their first answer). For example, some answers proffered may be "half a dozen eggs" or "six pack of beers". Readers will notice that these examples first related to the number and instruction and then attempted to jump to new domains (groceries/consumer products) only in

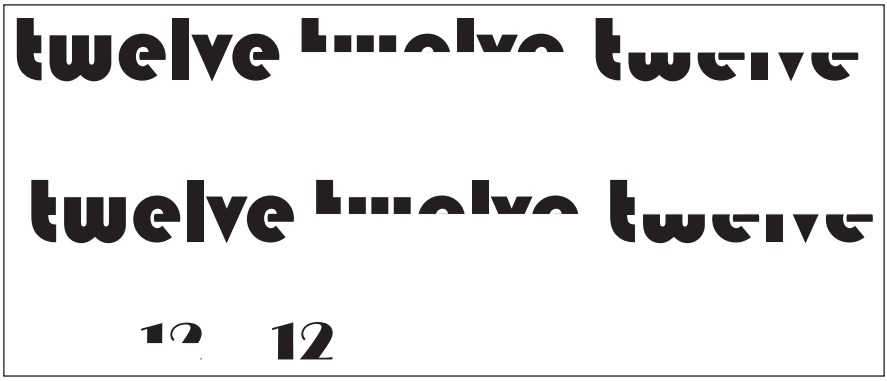


Fig. 7.2 From Math to Martian Modules ☺

the second phase of thinking. This is quite common thinking habits, as thinkers' mental set fixation wants to be heard or acknowledged. Thereafter thinkers can deliberately and forcefully use their more complex and hard-working deep cognitive engagement thinking to find alternatives beyond their natural first-response ideas.

7.3 Heuristics – Mental Short Cuts or Thinking Bridges

It seems that the human brain has adapted to make sense of the overload of information from our natural environment, by developing mental short cuts. Cognitive psychologists Daniel Kahneman [27] and Amos Tversky brought into sharp focus the role of mental shortcuts, called heuristics, to ease complex thinking processes and judgement in uncertain circumstances. A heuristic is a mental shortcut or a set of rules that helps people to make decisions and judgements quickly, without spending a lot of time researching and analysing information [29]. Some studies call heuristics "fast and frugal" judgements or inferences as they enable decision-makers' ability to reduce thinking time by cutting cue searching short, reducing the time to search, retrieve and store cues, simplifying weighing the cues for importance, reducing the amount of information involved and/or allowings the thinker to examine fewer alternatives. These cognitive shortcuts normally start with the goal, and work backwards to find a solution to a problem ([30], p. 807). Heuristics typically follow three stages [31]. First, heuristics specify the search for cues (e.g. either randomly or in order of validity). Second, heuristics include rules about when the searcher should stop looking for information. Third, the judgement or inference is made by processing the found cues. We provide a brief example of this process by looking at the "satisficing heuristic", first described by Herbert Simon [32], and relates to sequential searching [33]. One of the best examples of satisficing to explain this mental short cut, was described to me once as it relates to selecting a

spouse or life-long partner. First, it is impossible to meet all possible candidates (either in sequence or together – even if they were interested in meeting with you/me). Second, it would be impossible to make a long list of requirements or special attributes and then create a weighted matrix to determine who the most likely or even most highly rated "winner" of the title of husband or wife may be. Lastly, when would the seeker stop searching? At what point do you know you have found the best possible match? Most people use the satisficing heuristic. For this heuristic, the search rule is to find someone who meets a very small set of requirements, but most importantly is within a reasonable distance to meet in person AND will actually meet with you. One might add a few criteria (based on personal perceptions and cultural values particular to oneself) like: fairly attractive, reasonably well educated, good prospects and earning power, and perhaps of the same religion as oneself. Then, once this short list of people has been met, select the first one that is closest to meeting all of the requirements in your pre-determined small set. The next rule is to stop searching and stay loyal to this choice.

Hundreds of heuristics over as many disciplines have been studied and recorded in books, journal articles, textbooks and in practitioner guides. We highlight a few to illustrate how they hinder or help the creative process[1].

7.3.1 Gut Feelings, Recognition, Anchoring, Consistency

Gerd Gigerenzer asks the question: "Can following your gut feelings lead to some of the best decisions?" ([34], p. 3). Gerd describes "gut feelings" or "hunches" as decisions that appear quickly in consciousness, for which the underlying reasons are not clear to the thinker, but are strong enough to act upon ([34], p. 16). His book *Gut Feelings* describes how the mind adapts to circumstances where uncertainty is high, and rationality low. Times where the mind relies on unconsciousness and rules of thumb to make quick, but effective decisions. Gigerenzer labels this recognition heuristic a "primordial psychological mechanism ([34], p. 111), seeing that this ability to recognize objects, faces, places and other visual cues as either familiar or unfamiliar, remains in operation even when other mental functions break down". A quick summary of the recognition heuristic is that the person recognizing an alternative, immediately interprets the recognized entity, idea, event of higher value than other alternative. One of the most well-known heuristics in business, is the recognition heuristic. An example from retail, is when consumers use the fast and frugal brand recognition heuristic when choosing between alternative products. Marketers invest millions of dollars, or large chunks of their advertising budget, purely to

[1] Many cognitive mistakes are highlighted by Daniel Kahneman in his book Thinking, Fast and Slow. This book is worthy of full and intensive study, but without plagiarising the book we cannot do Daniel Kahneman's expertise and the depth of insight captured in the book full justice. So, I strongly suggest that readers of this book invest in reading Kahneman's international bestseller to minimize thinking errors.

improve brand (logo, name, colours, slogan, sound) recognition, to ensure than consumers select their product based on this recognition heuristic. This recognition heuristic is used by experts and novices alike. A famous business professor uses the heuristic. For example, when you buy a luxury item like a camera, watch, mobile phone, choose a brand you recognize and don't buy the second least expensive model. This heuristic contains both the choice (cues) and the final decision criterium (stopping). In practical terms it means that the recognition heuristic indicates the rules to search for alternatives, as well as the rule or rules about when further search can be stopped, as the suggested/found alternative meets the "stopping"/"satisfying" rule.

Another example from sales and marketing is the "price heuristic". Consumers judge higher priced items to have higher quality than lower priced products. Shah and Oppenheimer report on the "outrage heuristic", in which people consider how contemptible a crime is when deciding on the punishment [31]. We cover a few other heuristics here,

- *"Consistency heuristic"* is a heuristic where a person responds to a situation in way that allows them to remain consistent. (E.g., I think of myself as generous and caring, therefore when a child approaches me for a donation for the school library, I simply have to make a donation.)
- *"Representative heuristic"* is a decision rule that will select the alternative or solution that is most likely to be representative of the population at large or the "average" of the category or group. So, it is a thinking shortcut that decision-makers use when trying to decide whether object/issue A belongs to class B, based on how similar A is to other examples in class B.
- *"Anchoring-and-adjustment heuristic"* final judgements are assimilated toward the starting point of a judge's deliberations [35]. For example, if an offer is made on a house opening the negotiation at (say) $2 million, then it is likely that the deliberations will revolve around that initial $2 million offer, rather than to consider other market factors and a host of other cues.
- *"Educated guess"* is a heuristic that allows a person to reach a conclusion without exhaustive research. With an educated guess a person considers what they have observed in the past, and applies that history to a situation where a more definite answer has not yet been decided. (E.g., House prices in this area are between $200,000 and $500,000. Because the house is newly renovated and has a location close to a good school, it is more likely to be around the $400, 000–$500,000 than the lower end of the price scale.)
- *"Availability heuristic"* [36, 37]. This is the tendency to judge the frequency or likelihood of an event by the ease with which relevant instances come to mind. The ease with which relevant instances come to mind is influenced not only by the actual frequency but also by factors such as how salient or noticeable the event is, how recent the event is, and whether attention was paid to the event. (E.g. People fear dying in an airplane versus in a car, or being attacked by a shark rather than illness from food poisoning or allergies.)

- *"Absurdity heuristic"* is an approach to a situation that is very atypical and unlikely – in other words, a situation that is absurd. This particular heuristic is applied when a claim or a belief seems silly, or seems to defy common sense. (E.g. "The young boy jumped right over the 6 foot fence, without touching it when the big dog chased him". Yeh right!)
- *"Common sense"* is a heuristic that is applied to a problem based on an individual's observation of a situation. It is a practical and prudent approach that is applied to a decision where the right and wrong answers seem relatively clear cut. (It is common sense not to park on a kerb, where large crowds of school kids have to pass when school ends, as you are very likely to get a traffic fine. More likely than on a small, irregularly-used side-track.)
- *"Contagion heuristic"* causes an individual to avoid something that is thought to be bad or contaminated. (E.g., When eggs are recalled due to a salmonella outbreak, someone might apply this simple solution and decide to avoid eggs altogether to prevent sickness.)
- *"Familiarity heuristic"* allows someone to approach an issue or problem based on the fact that the situation is one with which the individual is familiar, and so one should act the same way they acted in the same situation before. (E.g., Last Christmas we had a family dinner at GrandMa's house. We are likely to do that again as her home is easily reachable and that's how we did it last year.)
- *"Scarcity heuristic"* is used when a particular object becomes rare or scarce. This approach suggests that if something is scarce, then it is more desirable to obtain. (E.g., marketers will say "first come first served" or "only 6 per customer".)
- *"Rule of thumb"* applies a broad approach to problem solving. It is a simple heuristic that allows an individual to make an approximation without having to do exhaustive research. (E.g., As a rule of thumb, vegans are also more environmentally conscious and caring of nature.)
- *"Take the best"* heuristic infer which of the two alternatives has the higher value by searching through cues in order of validity, stopping the search as soon as the cue discriminates and choosing the alternative this cue favours.
- *"Imitate the majority"* to prevent a costly information search, simply see what the majority of people in your peer group doing and imitate their behaviour.
- *"Imitate the successful"* – to limit slow and cumbersome learning processes and time-consuming information search by looking for the most successful person (or brand) and copying his/her behaviour.

The short list of most common heuristics is an extract from various trusted scholarly works [29, 34, 38, 39].

7.3.2 *Malfunctions: "Made Up" Truths and Prejudices*

The challenge of the creative mind is to go beyond what is known, beyond the information given, and create something novel, unique, unknown. Gerd Gigerenzer suggests that simple instincts and mental shortcuts (heuristics) can be explained by the "adaptive toolbox" of humans [3]. These are simple mechanisms that humans' brains developed over centuries to function in the dynamic, dangerous and complex world we inhabit. Our brain goes beyond the information provided and infers "facts" based on past experiences and learnt "truths" about the world around us. For example, illustrated by the two pictures below (Fig. 7.3), the brain assumes a 3D-world with darker areas indicating shading and lighter areas indicate areas hit by a single light source. As humans, we used to the sun or moon lighting objects, therefore the brain assumes the dots are hollows in left hand picture, and the dots to the right are half-spheres or curved out of the paper. If you turn the page around, you will notice your brain adapts and changes the perception to be the opposite way around. German psychologist Hermann von Helmholtz [40] labelled the phenomenon where we combine data from our senses and prior knowledge to automatically weave together an interpretation, "unconscious inferences".

Although heuristics are efficient conscious or unconscious cognitive processes, it is important to note, as emphasized in the work of Gerd Gigerenzer [34] that all heuristics do not help people under all circumstances to produce better decisions. Faster, yes but not always better. Just as more complex computational and information-rich decision are not always better [34], decisions made using heuristics that ignore some information relevant to the decision may not lead to the most effective decision.

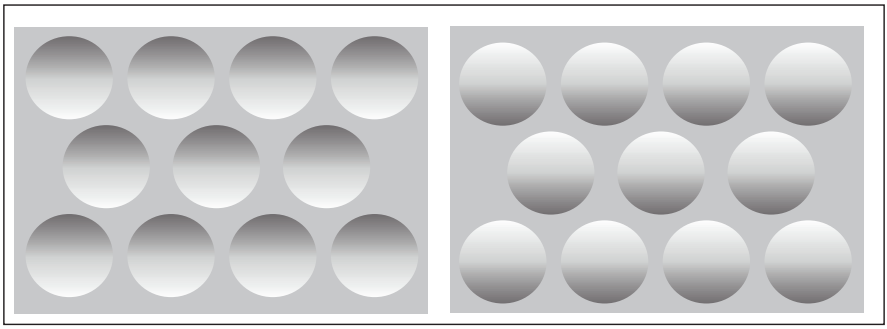


Fig. 7.3 How the brain reads shadows and lighter areas. (Adapted from *Gut Feelings* by Gert Gigerenzer [34], p. 43)

7.3.3 When Less Is Not Better: Unconscious Bias, Prejudice and Expertise

As seen in the section on heuristics, human minds have been trained to intuitively complete incomplete information, and similarly use heuristics to reduce complexity, particularly when the available information is too abundantly available. But, while heuristics can speed up our problem and decision-making process, they can introduce thinking errors and biased or prejudiced judgements. First, just because a particular solution has worked in the past, it will not necessarily work today or in the future – so relying on an existing heuristic can make it difficult to see alternative solutions or come up with new ideas. Second, just because a particular type of person or action had resulted in a particular (positive or negative) outcome in the past, does not mean it will happen again or result in the same outcome in the future (given how fast the socio-cultural, technological and natural environment changes).

As decision-makers we tend to avoid doing any extra cognitive work in analysing large amounts of data, if we think there is a shortcut to the answer. Daniel Kahneman sums it up: "This is the essence of intuitive heuristics: when faced with a difficult question, we often answer an easier one instead, usually without noticing the substitution." Fortunately, applying well established heuristics often makes our mental work less, but the consequences of getting it wrong have to be taken into account.

The same process of glossing over factors that makes heuristics convenient and offer quick solutions may hinder the making of decisions about more complicated issues [41]. A particularly problematic area of ineffective heuristics, where decision-makers take one or two noticeable attributes to classify concepts, contribute to stereotype and prejudice. Generalized beliefs based on race, gender, age, or sexuality are a natural part of human cognition. When people use mental shortcuts to categorize people, they overlook relevant information and may create stereotyped categorizations that are not in tune with reality. For example "men are arrogant", or "women are bad drivers", or "Asians like spicy food" are clearly vast generalizations (categories of personality traits, skills or competencies) that statistically or logically cannot be true for such large groups of people. Nevertheless, since the big data necessary to understand all humans as uniquely different individual are too vast to consider (especially for quick inferences), definitionally heurists help with sense- and decision-making. Availability heuristics are often based in fact or regularly encountered phenomena, so even though not ubiquitously true, they make offer useful shortcuts.

A useful tool to bring a diverse range of balanced opinions to the thinktank is Edward De Bono's Thinking Hats. This set of tools might be useful to allow emotions and pre-conceived biases and likes to surface and be dealt with in order to reduce these thought processes' impact on future suggestions. (See Chapter 11 for De Bono's Thinking Hates).

This section of Chapter 7 merely touches on some of the social psychology research into the cognitive tools and mental heuristics we use, which underpin judgements, sense and decision making. Awareness of our mental processes might

provide some insight into the often-unconscious biases, prejudices, selections and assumptions we might use when making decisions; in particular, all humans' tendencies towards stereotyping, prejudice and discrimination. We know that even well managed intuitions often ignore information to make fast decisions. It is good practice to double-check our decisions (both fast and slow) for inherent biases, erroneous generalizations and other self-imposed limitations.

7.4 Overcoming Thinking Errors

7.4.1 Useful, Fast Heuristics

It is important to note that heuristics, although short and fast thinking bridges to fast decisions (often based on limited information searches), are not all bad. The study of fast-and-frugal heuristics by Gerd Gigerenzer [42] has shown that less effort can lead to more accurate judgements and inferences – as accurate as those made by experts in the field.

In sharp contrast to these short, sharp heuristics, the marketers' mantra seem to be "the more choice, the better". This myth was debunked in an experiment by Malhorta [43], finding that more than 10 alternatives cause poorer choices in consumer decisions. Another example of how too much choice is not always better relates to Proctor and Gamble's (P & G) Head and Shoulders shampoo. When P & G reduced the number of versions from 26 to 15, sales went up by 10%. When Draegers Supermarket in California displayed in two separate taste tests either six or 26 jars of unusual jams, more customers stopped to investigate (40% vs 60% respectively), but in terms of actual purchases, shoppers purchased 10 times the number of jams when the selection was limited [44]. The "less is more principle" even holds true for dating! In small study of young singles who were given online-dating profiles, the same pattern emerged. Although the dating young adults indicated they would prefer more choice, when given more choice, they found the experience less enjoyable, satisfaction did not improve and their perception of having "missed out on a better choice" was unaffected [45]. So you might ask: how much is optimal? According to research neurologist and decision psychologists, there is a limit to the information the human mind can digest at a given moment and it is linked to the capacity of the short-term memory. Originally researchers offered four as the number of visual items or "chunks" the STM is able to store at one time [46]. Psychologist George Miller [47] proposed the number seven (give or take two for the average person), and business researcher Malhotra [43] reported investigations pointing to ten as the magic number for consumer decisions.

The belief that the more time one spends to consciously contemplate decisions, the better the decision will be, is another myth. This speed-accuracy trade-off myth is only true for novices. Multiple experimental studies with experts, ranging from golf to chess and quiz masters (who were asked about geography and general

knowledge), to firefighters and pilots [48–51] find that the best options tend to come to mind first. At the expert level, "[the thinking] processes run best outside of conscious awareness" ([34], p. 35). So, more time, thought and attention are really only better when not applied to expertly mastered skills, and disrupt performance when too much thinking about the process takes place. Scholars conclude that experts generate the best option as their spontaneous first effort [34, 52] and that more time leads to diminishing returns. So, in summary, there are four key findings in this section: (i) "stop thinking when you are skilled"; (ii) more information is not always better – gut feeling can outperform a considerable about of knowledge and information; (iii) Over-deliberation will impede the gut feelings of trained experts; (iv) simple rules of thumb can predict complex phenomena (parsimonious configurations of conditions).

The creative thinking frameworks and mnemonics created by Bob Eberle, Edward de Bono and other scholars, such as SCAMPER [53] and CUPPCO (set out in the table below) are useful and similar to heuristics. These frameworks create mental short cuts to recall and apply theoretical models to complex decisions. (See Chapter 10 with details about these models and creative thinking frameworks.)

7.4.2 The ATR Framework

As discussed earlier in this chapter, creative genii and would-be innovators seeking to produce novel, value-creating ideas, face significant challenges not just from opposing stakeholders, but even from their own inherent sources of cognitive bias. To overcome common thinking errors, creatives (and business decision-makers) could use the framework represented by the pneumonic: OPQRST or assumptive thinking reduction (ATR) framework. Figure 7.4 illustrates the iterative process of erroneous thinking reduction, covering the six intertwined bias and error reduction techniques: orientation, process, qualify, reflect, situational (and contextual) awareness and tools. In the next few paragraphs, we will deal with the six tools in the OPQRST loop that aids genii to overcome these erroneous thinking patterns that limit creative thinking. (See Table 7.2 for Erroneous thinking reduction strategies.)

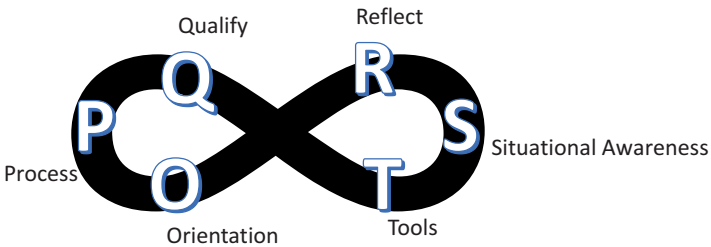


Fig. 7.4 The infinite iterative loop of erroneous thinking reduction – the ATR framework

Table 7.2 Negative thinking boxes

1.	**Black-and-White Thinking**	Extreme thinking. Things will either go very wrong, or very badly. Right or wrong. No middle ground is considered. Self-talk: "I am not a winner, I'm a loser."
2.	**Catastrophizing**	Whatever can go wrong will. Over-estimating the chance of disaster or a negative outcome. Expecting that something unbearable or intolerable will happen. Self-talk: "I am going to say something stupid and make a fool of myself."
3.	**Comparative thinking**	Performance is judged by comparing to others, especially for experts (masters in a domain) or exceptional performers. Self-talk: "John is so much better than I at this. Compared to his ideas, mine are useless". OR "I will never paint like Picasso, so why try?"
4.	**Fortune telling**	You know how something is going to turn out, so you do not both putting yourself in that situation. Making negative predictions discourages you (and the team) from taking positive risks. Self-talk:" There's no use going for that idea. I know it won't work out."
5.	**Labelling**	We attach a description to ourselves, other people or events and then assume any similar or related labels also apply. Self-talk: "The idea I just suggested is terrible. I am useless at being creative."
6.	**Mind-reading**	We attach a description to ourselves, other people or events and then assume any similar or related. Self-talk: "She thinks my idea is too far-out. She is threatened by it."
7.	**Over-generalizing**	Coming to a single conclusion, based on a general event OR coming to a general conclusion based on one piece of evidence or one event. Not looking at the situation afresh but thinking that what happened in the past will happen again and again. This type of thinking is characterized by the use of "always, never, everybody, this firm, our customers…". Self-talk: "This is what happens all the time. We won't get approval for this idea. We never do in this department."
8.	**Projection**	Projecting behaviour onto others, without any evidence or signals that the anticipated outcome might be the likely outcome. Self-talk: "My boss often criticizes new ideas. He won't back me on this one either, so I won't even offer it!"

Adapted from Griffith [13], p. 74

Orientation Thinking errors such as assumptions, biases, conventions and prejudices constrain successful problem solving and divergent thinking. The first step is to recognize the likelihood of such habits and to be critical of one's own selective thinking and mindful of the implicit beliefs that may drive one's own thinking. For example, in business we make many assumptions about what our customers are like or what they like (e.g. old people are not our customers); where we should work (in the office, obviously?); how to organize our offices (open plan is the least expensive option) and, most offensive to the author, "not everyone is creative". Dropping an assumption about businesses needing staff may lead to new business models, as evidenced in the many shops in Italy that consist entirely of vending machines, or the vending machine diner in Japan, named Jihanki Shokudo (Automat Diner).

Patterns & Processes Set up processes and checklists that have multiple checkpoints to limit erroneous habits of the mind, but mostly to remind creative thinkers of the possible stumbling blocks to overcome. These checklists can consist of a number of questions, taking time for incubation and searching for new facts to build domain knowledge to apply to the problem.

Chris Griffith [13] warns against being too critical or indulging in negative thinking patterns, and leaving these critical thoughts unchecked. His warning is: "remember every time you stop to evaluate, you stop being creative" ([13], p. 73). Creatives need to become disciplined to think without the limiting boxes of black-and-white thinking; catastrophizing, comparative thinking fortune-telling; labelling others; mind-reading; overgeneralization; and projection (expanded in Table 7.2 below). Although these two points may initially sound contradictory, the checklists are merely a checkpoint, not a stop in the line of thinking; a bit like the check-point on a long high-way – it is not meant to stop you dead in your tracks, or end your journey, but merely provides a chance to reflect and reconsider the choices you made or evidence you have considered on the way to your decision.

Qualify Information, facts and evidence: Challenge each assumption, check on selective and reactive thinking. Treating assumptions as hard facts can be limiting, even dangerous. It is a natural habit to think that if an idea sounds plausible it is "good enough". Beware of taking contributors' ideas at face value, without checking the facts. Quite often the news media distorts and fabricates facts. Davies [54] reports on 2000 news stories in four respected British newspapers (Independent, Guardian, Telegraph, Times) where only 12% of the articles were wholly composed by the reporters and fact-checked, finding that most articles were from second-hand material or hearsay. So most of the "facts" we read in newspapers are manufactured truths or unchecked assumptions. Do not allow yourself and your project team to fall into the trap of fabricated truths and unchecked anecdotal information.

Reflect & meta-cognitive awareness!

One of the best ways to improve thinking and learning from past mistakes (and successes) is meta-cognition (thinking about one's thinking). (Also see Chapters 5 and 6 for more in-depth discussions about meta-cognition.) Cornoldi [55] defined the meta-cognitive attitude as the general tendency of a person to develop reflection about the nature of his/her own cognitive ability, and to think about the possibility of extending and using this reflection. In the NetflixTM series "Queens Gambit" the main character, a master chess player, lies awake at night rethinking every move and considering alternative moves that might have resulted in a better outcome. In addition, all players in the chess matches used self-recording notes to aid memory and to consider the impact of a move on the overall game strategy. These are illustrative of the habit of reflecting on one's thinking to improve and anticipate future decisions of the same nature.

Meta-cognitive awareness includes at least three different kinds of metacognitive knowledge: declarative, procedural, and conditional knowledge [56–58]. Declarative knowledge is knowing about things. Procedural knowledge refers to knowing how to do things. Conditional knowledge refers to knowing the "why" and "when"

aspects of cognition. Gregory Schraw [58] suggests three components to meta-cognitive awareness: planning, monitoring and evaluating. A checklist (adapted from [58], p. 121) that may help thinkers with reflection and metacognition during all these three phases is set out in Table 7.3.

Thought process checking tools listed by various authors [59–61] include thinking aloud, modelling and journaling. Thinking aloud is verbalizing or making processes overt that are normally covert; modelling is a self-managing strategy that allows thinkers to observe others and adopt components or activities that work for themselves; and journaling is keeping a written record of thoughts and actions to monitor one's own thinking strategies [62].

Situational Awareness: Become aware of self-imposed limits (that might not be limitations at all). In marketing this phenomenon is called "myopia", a term borrowed from medicine that indicates limited vision or tunnel vision. Marketing myopia, first expressed in an article by Theodore Levitt [63] refers to an inward looking approach, where companies focus on their own systems, needs and short-term strategies, rather than on the needs and wants of customers – and fail as a result. An example of being aware of contextual opportunities and threats is provided by the story of Virgin Air, founded by Richard Branson, which flouted the rules followed by established competitors such as British Airways Pan Am and American Airlines by offering great service to business passengers, free drinks for economy passengers and reviving a stuck-in-a-rut industry with new, innovative perks to flying. Another example of a newcomer challenging "business as usual" is The Body Shop™, which flew in the face of other cosmetic companies. At the time of the launch in 1976, most beauty shops were boring places that sold cosmetics in

Table 7.3 Regulatory checklist of three meta-cognitive phases

Planning	
1.	What is the nature of the task?
2.	What is my goal?
3.	What kind of information and strategies do I need?
4.	How much time and resources will I need?
Monitoring	
1.	Do I have a clear understanding of what I am doing?
2.	Does the task make sense?
3.	Am I reaching my goals?
4.	Do I need to make changes?
Evaluating	
1.	Have I reached my goal?
2.	What worked?
3.	What did not work?
4.	Would I do things differently next time?

For some extra details please see Chapter 5 on metacognition and reflection
Adapted from Schraw [58]

expensive, pretty packaging that were both bad for the environment and tested on animals. The Body Shop concentrated on cheap packaging, fostering a natural, environmentally conscious image, marketing to consumers who were socially and environmentally conscious. In this way, The Body Shop™ opened up a new market segment, and took business away from well-established competitors. From the other side of the coin (here the competitor view) sticking with "business as usual" is akin to intellectual laziness. Some businesses meander on for years, even decades, with the same processes, procedures and long-standing assumptions. In 2009, Kevin Johnston ([64], p. 144) added two additional types of business myopia, namely: "capability myopia" and "boundary myopia". An example of capability myopia is provided:

"Xerox provides a classic example of cognitive specificity [65]. Although Xerox's Palo Alto Research Centre (PARC) is famous as the birthplace of many ground-breaking innovations such as the 'windows and mouse' user environment, Xerox only commercialised innovations that fitted its copier and printer business model [capability myopic view]. Tripsas and Gavetti [66] illustrate how the cognitive frameworks of managers in Polaroid™ effectively precluded the company from taking advantage of its technological knowledge in the digital imaging market. Apple, on the other hand, thought 'outside the box' and has very successfully transferred its core competences in digital technology, design and marketing from the personal computer domain to music with the iPod™. The low specificity of these competences and of its corporate brand were not crushed by cognitive specificity in strategy formulation." … "Current dynamic marketplace shifts demand constant renewal and even total reinvention by organizations. But the potential to renew may never be realized if a highly bounded organizational self-concept of a firm is held by its senior management. This current and limited organizational self-concept results in boundary myopia. This myopia (blindness) may be about the supply chain or people the firm is willing to work with. Johnston [64] summarizes it in this phrase: "the ties that bind us are also the ties that blind us". Through insights provided by systems thinking and organizational learning, senior management may be made aware of their current and its constraints, to challenge its assumptions, to reframe it and so generate more innovative strategic options" (p. 142).

7.4.3 Insight – Solving Insight Problems Using Six Insight Mechanisms [67]

Jennifer Walinga and associates [68] sought ways to reduce barriers and surface unwarranted assumptions that may hamper creative insight or impede thinkers' progress towards a goal. The results of their experimental laboratory studies indicate that training that focuses on recognizing and reinterpreting barriers, revising goals and considering possible mental barriers, helps with effective problem

Table 7.4 Combined barrier/assumption/goal training questions

1.	What do you find yourself focusing on? What strategies have you been trying to solve the problem?
2.	Why are you using these/this strategies? What are you trying to do? And why do you want to do that? What is actually important to you? Is your strategy working? Why not? What is getting in the way?
3.	What is the task again? What was the original problem as it was set out? What was your original goal? Could the task involve some sort of principle, concept, or fact that you already know but haven't considered? Is there another discipline or dimension that you could consider with similar problems and solutions for those problems?
4.	Could it be that you are simply not remembering something? Would it help to scan your memory for similar problems such as this? Is this problem difficult to keep track of? Are you keeping track of what you have tried and have not tried, of all the possibilities?
5.	What assumptions are you making? What are you assuming is necessary to solve this problem? Are your first impulses misleading? If you are stuck, is it because you are making wrong or unnecessary assumptions?
6.	What is posing a barrier for you? And how is that getting in the way? What makes that a problem? What is it that is getting you stuck or is getting in the way? If you cannot change this, what is the challenge you are faced with now? What bugs you about it? So what are you really trying to do? What is your real challenge? What is the real problem?

solving and insight. Their study found that tacit assumptions may restrict alternative problem representations. Walinga's training suggests a script or checklist of questions to remind creatives to consider their own mental barriers and restrictive assumptions and the original purpose/goal. We provide a short checklist in Table 7.4.

Insight problems differ from non-insight problems, since standard incremental, logical analytical thinking does not provide answers or viable solutions. Insight can be seen as a process with four stages. Stage one is problem awareness. In stage two the thinker gets stuck. This is called impasse or fixation, as the thinker is stuck in a domain, or fixates on irrelevant facts, or is being misled by ambiguous information. To move forward, the thinker enters the third stage, where the thinker reinterprets the problem, or redefine and applies a new framework. Thinkers experience a sudden, surprising "a-ha" moment of insight and become consciously aware of a single solution or range of possible solutions, but may be consciously unaware of how they overcame the impasse or achieve the solution. To experience these four stages, try the rebus problems in Fig. 7.5 (Solutions and more rebus problems are at the end of this chapter).

Instruction: Find the English expression or phrase (Solutions are at the end of this chapter)

Fig. 7.5 Rebus problems

7.4.4 Checklists for Effective Decisions

A good place to start is to check your thinking against this 4-item checklist: (i) reality testing (are these thoughts facts or mere project/perception)? (ii) Evidence checks (What else could this mean?/Is there evidence that supports my perception or viewpoint?) (iii) get perspective (will this matter in 5 years from now?); and (iv) goal-directed thinking (will thinking like this help me to feel good and achieve my goal?).

In addition, Edward de Bono suggest that project teams assign a "blue hat" thinker during think tanks and brainstorming sessions (see Chapter 10). Blue hat-wearing team members manage the process, extract ideas, ensure that all perspectives are covered, and all thinkers are given an opportunity to add their perspectives (even if they dissent or offer a negative response). In Chapters 10 and 11 on DT's reflective practices, we discuss more than 20 tools that are designed to aid effective thinking and overcome mental set fixation, premature ejection (stopping one's thinking process too soon) and other erroneous thinking habits.

7.4.5 Incubation

There are many well-known instances of moments of insight following times of incubation and allowing one's subconscious mind to deal with the problem, but possibly none more famous than the EUREKA! example. King Heiro assigned the Greek mathematician Archimedes with the problem of determining whether his crown was made of solid gold or a cheaper version made of silver, merely covered in gold. Archimedes had a firm instruction to assess the crown without damaging or cutting into the crown. Archimedes contemplated the issue without success, but as he sank into the bath on day, he noticed the water displacement. He then realized

that the volume of irregular objects could be measured with precision, a previously intractable problem. He connected this to the volume of an irregular object, a previously intractable problem. "Crying Eureka! Eureka!" Archimedes ran naked through the street, wanting to share this valuable insight as it opened up the weight:volume problem he had to solve to find the king's answer. Now that Archimedes could also with some accuracy measure volume, the metal's density, as important indicator of purity (as gold is nearly twice as dense as silver and therefore has significantly greater weight for the same volume) could be measured with accuracy and certainty. This scientific insight led to evidence that established the guilt of the goldsmith [69, 70].

Many creativity scholars who investigate the role of the unconscious mind refer to dual-process theory (similar to Kahneman's 2-system theory) that includes both automatic, implicit and nonconscious thought and the other processes that use controlled, attentional focus. These processes operate in parallel, but the non-conscious system has far greater capacity [71]. Unconscious Thought Theory is based on experimental evidence (laboratory work as scholars are unlikely to be present at a masterful Eureka moment) ([72], p. 509) that both modes of thinking have particular advantages. "[C]onscious thought can follow strict rules, whereas unconscious thought is better suited for integrating numerous decision attributes… the sequential integration of conscious and unconscious thought solved complex choices better than conscious or unconscious thought alone. Further, integration worked best when unconscious thought followed conscious thought. Although the scientific community is still pursuing a clear understanding of the role of incubation, several studies found a positive effect on divergent thinking (without being clear on what is going on in the mind during this period of incubation). Anecdotal evidence by various professionals (academics, designers, architects) indicates that their own forced incubation – i.e. intentionally setting aside the tasks or problem for a period and working on unrelated tasks – had very positive results. From the various incubation experiments, the following practices might be useful to overcome fast and erroneous thinking habits, by slowing down the process with deliberate incubation:

1. Rest. Cognitive work is hard work for the mind. Distractor tasks that are not related to the taxing problem allow the previously taxed mind to rest, while other areas take on the new tasks. Highly related tasks will not allow this much-needed rest.
2. Interrupt your work to break the pattern or continuous work. These interruptions are likely to allow your unconscious mind to get a chance to work.
3. Step aside to get a new perspective. Revisit the facts and information with a view to identifying irrelevant and misleading information. Consciously provide the mind with alternatives paths to consider and to create 'chance' permutations. (See Ishikawa's techniques in Chapter 10.)

7.4.6 *Expand Knowledge and Acquire Expertise*

If you want to solve problems with greater success and ease, you need to invest in knowledge in a wide variety of domains [28, 73]. For optimal creative alternatives or Big-C leaps, associations between distant domains are likely to lead to novel and unique solutions. It is not the high grades or expert achievement that are important to creative solution finding, but rather the ability to provide different sorts of information, discount irrelevant facts and identify inconsistent information that delivers CiQ. Various studies confirm that high grades or high levels of academic achievement (in either science or art) do not correlate strongly with adult achievement (Simonton, 1988, pp. 118–126). But there is some evidence that formal education and expertise can get in the way of creativity, as discussed in Chapter 2 (see Fig. 2.3). The real focus needs to be on absorbing relevant information from the context of the problem, the environment, and the beneficiaries of the solution of the problem. For the creative's mind to make sense of the relevant facts and bits of information, his/her mind needs to spot opportunities to link various past experiences, current information and projected alternatives. "People are more creative when they absorb relevant categories and information, and that requires you to be critical and evaluative as you decide which information to look for" and "people are more creative when they structure their information search, retaining on the information necessary to understand the problem situation" ([28], p. 96).

7.5 Conclusion

Both the conscious and the subconscious mind play important roles in creative problem solving. Various scholars agree that there are two systems of thinking. The first, fast, System One, quick-thinking way is based on past experiences and intuiting, and the second, slower, more deliberate, System Two processes are based on some logical process. Thinking processes are prone to various errors such as bias, prejudice, poorly applied heuristics and incorrect assumptions. Various experimental studies have shown that incubation, using checklists to reflect on thinking patterns and habits can have positive effects and reduce some of these errors. It is important to note that for our survival, humans need both fast and slow thinking. Heuristics and other mental shortcuts are important to make sense of the vast pools of information need to consider to make hundreds of thousands of decisions each day. Heuristics can be fast, frugal and effective – even as good as or better than an expert's decision. But, under some conditions and in some circumstances, more deliberate decision processes may be required.

Sometimes getting somewhat distracted, resting and refocussing on different parts of the problem may lead to novel creative thinking. Experience impacts and moulds our thinking as humans. Therefore, creatives should relentlessly pursue lifelong learning, continuous exposure to diverse and varied experiences and persistent

knowledge gain in a wide range of domains and disciplines. Further, creatives will do well to consider meta-cognitive processes to reflect on their thinking habits and patterns. In Chapters 7 and 10 we also cover various techniques and tools to consider relevant facts and evidence, and discard irrelevant information, helping creatives to use a range of divergent and convergent thinking techniques to produce novel, appropriate and valuable ideas.

CREATiViTY LABORatory

Activity I: Mental Gymnastics

Try to recall a time when a mental model used, or a bias, preconceived idea or ethical/moral judgement has led you to a poor decision. Now try to recall a time you could not solve an important problem or procrastinated in deciding to solve a problem. What prevented you from finding a suitable solution? Can you try to record the self-talk or personal judgement that went on in your head that might have prevented you from finding this solution? What diversions can you create, or which tools can you use to prevent future barriers and blocks to appear?

Activity II: Mental Locks & Blocks

In many countries (and workplaces) recycling is not as prevalent as senior decision-makers would like it to be. Consider the mental blocks and use Table 7.2 to discuss a list of possible negative thinking habits that might be at the heart of this inertia. (You might prefer to work on a similar problem in transport; e.g., how many people resist to use public transport such as buses, ferries, subways, and trains; depending on the situation in your town or country.)

Activity III: Biases and Perceptions

Deeply seated cultural perceptions and well-established conceptions are very resistant to change. Can you use some of the thinking habits that might explain why people still think of creatives as “single lone geniuses who are very likely to come up with novel, disruptive innovations in a flash of inspiration”? Do you still share this concept of the lone creative genius? Where do you think you (and the other people you have considered) learned this conception of creativity ([28], p. 280).

Activity IV: The Da Vinci Challenge

Some people may think of Leonardo Da Vinci as highly creative. Do you know what he is famous for? When, where and how did you learn about Da Vinci? Is he a creative genius or merely a smart scientist? Is there a difference? If so, why? If not, what makes him both (genius scientist and creative genii) or neither?

Activity V: Rebus Problems of Insight

Study the five rebus problems below and identify the five common English phrases they represent.

Music 11 ears

haPTOMer

Give Get
Give Get
Give Get
Give Get

GET GO

STA4NCE

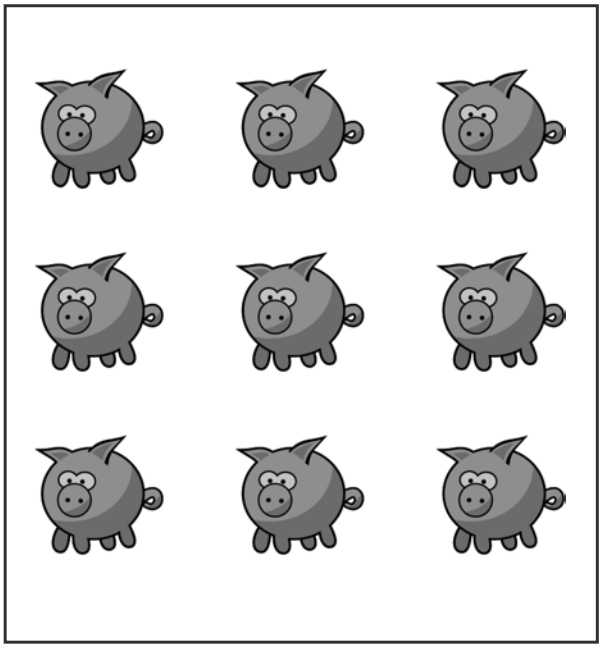
Activity VI: The Walinga Experiments

(See activities VI.1 to VI.3 – extracts from the experimental research study by Walinga and Cunningham [68])

Activity VI.1: Walinga Experiment, Task 1

Use the diagram of the pigs in a pigpen.

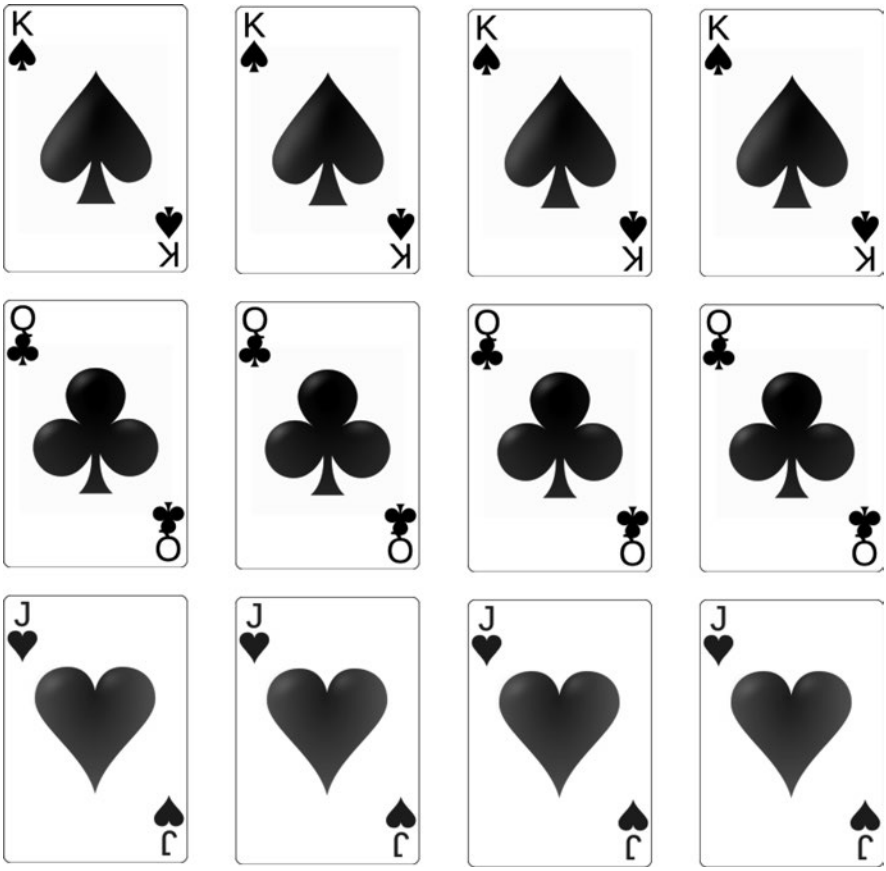
The tasks is to add two squares so that each of the nine pigs ends up in a separate enclosure. The answer is at the end of the chapter.



Activity VI.2: Walinga Experiment, Task 2

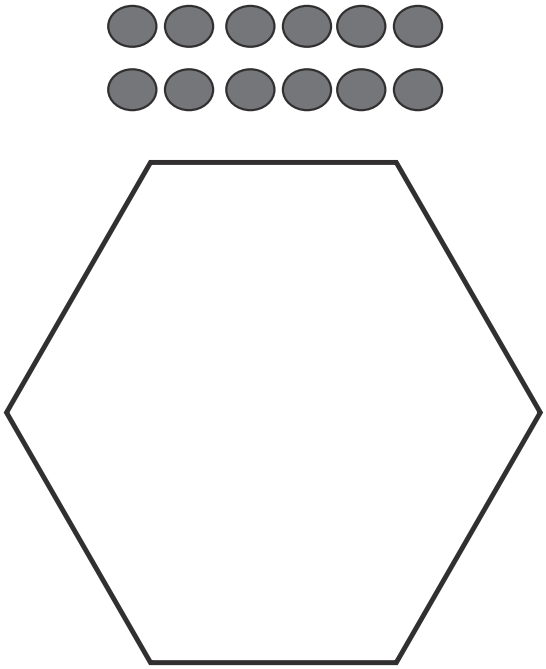
Use the 12 cards from a standard deck of cards: 4 Kings, 4 Queens, 4 Jacks.

The task is to arrange them in a row – a grid, a table – so that each row and each column contain only one Jack, one Queen and one King [35].



Activity VI.3: Walinga Experiment, Task 3

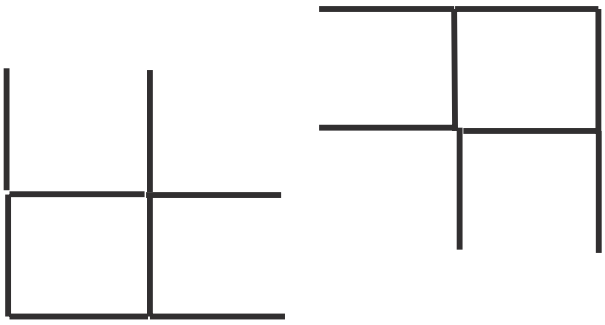
Use the figure with one hexagon and 12 discs. The task is to arrange the 12 discs so that each side of the hexagon has 4 discs [35]



Activity VII: Flying Fish

Use 8 matchsticks to set up in the figure on the left below.

The tasks is to move three sticks and change the pattern on the left to look like the pattern on the right. [Source Kokinov et al. 1977.]

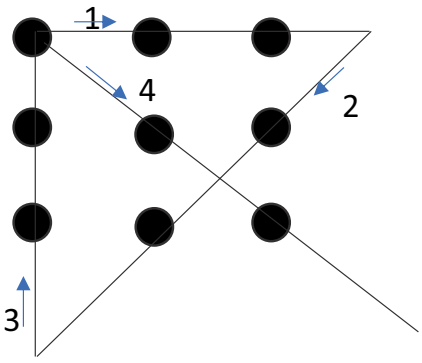


Activity VIII: Check Your Assumptions

Humans make hundreds of thousands of decisions every day, from what to eat for breakfast, to which bus to catch to work, what music to listen to, who to greet, who to ignore, how to relax. Some decisions may affect other people, either directly or indirectly. For example, we might make a decision about who to assign to a particular project – which will directly affect that person and their subsequent decisions. Employing a particular person may affect a huge range of decisions from where they live, what size of house to buy or rent, how to commute to work, what clothes to buy and a wide range of income-related decisions. A large number of these decisions will unconsciously rely on stimuli from the environment, resulting in biases and prejudices we may or may not be aware of. For example, a house by the sea might seem more desirable as the ocean represents relaxation and good views. But, the property buyer might end up with a house in a suburb that is near the sea, but her own house has no view and is quite far from a beach due to income, bus routes or other factors affecting the final purchase. Or she might purchase the desirable house near the beach, only to find the weather too harsh or the house prices drop due to smelly industrial plants nearby.

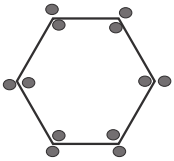
Think of a recent business decision you have made. Create a mind map or concept map (impact decision tree) of all the people affected by this decision (place them in circles around the central concept). One the lines between the core decision and the impacted parties, show which assumptions you might have made about how this decision will affect those stakeholders. On the lines next to their names (or roles) record some assumptions or perceptions they might have about your decision. Reflect on what you might do differently or how you could express your ideas to ensure that your intentions are clear. What can you do to gather information so that you can reduce assumptions for future decisions of this nature?

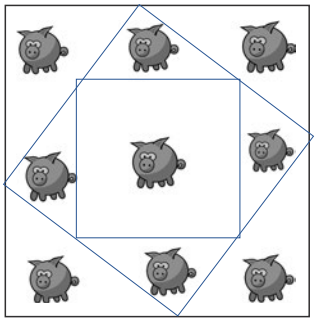
Solution to the The Nine-dot Problem in Fig. 7.1



Solution for Fig. 7.5 Inside job, At Crossroads

Solution to Activities VI.1 to VI.3





Solution to Activity V Rebus Problems of Insight: Music to one's ears; For Instance, mixed METAPHOR, forgive and forget; get up and go.

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Chapter 8
Person: Personality, Affect, and Inventiveness

Rouxelle de Villiers

Abstract Personality refers to the characteristics of the person that account for consistent patterns of feelings, thinking, and behaving, that distinguishes one person from another and persist over time. Personality has conspicuous impact on creative intelligence (CiQ) and individuals' success (or failure) in developing new ideas and translating those novel, original ideas into appropriate, valuable actions or artefacts. There is an extensive body of knowledge on the impact of personality traits on creative intentions (motivations), inventions (enacting or executing ideas) and how these traits interact with the creative teams and processes that occurs at work. It is important to note right at the outset that creative personalities vary greatly between domains and disciplines. A further key concept readers will quickly arrive at, is that there not one single identifying personality trait for creative genii. Also, no personality traits should be regarded as predictive of performance (either at work or at play), without considering the wider context or the specific situation (i.e., the other Ps in six Ps of creative intelligence).

Keywords Affect · Imagination · Intrinsic motivation · OCEAN five-factors · Personality traits · Self-actualizers · Self-efficacy

Learning Objectives
On completion of this chapter, the readers will be able to:

- Understand the various perspectives of personality and its impact on CiQ.
- Give examples of a range of personality traits and indicative and contra-indicative of high levels of creative competency.
- Discuss the role of non-conformity and discretion in creative endeavours.
- Consider your own personality traits and those of your team and develop plans to develop CiQ interventions that might be useful to a person/people with those traits (Fig. 8.1).

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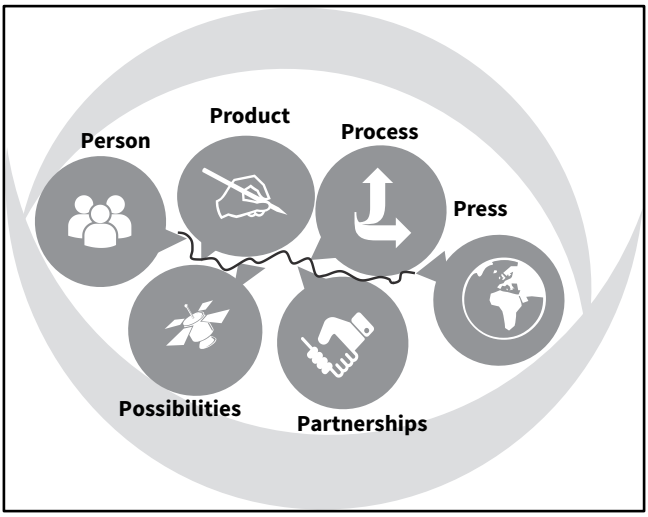


Fig. 8.1 The Multi-factor Model of Creativity: The 6Ps of CiQ

8.1 Introduction

The 6Ps model of creativity, highlights the tenet that many factors and antecedent conditions support or create barriers to creative thinking. There are many reasons why individuals fail to be creative or to develop CiQ to a level of expertise (higher than the natural, daily creativity required to survive in this complex environment). An individual's personality is one of the most important influences on people's potential and lived creativity. This chapter investigates and expands on the Person aspect of the 6Ps model, by providing research-based evidence of the influence of personality traits and affective processes on creativity and CiQ.

8.1.1 Personality Traits

A study of the contradictions or consensus between personality definitions in psychology finds that the central definitions in use today share one central idea: that is, that personality is a system of parts that is organized, develops and is expressed in a person's actions [1]. To illustrate these differences, we cite three definitions with some minor differences. Pervin et al. [2] note that "personality refers to the characteristics of the person that account for consistent patterns of feelings, thinking, and behaving" (p. 6). Raveena Helson [3] focuses on individual differences: "personality is the relatively enduring organization of motivations and cognitive and affective resources (traits) that any person manifests or that distinguishes one individual from another" (p. 361). A more refined definition by Phares [4], which includes the

impact of situational factors, focuses on the "patterns of characteristic thoughts, feelings, and behaviours that distinguishes one person from another and that persist over time and situations" (p. 4). A similar focus on contextual influences is found in the definition by Larsen and Buss [5]: "Personality is the set of psychological traits and mechanisms within the individual that are organized and relatively enduring and that influence his or her interactions with, and adaptations to, the intrapsychic, physical, and social environments" (p. 4).

Guilford was one of the earliest researchers (during his presidential address to the American Psychological Association in 1950) to emphasize the importance of research on the creative personality, and he conceived creativity as a set of traits. Since then, several researchers [6, 7], have endeavoured to identify clusters of traits that accurately describe the personality, characteristics, competencies and attributes of creatives[1] (collective noun for people who are considered or self-define as creative). As early as 1950 the Institute of Personality Assessment and Research (IPAR). Most of the personality tests (as they relate to creativity) included "conceptualization and measurement of several aspects of creative personality: originality, complexity of outlook and independence of outlook" (p. 363). The most important cautionary notes, before we even look into a common set of traits, are that (i) the field is still tormented by anomalies and contradictions and although findings are promising, they are not cast in stone, (ii) personalities and traits may change with age, with cultural differences, and may even change within the person over time, and (iii) many studies indicate that extrinsic goals affect the creative output (product) and that extrinsic motivation (e.g. some rewards) decreases creativity. Finally, one must consider the impact of the situations and the environment in which affect any (and all) human behaviour. For example, Sally might be very happy, even eager to participate in creative activities like drawing, singing, and baking at home, but when at school, her more introverted nature precludes her from realizing her inherent potential and creative personality in the more public situation.

In the 1970s and 1980s several studies identified traits of creative people. These studies listed more than 20 traits (see Table 8.1 as recorded by Keith Sawyer [8], p. 65).

In an intensive and robust study by MacKinnon [9], peers were asked to nominate remarkably creative people in their field to invite to participate in an intensive battery of tests at Berkeley. The researchers at Berkeley found these highly creative participants shared common traits and habits of the mind:

(a) Openness to new experiences.
(b) Alertness, observance, and discernment. They can quickly scan a range of ideas, select the most relevant to solving a problem and have a wide range of information from their own well-informed, well-read and wide range of experiences.

[1] In this book, "creatives" as term is used as collective noun for people who are considered by others, or self-defines, as being highly or at least moderately creative.

Table 8.1 Personality traits of creative people

Articulacy (verbal fluency)	Flexible decision-making	Independence of judgement
Willingness to take risks	Independence	Ability to accommodate conflicting traits within oneself
Autonomy	Broad interests	Self-control
High energy	Attraction to complexity	Tolerance of ambiguity
Courage of one's convictions	High energy	Metaphorical thinking
Ability to hold to routines and schedules	Ability to internally visualize problems	Believing in oneself as being "creative"
Ability to identify a "good problem" in their industry	Question asking and investigative skills that aligns well with the area of interest.	Domain specificity and mastery of a range of domains.

(c) Above-average intelligence in particular domains, e.g., architects scored high in spatial intelligence, whereas writers scored highly on verbal intelligence.
(d) A noticeable preference for complexity. Creatives enjoy discovering unifying principles that bring order to complex, unfinished or unsolved problems.
(e) Balanced personalities
(f) Relatively unsuppressed impulse and imagery and a relative absence of repression to control spontaneity.
(g) Balanced personality to express a range of both traditionally masculine and feminine traits.

8.1.2 Personality Types

Despite the changeability of personality through a person's lifespan, a series of longitudinal studies (by Rubin [10], and one over 44 years by MacKinnon [9]) report robust evidence that specific traits are associated with creative potential and performance [10, 11].

A further problem underscored by various opponents of the tenet that a set of traits are common to creatives, is that of the creative output/product. They claim that, if there is such a thing as a creative personality, these key traits are probably measured either by the creative "product" (output of the creative person) or as measured by awards or recognition in the field by experts and formal judges (e.g., advertising awards, literary prizes, innovation awards). These measures have obvious limitations, such as the bias or prejudice of the experts; the (unintended) exclusion of or disadvantage of underprivileged communities where resources and development aid may be scarce; what creative output may be across fields (e.g. comparing literature, fine art, architecture, process and IT innovation); relevance and range of the selected creative output being assessed and agreement on what the criteria for

the product/output should be. Also, when closely studying the provided definition, the very definition indicates that not all creatives will reveal the same set of traits, but individuals are likely to combine these traits in unique way [4]. Not all researchers agree that creatives will display consistent behavioural patterns over a variety of situations and stress that significant domain differences are evident for creative talents.

A contrary view is expressed by some psychologists. A meta-analysis of 45 years of empirical research into the behavioural patterns of creative people [12], finds that "a creative personality does exist, and personality dispositions do regularly and predictably relate to creative achievement" (p. 304). Many studies do answer the question of whether there is a so called "creative personality, with a resounding YES! We cover the main findings here, but readers are cautioned to consider the uncertainty about whether these traits manifested by creatives led to this creative performance and/or if the measures have predictive and fit validity (notably, personality might only be part of the causal links between the person and their output).

The OCEAN five-factor model is widely used, and generally used to report on five personality traits: O = Openness to the Experience; C = Conscientiousness; E = Extraversion; A = Agreeableness; N = Neuroticism. According to a host of scientific experiments, the personality trait of Openness to Experiences (O) is most closely related with creativity. The "openness" trait includes: openness to fantasy (imagination); aesthetics (being artistic); feelings (experiencing and valuing feelings); actions (trying new things and having many interests); ideas (being curious and smart, welcoming challenges, and being unconventional) [8] (p. 66) Multiple empirical research studies have repeatedly demonstrated the role of Openness in predicting creative achievement [13–15]. Keith Sawyer summarizes six facets that are measured as part of openness: fantasy, aesthetics, feelings, actions, ideas, and values. Four studies [14, 16–18] confirm some evidence of a negative relationship between the remaining traits of Conscientiousness, Neuroticism, Agreeableness (negative), and a positive relation to Extraversion.

Controversial psychologist and Harvard Professor Jarod B Petersen often stresses in his public addresses that only two personality traits correlate highly and can be a test for creatives, namely openness and intelligence (measured as iQ). According to Petersen, to identify creative employees or entrepreneurial types, one must look for merely two characteristics – an open, liberal mindset and a high iQ. The openness trait is often closely aligned with a high level of inquisitiveness. In similar vein, a study by Mihalyi Csikszentmihalyi [19] with artists as focus group, found those who spent a lot of time planning and preparing before they painted, turned out to be more successful artists 18 years later. They further displayed some distinctive personality traits, with high scores in introspection, imaginativeness, self-sufficiency, aloofness, and sensitivity. Traits found to be contra-indicative to creativity were cheerfulness, conformity (to norms), conscientiousness and ego-strength. In terms of Meyers-Briggs indicators a study of artists and art guild members [20] found creatives to be oriented towards intuition (as alternative over senses). Several authors [21, 22] report that creative types (including writers, artists, scientists,

psychologists and architects) are more liberal and more adventurous than the general population.

8.1.2.1 Autonomy

Author of numerous books on creativity, and trained psychologist Mark Runco [11] writes that autonomy is necessary for all creativity due to the originality component in the definition of creativity. To produce something that is novel and different from what others are doing, creatives need to have some level of independence and autonomy. A study by Runco and Albert [7] reports that autonomy is not only provided but expected by the parents of gifted children. The parents in this study [7] reported that the higher the divergent thinking skills of children tasked with a particular task, the lower the appropriate age at which the parents would allow autonomous decision making. Runco hastens to add a caveat, underscoring that children need to be given independence to develop the self-control and discretion needed for creative thinking. Parents must also "guard against giving too much freedom, to teach good decision and thinking habits, and guard against permissiveness or overly selfish decisions" ([11], p. 289). In summary, an appropriate level (for the age) of freedom and autonomy is required to deliver creative output.

8.1.2.2 Persistence, Courage & Self-Actualization

In 1968 Abraham Harhold Maslow defined" self-actualizing (SA) creativity" as an innate ability of people – sought throughout self-actualizers' lives, even through ordinary activities such housekeeping, teaching, cooking and general living [23]. In the book *Motivation and Personality* Maslow [24] mentions "talents" along with "potentialities" to be realized by SA creativity (p. 170). Maslow [24] did not mean the "special-talent of the Mozart type" (p. 170) but rather the creativeness hidden in daily, routine activities. An example of such SA creativity is an ordinary housewife who, without training or a recipe created by a chef, creates an extraordinary, tasty "first rate" soup. Maslow [24] describes self-actualizers as strong people, so much so that sometimes they are regarded as ruthless by people around them. Maslow uses a truly inspiring analogy when expanding on his SA creativity theory, comparing the relationship between self-actualizers and their jobs to a romantic relationship. For SA creatives, a good fit between job and person enables self-actualizers to overcome the dichotomy between work and play. Consequently, pay is only a by-product of the uplifting, intrinsically motivational experience of a rewarding job.

Without confidence some individuals will never achieve their full potential. This is true not only in sports (e.g., Olympic athletes need talent and an appropriate dose of confidence), but also in creative endeavours. Feist [12] found self-confidence a key characteristic, along with openness and low conventionality, of world-class creatives. Too much confidence will result in a lack of effort and investment to develop and refine the requisite skills, while too little confidence will probably prevent the

person from even taking the first step towards demonstrating that ability. At the same time, creatives need to be resilient and have the courage of their convictions to execute their vision of themselves and of their ideal self. In addition, creatives are reported to have unusual levels of sensitivity, connecting this above-normal physiognomic sensitivity to empathy, affect and artistic style, and the urge to look deeper than the surface to let this insight form their prospects [25] (p. 335). This paradox between a sensitivity to other humans and resilience to stand up to pressures to conform to conventions demands courage and ego-strength from creative individuals (Ci). Mark Runco [26] recommended that the most important thing parents and educators can do to product students' creativity, is to reinforce ego-strength, or in other words, strengthen their persistence and courage to pursue their SA creativity.

Several scholars claim that creatives' persistence is the very reason why they can battle with adversity. Howard Gardner's [27] study of renowned creators found perseverance to be important. Each case studied was almost obsessively committed to their work. Howard Gardner [27] suggests that this SA tendency may be one of the reasons why creatives are often playful and childlike. Children are spontaneous, uninhibited and authentic. These characteristics is advantageous to their creativity. Similarly, SA creatives are spontaneous, authentic and uninhibited with the same benefits that can be seen across their tasks and across their life span. This brings us to the next character trait of playfulness.

8.1.2.3 Playfulness

> The opposite of play is not work, it's depression. To play is to act out, be wilful, exultant and committed as if one is assured of one's prospects. – Brain Sutton-Smith, Prof of Education, University of Pennsylvania

Development theorists Lev Vygotsky and Jean Piaget tie learning and intrinsic motivation to creativity and play. Imaginative play and object substitution (treating one object as if it were another during play) stimulates creative imagination from early in life. For example, in children's play a stick acts a sword and in a later game the same stick is a horse; an Alice hair-band acts as tiara for a princess and next as an eye patch over the eyes of a pirate. Vygotsky (cited in [28]) proposed a developmental theoretical framework in which pretend play is learned through interactions with more experienced play partners and leads to the development of higher mental functions, such as creative imagination. These mental functions can be consciously regulated through inner speech. A new level of creativity is reached as imagination and thinking in concepts begin to collaborate and is only full realized in adulthood. Play fosters the development of cognitive and affective processes that are important for creative intelligence development and creative thinking habits.

Various studies confirm that playful individuals tend to score higher on tests of creativity and are also judged to be more creative by others [29–32]. Jeffrey Dansky [33] reports that the "dimensions of creativity to which play will be related are flexibility and the ability to produce ideas and behaviour sequences that are both novel and adaptive" (p. 393). Many businesses are now responding to the encouragement

to introduce both structured (serious play) and unstructured play (role-play and simulated interaction) to prompt and nurture creativity in staff and to bring playfulness into the workplace. This playfulness[2] can stimulate new thinking and collaboration – even for such lofty executive decisions as scenario planning and rebranding [34, 35]. As discussed later in this book, businesses also aim to prompt playfulness in their culture and attempts to redesign the physical appearance of their offices to reflect this intent and corporate culture.

In his book, *A Whole New Mind*, Daniel Pink [36], dedicates an entire chapter to play, stating that "play is becoming an important part of work, business and personal well-being, its importance manifesting itself in three ways: games, humour and joyfulness" (p. 188). The impact of play on emotional development is well recorded, and the section below will flesh out the link between affective development and creativity.

8.1.2.4 Emotional/Affect

Our report here relies heavily on the seminal work of Sandra Russ. Russ [37] studied the link between affective and cognitive processes and creativity. Russ [37] describes affect as the broader concept for which emotion is a subset, and defines emotion as a state of aroused feeling or agitation (p. 660). Sandra Russ [37] states that "the development of affective processes are important in the development of creativity" (p. 659) and lists five affective processes important in creativity. These five are (in no particular order): openness to affect states; access to affect-laden thoughts and fantasy; affective pleasure in challenge; affective pleasure in problem-solving; and cognitive integration and modulation of affective material. In addition, Russ finds three motivation systems that include affect components, namely intrinsic motivation, curiosity and conflict-resolution. In contrast to extrinsic motivation (such as incentives, rewards or punishment), which is detrimental to creativity, intrinsic motivation promotes and drives creativity. According to Russ, intrinsic motivation (the value of getting the creative task done) drives perseverance and resolve to find the solution to a problem. Further, "love of the task" [37](p. 663) has been found to be an important part of creative work. Mark Runco [38] supports the tenet that creatives find affective pleasure in the challenge of pursuing a solution to a problem. Runco defines an optimal level of challenge as the perfect balance point for an individual, where the best mix or tension from seeing the problem and the size of the challenge, is contrasted with the anticipated pleasure of solving the problem through a creative act (or creative intelligence).

To aid interpretation and access, we provide a short definition to elucidate these affective processes in Table 8.2.

[2] Several years ago Professor March pointed out that rational choice involves two guesses, a guess about uncertain future consequences and a guess about uncertain future preferences, and called for the development of a **technology** of **foolishness.**

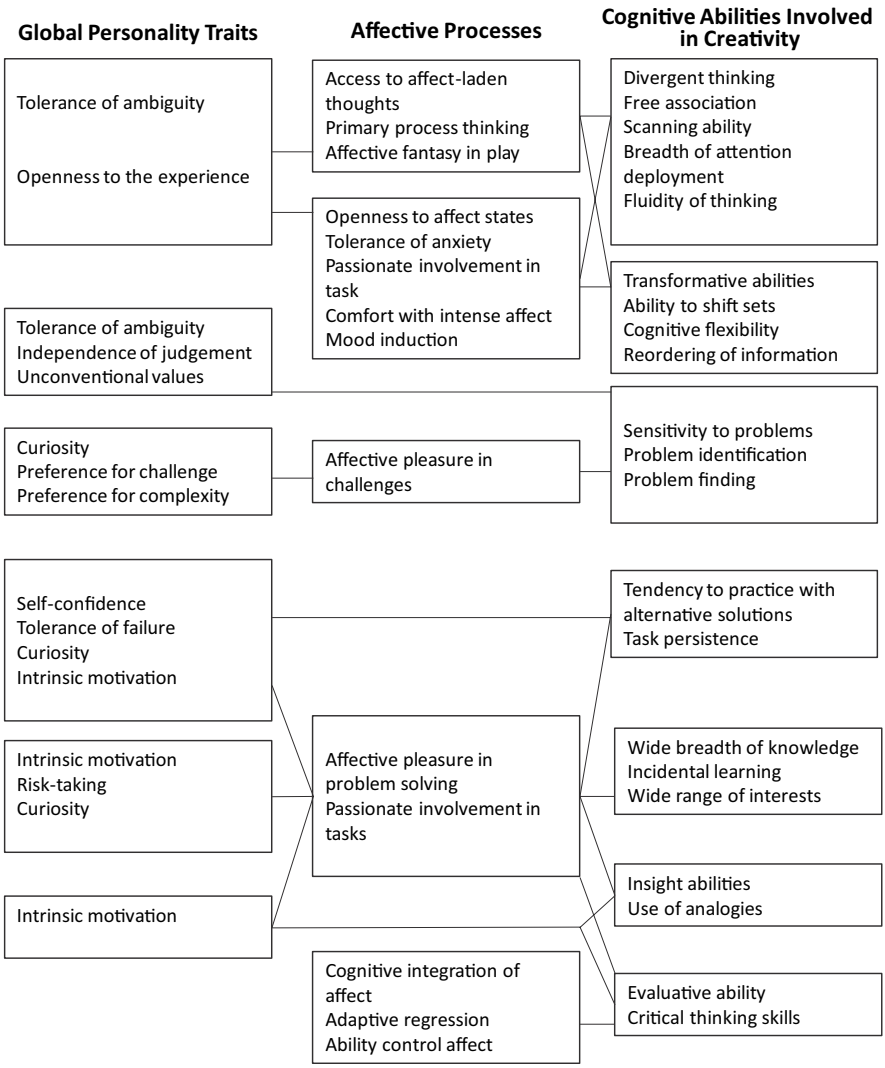
Table 8.2 Affective processes important in creativity and motivational systems

Types of affective processes	Definition
Openness to affect states	The ability to feel specific emotions or affect states as they occur.
Access to affect-laden thoughts and fantasy	The ability to think about ideas, images and fantasies that include emotion or affect.
Affective pleasure in challenge	Affect comes from thinking about a problem or mystery and wanting to immerse oneself in the task.
Affective pleasure in problem-solving	The feeling of deep pleasure that comes from completing an artistic or creative task or solving a problem
Cognitive integration and modulation of affective material	The ability to control, think about and regulate the affective events of experiences and to not be swept away by them.
Intrinsic motivation	Motivation that comes from within the person to complete the task, rather than from external sources (e.g., rewards or evaluation).
Curiosity	A motivational state that indicates an individual's striving to maintain an optimal state of arousal.
Conflict resolution/ sublimation	The ability to channel one's energy into a specific creative task or the motivation coming from the need to solve a mystery or resolve an internal conflict or distress.

Investigative studies by Sandra Russ [39] resulted in an Integrative Model of Affect and Creativity (IMAC). In this model of affect, global personality traits are linked to specific affective processes and facilitate the cognitive abilities required for and involved in creative endeavours. An assumption of this model is that personality traits facilitate cognitive abilities [37] required for creative thinking and creative processes, and processes are likely to facilitate affective processes in a reciprocal manner. Linking back to our earlier chapters on the way the brain functions, it is noteworthy that creative processes require interaction and exchange of information between the two hemispheres of the brain. Klaus Hoppe's investigative studies indicate that cognitive representation of emotions occurs in both hemispheres and that the corpus callosum helps to facilitate the exchange between the two hemispheres. Further, neuroscientists report that emotional memories are stored in the amygdala, whereas non-emotional memories are stored in the hippocampus. Therefore, emotional processes and systems can act independent of the cognitive systems. In creative endeavours, this means that emotional memories made over the various life stages of a person becomes very important to the cognitive abilities involved in creativity (Fig. 8.2).

8.1.2.5 Self-Acceptance/Honesty

Mark Runco [11] reports that "self-actualization of creative individuals is indicative of self-acceptance and honesty [towards oneself], about one's own self" (p. 283). Not only are creative individuals less likely to respond in desirable ways to social norms and expectations, but they are also more likely to admit to their own



NOTE: In this model of affect and creativity the major cognitive abilities that emerge as unique to and important in the creative process are linked to specific affective processes and to global personality traits. In some cases, the personality traits are behavioural reflections of the underlying affective process.
Adapted form the work by Russ, S. (1993). *Affect and creativity: The role of affect and play in the creative process*. Hillsdale, NJ: Erlbaum.

Fig. 8.2 Russ Model of Affect and Creativity

shortcomings. In several research studies, the number of unfavourable adjectives selected in self-reports by creative architects correlates with the architect's creativity ratings [9, 40]. In two separate but similar studies on creative architects' self-perception [41], less creative architects were found to be defensive, and selected

adjectives like reliable, dependable, tolerant and understanding. In contrast, those participants rated by experts as highly creative, self-selected adjectives like excitable, high-strung, nervous, temperamental and (inner) restless(ness). Gough reports on a factor labelled *lability*. *Lability* is defined as: "high ego strength, with an adventurous delighting in the new and different and a sensitivity to all that is unusual and challenging, the main emphasis is an inner restlessness and in inability to tolerate consistency and routine" (Cited in Runco [11], p. 283). It comes as no surprise that lability is correlated with the creativity scale ratings. In fact, lower scoring creatives are more routinized, planful and observant of conventions. They also have stricter opinions of right and wrong and a greater need for order. Higher-order creatives are more emotional, excitable and the most creative were the least conventional.

Linked to self-acceptance is self-efficacy, which we discuss next.

8.1.2.6 Self-Efficacy

Self-efficacy is the personal belief in oneself, about the level of competence to be displayed in any given situation [42–46]. Self-efficacy reflects an individual's perception of their capability to perform specific tasks; and creative self-efficacy is an individual's belief in their own ability to produce new and useful solutions to problems [46, 47]. Although self-efficacy does not show actual capabilities, it is a strong predictor of behavioural changes until the outcome is achieved. Factors that affect the level of self-efficacy are mastery, experience, vicarious experience (learning by observing experts or experienced people), verbal persuasion, and physiological state/emotional arousal [42, 45, 48]. Self-efficacy has been shown to predict capabilities, although it does not measure or indicate actual capabilities as people's willingness to pursue mastery is impacted by their personal sense of value [49, 50], and the emergence of creativity [46].

A strong sense of self-efficacy is especially valuable for entrepreneurs and inventors. According to Schwartz [51], a deep conviction that what one wants to do or achieve can be done, or that there is a solution (that could and should be found) for a sticky problem, is necessary for achievement in creative endeavours. Researchers at the University of Giessen in Germany found a strong correlation between self-efficacy and business creation and success [52]. Researchers suggest that the reasons for this close association between self-efficacy and creative success (in entrepreneurs) include: (i) motivating people to take the initiative in pursuit of a solution, (ii) aiding in perseverance in the face of adversity and helps them to cope with challenges; (iii) providing them with self-confidence in their ability to perform unanticipated tasks; and (iv) providing a hopeful outlook and vision for the future. The good news for creative leaders, people seeking to develop their own CiQ and that of their team, is that self-efficacy enhancement is followed by creative performance improvement [53, 54]. These studies find supportive evidence for the tenet that employee creative role-identity and how they perceive creative expectations from supervisors, enhance and increase employees' capacity for creative work.

Whatever you can do, or dream you can, begin it.
Boldness has genius, power, and magic in it.
William Murray, Scottish Himalaya Expedition.

8.1.2.7 Open-Mindedness

Many psychologists link open-mindedness to openness to experiences. We are yet to find a study on creativity that does not list "openness" or "open-mindedness" or various terms indicating a person's openness to the objective, subjective and social worlds and a keen sensitivity to fantasy feelings, aesthetic ideas, actions, and values as a key trait [11, 55–58]. Helson [59] went as far as calling openness a "cardinal characteristic", with originality listed as the only other cardinal characteristic in her 1999 study.

For particular demographics (such as females and young children), two studies highlight the traits identified. A year-long longitudinal study of successful, productive creative women (IPAR, 1960) demonstrates key traits of social poise, self-assurance, independence, autonomy and persistence. An in-depth study by Csikszentmihalyi [19] of highly successful artists, verified a distinctive pattern of traits such as introspection, imaginativeness, self-sufficiency, aloofness and sensitivity.

A pivotal study by Donald MacKinnon [41], investigating the personality, ego and self-image of three groups of architects (categorized by experts into three levels of creativity: high, moderate and low), found that the most creative architects were the least conventional. The highest level of creative architects indicated a high level of drive towards and responsibility for the standards of "what is right and proper in architectural design" (p. 273) and describe themselves as "independent" and "autonomous" in thinking and behaviour. This autonomy they describe refers to two levels: (i) unwillingness to work in teams of practical architecture and design, and (ii) lesser interest than lesser-creative colleagues in keeping up with current publications and literature" (p. 274). The latter trait is interpreted by MacKinnon as more-creative individuals being intentionally marginal and avoiding administration. Mark Runco [11] reports on contra-indicative traits "include[ing] ego-strength, cheerfulness, conformity to social norms and conscientiousness" (p. 288). In addition, imagination, as trait related to "openness", but somewhat different in definition and cognitive capabilities, is recorded as important trait, which we cover in more detail in the next section.

8.1.2.8 Imagination

The term imagination originates from the Latin verb imaginari, meaning "to picture oneself." It was only in the late 1700s that imagination was recognized as part of humans' general information processing and information generating habits [47].

In general terms, the Miriam-Webster online Dictionary [60] defines imagination as the act, process, or power of forming a mental picture of something not in the present and especially of something a person has not known or experienced. In design and neurocomputing, imagination is broadly defined as the manipulation of information that is not directly available to an agent's senses [61]. Furthermore, some scholars also define imagination as the ability to think of what is not present, that which is unreal, absurd, giving people almost unlimited conceptual powers and the ability to conceive and transform something unreal into a design or plan [62–64]. Beaney [62] indicates that imaginative people can offer fresh perspectives on what is familiar and create new possibilities where none were available before. Imagination is the ability that allows people to go beyond their actual experiences and build alternatives.

Academic studies indicate that imagination is the driving force behind the cultivation of creative thinking [65–68]. Further, both pedagogical and andragogical (teaching adults) studies find that there is an urgent and critical need to develop creative imagination in students, to deal with the changing world. Creative competencies will enable future entrepreneurs' and leaders' ability to recognize threats, resolve sticky social problems, and exploit opportunities of the survival and well-being of value to human society.

Jerome Bruner [69] theorized that human thought develops along two semi-autonomous lines (both adaptive to contextual and circumstantial events) namely paradigmatic and narrative lines. The paradigmatic dimension involves logical, sequential ordering of experience. In the paradigmatic dimension ideas are formulated in verbal terms in our own thoughts, as well as in our communication with others – according to Bruner the most advanced from is mathematical expression. In contrast, the narrative dimension constructs possible realities through bursts of images, usually visual or auditory, but sometimes kinaesthetic, tactile, olfactory, or gustatory (any of the human senses). While sequential in how it is communicated to others, it could be called "episodic" or fantasies and daydreams and is often expressed as a story. Bruner indicates that the purpose of the narrative dimension, and how it is communicated, is not truth but verisimilitude (like life).

Quite similar to Bruner, Seymour Epstein developed the Cognitive-Experiential Self Theory [70](CEST), which also considers two operating systems that deal with information differently and operate in parallel, are independent but integrative, but operate using different rules. The two systems by which people adapt to their physical and social milieus are: the pre-conscious experiential system and the conscious rational system. CEST posits that everyone automatically constructs an implicit theory of reality that includes a self-theory, a world-theory, and connecting propositions. It is assumed in CEST that the experiential system is an organized, adaptive system of schema, rather than simply several unrelated constructs or so-called cognitive shortcuts (e.g., Tversky & Kahneman [71]). The experiential system adapts by learning from experience rather than by logical inference, operates in a manner that is preconscious, automatic, rapid, effortless, holistic, concrete, associative, primarily nonverbal, and minimally demanding of cognitive resources. "Although the experiential system is a cognitive system, its operation is intimately related to the

experience of affect. It is, in fact, inconceivable that a conceptual system that learns from experience would not be used to facilitate positive affect and avoid negative affect" ([72] p. 160). The experiential system is a cognitive system but both influences and is influenced by affect (emotions or subjectively experienced feelings). The experiential system is more strongly associated with affect – the ability to be creative, and with interpersonal relationships and empathy than is the rational system.

Researcher and educator Vygotsky [68] considers imagination as developed and formed using building blocks supplied by reality, involving feelings, experiences and influenced by contexts [68, 73]. During the creative thinking process (defining a problem, generating ideas, selecting the best ideas, and realizing the ideas), people use their imagination to think about something, forming a picture or word, and constructing alternative solutions that do not already exist.

Think of imagination as a muscle: If it is not exercised, it will atrophy, forget the experiences that forged the imagination and be unable or inhibited to undertake creative tasks or empathetic links. Research [74, 75] has undoubtedly established a link between imaginative play and divergent thought, imagery capacity and storytelling abilities in children– even if just the willingness to tolerate divergent mental operations. The willingness of and tolerance for fantasizing and daydreaming that child play develops brings willingness and tolerance of mental leaps and enjoyment that characterize adult creativity Singer (1999). Elaborate middle-childhood fantasies foreshadow the most creative features of human development.

Neurobiologist Bernard Baars [76] writes about the "theatre" of consciousness when metaphorically referring to processes where the human brain reverberates or regurgitates materials and even unconsciously works and reworks new information into TUITs-fleeting daydreams as building blocks to intuition. With intuition itself being the precursor to imagination and the creative process. "Global workspace" theory [76–78] suggests that humans make associative connections about passing events, sensory stimuli (such as sights, sounds, smells, taste, and touch) that are turned into small-scale stories that recur and are reworked in somewhat altered forms in working thoughts, our daydreams, and night dreams. A most useful concept for our studies of creativity here, is the "absorbed state" defined by Baars [76, 79] as the state where the actor (here the creative) can experience the world without limitations of self-doubt, where other external stimuli from the environment can be ignored in order to focus and the rest of the world seems to fall away – leaving the ability to become fully absorbed in the world of play (see http://cogprints.org/944/1/BKintro.htm for archived information about the play between conscious and unconscious mind processes.)

(Please see Chapters 7 and 9 on incubation or unconscious deliberation.)

8.1.2.9 Intrinsic Motivation

Several experimental studies consider a wide range of motivational drivers, ranging from catalysts such as relieving adversity or discomfort (a type of "necessity is the mother of all invention") to particular personal goals such as a yearning for

immortality [80]. "Creativity comes from this struggle out of the rebellion the creative act is born [expression] a passion to live beyond one's death" ([80], p. 31). In the field of human development, human resource experts refer to intrinsic (inner drive) motivational drivers and extrinsic factors (such as rewards, awards, punishment, surveillance, grades, and incentives such as money or recognition, authority and promotion. Theresa Amabile's huge set of studies [81–85] over more than 30 years, finds that intrinsic motivation is often associated with creativity, whereas extrinsic motivators are likely to distract from or interfere with creative endeavours, but both can sometimes energize a creative person. A cost-benefit approach to intrinsic and extrinsic motivation sees associations with "the mad genius" as a social cost to limit creativity [86]. In contrast, the benefits in psycho-economic terms are both to the individual and to society. Amabile's componential theory of creativity [83] stresses intrinsic task motivation as one of three internal drivers for creative success. According to this theory [83], four components are necessary for any creative response: three components within the individual being domain-relevant skills (expertise in the relevant domain or domains), creativity-relevant processes (cognitive and personality processes conducive to novel thinking), and intrinsic task motivation (to engage in the activity out of interest, enjoyment, or a personal sense of challenge). The external component is the social environment within which the creative is working [83].

Russian psychologist Diana Bogoyavlenskaya investigated the impact of intrinsic motivation on creative thinkers. Bogoyavlenskaya's theory (1983, cited in [87], p. 252) defines creativity as "going beyond predetermined problems, to solve problems that go beyond the solutions required of them." Her work is summarized in the *International Handbook of Creativity* as demonstrating ([87], p. 254) that "spontaneous, productive, undetermined activity is on the one hand related to real-life creative achievements, and, on the other, unrelated to traditional measures of creative production [88](Torrance and Guilford's tests). An important finding cited in the *International Handbook of Creativity* [87], is that Bogoyavlenskaya defines three levels of creativity, driven by different motivations. At the lowest "stimuli-productive" level, creatives are driven by external forces and they "produce novel products because they are asked to do so" (p. 252). Diana relates this level to the person's lower intelligence, which prevents them going further than what is required. At the "heuristic level" [87], due to experience and when people have reliable methods of solving problems, they consider and analyse the content and structure of their activities, leading to original and witty ways to solve other presented or commissioned problems (p. 252). For this level people go beyond the expectation of the task and each finding is a discovery. They are motivated by novel problems and are mostly pragmatists – external motivation does not fully disappear. At the highest level, labelled the "creative level", discovery is not just a means to an end and no-one needs to approve or justify the finding. The creative thinker is not purely looking for a solution to an objectively defined problem, but rather attempts to find solutions to self-defined problems, relying on internal motivation to do so.

8.2 The Paradoxical Character of Creatives

A quick word on paradoxes in creative personalities

Mark Runco [11] refers to the paradoxical character of creatives. By this he means that the creative personality is associated with both favourable and unfavourable traits. For example, the trait of endurance, when seen as the ability to work for long, uninterrupted periods on a task and to stick with a problem even when not making progress, is not characteristic of highly creative people. But, although lesser creatives report that they stubbornly work on a problem, more creative individuals indicate that they have several projects on the go at any one time and may move from one problem to another to refresh and take advantage of incubation. Other studies [89, 90] report on creatives' preference for challenges and disorder, rather than overly simplified problems or briefs. Highly creative individuals (architects in these studies) are less conventional, but report that their ideal selves would be more sympathetic, sociable, generous, warm, and patient. Studies involving other career types also uncovered paradoxical traits.

It is clear from these characteristics, traits and attributes that the creative level of productive activity can by improved through learning, through educational interventions that encourage creative process, independent problem finding, independent research and reflection (Bogoyavlenskaya, 2002 cited in [87](p. 254) and perhaps newly acquired or somewhat altered thinking and doing (experiencing) habits.

Albert Maslow's report [24] on self-actualizing creatives covers a range of paradoxes in character traits. Maslow [24] concluded that self-actualizers did not need to resolve dichotomies such as being selfish or altruistic; therefore, they can exhibit both in their behaviours. Maslow [24] did not claim that self-actualizers (SAs) are perfect human beings; on the contrary, he noted that SAs have multiple human failings such as being boring, stubborn, absent-minded, and inclined to forget requirements of social politeness when they concentrate on something. But Maslow [24] regarded SA creatives as strong people who, when they deem it important can: speak harshly to people, display behaviours that might even be regarded as rude, ruthless or harsh to others, and be clear about their anger and be strong-willed when it comes to counterattack evil people in order to solve problems that align with their personal values.

Frank Barron writes about creatives' "controllable oddness and controlled weirdness". Creative people have the potential to be weird and wacky but (do and should) control it. Creatives are imaginative, non-conformist and several traits of the creative personality can lead to impulsivity. But, as the very definition and two central conditions of creative output (novel, appropriate) indicates, creatives also realistic. True creatives are grounded by their knowledge of how far the tactics of being weird, wacky or contrarian, should be pushed, before they are seen as "counterformist". – indicating a habit to oppose or react negatively to others' viewpoints [11] (p. 293). This is purely difference for difference's sake, rather than focusing on solving the problem and judging efforts not by their anti-social stance or unconventional outcome, but rather by contributing value to solving worthwhile problems. To

remain valuable contributors, creatives need to question the status quo, authority, and norms – but within reason and while considering that oppositional thinking merely to defy might be more ego-centric and self-motivated than necessarily conducive to appropriate and original directions.

8.3 Conclusion

Creative personalities are a complex combination of traits, habits of feelings, thinking, and behaving and characteristics. It is important to note that there is no "standard" or "one" creative personality type. Further, creative personalities will differ between domains and disciplines. The creative personality is complex and often even paradoxical. Mostly, traits are indicative of the potential or likelihood of being creative, rather than an absolute measure of the creative person. For example, autonomy and openness are indicative traits, but do not in themselves (in isolation) predict highly creative personalities. In contrast, conformity is contra-indicative – meaning that people who prefer to conform to societal norms and expectations are less likely to possess creative personalities. Context is always important in making judgements – and more so for creative performance. As we discuss in Chapters 15, 16 and 18 the immediate environment within which the creative performance is demanded will affect the person. Compatibility between the person and the domain (or career) is relevant and important in order for creative people to prosper and thrive.

CREATiViTY LABORatory

Activity I: As Easy as ABC

Try to solve this puzzle, using your own frames of reference. There is no right or wrong answer, but only your own creativity. Try to imagine or construe at least 9 answers. Ask someone in another discipline what they think the answers might be. Consider their perspective and ask yourself what prevented you from seeing that solution OR what knowledge and experiences helped you to see the same possible solutions.

If ABC goes to ABD, then what does XYZ go to?

Activity II: What Is Your Creative Style?

Meta Wagner [91] identifies five creative types in her book *What's your creative type: harness the power of your artistic personality*. We list them below. We add a few of the identifiers Meta Wagner uses to allow you to determine your own likely style. Pick as many types as you think are applicable to you, even if only vaguely. What do you think people of your personality type do when they hit a snag, hear creativity squelchers or face setbacks? Use the table to consider what you might take from the other styles (those you did not tick for yourself), and how their coping or survival mechanisms might help you to achieve your full potential. Use the space below the style to make some suggestions to yourself and to propose a set of actions to make this intention reality (Table 8.3).

Possible answers provided by other participants and M Wagner [91] are: XY1, XY, XYD, WYZ, XYaa, XYi (i as imaginary number); the next key on your mobile phone?

Table 8.3 AII Find your Inner Genii

Five creative types	Type description	You? ☑	What can YOU learn from their style?
The A-lister	They go for ego-fulfilment. They want to have the emotional impact, adoration and love of their fans.		Humble yet confident Talent is God-given Remain endlessly relevant Nothing spurs ideas like rivalry
The artisan	They believe creativity is its own reward. Their creativity is serious work not just play.		Really truly into their craft – Geek Mastery – 10,000 hours invested Revere and honour their predecessors Love collaborating
The game-changer	They strive to produce something new and startling. They love breaking boundaries and have a firm vision.		Ask Why not? Have a vision Risk-takers Always learning by experimentation Bounce back from rejection Slow, steady, persistent
The sensitive soul	They pour their ample emotions and affective energy into creative outlets. They believe their creativity can help inspire, comfort or heal others.		Express their feelings Experience emotions intensely Believe creativity has saved them Use art to feel connected Try to capture every moment of life
The activist	They use their creativity to change the world. They are willing to risk their freedom, even their lives to produce output with political/social purpose. Wants to achieve balance between the art and the message.		Push the world in a chosen direction Boost art's impact publicly Become the face of a group/team Enjoy being un-PC Walk the walk, talk the talk Realistic idealist

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Part II
The Process of Creative Endeavours

Chapter 9
Creative Thinking: Designed for Humans

Mark Kilgour

Abstract The creative thinking processes is complex. Techniques and systems that work at one stage of the process can be detrimental if applied at another stage. This chapter discusses the Four Stages Model of the Creative Thinking Process, and highlights the importance of understanding what occurs within each stage. With this knowledge individuals and organizations can enhance their ability to develop creative ideas.

Keywords Creative thinking processes · The four stage creative thinking process model: problem definition · Idea generation · Idea refinement · Idea evaluation

Learning Objectives
On completion of this chapter, the readers will be able to:

- Demonstrate an understanding of the four stages of the creative thinking process –
  - Problem definition,
  - Idea generation,
  - Idea refinement,
  - Idea expression.
- Discuss how each stage will be influenced by techniques or external inputs. These include such factors as the type of knowledge that is provided during each stage, or the type of evaluation process.
- Develop organizational based processes that can be applied at each stage of the creative thinking process in order to enhance the generation of creative ideas.

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9.1 Introduction

One of the key reasons for the current surge in interest in creativity is the rapid development in artificial intelligence and automation. With the growth of big data, cloud computing, the internet of things, advanced algorithms, and machine learning, many tasks in industries that have traditionally relied heavily on human capital are now being undertaken by computers. Tasks that are highly repetitive, or that can be performed accurately by calculating relatively consistent patterns in large datasets, can be automated relatively easily. As 5G and the internet of things means data becomes increasingly available, industries from home building to transportation, from accounting services to education, are all experiencing major change.

The effects on people, incomes, societal equality, and employment, are dramatic and are only destined to increase. For example, self-driving trucks and cars (not to mention drones), are destined to radically change the freight and taxi industries. In the US alone over 1.5 million people were employed in the truck transportation industry in 2019 [1]. Add to this the effect on the people who drive taxis, school buses, coaches, and courier vans, and the potential employment impacts and flow on effects to the economy will be enormous. Yet people are incredibly adaptable, a reflection of our creative abilities. It is these creative abilities that are coming to the fore. While research into creative problem solving by computers is beginning [2, 3], the complexity of the human brain means that we still have a substantial edge. Moreover, if we can address the wealth distribution issues in societies, then growing automation should lead to people having more time to focus on a wide range of creative endeavours, from new product development to music and art. It is therefore important that we understand creative thinking processes and how we can improve them.

9.2 The Creative Thinking Process

One of the advantages people have over machines is our diversity, combined with our ability to connect seemingly unconnected information. Generating creative ideas involves combination processes [4–8]. We take two previously unconnected ideas and combine them in a new way to generate an idea that is both original and appropriate. For example, a new creative style of cooking may merge two distinct national cooking styles to generate a unique taste sensation. A research and development person may add senses to a drone so that it is able to kill moths in greenhouses [9].

These combination processes involve combining ideas within our minds that result in unique ideas. These new combinations are unique as they are based upon our individual knowledge. Our individual knowledge is at least slightly different from everyone else, as we all live different lives and have had different experiences. These unique experiences are the basis of our knowledge, which in turn are the basis for our creative ideas. Our individuality means that the human potential for creative

ideas is vast. Making these new connections between ideas is a process that happens inside the mind of the individual. While other people can assist our creative processes by providing new information to use in our creative combination processes, it is the individual that comes up with the new combination - the creative idea [10].

So, given we each possess different knowledge, and this knowledge is the basis for developing creative ideas, we all have the ability to be creative. This does not mean that developing, refining, and presenting creative ideas is a simple process. While we all have the potential for generating creative ideas, developing highly original and appropriate ideas, and then getting these ideas accepted by others, is a complex and difficult process. In order to reduce this complexity, it is useful to break the process into stages. Once these critical stages of the creative thinking process are understood, we can use this understanding to improve our creativity.

9.3 Stage Based Models of Creative Thinking

A number of academic researchers and practitioners have developed stage-based models of the creative thinking process. One of the earliest models was developed by Graham Wallas in 1926 [11]. This model proposed four stages;

(i) Preparation,
(ii) Incubation,
(iii) Illumination,
(iv) Verification.

The first stage involves defining and understanding the problem. Stage two involves taking a break from actively working on the problem to allow the mind to subconsciously think about the problem and generate new connections. Stage three involves the 'aha' moment. This aha moment is when there is a sudden conscious breakthrough; a new combination is made in our mind. Stage four involves refinement and verification of that new, previously unconnected, combination [12]. Although researchers have suggested that this model is limited in its ability to differentiate between creative and non-creative thinking processes, as well as telling us little about the thought processes that occur within each stage, it has provided the basis for the development of subsequent models [12–14].

Over the last 70 years a number of researchers have looked into the sub-processes within the overall creative thinking process. This has resulted in a number of different creative thinking process models that differ to the Wallas model. If you look of these different models it becomes clear that there are certain processes that can be attributed to different stages, and that these processes can be enhanced (Fig. 9.1).

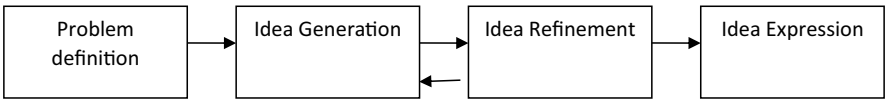

Fig. 9.1 The four stages of the creative thinking process. (Reproduced from Kilgour [14])

9.4 The Four Stages of the Creative Thinking Process

The above four stage creative thinking process model incorporates findings from a variety of prominent researches. While people can, and should, move back and forth through these stages, it is important to separate these stages. This separation allows us to better understand the thought processes within each step. Please note that there is only one arrow that points backward. This occurs between the idea refinement and the idea generation stage. This is not to say that this is the only stage at which people jump back and forth revisiting stages, just that this is where it occurs most frequently.

What makes the development of creative ideas complex is that unless we understand the cognitive processes that occur within each stage, we do not know which techniques and expertise to apply, or when to apply them. Unfortunately, what works to improve creative thinking during one particular stage, can reduce creativity in another. For example, providing a lot of detail early in the problem definition stage may result in what is referred to as functional fixedness, or the problem of the idea generator of getting 'stuck in the box' [15–17].

9.4.1 Functional Fixedness

Functional fixedness is where a person is unable to envision alternative solutions because they are too busy thinking about the information that they have been given. If during the *problem definition* stage people are given too much information, functional fixedness can occur. In contrast, providing information during the idea refinement stage can benefit creativity. Information at this stage can assist people in refining their ideas, and improve the likelihood of external judges accepting their creative ideas.

Another major issue relates to the fact that not all creative ideas are created equal. If the focus is on developing incremental, or gradual, improvements then different techniques should be used than if we are wanting to encourage Big C, radical change, ideas. An understanding of the four steps and the thought processes involved in each, makes this clearer.

9.4.2 The Importance of the Four Stages

One of the core advantages of breaking up the creative thinking process into a series of distinct steps is that we can develop specific techniques to assist at each stage. Since the early creativity studies in the 1950s, the ability to enhance creative expertise has been clearly demonstrated. However, most of the existing creativity techniques and training programmes focus on either stage one or two of the process, and

teach expertise that assist one of those stages [8, 18–25]. Indeed, most creativity techniques are focused on stage two, idea generation.

However, the effectiveness of any technique will depend upon the individual generating the creative idea. Creativity techniques must be adapted to suit the expertise and knowledge of the person using them. For example, training a person to use a simple divergent thinking technique to assist in idea generation processes in stage two will provide little benefit if they already have strong abilities to connect unusual ideas. This ability is referred to as being a strong divergent thinker. In contrast this type of training will prove highly beneficial to a person with limited knowledge and expertise in divergent thinking techniques.

Training our mind is like training any other part of our body. A good analogy is running. While there are only a very few people who have the natural talent to be Olympic level sprinters, we could all benefit from training to some degree. The less we currently know about running techniques, the more we would benefit from such training. However, just like running, we do not want to practice bad techniques, or over train one muscle group at the expense of other muscles, or injury.

The use of a particular technique must relate to the correct stage. A technique applied in one stage may be effective, that same technique applied at a different stage can be detrimental. For example, providing extensive evaluative information during idea generation processes can result in people becoming fixated on that information. This may limit their ability to think across domains and therefore reduce the likelihood they generate original ideas. So while both divergent and convergent thinking techniques can assist the creative thinking process, they must be applied at the right stage in the process.

It is also important to consider the full range of expertise needed for successful creative ideas to gain acceptance. Unfortunately, unless a person has well developed idea refinement and idea expression skills, any creative idea they develop is unlikely to be valued by others. Unfortunately, it is often very difficult to get external judges to see the value of highly creative ideas. Therefore, how those ideas are presented is crucial.

Given the complexity of generating creative ideas, and the problem that the effectiveness of different techniques will depend upon how and when they are applied in the process, many people just assume creative thinking is an inherent process. This is not true. While a person's creative potential is a combination of both nature and nurture, there are many things we can do to improve our creative thinking processes at each of the four stages.

9.5 Stage One: Problem Definition

There are a number of questions related to this stage. These include:

1. Are some people more likely to define problems from a broader, less orthodox perspective than others?

2. How does our existing expertise or knowledge influence how we define a problem?
3. Are there techniques we can learn to improve our problem definition processes.

Given the importance of how we frame a problem, this step involves understanding how people in different situations define problems, and the implications for the type of solution generated.

9.5.1 The Importance of Problem Framing

The importance of how you frame a problem is well stated by Vaughn "What you want to know determines what you do, and the limits of the findings" ([26], p.46). Researchers have looked into how problem definition influences creative thinking processes [27, 28]. They found that the way in which a problem is defined has a strong influence on the creativity of the response.

By looking at how our mind works to come up with solutions to problems, we can see how problem definition processes affect creative thinking. How we define our problem sets the starting point from which we then generate solutions, as well as setting the parameters for the search. Guilford introduced the concept of search parameters as a way of describing the process that occurs when we define our problem. Essentially if we define our problem too narrowly then we limit the search parameters (where we look), and subsequently our ability to think across different domains to find solutions. Narrowly defined problems essentially put us in a box and narrow down the range of places we look for solutions. The result is that we either use existing solutions, or we generate very small c solutions. The narrower the starting and search parameters for our idea generation processes, the more we limit our ability to think across divergent memory categories in order to generate new ideas.

For example, let us say a few years ago I needed to clean the windows of my high-rise building. I frame the problem as – who do I get to clean my windows? As I have had my windows cleaned many times in the past, I open my existing memory categories and pull out the name of the company who has done a good job previously. I hire that firm which has suspension platforms and plenty of safety equipment and off they go. This solution does not require a lot of mental thought. If I have had my windows cleaned many times before, it takes almost no thought at all. In contrast, if I were to redefine the question as 'what is the best way to clean my windows?', this may result in a very different set of memory being accessed.

If I had defined the problem as 'what is the best way to clean my windows?' I have essentially set my search parameters a lot wider. If later that week I happened to be trailing my son's new toy drone, I would be more likely to relate the idea of a drone flying around the house to the problem of '*what* is the best way to clean high rise windows'. This new connection may lead me to think about how drones could be adapted to do the job more safely. This example is in line with the findings of

Kim [28] who found that if a question can be answered simply it does not often lead to creative solutions. The question needs to be difficult and not be able to be answered in a straightforward fashion.

But given that we can define any problem in either a narrow or broad, simple or difficult way, why do we not just always define our problems broadly? Unfortunately, reframing questions so that they result in more creative answers is not as easy as it sounds. One major issue in relation to creative problem framing is that our existing knowledge can work against us.

9.5.2 Knowledge and Problem Definition

Redefining a problem works by allowing inclusion of information that would otherwise not be considered. People are generally cognitive misers, we do not want to think at a deep cognitive level all of the time. Constantly thinking creatively is very taxing and can result in burnout. Therefore, we develop simple decision rules to allow us to make decisions quickly and easily. A decision rule is a simple formula we apply to make routine decisions without having to think about all of the reasons as to why. For example, we look left and right before we cross the road without even really thinking about it.

The more expertise we have in an area, the more likely we will have developed simple decision rules to solve the problem. These rules become almost automatic and mean that even when the environment has changed, we keep using them when they may no longer be appropriate. We see this constantly in our current environment where people ignore new technology in favour of the ways they have done things in the past. However, if we are wanting to generate creative solutions, we need to utilize and integrate new information to generate those solutions.

The reliance on using past ways of solving a problem (historic solutions and decision rules) results in routine, uncreative solutions – I use the existing company to clean my windows. In contrast, if I use information contained in the problem, and that problem is defined in an unusual way, then this is likely to require a creative thinking process in order to develop a solution. Therefore, the type of solution I come up with will depend upon both my tendency to use easy historic solutions, but also how the question is framed. Unfortunately, research indicates that people tend to rely on historic solutions to solving problems, even when the problem itself has changed.

As a person becomes more and more knowledgeable on a particular problem, they become more and more likely to use these historic memory-based solutions or decision rules. However, whether we use previous ways to solve a problem, or use new information from our environment to develop creative solutions, is not set. We just need to be aware of how our existing knowledge can result in narrowly defined problems, and instead we should actively redefine problems. Indeed, researchers have found that the act of just asking for a creative solution, versus a solution, results in less tendency to use existing historic information and results in more

creative outcomes [29]. Of course, generating creative solutions is much more cognitively taxing, more effortful and tiring, than using existing solutions that take little effort.

What we can conclude is that our existing knowledge and experience can hinder our ability to generate creative solutions as we apply heuristic, or automatic thought processes to define and solve problems. We therefore do not consider the potential for new, better, creative solutions. In other words, our existing knowledge in a particular area will influence the means by which we solve problems. If we have extensive domain specific knowledge in an area then this has the benefit of meaning that we have developed decision rules that we can apply with limited mental effort. These solutions are fine, unless either the situation changes and that solution is no longer highly effective, or if new, better, solutions are needed. In this case our existing knowledge can work against us. However, we can forcibly redefine problems in order to be more likely to generate creative solutions. One way we can overcome the problem of our own expertise limiting how we define problems is to use other people.

9.5.3 Cross Disciplinary Teams

As we define a problem based upon our own knowledge related to the area, people from different backgrounds are likely to define the problem in different ways. The more different their expertise is from us, the more likely they will define the problem in a very different way. For example, let us say we have the problem of how to reduce cats from killing native birds and lizards in suburban areas. A doctor may define the problem differently from an urban planner, or a hunter. The doctor may state the problem as 'stray cats breed too quickly'. The urban planner may define it as 'the rules around domestic cats in areas with large areas of native bush are inadequate'. When we have a situation where we want a creative solution we can therefore set a very broad vague initial problem, and get others to define the problem from their own unique perspective. We can use these and other techniques that act to deliberately define the problem in an unusual manner in order to provide a stronger basis for the development of creative ideas [30].

9.5.4 Polar Opposites

Another simple technique that I have seen used in advertising agencies was for members of the creative team to redefine the problem in the exact opposite way from the client's definition. These and other basic redefinition techniques force us to think across to unusual categories. By using simple techniques such as asking other people to define our problem, or stating a problem from the polar opposite angle, we are forcing ourselves to use unusual problem operators and minimizing our reliance on past experience and simple decision rules to solve the problem. This means we

are not as reliant on an incubation period. An incubation period is a period of time where this redefinition process occurs by chance, due to environmental factors. This time provides an opportunity for our subconscious mind to redefine our problem [31].

9.5.5 Multiple Projects

An interesting finding by Simonton [32], in his research into creative geniuses is that many of these geniuses had been working on multiple projects at the time when they made their creative breakthroughs. Given that creative ideas are a combination of distant domains of knowledge, working on different areas provides us with information as the basis for thinking about problems in a different way; it broadens our search parameters. This is perhaps why the concept of incubation is so firmly entrenched in the psychology of creative thinking [33]. Not only does an incubation period allow our mind to wander, temporarily relaxing what might be too rigid a search process for new ideas, it also provides our minds with an opportunity to make these distant connections. While most of us are highly specialized and are not able to work on multiple, very different, projects, organizations can facilitate creative solutions by (i) utilizing cross disciplinary teams. (ii) designing work environments that encourage a degree of variety for their knowledge workers, and (iii) provide time for problems reframing and idea incubation.

9.6 Stage Two: Idea Generation

The second stage of the creative thinking process is the one that has captured the most attention - how do we generate creative ideas? We know that creative ideation processes involve combining different areas, or domains, of knowledge. The more unusual those domains the more original those new connections. This essentially means that creative thinking involves divergent, cross category thinking. This concept of divergent thinking was introduced by Guilford in 1968 and since then researchers have incorporated divergent thinking into their theories of creativity [7, 33–35].

Researchers have also looked into the extent to which this ability to think divergently can be taught. Findings indicate that divergent thinking can be taught, although the research primarily uses novices as research participants [18, 22, 30, 42]. An experimental study that uses professional advertising practitioners, indicates that techniques need to be adapted to suit the level of divergent thinking expertise of the participants [36].

Divergent thinking techniques force respondents to use unusual domains as the basis for their creative combination processes. When undertaking research in advertising agencies it soon becomes clear that most experienced creative staff (the staff

responsible in the agency for develop creative advertisements) have developed and internalized forced divergence techniques. For example, one creative after being given the advertising problem from the client – the client brief (the brief contains information about the brand message, target consumer and other pertinent information), would open a dictionary at a random page and select a word to use as the basis for their creative combination processes. Essentially, creative techniques work by utilizing these forced divergence principles [19, 24, 36, 44]. In teaching these techniques, it is important to remember that thinking across unusual domains of knowledge is a difficult and cognitively taxing process and this expertise needs to be built up over time.

In addition, not only must we be able to access different domain knowledge as the basis for creative ideas (either forceable or through techniques), we need to have the time to think and make internal connections between these ideas.

9.6.1 Environment Factors and Divergent Primes

> "The accidental nature of many discoveries and inventions is well recognized. This is partly due to the inequality of stimulus or opportunity, which is largely a function of the environment rather than of individuals" Joy Paul Guilford ([13], p.79).

The importance of forcing ourselves to use unusual ideas to develop creative ideas is highlighted through a review of how great creative discoveries have occurred. A number of great inventions have been the result of chance connections. In these cases, a person who is working on another problem comes across environmental conditions, situations, and particular stimuli, that make them think about a problem from a different angle. The classic example is the accidental discovery of penicillin by Dr. Alexander Fleming [37].

In the case of penicillin Dr. Fleming found a fungus that had invaded one of his petre dishes. This fungus had grown on the dishes when he went away on holiday. The fungus did not allow bacteria to grow. This caused him to make the connection between the fungus and its antibacterial effects. Chance factors in the environment allowed Dr. Fleming to move away from the current areas he was looking at for solutions, and allowed new information to be used to develop novel combinations. This example highlights the importance of forced divergence techniques, as we can use them rather than waiting on the chance of random serendipity.

There are many different types of divergent thinking techniques. In advertising these include the Advertising Templates model by Goldenberg, Mazursky and Solomon [22], and the Remote Conveyor Model (see Rossiter [38]). People have also identified the value of using metaphors and analogy to assist people to think across domains. The list of these different techniques is almost endless. What all of these techniques have in common is they are essentially forced divergence, or associative, techniques. They force people to associate different ideas during their idea generation processes, opening up thought categories that would not otherwise have been used.

In summary, it is clear we can teach people to develop more divergent or unusual ideas through the use of divergent, or associative, techniques. These might involve random words, the use of metaphors or a range of other techniques. These techniques need to be adjusted to the skill level of the participant. The more a person has experience in divergent thinking, the more distant, or hard, the technique that they will be able to use. We also need to be careful in that these techniques generally encourage more unusual or novel solutions, but the resultant ideas might not be viewed by external judges as appropriate. As creative ideas must be more than just bizarre novel ideas it is important that those ideas are also refined and made appropriate to the situation.

9.7 Stage Three: Idea Refinement

A bizarre idea is not a creative idea. A new product idea that is well in advance of the technological capability that allows it to be developed, is just a novel idea. In the sci-fi TV shows of the 1970s the wireless telecommunication devices were just novel ideas. The technology did not exist to make those products at the time. We can encourage people to make divergent connections but we must also make those ideas workable. The connection of distant domains is the exciting part of the creative thinking process. It is the 1% inspiration. Creativity still requires the 99% perspiration. In addition, while we may see the beauty and logic of our creative ideas, this is not enough. We must get others to be able to see that logic.

The third stage of the creative thinking process model is idea refinement. This process can take a long time, as while the idea generator can see the connection, they will need to develop that idea so that others can also see the idea's relevance. This involves developing the links between those two distant domains so that they can be explained to a person who does not share the knowledge of the two combination domains to the same extent as the idea generator. The process involves convergent thinking. Convergent thinking comprises of extending category links, adding justification, explanation, and elaboration.

It is important to note that both divergent and convergent thinking requires strong knowledge structures. We need knowledge of different and varied domains of knowledge to act as the basis for divergent thinking and also to assist in our refinement processes. However, during the idea generation stage, divergent thinking techniques can be temporarily applied to assist us to make unusual connections and these techniques are not domain specific and can be learnt. In contrast, undertaking convergent thinking requires strong knowledge categories, or input from other knowledgeable experts. This knowledge is domain specific and takes time to develop and is not a one-off universal technique that can be applied like divergence techniques. This highlights the need to distinguish between lasting traits and temporary mindsets and reflects the need for both content knowledge and expertise in creative thinking processes.

Given that the refinement process takes time and effort, if we want to encourage highly creative ideas in our organizations we must allow creative individuals time to sit down, reflect upon, and refine their ideas. Organizations must also recognize that many highly unusual connections between distant ideas will not be able to be made appropriate in an economic way. There will be a lot of failure. Organizations must be willing to accept failure but can also set up processes to enhance the chances of success. One of these processes is the use of small teams to assist in the refinement and expression stages.

9.7.1 Small Team Expression

It is clear from working with advertising agencies that having small two-person teams made up of people who understand the difficulty in generating, refining, and expressing creative ideas, assists the process. These two people teams provide a supportive environment to test unusual ideas and provide an alternative perspective that helps in early stage refinement. It is important that any ideas that cannot not be made appropriate are rejected early, as there is a high the cost of developing ideas. A supportive team assists creative people to give up on their ideas, while minimizing the demotivating effect from that rejection.

9.7.2 Screening Models

Another process that can assist during the refinement process is the use of screening models. These models identify key criteria that drive the acceptance and success of innovations in a particular area. Hence, they provide useful information to people when they are refining their ideas prior to presenting them. There has been a significant amount of research that looks at screening models in new product development. These models can be used to evaluate early stage new product ideas and have been shown to be effective determinants of future product success.

Other evaluative tools are used in other fields. In advertising copy testing and other forms of evaluation are applied to test creative ideas and enhance the creativity of advertisements. Creative staff know the criteria and can use this knowledge to refine their creative ideas to make them more appropriate. However, it must be noted that given the unusual nature of highly creative new combinations, if these evaluative tools are not applied corrected they are likely to result in incremental rather than paradigm shifting creative breakthroughs.

In summary the refinement of creative ideas is often a long and laborious process. Organizations can assist the process by setting up appropriate systems to encourage, motivate, and reward refinement processes. Using small supportive teams can assist with the refinement of early stage ideas and appropriate screening models can be used to provide information on key evaluation criteria to assist in the

refinement of ideas. However, especially for Big C ideas, it must be accepted that there will be a high percentage of failure when attempting to develop economically viable and appropriate creative ideas.

9.8 Stage Four: Idea Expression

> Whether a creative idea ever sees the light of day is not only dependent on the expertise of the person generating the creative idea, but also the knowledge and assessment processes of others. [39–42]

The ability to generate original and appropriate solutions is not enough, those ideas must be expressed and implemented. The final stage involves taking ideas that have been internally developed and refined, and presenting them for evaluation; the artistry element of creativity. Most creative ideas are undoubtedly lost, not due the novelty of the ideas, but an inability to either express those ideas, or to get other people to recognize the value of those ideas. Once a person generates what they consider to be a creative idea (both original and appropriate), it must then be expressed to others for evaluation. This assumes a definition of creative ideas that includes a 'socially valued' component. Socially valued means a creative idea must be valued not only by the person who generated it, but by others.

When it comes to most creative endeavours, it is the external evaluation of the idea that matters. While generating a creative idea provides a lot of satisfaction and value to the person who generates the idea, if we are in business, advertising, or trying to make a living as a musician or artist, it is crucial that others also value our creative ideas. In terms of the two main constructs of creativity, originality and appropriateness, research indicates that it is much easier to get others to see originality than appropriateness [42]. This is not surprising when you think about creative ideas.

Creative ideas are the combination of unusual domains, being unusual means that most people would not normally associate those ideas, and hence most people will see that combination as new or original. Appropriateness however refers to how relevant that idea is. Can I see the value of that product that is being promoted to me, or the new product in the store? This is dependent not just upon the relevance of that idea to the person judging the idea, but how well the idea is expressed.

These unusual combinations require external judges to really think deeply about the idea and how the connection of those two unusual domains makes sense. This is very cognitively taxing and therefore people are often reluctant to listen to creative ideas, especially if they are poorly expressed. Poor expression makes it even more difficult to evaluate ideas and hence we need to ensure our creative ideas are presented very well.

Unfortunately, research into creative expression is very limited. Yet if you speak with creatives in advertising agencies they will tell you that a large part of their job is 'selling' their ideas. This expression process occurs at different stages of the creative idea development process. Ideally, when developing creative ideas, we can discuss them with another knowledgeable and responsive person who will provide

constructive feedback very early in the process. This can help us to both screen early stage ideas and provide useful feedback to improve the presentation of the idea.

9.8.1 Presentation Skills

Research has indicated that creative ideas do not speak for themselves [43], indeed one of the most important elements to achieving acceptance of creative ideas are the artistry or presentation aspects. The presentation of creative ideas means ensuring they are stated in simple terms and that the elements of the concept flow well – you can tell a good story. Part of this is the elements of a good presentation that draw the attention of the audience, the artistry and aesthetics. As an individual, as well as for organizations it is therefore crucial that creative staff are given extensive training in presentation skills, especially in the mediums they will be using when expressing early stage creative ideas.

9.8.2 Expression Traits

> "Vincent van Gogh – whose notoriously poor self-presentation alienated his contemporaries, instilled negative performance expectations, and helped delay acceptance of his work until well after his death" (Wallace, 1969), (as cited in Kasof, p.347, [43]).

A key part of expression is the expression traits of the presenter. Given that by their nature, creative ideas are unusual and contradict current norms, it is not surprising that research has shown that creative individuals exhibit high levels of self-confidence and a lack of need for social acceptance [44, 45]. In conversations with people in the creative industries it quickly becomes clear they have a 'thick skin'. Rejection is part of the job and you need to be able to accept it and quickly move on. Speaking to advertising creatives they often lament that their most creative ideas are stuck in their bottom draws waiting for the right time and the right client to get out. In the academic world most publications in the top journals are rejected. It is not an easy process for a person to keep presenting their unorthodox ideas in the face of high levels of rejection.

For many people they will not have the level of confidence to present their ideas. This means that most creative ideas never see the light of day. Facilitating and encouraging people across the organization to present their unusual ideas in a supportive environment is therefore important. To encourage creativity organizations must also accept failure, and correctly motivate and reward people.

In summary the difficulty in evaluating the creative ideas increases the importance of good presentation. Organizations that want to achieve creative outcomes must invest in training, systems and setting up a conducive environment. They must also be aware that presenting ideas that contradict the current norms is psychologically daunting for most people.

9.9 Summary

Creative ideas are rare and have the potential to change the world. Unfortunately, we do not see enough Big C paradigm shifting ideas. This is often due to the inertia of current systems which adds to the difficulty in creative development processes. However, we have learnt a lot about the creative thinking process over the last seven decades and this has been facilitated by breaking the process up into stages. This has allowed us to better understand what works and does not work during each stage and to develop techniques, systems and processes. This chapter provides a brief discussion of each of the four stages in the creative development process, providing insight and understanding of what can be done to improve each stage. While there is insufficient space to discuss the wide variety of techniques that can be used to assist each of these stages a few key points are listed below;

Problem Definition

- Make time to reflect on everyday tasks and define then as hard to solve problems
- Be aware of how your existing knowledge can limit how you define a problem and actively seek out alternative ways of defining problems
- Use cross-disciplinary teams to assist to redefine problems
- Use re-definition techniques
- If possible work on different types of projects and take time to think across those projects to assist in problem redefinition
- Design work environments that encourage a degree of variety for knowledge workers
- Provide time for problem reframing and idea incubation

Idea Generation

- Use divergent thinking or associative techniques that are appropriate for the person's current level of expertise
- Develop your divergent thinking expertise over time with practice
- Avoid providing too many structured criteria or evaluative information if you want Big C creative ideas
- Allow plenty of time for knowledge workers to generate ideas and be aware that it is a highly cognitively taxing (demanding) activity

Idea Refinement

- Set up systems to encourage, motivate, and reward refinement processes
- Establish small supportive teams to assist with early stage idea refinement
- Use appropriate screening models, although be aware that these will favour small c incremental creative ideas
- Have a high tolerance for failure, but establish learning processes from these failures

Idea Expression

- Be aware that presenting ideas that contradict current norms is challenging for most people
- Encourage and reward creative expression to build employee confidence
- Train knowledge workers in the use of appropriate presentation media

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Chapter 10
Creative Thinking, Problem Solving and Ideation Tools

Rouxelle de Villiers

Abstract It is a myth that creative genii sit quietly hoping for inspiration and insight come to them in a flash of illumination. Some discoveries are either by accident or the result of some form of creative "spark of genius", but for most novel, valuable business solutions, problem-solving often starts with a design challenge/problem or opportunity. Thanks to decades of research and tried-and-tested tools applied in a range of domains and business disciplines, a treasure trove of creative problem-solving tools and techniques is available to creatives and innovators. These tools turn problems into possibilities, and provide opportunities to develop ideas, processes, products, or procedures that are new to that job, team or organization. Business Schools and industries have no shortage of models, frameworks and tools to improve business effectiveness or generate new and interesting problem solutions for clients. Thinking tools have merit and include divergent or convergent (or both) thinking techniques. We cover thirteen of the most well-known and useful tools and techniques in this chapter. There are many more, but the scope of this book limits what can be covered here.

Keywords Analogical thinking · Brainstorming · Convergent thinking · Divergent thinking · Facilitation · Lateral thinking · Mind-mapping · Problem-solving tools · Role-play · Six thinking hats · Synthesis

Learning Objectives
On completion of this chapter, the readers will be able to:

- Identify the appropriate problem-solving tool to use for a specific situation or to match his or her preferred thinking style
- Apply a range of thinking tools to assist in the ideation and idea refinement stages of creative thinking tasks.

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- Deliver creative ideas for further development within a business environment.
- Differentiate between convergent and divergent thinking tools to aid intentional innovation processes within organizations.

10.1 Introduction

Creativity is reliant on novel ideas, unique synthesis of prior knowledge into new insights, and finding appropriate solutions to problems; it is therefore essential for success in any career, job or human venture, and in fact for normal living. Guildford's mental testing movement reports that creative thinking is a normally distributed variable with a continuous distribution. This implies that everybody has the ability (or at least the potential) for creative thinking to a greater or lesser degree.

In storytelling (such as writing and film making), marketing, product development, sales, architecture, engineering and other design careers, jobs literally depend on creative abilities and creative intelligence (CiQ). It is challenging to consistently produce new ideas, and just like authors and storytellers, designers, architects, marketers and just about all creatives at some time or another reach a point where their ideas feel blocked. Fear not! Just like writer's block, such mental blocks are temporary. Although you may think others will see you as an imposter – secretly not as creative as you or your employer originally thought – you have not run out of creativity. You might have run into a stumbling block, or a squelcher may have squeezed the creative juices out of you. You may have temporarily run out of the "big ideas" that you need for a campaign or project. You may also have run out of energy and need to recharge, or reached one of the mental blocks we discuss in Chapter 7. Or perhaps you simply need a few tools to harness your unlimited creative power. Just as Aladdin needed to rub the lamp to release the genie to deliver the magic, you need to take the right actions, and use the right tools and strategies to unlock your creativity. Creativity is an infinite resource. You simply need to find the keys to unlock the vault to release the genii. In the next few sections we will discuss strategies, mind tools, and various divergent thinking and cognitive techniques to ideate, gain insight, or stimulate novel, unusual connections and solutions. Combinations of or slight alterations to the weird, the outlandish or even the banal can lead to novel, radical and disruptive inventions or alternatives for consideration and testing. See Chapter 14 for how to test inventions for viability.

There are literally hundreds of idea-generating tools in the popular literature and published books. The scope and focus of this book prevent us from covering them all. We include those thinking tools we found most helpful in our own careers or those most well-known in the organizations we work with, and therefore likely to be useful to our readers.

10.2 Brainstorming & Brainwriting

No book on creativity is complete without at least a small section on brainstorming. Brainstorming is possibly the most popular and widely known of all group creative techniques. Originally designed by Osborn [1], brainstorming is a face-to-face group thinking and idea generation technique. Although brainstorming as a concept for generating ideas will be known to most businesspeople, not all business teams use the tool effectively. Most teams know the four basic "rules" for effective brainstorming as: assemble a group; make the problem or objective clear to all participants; allow everyone to contribute ideas to ensure a high quantity of ideas; do not assess, criticize, judge or discard any ideas during the idea generation part of the brainstorming session; build on others' ideas … and then … creative magic will happen. Unfortunately, this is not the full (or even correct) success recipe, since humans suffer from three psychological limitations that limit the sharing of even the best of ideas. Unfortunately, recent research indicates that less than half of the available ideas in the room are shared. Why is this? How does this happen? This unfortunate reality is linked to four psychological principles of groupwork: evaluation apprehension; conformity or groupthink [2–5]; anchoring; and social loafing. Apprehension about evaluation by peers in the group can prevent people from offering ideas they may have pre-judged to be either unacceptable, doomed to failure or likely to be ridiculed by their peers. Further, in most group brainstorming sessions, a few assertive individuals (2 or 3 people) do 60–75% [6] of the talking and the rest are likely to be led by or conform to their ideas. Even worse, these initial ideas shared by a few are likely to disproportionately influence the rest of the ideas – this is called anchoring. Other participants unconsciously model their thinking on the prior conversation, thus limiting a wider range of domains or disciplines from being covered. The fourth psychological principle is named social loafing. This may result from the first principle: the assertive participants domineer the conversation and therefore the less dominant participants' ideas are ignored or never expressed. Loafing may also occur because it is easy to get away with not contributing in a large group – a phenomenon also labelled in education circles "being a group passenger".

To limit the consequences of these four impacts, two main types of adapted brainstorming have developed over the years: nominal brainstorming and brainwriting. For both of these, the aim is to allow individuals to generate a wide range of ideas before they are anchored or influenced by the group's contributions. Nominal groups start with a collection of individuals contributing anonymously to a pool of ideas (after a given, pre-allocated time to write down ideas and submit them to the pool). The merit of the idea, and its evaluation, is therefore separated from both the contributor and the evaluation process. This allows lower-status or more introverted participants to contribute ideas, meaning that all participants get a chance to contribute). Scholars [7] report that nominal groups generate better quality ideas, but interactive groups (traditional brainstorming groups) generate ideas of higher feasibility:

in other words less novel, but more appropriate ideas are generated by traditional brainstorming groups.

In brainwriting, ideas are written on a bulletin board (real or online) and are available to all participants after a pre-determined time. Individuals think on their own, before being exposed to other thinkers' ideas. Leigh Thompson [8], a management professor at the Kellogg School, found that brainwriting groups generate 20% more ideas and 42% more original ideas compared to traditional interactive brainstorming groups. In her book *Creative Conspiracy*, Prof Thompson discusses the range of benefits that stem from using brainwriting, designed by Prof Paul Paulus of UT Arlington.

In a blog contributed by RightSource™, [9] summarizing the work of Prof Thompson, the formula for a productive and effective brainstorming session is: ideas should be produced individually, while vetting of ideas should be done in a group: individual ideas + group analysis + democratic evaluation = good ideas. The tried and tested procedures are:

- Provide people with pads of sticky notes and pens so they can write their ideas down.
- Tell them what category/categories of ideas you want them to brainstorm.
- Set a timer; 2–5 min works well. You want to encourage people to write freely and get all their ideas out, without taking the time to evaluate them.
- Everyone should write down as many ideas as possible in the time frame. One and only one idea goes on each sticky note. (Make sure the team works silently, which will allow everyone to "share" their ideas at once, so they aren't influenced by anchoring and conformity.)
- Repeat steps 3–4 until you have many more ideas than you think you need.
- Have everyone post their ideas on the wall. This keeps the voting democratic because you do not know who wrote down which ideas.
- Everyone should then read through all the ideas and put a star on their top three (or whatever other number is appropriate).
- Use this voting system to kick off a critical discussion of the most popular ideas. Going around in a circle will ensure that no single idea is symbolically given priority over another.

Chris Griffith [10] suggests in *The Creative Thinking Handbook* that there needs to be careful consideration of and planning for two phases: (1) Pre-preparation; and (2) the session structure) for the "correct" brainstorming strategy (page 104). For the pre-session stage, he suggests finding a quiet, comfortable room that is available for at least one full hour. Aim for a round-table set-up with a number of props and coloured pens, and offer brain food and refreshments. Other materials to collect are flipcharts, whiteboard (s), whiteboard markers, timers, blank sheets of paper, sticky notes, timers, sticky tape or other temporary adhesives. In-session considerations are to select a facilitator; and to define the problem clearly or define the challenge accurately. The facilitator needs to control the group, allowing no lengthy discussions during the idea flow part of the brainstorming and encouraging equal

contributions. The facilitator must build in breaks to allow for refreshments, brain breaks and incubation to allow participants' unconscious mental processes to hatch new ideas.

The main defining principle for the altered brainstorming method of brainwriting is that idea generation should exist separate from discussion and idea refinement (which may involve sparking new ideas from those already generated, e.g. combining). The same general process is to generate ideas first by writing individual, categorized ideas first, and to talk second.

"When you have a brainstorming session, what you're hoping is that people are putting out any idea, without regard to any judgment or evaluation," says Leigh Thompson, professor of management and organizations at Kellogg and author of *Creativity Conspiracy: The New Rules of Breakthrough Collaboration* (2019). The article, based on a study by Elisabeth Wilson, Leigh Thompson and Brian Lucas [11], suggests that managers and group facilitators need to remove the barriers to self-censorship and create a level of comfort in bringing new ideas to the forum by allowing participants to each recount an embarrassing story. In scientific studies, the groups who broke the ice by sharing embarrassing moments got the creative juices flowing, generating significantly more ideas than those who recounted a proud moment or achievement, or the control group who told no stories. Scholars suggest that individuals who air their embarrassing stories encourage others to stop censoring themselves, thus enabling the flow and contribution of more outlandish ideas.

Software to support and apply the brainwriting principles to group meetings in a digital environment was developed by Carl Nordgren, who delivered the mobile app Candor™ as a way to generate, capture, organize, and evaluate ideas while bypassing some of the main obstacles posed by traditional brainstorming. With Candor™, ideas are generated in advance in writing, and later discussed and evaluated in person. This procedure increases the number and range of ideas that are proffered for consideration.

10.3 Mind Mapping

Creativity loves mental leaps, random associations, novel connections between ideas and associations between closely related or totally unrelated concepts. A valuable aid to facilitate this type of creative connections is a tool called Mind Mapping, developed by Buzan and Griffiths [12]. Most businesspeople will know Mind Maps as a useful technique for categorizing or linking ideas and recording existing knowledge. Originally designed to record connections between ideas, with its visual approach of providing line-links between concepts, mind mapping naturally facilitates connections between thoughts and ideas. A mind map may help in seeing how separate constructs might be combined in a new idea. Mind maps can also demonstrate how two separate alternatives might lead to an even better third alternative,

and are therefore very handy for recording brainstorming sessions or as a way for an individual creative thinker to expand on ideas. (For guidance, see a 3-min tutorial by Macgrercy Consultants at https://www.youtube.com/watch?v=wLWV0XN7K1g.)

10.4 Scamper®

Bob Eberle's creative idea generation tool, designed in 1971 and described in his book *Games for Imagination Development* [13], ignites creative thinking during brainstorming sessions. It is also very useful as a set of questions or a thought-provoking framework to help in developing or improving products and services. SCAMPER is a mnemonic for seven techniques; (S) substitute, (C) combine, (A) adapt, (M) modify/magnify, (P) put to another use, (E) eliminate/minimize, and (R) reverse/rearrange.

The SCAMPER Technique is versatile and simple to apply. The first step is to consider an existing product or service. The product could demand small to serious innovations or be used as the basis for another (future) product or service. The next step is to deal with each of the ideation questions at a time, finding alternative answers to each one in turn. For example, let us consider M & Ms, using the initial small, button-like, hard-coated chocolate pebble as the departure point. To find a new product we can apply S, and substitute either the chocolate (say with mint fudge or praline) or substitute the hard outer shell with a soft biscuit coating, or even a fruit-based skin. As a second example, we can consider using M (modify/magnify) and R (reverse). We can either magnify the inner, making the whole inner pebble bigger, still with a hard outer coat, OR magnify the coating, having a larger pebble, where most of the size increase is due to a thicker outer layer and a tiny chocolate centre. The sweet that results from the R in SCAMPER will be a chocolate-covered sweet, with a hard core at its centre. In the final stage, all creative answers are considered, judged, and filtered in terms of 'useful', 'not useful' and 'somewhat useful'. Further refinement of the initial ideas is likely to deliver even more creative alternatives. For example, the hard centre of the sweet produced when reversing the layers could have several layers with various flavours, or could have different colours and flavours in different sweets; say various fruit flavours, or various popular soda flavours. Viable ideas are collected and examined further.

10.5 De Bono's SIX THINKING HATS®

The six thinking hats is a fairly involved idea-generating tool. Some companies spend days (or at least hours) training their creative teams on how to use the tools. We suggest that you read the book by Edward de Bono [14], attend a course, or purchase the guides on applying the Six Hats to your industry or service type. We give a quick overview here and some tips and hints, but to implement this parallel

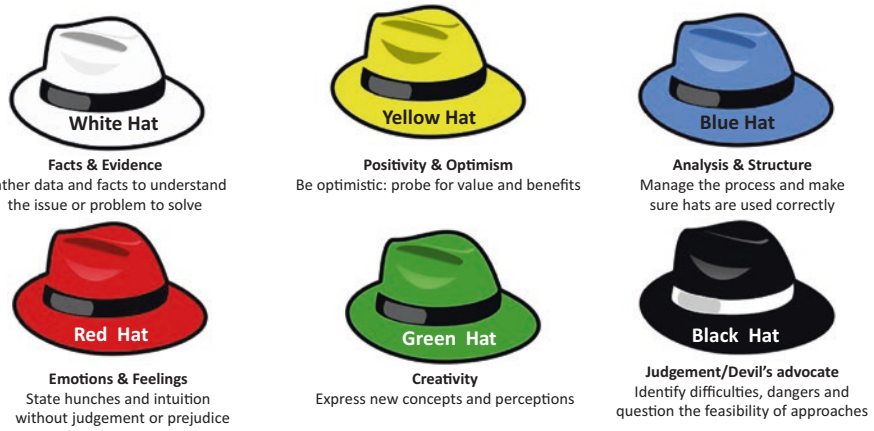

Fig. 10.1 De Bono's six thinking hats. (Based on the work of Edward de Bono [15])

thinking approach in groups, and plan your own think tanks, we suggest in-depth study of this tried and tested group thinking tool. The Six Thinking Hats is an effective parallel thinking process that helps groups to be more productive, more focused, and team members to be directed and mindfully involved. It prevents some of the psychological limitations of group thinking, such as conforming (discussed earlier in this chapter) and anchoring.

Six Thinking Hats was written by Edward de Bono in 1985 [15] and has become an approach to group brainstorming that is now widely used by businesses of all sizes and in a range of industries. The Six Thinking Hats approach and the associated idea of parallel thinking provide a way for groups to plan thinking process/tasks, and a means to organize thinking processes in a cohesive manner.

> Creative thinking is not a talent; it is a skill that can be learned. It empowers people by adding strength to their natural abilities, which improves teamwork, productivity, and where appropriate, profits. —Edward de Bono.

Edward de Bono identifies six different ways of thinking, each represented by a different coloured hat. The metaphor applies to thinking "wearing a different hat", using different ways to brainstorm and approach problems from various angles (Fig. 10.1).

The White Thinking Hat – Seeks Facts and Evidence

The white hat focuses on the available data. While wearing the white hat, thinkers collect data, and known information. Like a newspaper journalist or detective, white hat wearers gather facts and clues, but remain neutral, avoid jumping to conclusions and try to be unbiased. Evidence is analysed and weighed to see what facts and knowledge are available, and what is missing. White hat wearers ask:

- What do we know about this issue?
- What don't we know about this issue?
- What can we learn from this situation?

- How can we get the information we need to solve this problem?
- Are there potential existing solutions that we can use to solve this problem?

The Yellow Thinking Hat – Seeks Values and Benefits
This phase of the think tank represents enthusiasm and optimism – it brings positive energy to the idea generation process.

With the yellow thinking hat, you seek to find the benefits and value of ideas. You should not be hampered by limitations or boundaries, but rather believe that where there is a will, there's a way. As this is an optimistic role that focuses on what can be, questions are:

- What is the best way to approach the problem?
- What can we do to make this work?
- What are the long-term benefits of this action?

The Black Thinking Hat – Seek Pitfalls
The black hat represents the devil's advocate and judgement (even dissent). While wearing this hat, thinkers focus on the problems, the negative and how the situation, solutions or alternatives offered could go wrong. While wearing this hat, the proposed ideas and alternative solutions are considered for flaws, weaknesses, and possible dangers. This is not just a problem-seeking hat; it also considers the costs and resources necessary to execute the proposed alternatives to accomplish the project goals. Black hat questions include:

- How will this idea likely fail?
- What is this idea's fatal flaw?
- What are the potential risks and consequences?
- Do we have the resources, skills, and ability to make this work?

The Red Thinking Hat – Seeks Emotions, Fears, (Dis)likes
While wearing the red hat, thinkers offer ideas, proposals and comments based on gut feelings, hunches, and intuition. This hat is often used to gather the feelings and emotions of participants upfront, so that the group members can be heard and offer ideas without evidence, facts or data. It is also the hat that is re-appointed to consider whether the selected idea "feels like a fit" or "feels right for us". It provides a forum for airing participants' ideas based on experience, but on a purely emotional level. The aim of red hat thinking is to make intuitive insights known; allow the team's hunches and feelings to surface; reveal the hidden flaws and strengths of new ideas; use instinctive responses to consider potential weaknesses and pitfalls; and air likely internal conflicts. Red hat questions include:

- What is my gut feeling about this solution?
- Based on feelings, is there another way to fix this problem?
- What are our feelings about the choice we are making?
- Does our intuition tell us this is the right solution?

The Green Thinking Hat – Seeks Possibilities and Alternatives
Green hats are a metaphor for growth, fertility, progress and possibilities. When wearing the green hat, thinkers explore possibilities and think outside the box. When donning the green hat, thinkers are expected to bend the rules, forget limitations and "normal company" restrictions. During this stage it is expected or even required to go beyond the limitations of realism – no idea is too weird, too wild, or too abnormal to be discarded. They are all noted. Green hat wearers refrain from judging ideas or suggestions that are offered, but rather expand, transform, add, re-engineer, recycle and combine ideas to explore what is possible: this is blue sky thinking (not blue HAT thinking). Green hat questions include:

- Do alternative possibilities exist?
- Can we do this another way?
- How can we look at this problem from other perspectives?
- How do we think outside the box?

The Blue Thinking Hat – Seeks Control, Order and Collaboration
This hat is normally allocated to one member of the team. This hat charges the person with a management role (note it is not the project or team manager but a team role for the think tank) to keep activities on track; help participants to stick to the focus, agenda, norms and tasks of the group; organize the think tank and call people to action to participate. This role maintains order (e.g. asks people to tag ideas on the board) and organizes the proposals, follows up and draws up the resulting action plans. When wearing the blue hat, your job is to manage the thinking of the other hats to ensure that the team stays focused and works more efficiently toward a workable solution. The role makes sure the other hats are being used correctly. Questions include:

- What is the problem?
- How do we define the problem?
- What is our goal and desired outcome?
- What will we achieve by solving the problem?
- What is the best method for going forward?

There are multiple ways to apply this model of thinking to group or individual think tanks. The hats are mostly used in a metaphorical manner, and the blue hat wearer will call out the stage (i.e. which hat thinking style is required). Some groups allocate a hat to a particular (but randomly assigned wearer) for the duration of the meeting, while others rotate the hats in equal time intervals or over a series of think tanks. In terms of which sequence to wear the hats, it depends on what the desired outcome is, or what needs to be achieved. Not all meetings require all hats. Some marketing product developers, when brainstorming product launches for example, take the following approach and sequence of hats: blue hat (to define the purpose of the meeting and get it started); green (to inspire creativity to ideate new and exciting way to reach client audiences); red hat (to consider what emotions the various campaign possibilities would inspire in staff and clients). Some event managers suggest using the blue hat (as in the previous example to define the problem or aim), and

then use the red hat to allow emotions to surface and address major affective hurdles before they derail the think tank. Then they use the thinking hats by allocating them randomly to particular team members for the duration of the 1.5-to-2-h event planning think tank.

10.6 Lateral Thinking, Random Pictures, Random Word Techniques

Lateral thinking is the ability to use imagination and thinking in non-normal ways to look at a problem in a fresh way and come up with a new solution. Based on the idea that creativity is the ability to connect random or unrelated concepts, creative thinkers use tools to spark new associations or force them to link remote concepts to the problem. Two such tools are using random pictures or random words to spark solutions to problems. Consider the product development problem of creating a new toy for tweens (say 5–8-year-olds). Using the random word technique, thinkers may open a book of fiction or even a dictionary at a random page and scroll down to a random word. (Design thinkers often make their own random word cards on a 12×12 matrix and use two dice to determine which word to use.) This word should then be incorporated, somehow, into the suggested solution. Using a hard copy of the Webster Dictionary, the random word we stumbled upon was "rope". So, as our brains do, your mind might immediately jump to known toys like skipping ropes, "tug of war" ropes, climbing ropes, and so forth. Participating thinkers can now repeat the process to identify another random word to link to the first. Our experiment identified snake next. So, the "snake-rope" or "rope-snake" combinations resulted in (1) a toy that is a bit like puzzles or blocks, but like the connectors of puzzles or blocks, each rope ends in two adaptors/endings that allow for double or triple links between ropes. This allows kids to build their own nets, carry bags, and even small hammocks.

The random picture works similarly, but instead of words, a picture book, magazine or image site can be used to access random pictures (either of objects or actions). One of my clients has a set of full-colour photos (like deck of cards) from which to draw a random picture to inspire stories. Considering the toy for tweens once more, say we draw a picture of a very old lady. This might lead us to leap to fairy tales, witches and wizards. The witch idea leads to the idea of costumes with accessories such as mice, a black cat, a wand, a book of spells, and so on. A further mental leap gets us to the concept of "magic", which leads to a toy kit for magic tricks, containing a top hat, a black-and-white magic wand, a cape, and so on.

Attribute listing is another lateral thinking tool, where thinkers take an existing product or system, and break it into parts. Once the various parts have been identified, the attribute of each part is considered, along with how this part contributes to the whole. Thinkers then recombine these key parts and alter, revise or remove them to identify new forms of the product or system. Let's take Oreo Cookies as example. See the Matrix in Table 10.1 for a simple deconstruction of the traditional Oreo to consider new product developments:

Table 10.1 Reconfigured attributes of the American cookie, Oreo™

Deconstructed elements	Attributes	Reconfigured/altered attribute
Chocolate biscuit/ cookie	Hard	Soft one side; soft both sides; one side hard chocolate cookie, other side crust (say) caramel crumbs
	Dark chocolate	Red velvet, white chocolate; yellow lemon, light green lime
	Almost black	Red, white, yellow, lime-green; caramel brown
Embossed with slight riffled edge	Embossed with Oreo design	No embossment; embossed with Disney character (for kids); star wars emblem for young adults; coin face (for different countries)
Creamy Centre	White	Pink, blue, dark brown. OR Double centred: creamy white and cinnamon light brown
	Creamy	Jelly-like, hard, solid, crunchy
	French vanilla	Strawberry, hazelnut, lemon, orange, cherry, cola, salty caramel
	Between cookies	Over the entire cookie: fudge covered; hard chocolate covered; half-covered in strawberry dip; half-covered in cinnamon dip.

See https://www.oreo.com/oreo-cookies
Adapted and used with permission from the website, by Design Retrospective™

10.7 Five WHYs (5Wise Genii)

Taiichi Ohno, former Executive Vice President of Toyota Motor Corporation [16] suggested in his article TOYOTA Traditions, that a problem is not "a negative, but, in fact, 'a kaizen' (continuous improvement) opportunity in disguise." Whenever one cropped up, he encouraged his staff to explore problems first-hand until the root causes were found. "Observe the production floor without preconceptions," he would advise. "Ask 'why' five times about every matter." … He adds, "For Toyota to respond to market change, it is essential each associate is aware of problems and works to improve operations at every possible opportunity." Whenever a problem arises — whether it be in the factory or on the sales floor — we should follow Ohno's advice: go directly to the source and keep asking, "Why?" By never becoming complacent and always seeking to innovate, Toyota will be ready to overcome any challenges it may face in the future.

Taiichi Ohno gave an example of the 5Whys questioning style, citing the incident of a welding robot stopping in the middle of its operation. Through persistent probing into the problem, using the 5Whys in sequence (when asking the users/frontline/ most experienced staff members), the project team finally arrive at the root cause (RC):

- W1: "Why did the robot stop?"
  The circuit has overloaded, causing a fuse to blow.

- W2: "Why is the circuit overloaded?"
  There was insufficient lubrication on the bearings, so they locked up.
- W3: "Why was there insufficient lubrication on the bearings?"
  The oil pump on the robot is not circulating sufficient oil.
- W4: "Why is the pump not circulating sufficient oil?"
  The pump intake is clogged with metal shavings.
- W5: "Why is the intake clogged with metal shavings?"
  Because there is no filter on the pump. (RC)

Chris Griffith [10] suggest that decision-makers and problem solvers need not stop after five Why's. One can keep drilling down and probing to understand all the issues, build a comprehensive picture of the complexity of the problem, and determine the underlying causes.

10.8 Five Whiskeys in a Hotel (5W1H)

The 5W1H Framework ([10], p.85) provides a tool for gathering various perspectives and approaching a problem from a range of angles. This is particularly useful for complex problems, involving large numbers of stakeholders. It is very simple to use, as it is based on open-ended questioning techniques decision-makers are very familiar with: Why?, Where?, Who?, When?, What?, and How?

Using the *"Why?"* question at least five times to get to the root causes of a problem has been discussed already in Sect. 10.7, so we will focus on the four remaining questions.

The "*Where?"* question(s) uncover concerns, problems or opportunities regarding place or location, and can relate to both the location of the problem and the implementation of the solution(s). Where questions relate to where the problem can best be solved.

Very often, Where questions relate to "*Who"* questions and answers. Who can help to solve the problem? Who has the expertise to provide useful, practical solutions? Who questions help to directly or indirectly identify the person or people involved in the solution. They relate to Where, in relation to where and thus by whom the solution might be implemented, whether the problem can be resolved from a centralized unit (e.g. Head Office) or from decentralized units (e.g. each local franchise, branch, or service agent). Who questions need to consider both the stakeholders and the problem solvers. For example, if there is a problem with staff turnover, those leaving, those staying, HR and the line managers should be considered in refining the problem, finding solutions and selecting the most viable solution(s).

"*When?"* questions deal with timing and all sequential issues. When would be the best time to deal with the issue? When should solution(s) be implemented?

"When?" relates to deadlines, timeframes and milestones to be considered when solutions are considered. When questions determine parts of the solution that feed into the action plans and fit with the project implementation plans. For example, for our staff turnover problem, we might decide to implement a range of incentive and training programmes. When should managers be trained? What is the best time to calculate forecasts and set the incentive schemes up? When will the measurement and rewards take place? What is the best time to have an award function?

"How" questions relate to the origin of the problem and the impact and implementation of the solution. Some examples of How questions are: "How did the problem result from our activities? How did the problem evolve over time? How does the problem affect the users? How does the solution need to resolve the current dilemmas? How will the solution impact other tasks? How does the solution impact strategy and brand reputation? How will the different alternative solutions impact resources and influence other business units?

10.9 Alphabetical Thinking (Aka the A^2Z Tool)

This tool, for generating a divergent list of random concepts, can be used very simply or as a slightly more complicated thinking aid. The simple application is to ideate in alphabetical order. The first step is thus to identify words that are clearly and closely related to the problem in alphabetical order. Individuals or groups call out a word that relates to the problem, going down a vertical list from A to Z. Only the first word is accepted, and the group (or individual) moves to the next word. On completion of the full list (this should take roughly 2×26 min; about an hour) the think tank uses the alphabetical list of cause-related issues to think of solutions to that particular cause.

The more complex (or involved) application is to write the letters of the alphabet vertically downward (either on paper or digitally). Next to each letter the individual or group writes the words that come to mind, next to the letters, in consecutive order. More than one word is related to each letter of the alphabet (either the facilitator or the group decides how many words, but does not judge, criticize or qualify the word offered unless it does not match the letter of the alphabet). To prevent anchoring or social loafing, and to get a wider range of concepts while allowing people to work at their own pace, this list can be compiled individually and thereafter ALL concepts for each letter can be listed on a board or in a group format (e.g. Google Notes). The complete list of words is then used to spark ideas related to the "new" concept or sub-construct that relates to the problem. The question participants have to ask, after the alphabetical list has been generated, is how does each word relate to the solution? In this way, mental set fixation and anchoring can be overcome in group or individual think tanks. One way creative think thanks apply the A^2Z thinking aid is to give three to four letters, including the clustered concepts, to a small group (1–5 people) to generate solutions. These clusters, with their solutions, are swapped with the next group in the next round to build on the ideas generated.

10.10 Role-Play or What Would this Job Do? (WWJD – Functional Perspectives)

Research indicates that role-play has two valuable psychological benefits: it allows role-players (aka actors) to escape the limitations of their own skin (self-identity) and removes the self-auditing and lack of communication confidence barriers to enable people to present novel, even somewhat whacky ideas. Role-play or simulated interactions allow even the shyest of participants to take on a new persona, which may allow the shy individual to express him/herself more freely. Further, providing props such as masks, costumes, swords, beards, and other accessories turns the serious task of problem solving into the more familiar, entertaining task of play. As discussed earlier, playfulness allows for stories, flights of fantasy and escapes from reality that can reduce or eliminate fixation. Specifically, if participants are provided with job functions, personas or roles to enact, the simulated roles may move role-players from role fixation (on their own role in the business) to roles useful for solution-finding, such as customer, supplier, retailer, wholesaler, distributor or a range of other stakeholders.

Think tank facilitator, Rouxelle de Villiers (2021, unpublished study), suggested using full colour key cards (with names and demographics) representing a range of job functions, or the Little People™ tiny toys that represent different job functions. These toys also bring an element of colour and joy, and further offer sensory stimulation for people who are tactile and enjoy kinaesthetic (touch) stimuli. Various children's games (e.g. Guess Who™; Lego ™) have characters that are useful as props for think thanks. By taking these toys and placing them as props in a hat or soft bag to draw from, participants can end up with a random allocation of job functions or problem-related roles to consider during either the empathy phase (see Chapter 11 on Design Thinking) or the ideation phase of WWJD.

It is really simple to implement role-play or simulated interaction as ideation or empathy-generating tools. Participants can either simply think about a role (e.g. client, user, developer) or a random job function (e.g., teacher, librarian, nurse, accountant, butcher, pilot), or can draw a role (in the form of a card, doll, or persona key card) from a hat. After this, thinkers can select props to help them identify with or envision the role. Not all role-plays or simulations use props. They are nice to add, and add playfulness to the role-play, but are not essential additions to the think tank.

Easy implementation steps are as follows: The group designs a short drama or sketch where the problem manifests itself as it currently appears in the real world. Various role-players can enact the short sketch or drama. (This enactment is not always necessary, as participants are normally selected to brainstorm problems they are quite familiar with. However, it helps for them to see the problem from various "new" perspectives they might not have considered before.) The next step is to stop the role-play and allow participants a few minutes to mentally visualize the persona they represent – as these personas would be affected by the problem. Allow further time to consider how the role/job/persona would solve the problem under investigation. For the next step, the solution can be enacted, or there can be a discussion

about possible creative solutions, as seen from the perspective of the selected roles or job functions. Ideas from various contributors (those with functional roles and random job functions) can be combined to form novel, appropriate and viable ideas for further refinement to create viable solutions.

10.11 Metaphorical (Analogical) Thinking

In Chapter 7 we touched upon the use of metaphorical thinking to overcome self-imposed hurdles and mental obstacles in the form of limitations such as "There is only one right answer". A tool suggested to overcome this "single solution perspective" is to use various metaphors to reconsider either the problem itself or the possible solutions to the problem. Author Chris Griffith ([10], p.120) calls it a "potent way to escape the constraints of conventional thinking and embrace ambiguity." Further, metaphors help to verbally express complex concepts (including emotionally charged activities) and make sense of the unknown through the already known.

Well-known metaphors scattered through our language that help us understand complicated concepts in terms of ideas that are simpler, more well understood, or well-known to the listener, include: * time as money (e.g. you are wasting time; that error cost me an hour; she's living on borrowed time); * finance as water (e.g. cash flow; capital drain; sinking fund; liquid assets; flood the market); *thinking as a menagerie (e.g. leap of thought, jump from one idea to another; eat, drink and sleep hobbies); * business as a jungle (e.g. It's a jungle out there; dog eat dog; survival of the fittest); * life as a journey (e.g. we have come far; his career is on the rocks; she is at a crossroads in her career) and * knowledge sources as treasures (e.g. there is a rich source of info in that database; that encyclopaedia is a gold mine). Kevin Duncan, a business consultant, refers to the "analogy springboard" in *The Ideas Book* [17].

Metaphors are conceptual combinations, involving a vehicle concept to map onto a topic concept. The vehicle moves the listener from one main concept (the topic) to another second concept (target). Quite similarly, analogies involve a base domain and a target domain [18]. An example provided by Gentner [19] is "children are sponges". Children are the topic (or target) and sponges are the vehicle (or base). A key characteristic of a sponge, namely soaking up things, is mapped onto children – suggesting that children "soak up knowledge". The consulting firm Synectics™ suggests four forms of analogy to generate creative ideas (based on the studies by Gordon, [20], pp. 36–53): Personal Analogy (personally identifying with elements of the problem: e.g. if you have a problem with cats catching birds, imagine yourself as the predatory cat – or the threatened bird); Direct Analogy (the problem is with cars, so what other vehicles can we consider – boats, planes?); Symbolic Analogy (using poetic phrases and impersonal images to describe a problem, e.g. feral staff – when staff turnover is high; think like a journalist by creating a short, catchy title of only seven or fewer words); and Fantasy Analogy (wildest fantasies – if all our wishes came true, how would this work?). To find a useful metaphor to assist in

mental leaps, consider both the vehicle and the target. Figurative combinations can be even more inspiring than direct or literal combinations. (e.g. a literal combination would be "children are like sponges": i.e. sponges soak up stuff, kids soak up information; while a figurative analogy could be "a dirty mind"; dirty things are covered in grime and filth, and figuratively, so is a dirty mind). Gentner [19] suggests that thinkers using analogies can consider either mere attributes (colour, weight, size, other features) or less superficial relational comparisons (relationships such as: sounds are waves, the earth is like a magnet; life stages in humans are like those in amphibians or insects; cars relate to petrol as humans relate to food.)

Analogies and metaphors help thinkers to find alternative sources of ideas and insights into problems because of conceptual transfer. A good example is the hook-and-loop fastener (branded Velcro™), invented by George de Mestral in the 1940s. While hunting in the Jura mountains, the Swiss engineer realized that way the tiny hooks of the cockle-plant burs stuck to his dog's fluffy hair and his own pants could be used as a metaphor for "fastening". Similarly, various fruits such as bananas and peas have inspired creative designers to develop packaging that either opens like the food (peas inspired how cigarette packages are opened) or show how the packaging can be recycled or how the packaging can preserve food. (For novel and inspiring examples see http://graphicloads.com/creative-and-fun-packaging-design-ideas/). The way various animals protect themselves inspired tools and war machines like the tank and the shield. History and nature inspired Danish architect Jørn Utzon, both in the design and in finding solutions for the tiling of the Sydney Opera House. Elements of this highly innovative design were inspired by falling leaves, birds' wings, segments of citrus fruits, shells, walnuts, palm trees, and a Mayan temple in Mexico.

In practice the four stages that are useful to general creative insights from metaphors or analogies are covered here. As the first step in the process of metaphor-based creative thinking, practitioners suggest selecting an "action" metaphor to extend comparisons in creative thinking activities. For example, if the problem is (say) a business with too few customers, use actions such as *riding a bike; * catching fish; *travelling abroad; *running for office; *body-building activities; *baking a cake. (Select ONE metaphor that is familiar to the thinkers in the group).

The next stage is to unpack the metaphor as a list of actions (setting the original problem aside completely). Let's take the last action listed: baking a cake. The actions involved are: find a recipe from an expert; use quality ingredients; collect the ingredients; use a temperature-controlled oven; mix the ingredients carefully; beat the eggs and fold them in; butter the right size baking dish; bake at the right temperature for the type of cake; ask an expert (YouTube, book or family) about readiness checks; remove the cake using gloves; let it cool; decorate the cake.

In the third and last stage (when used for ideation - not including idea assessment), thinkers map the metaphor-related actions to the original problem. Back to the cake example, listing a few steps to illustrate:

*Find a recipe from an expert = Look at what other brands are doing to attract customers (e.g. big brands from the same industry; direct competitors);
*Bake at the right temperature = Make sure the products appeal to the right target audience and that we don't "under-bake" the value;
*Decorate the cake = After completing the sale, what value do we add?; how do we make the experience memorable, special or outstanding?

This tool can break mental set fixation, bring play into the process and trigger the mind's memory bank to find similarities between seemingly unrelated concepts, which is the very essence of creative thinking. We have covered only the idea generation stage here. The generated alternatives then need to be refined and assessed for appropriateness and sensibility (see Chapters 11 and 14).

10.12 Synectics

Synectics is a process of carefully and consciously relating seemingly [21] unrelated ideas or problem elements [22]. It relies on metaphors to make the strange familiar and the familiar strange [22]. It is a problem-solving methodology that was developed by George Prince and William Gordon to stimulate thought processes of which the creative thinker may be unaware. This structured thinking method originated in the Arthur D. Little Invention Design Unit in the 1950s. It is a comprehensive creative problem-solving process, which addresses all stages of the creative process and emphasizes differentiation between idea generation and idea evaluation.

Analogies
Synectics uses three metaphoric forms: the personal analogy emphasizes empathic involvement by having subjects try to identify with the object of the analogy; the direct analogy focuses on making connections between the object of the analogy and external facts/knowledge; and the symbolic analogy is a two-word description of the object of the analogy in which the words appear to contradict each other. At this point, we offer a few quick words to further explain the various analogies. Direct analogies are often the closest to how nature solves problems. Here the thinker applies facts, actions and ingredients from other sources, such as borrowing solutions from nature (such as "How do birds' wings work to help them stay in flight?" or "What can we learn from how otters build dams in running streams to ensure we can build strong walls?") By considering how living things or laws of nature cause or solve related problems, thinkers may adopt that approach and apply it to the current problem. In personal analogy, a thinker identifies with the problem, or at least a particular component of the problem, placing him/herself directly into the problem, accepting the role of some integral part. For example, in considering how to solve some mechanical problem with an engine, or improve its efficiency, the thinker might imagine being some moving part, enact the movement or imagine how that part "feels/behaves" and what they "drink, eat and sleep". In symbolic analogy, thinkers also identify with components, but here they consider objects,

images, words and phrases related to the problem. For example: If you were the stop sign in front of the school, how would you get more people to come to a complete stop? During fantasy analogical thinking, thinkers consider how situations would be if what is now impossible, were to be possible. Thinkers fantasize about ideal solutions that might not be practical now … but with the right innovations or inventions might be possible. Current limitations are discounted or ignored. (Also see the "What if?" tool discussed in Sect. 10.13.)

Roles

Synectics distinguishes between three roles: the facilitator is in charge of managing the process, but does not direct content; the client is the problem owner; and the participants are others who contribute their ideas about the problem at hand. Because participants do not own the problem, it is believed that they can provide the unique perspectives necessary for finding an innovative solution. Kostoff [27] also emphasizes the importance of obtaining fresh perspectives through cross-disciplinary access and experience.

Rules & Procedures

In general, there are three main "rules" for this method [20, 24–26]. The following steps are followed to accomplish the idea-generating goals of the problem owner(s). (If there is more than one problem owner, they need to take turns to state the problem in the "I wish" format discussed next.)

- The problem owner (there is only one per group at any one time) describes the problem in terms of wishes; that is, expressed as, "I wish…" or "how can I". This is more speculative and acts as a psychologically legitimizing sentence structure (e.g. "I wish kids of all ages could safely get themselves to school", rather than "Kids of all ages need to get to school safely without being driven". "How can we get all students to attend all classes all of the time?" is more stimulating and engaging than: "The problem is that all students do not attend class".
- The group generates as many solution approaches, called springboards, as possible.
- Contributing participants produce "headlines" ideas. "Headlining" simply means that the person giving the idea states the idea succinctly, only adding clarification if requested by other participants.
- Listeners, throughout the problem statement or headlining by others, use the "in-out active listening" technique. This means that listeners, when they have an idea pop up while they are listening, write it down quickly, to return their full attention to what is being said. This allows absorption of critical facts and others' ideas. In most ordinary groups, people with ideas are eager to share, and rather than listening, they rehearse their expression of ideas and try to find a space in which to interrupt the speaker.
- The group and the problem owners select and focus on generating solution ideas for the most promising springboards. ([26], p.153).
- After selection, various of the viability or appropriateness tools, which are discussed later in this book, are used to determine which ideas should be developed or taken to the next level for consideration and refinement.

10.13 How Might We? (HMW)

"How might we?" (HMW) questions are short questions that launch brainstorms. HMWs emerge from your point-of-view statement or design principles as seeds for your ideation. The aim is to create a seed that is broad enough that there is a wide range of solutions but narrow enough that the team has some helpful boundaries. For example, between the too narrow "HMW create a cone to eat ice cream without dripping" and the too broad "HMW redesign desserts" might be the properly scoped "HMW redesign ice cream to be more portable." The proper scope of the seed will vary with the project and how much progress you have made in your project work. Begin with your Point of View (POV) or problem statement. Break that larger challenge up into smaller, actionable pieces. Look for aspects of the statement to complete the sentence, "How might we…" It is often helpful to brainstorm the HMW questions before brainstorming the solutions. For example, consider the following POV and resulting HMW statements. Challenge: Redesign the ground experience at the local international airport POV: Harried mother of three, rushing through the airport only to wait hours at the gate, needs to entertain her playful children because "annoying little brats" only irritate already frustrated fellow passengers. Amp up the good: HMW use the kids' energy to entertain fellow passengers? Remove the bad: HMW separate the kids from fellow passengers? Explore the opposite: HMW make the wait the most exciting part of the trip? Question an assumption: HMW entirely remove the wait time at the airport? Go after adjectives: HMW we make the rush refreshing instead of harrying? Identify unexpected resources: HMW leverage the free time of fellow passengers to share the load? Create an analogy from need or context: HMW make the airport like a spa? Like a playground? Play POV against the challenge: HMW make the airport a place that kids want to go? Change the status quo: HMW make playful, loud kids less annoying? Break POV into pieces: HMW entertain kids? HMW slow a bunch of rowdy kids down? HMW mollify delayed passengers?

10.14 "What If?" Model (WiM)

The ability to project oneself into the future is a very natural mechanism for humans, and probably has survival value. We project ourselves into future scenarios, such as: What if the COVID-19 virus spread everywhere and was uncontrollable? How can we still serve customers when we are restricted to isolated areas? What will I do if there is an earthquake? What can I do to protect my family against home invasions?. We can see ourselves in new situations and new circumstances (e.g. holidays, new careers, new living spaces). As humans we plan and save for the future. We project how many kids we want, what career we want to pursue, how we wish to retire, and other long-term future-directed activities.

Our imaginations are powerful tools, not only in protecting ourselves, but also in creating progress that aids our well-being and comfort (think of the use of

vaccinations that protect our families from infectious and contagious diseases). So a good tool to use to take our imaginations beyond the limitations of the current restrictions and constraints[1] is the "What if? … model" (WiM). In the WiM, the focus is on removing constraints, limitations and current reality. We can visualize the new reality, the new event/issue/solution where the restrictions are lifted and opportunities are rife. We can visualize the best and worst case scenarios. We need to feel, hear, see and smell the future and then touch it. Tangibilize what the idea will look like by making a sketch, or building a prototype or 3D-model.

10.15 CUPPCO (Aka CUPPA Coffee)

Probably the technique with the most names is the one we will name CUPPCO here. It has several versions and permutations, but the most common of them are named: Action-Object; Crazy Play; or in this book CUPPCO or CUPPa COffee (for ease of recall). This is the first of the tools and techniques listed here, where the technique also spells out the assessment of the generated solutions (or springboards in the terminology of synectics, where we join seemingly unrelated ideas). This technique therefore straddles two stages in the 4-stage model by Kilgour: ideation and idea assessment. The technique consists of two stages of approximately equal length (half the available time – we suggest at least 60 minutes) and comprises the following steps.

State 1:Ideation
Split the group into two equal sub-groups (it is not a problem if the groups are unequal by one member; in this case the facilitator joins the initial action-object pairs). Each member of each group gets a unique colour note-card on which to write a single word in large letters. One half of the group writes down objects (named Group O), and the other half (Group A) writes actions (verbs/activities). Adept facilitators often ask participants to record actions and objects unrelated to the problem or design challenges. This really facilitates large leaps and associations between very distant domains. This step requires no more than a minute or two of thinking-writing time. The next step is to pair a person from group A and a person from group O. Each action-object pair uses their combined term (AO or OA) to design a solution for the problem. (This particular step can be repeated as many times as the pre-allocated time allows.) In other words, participants go around and generate a proposed solution based on a unique combination of their idea and an idea from the other category.

Stage 2: Refinement and Evaluation
Pairs are asked to verbally explain their combined, proposed ideas in 30 s or less. A list of all the ideas is recorded on a large sheet of paper, or digitally, or on a whiteboard. When the ideation process is done in virtual groups online, synthesized ideas can be recorded on a shared screen, using the exact phrases used by the originators.

[1] Read the book by Stokes, P.D. (2006). Creativity from Constraints about the various disciplines, from literature to fashion, advertising and architecture, to music. ISBN 0–8261–7845-6

All ideas are recorded without judgement, allowing listeners to form their own impression and interpretation of the worth of ideas. All participants are given an adequate amount of time to create a shortlist of ideas worthy of consideration, using the checklist that forms the name of the technique: Customer attractiveness; Production & Product Viability, and Competitiveness/SCA. Participants can either be asked to select a small number (say 8–10 in total), or select three or four top ideas in each of the three Cu-PP-Co categories. This shortlist can either be discussed and an even shorter short-list selected for each of the CUPPCO worthiness idea categories, or further idea refinement can be planned for another day (allowing for incubation).

10.16 Conclusion

To conclude this chapter, we highlight the main premise of these tools, which is that creative contributions and insights often come from leaps between domains or associations and combinations of ideas from diverse disciplines. Scholars are quick to highlight that this does not mean that novices or strangers to a domain will produce more creative solutions, but rather that "creative ideas are more likely to emerge when your mind is filled with relevant closely related material" (Sawyer [28], p.125). Major contributions come from people who can bring in a different conceptual framework and integrate it with their deep expertise. Divergent thinking is at the core of most of these tools, complemented by convergent thinking to refine the generated ideas to appropriate, valuable ideas worthy of implementation and business innovation. Lastly we offer some practical tips for using these tools: (1) Keep an open mind - some ideas that seem crazy at the outset might just hold nuggets of gold; (2) Use initial ideas to enrich, build upon, expand and build stronger ideas; (3) involve all participants – often the quiet ones just need an opportunity to share and delight; (4) have the group mindset that there are no bad ideas, just underdeveloped ideas; and (5) document everything.

Finally, we hope to inspire you to do the CREATiViTY LABORatory exercises below. You will find a few valuable new tips and insights woven into the activities.

CREATiViTY LABORatory

Activity I: Self-Directed Brainwriting

Brainstorming is a group or team activity and is unlikely to have the same useful outcome when done as an individual (right? 😊) but a form of brainwriting, combined with incubation, might just deliver those treasured new ideas. Here is the way.

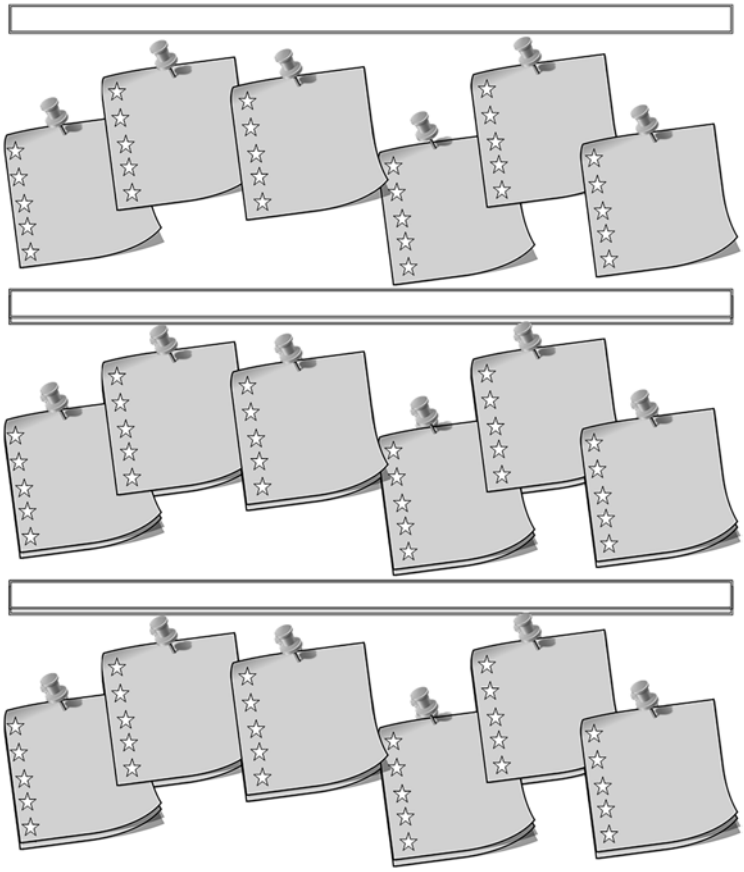

Fig. 10.2 Self-directed Brainwriting here

1. Write down a problem (or design challenge) as concisely and as accurate as possible in the first one of the framed boxes in Fig. 10.2. (*If you cannot think of one, here is one for you to mentally chew on: Too few parents volunteer for parent-teacher events to help teachers raise funds for additional school resources*.)
2. At the top of each Post-it note, next to the pin, write down a category or discipline you think can think of that may have something/nothing to do with the problem. Suggested: Furniture, Toys, Utensils, Tools, Scientific Instruments, Transportation, Appliances, Weapons, Health/Medicine, Fashion & Personal Accessories). (2) Brainstorm ideas – in your own mind! Do not stop until you have 5 or 6 ideas under each Post-It topic. (Try to list about 20 to 30 under each topic.) Challenge yourself even further: do not leave until you have 50 ideas or have spent 10 min by yourself contemplating the issue and generating ideas.
3. Set this list aside for at least an hour while you do other things (anything but actively thinking about this matter.)

4. Return to the Post-it notes and colour the stars next to the best ideas (you determine the criteria to be considered 'best'.)
5. Write the starred idea in the next one of the framed boxes and repeat the process. Do this at least three times. Any luck?

( Success has more to do with resisting premature rejection of the task, incubation, and considering various domains, than with luck!)

Activity II: The Problem with Private Property in Public Transport

Passengers keep leaving their umbrellas on public buses, causing huge problems for the bus company in storing and returning lost property. How can the transport services deal with this costly problem without simply shrugging it off as 'not our problem' and creating customer dissatisfaction? Use the three tools (SCAMPER, WWJD and Random Picture Technique) to ideate. Next, apply the 5WHYs framework to consider a range of causes. Then, use those causes to consider alternative solutions the bus company might use to either prevent or overcome this costly customer service. (If you are initially unsure how the job functions listed in the figure relate to the problem, try to make remote associations between the problem and the issues that job/role might deal with. How would someone in that role, solve the lost umbrella problem?) (Figs. 10.3 and 10.4).

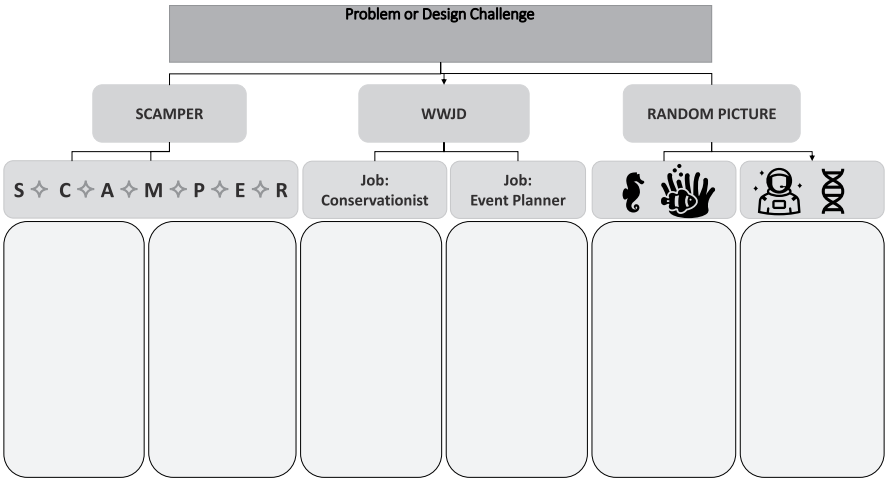

Fig. 10.3 Practice with three thinking tools

Fig. 10.4 Five Wise Genii

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Chapter 11
Design Thinking as a Problem Solving Tool

Rouxelle de Villiers

Abstract In chapter 10 we covered thirteen ideation tools. We dedicate this chapter to Design Thinking (DT), as a procedure to generate and test ideas, and even more importantly as a creative problem-solving methodology. DT is a human-centred process that will help designers, innovators, entrepreneurs and business executives to systematically solve complex problems, not only in product design and businesses processes, systems and other sticky organizational problems, but also in our communities and our everyday lives. Some leading global brands, such as Apple™, Google™ and Samsung™ have adopted the DT approach to complex problem-solving.

As DT is a shift in our way of thinking and a collection of hands-on methods and tools, we devote this chapter to this highly useful, well-honed 5-stage process. The chapter first covers the history of and thinking modalities involved in DT, then examines how various design thinking schools and leading universities (e.g., Stanford, Harvard and MIT) apply the DT principles using models with three to eight stages. Finally this chapter covers the 5-stage DT iterative process we propose for business executives – those who lead multi-disciplinary teams of innovators, ideators, intrapreneurs and others in business problem-solving roles.

Keywords Design thinking · Empathize · Human-centred approach · Prototype · Story-telling

Learning Objectives
On completion of this chapter, the readers will be able to:

- Understand the iterative nature of DT as well as its hands-on methods of thinking and doing.
- Apply a range of the thinking strategies and tools encompassed by the DT process.

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- Consciously break old habits of thinking and use a set of tools to find novel and appropriate alternatives to problems or design challenges.
- Differentiate between convergent and divergent thinking tools to aid intentional innovation processes within organizations.

11.1 Background

The concept and practices of design thinking [1, 2] (DT) are closely linked to the analysis of design thinkers' (DTers) processes, as described by Herbert Simon [3] and Donald Schön [4]. Donald Schön's book *The Reflective Practitioner* [4] is seen as the main catalyst for DT's adoption by various consultancies and agencies. The many articles and books written by principals from these design consultancies (e.g., IDEO) led to further popularization and expansion of DT in the management domain [5–7], and resulted in popularization to its "fad" status of today. In today's management toolkit, DT is offered as alternative to linear, analytical, and quantitative approaches to solving business and innovation problems [8].

Traditionally, design and the way designers think was linked to physical objects (e.g. [1, 2]). More recently, according to Prof David Keller of Stanford Business school, DT is being viewed a strategic weapon to solve really difficult problems in innovation. DT provides design thinkers (DTers) a set of thinking tools, and a 5-stage process to help divergent thinkers to consider content, capabilities, context and social needs to refine problems; consider a range of possible solutions; prototype likely solutions; fail fast; reiterate the process and innovate for viable, practicable solutions. Tim Brown, CEO of IDEO™, reports that "designers have a unique way of looking at things, and we call it 'design thinking'… [which] can be used to tackle a whole range of creative and business problems…design new strategy, open new markets, build new products, new services to meet new needs, …new ways of doing business and new ways to apply technology." [9] Global brands, including Adobe™ Apple™, Bank of America™, General Electric™, Google™, Hewlett Packard™, McDonalds™, Philips ™, Red Cross™, and Samsung™, have adopted the design thinking approach, and design thinking is being taught at leading universities around the world, including Stanford design school, Harvard, and MIT.

What is design thinking, and why is it so popular and effective? A study by Lotta Hassi and Miko Laakso [10], based on a management discourse on DT, describes DT as consisting of three dimensions: mentality, thinking styles, and practices. We discuss these three dimensions in the next sections.

11.2 Mentality

A comprehensive study [11] of the mindsets of DTers found 40 characteristics described in the literature. Researchers Marco Paparo, Cleo Dosi and Matteo Vignoli [11] describe eight clusters that capture the mentality of design-thinkers (DTers):

experimental, explorative and learning oriented; open-mindedness; willingness to integrate diversity; action - and visualization-oriented; holistic and integrative thinking; tolerant of ambiguity; risk embracing; and consciously creative. Tim Brown of IDEO™ views curiosity and finding fulfilment (even joy) in solving problems, as essential traits in creative leaders and effective innovators. Brown [6] and various other DT authors [12–14] underscore innovators' willingness to tolerate ambiguity, work within fluid and fast-changing contexts and processes, and generally accept failure en route to new solutions. All eight clusters [11] and the full set of 40 characteristics (p.371) extracted from prior literature are set out in Table 11.1 below. We add a ninth cluster from the work of Haasi and Laakso [10], namely visionary/future-oriented. A short definition of each mentality appears next to the title of each cluster, then a short extract from the prior literature, relevant to each cluster, and a short list of relevant studies is presented in the last column.

11.3 Thinking Styles

This dimension relates to issues such as cognitive styles, methods of thinking, and ways of processing information. Various proponents of DT stress the human-centred approach, thinking by doing, visualizing, and the combination of divergent and convergent approaches. Authors are consistent in emphasizing empathy towards current and future users (customers and other stakeholders) [5, 8, 14, 16, 37, 39, 40]. Innovation and management authors even label DT as synonymous with "customer-, user- or human-centred design" [41], with Porcini [42] labelling this customer-centredness as "being in love" [42]. The use of observational and ethnographic methods [5, 8, 32, 39, 43] is seen as a key means to achieve a deep and emphatic understanding of the customer. Beyond empathizing and understanding, collaborative design with customers [5, 12] is suggested as a viable approach. Proponents of DT see knowledge creation as an iterative, systematic process [44] where reflection-in-action [30] aids information gathering and knowledge advancement. The development cycles are systematic and rapid [8, 10, 14, 43].

DT practitioners use prototyping continuously [14, 20, 24, 36], starting "from day one" [5]. DTers explore what could be [20] by thinking: "What if… something completely new, could be, that would be lovely if it existed but doesn't now?" [39]. According to Lotta Hassi and Miko Laakso ([10], p. 7) "[p]rototypes are seen to facilitate thinking and knowledge creation by means of idea formulation and demonstration [40], to make concepts concrete [44], and to help the exploration of numerous possible solutions [20, 24]. In essence, prototypes can be seen as a tool for stimulating thinking and exploring ideas, not merely as representations of the products" [12]. Also, the prototyping stages are action-orientated. An action orientation or 'bias toward action' means "choosing action-oriented behavior over discussion and conceptual or analytical behavior. It is a preference to get out into the real world and engage users, do prototyping and test ideas as a manner of getting a team unstuck or inspire new thinking." ([11], p. 372). Further, Tim Brown, CEO

Table 11.1 Design thinking mindset characteristics

DT mindset characteristics			
Cluster	Definition	Characteristics	Literature
Experimental, explorative and learning oriented	An experimentation mindset is defined as "a bias towards testing and trying things out in an iterative way, and moving between divergent and convergent ways of thinking." ([15], p.47).	Learning oriented; unconstrained thinking; experimental intelligence; inquisitive and open to new perspectives; intellectual curiosity; playful and humorous; critical questioning - "beginner's mind"	[15–18]
Open-mindedness and diversity	"Open-mindedness entails being open to new ideas, new people and new ways of doing things, including … have a clear mission to create economic and human value for stakeholders" ([29], p.71). "Having an open mind means also to make errors and accept comments/ opinions on our own work. Only in this way it is possible reach high results" [19].	Open to diversity; willing to integrate diversity; embracing diversity; open to differences of personality and background; democratic spirit; open-mindedness; non-judgemental	20–22, 29]
Ambiguity, tolerance and risk embracing	Ambiguity is "the timely absence of information needed to understand a situation or identify its possible future states. Ambiguity is therefore a lack of information beyond risk or uncertainty which requires an awareness of all possible outcomes." ([23]: p.977).	Tolerance of ambiguity; open to the unexpected; embracing risk; comfortable with complexity and ambiguity	[15, 24, 25]
Empathy and user-centeredness	"The ability to 'put yourself in someone else's shoes' is essential if you want to understand the desires, hopes and problem of the users" ([11]: p. 372). "In designing something, we create value with people and for other people" ([29]: p.72). Empathy is the tool able to recreate abstractly a given situation and how individuals perceive it. [26]	User-centredness; empathy; human-centredness; social; co-develop value with user	[26–28]

(continued)

Table 11.1 (continued)

DT mindset characteristics			
Cluster	Definition	Characteristics	Literature
Action-oriented visualization-driven	An action bias means "choosing action-oriented behaviour over discussion and conceptual or analytical behaviour. It is a preference to get out into the real world and engage users, do prototyping and test ideas as a manner of getting a team unstuck or inspire new thinking." ([18]: p. 10)	Biased toward action; thinking through doing; prototyping visualization-oriented; desire to make a difference; optimistic and energetic	[15, 18, 28–31]
Radical collaboration	DT is fundamentally a social process and "only works in teams. Collaboration is essential for innovative outcomes" ([26]: p.7).	Eager to share; collaboratively geared; team collaboration; knowledge sharing; team working; active communication; visualization for collaboration	[16, 25, 31]
Holistic & Integrative thinking; problem framing	DTers see and understand the connections, the interactions and the dynamics of complex context. A holistic approach enables the capacity to simultaneously manage user's needs, problem's context, social and cultural aspects in which the solution will be used [12, 25] as cited in [11], p. 373). Identifying, framing, and reframing the problem to be solved are seen as equally important as solving the problem or finding an appropriate solution [12], looking beyond the immediate boundaries of the problem to ensure the right question is being addressed [36].	Mindful of process; holistic view; integrative thinking; problem exploration; problem framing	[12, 15, 17, 18, 31, 32]
Consciously creative	"Creativity" describes the individual's ability to develop ideas or products judged by others as new and adequate [33]. Creative people have to be unafraid to take the first step and unafraid of losing control of the process [34].	Conscious divergent thinking, connecting diverse domain and disciplines; consciously using thinking tools	[15, 18, 33, 34, 35]

(continued)

Table 11.1 (continued)

DT mindset characteristics			
Cluster	Definition	Characteristics	Literature
Visionary; future-oriented	Oriented towards what can be; what is possible, rather than what is. Vision versus status quo and intuition and foresight as driving forces; anticipate and visualize new scenarios. This future orientation is long-term, and the forces guiding the vision-driven process include intuition ([38, 42], and hypotheses about the future [38]).	Visionary; solution-oriented; positive, projective; intuitive	[36–38, 40]

of IDEO™, sees visualization as DT practitioners' main sensemaking device, using various ideation and communication tools to visualize ideas and concepts [8, 36, 43]. Symbols, models, mock-ups, and tech-based interfaces provide ways to express intangible concepts, models and ideas to aid common understanding [45], and allow for active engagement with shared ideas, revealing inter-dependencies, interactions and relationships that are not achievable with purely verbal presentations [44].

Additional practices of DTers that are valuable in working with diverse solutions and finding numerous alternatives are collaboration, team brainstorming and idea elaboration. Involving a wide range of stakeholders is seen as a key approach to refining the problem; finding a wide range of diverse (possible) solutions, and considering multiple domains and multiple stakeholders. Interdisciplinary teams are most typically employed throughout the design process, and teams may vary over the different stages of the DT process [5, 6, 8, 14, 16, 36, 41]. This concept links closely to the view of holistic thinking. Here DTers pursue 360-degree understanding of all issues [14], including the fact that the end-users' context, social and environmental factors are inherently linked to both the problem(s) and the solution(s).

A key challenge for a design team is to ensure that the problem is clearly defined and the working DT team has a common understanding of the context, capabilities, people and likely hurdles involved in the ideal solution. According to Nicholas Dew, DTers rely on their ability to think up new ways of looking at the problem [13]. This ability, referred to as "reflective reframing" of the problem or situation, includes questioning the way the problem is represented right from the outset [12].

Lastly, but at least of equal importance, are the dual issues of abductive and integrative thinking. Integrative thinking is seen as the cognitive ability to hold to opposing ideas in harmonious balance and to consider competing constraints, plaiting them into a solution that brings creative resolution to a third alternative model – containing elements of each idea or constraint, but superior to both [5, 20, 38]. This integration also refers to the ability to consider and create balance between the technical, business, and human dimensions [5, 14, 16]. DT pursues balancing (i) human-centredness with company-centricity throughout the cycle [44], (ii) exploitation with exploration, and (iii) analytical thinking with intuitive thinking [42, 44]. Abductive thinking goes beyond what is known (facts, theories, models,

design elements, products, machines, technology) to the exploration of what could be [20, 46]. Abductive thinking[1] challenges the known, the norms and current thinking, driven forward by the urge to create something new and find new opportunities [20, 38, 40, 47]. Tim Brown sees DTers understanding that there is no single answer to a problem, as a fundamental aspect of DT.

11.4 Practices

The "practices dimension" encompasses elements that are closely related to concrete activities, tangible approaches, ways of working, and using particular tools and processes of collaboration and integrative communication. Some of the elements included in the practices dimension include: human-centred approaches to problems; thinking whilst doing; synergy through collaborative work styles within multi-disciplinary teams; visualizing; tangibilizing (prototyping) solutions; and a strong emphasis on a combination of divergent and convergent approaches to generate multiple solutions to prototype, test and refine. DT practitioners emphasize DT thinking as inherently human-centred in approach, by "putting people first" [5, 42, 45], with 'people' being all stakeholders, and specifically the people with the problem that needs a solution. A key feature of the practices and processes in DT is the exploration of numerous problem statements and numerous possible solutions [20, 24]. Lotta Hassi and Miko Laakso [10] underscore the iterative and highly tangible approach favoured by DTers. The iterative development cycles of DT are characterized as rapid, systematic and continuous [8, 14, 36, 43, 44], with regular prototyping, testing and re-designing. This iterative process and visualization through prototypes facilitates idea formulation, aids in knowledge sharing, and facilitates discussion [37] by creating a means of demonstration [40], and helping to tangibilize[2] concepts [41, 44].

11.5 DT Process

Tim Brown, CEO of IDEO™, argues that DT in its most basic form is fundamentally "an exploratory process" that follows a non-linear, iterative design process with three basic phases: inspiration, ideation and implementation, to convert problems into opportunities ([6, 48], p. 17). The Stanford design school (commonly known as the Stanford d.school, established in the early 2000s by David Kelly) depicts the DT process in five stages: empathize, define, ideate, prototype and test (see Fig. 11.1) (https://dschool.stanford.edu). Some of the tools that are useful to

[1] Abductive reasoning is a form of logical inference formulated from inconclusive or incomplete information, relying on inference or intuition, and is directly aided and assisted by personal experience.

[2] Tangibilize – make it tangible or concrete; an equivalent term is 'concretize'.

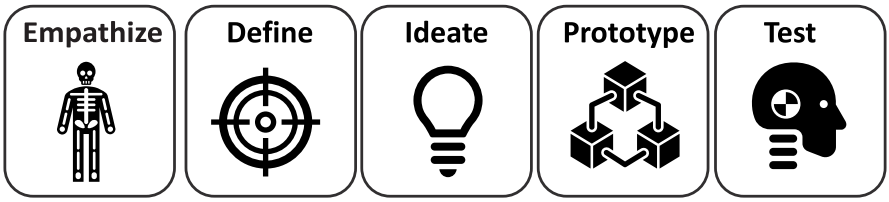

Fig. 11.1 The five stages of the DT procedures

Table 11.2 Models of design-thinking process in practice

Stage	IDEO	Continuum	Stanford Design School	Rotman Business School	Darden Business School
Stage I – Data gathering about user needs	Discovery and interpretation	Discover deep insights	Empathize and define	Empathy	What is?
Stage II - idea generation	Ideation	Create	Ideation	Ideation	What if?
Stage III - Testing	Experimentation and evolution	Make it real: prototype, test, and deploy	Prototype and test	Prototyping and experimentation	What wows? What works?

Adapted from Liedtka [28], p. 928)
IDEO.com. 2014. Available at http://designthinkingforeducators.com/.Continuum.com. 2014. Available at http://continuuminnovation.com/whatwedo/. Stanford Design School. 2014. Available at http://dschool.stanford.edu/use-our-methods/; University of Toronto Rotman School DesignWorks. 2014. Available at http://www.rotman.utoronto.ca/FacultyAndResearch/EducationCentres/DesignWorks/About.aspx; University of Virginia's Darden Business School Design at Darden. 2014. Available at http://batten.squarespace.com/

activate the team during each of the stages appear in the table next to each stage (see Table 11.2). It is important to note that the phases are not linear, but iterative (you can come back to an earlier or go to a later phase at any time). According to Tim Brown [6], the phases may be entered and left at random intervals and are best perceived as a system of overlapping spaces rather than as sequential, orderly steps.

There are many variants of the DT process in use today and being taught by various business schools. They vary from three to eight modes of thinking, or stages. However, all variants embody the same principles originally described by Nobel Prize laureate Herbert Simon in *The Sciences of the Artificial* in 1979. The various DT processes are summarized in Table 11.1, adapted from a study by Jeanne Liedtka [28].

In the next few paragraphs, we discuss each of five phases, provide some examples to aid in application, and present some ideas on how to implement DT to its full potential as a trans-disciplinary, collaborative complex-problem-solving process.

DT tackles complex problems in five iterative stages:

Empathizing: Understanding the human needs involved.
Defining: Re-framing and defining the problem in human-centric ways.
Ideating: Creating many ideas in ideation sessions.
Prototyping: Adopting a hands-on approach in prototyping.
Testing: Developing a prototype/solution to the problem.

Phase I: Empathy

> Empathy is at the heart of design. Without the understanding of what others see, feel, and experience, design is a pointless task. —Tim Brown, CEO of the innovation and design firm, IDEO.

Design thinkers (DTers) need to understand the context within which the problem they need to solve exists. One of the main distinguishing features of DT is its human-centredness. This means that an important aspect in the DT process is pursuing and building a deep understanding of the needs and desires of all the stakeholders; in particular the end users of the proposed solutions. DTers take deliberate and conscious action to understand the feelings, values, norms, pressures, and experiences of the end users and other key stakeholders. Tim Brown ([49], p.1) describes various actions including interviews, shadowing customers and users on their experience journey, seeking experience to understand the problem (e.g. using the product yourself) and non-judgemental engagement in an "effort to see the world through the eyes of others, understand the world through their experiences, and feel the world through their emotions." Some of the tools used to gain higher levels of understanding of the entire problem and how it affects users include reading customer complaints, and engaging in interviews, observations and immersive experiences. Immersive experiences are aimed at developing empathy by physically and psychologically experiencing the context of users; e.g., mystery shopping and shadowing. Shadowing is a user-observation experience, where DTers follow users for a day to experience every moment through their lens, get to understand their moments of joy and frustration and how the problem affects their service/product/problem experiences. For some projects, interviewing or observing experts may be useful in problem framing or solution finding. For example, to understand why certain customers are frustrated with flight onboarding processes, it might be useful to research how both the frequent flyer and the first-time traveller go through the booking-in process. Designers are likely to notice both the good and the bad, and consider ideas to reduce the bad and increase the good components of the experience. Dave Gray [50], the founder of XPLANE (goo.gl/EKnM3U), a consultancy company, developed The Empathy Map as a business tool to help organizations to understand their customers' experiences and expectations. A copy of the empathy map is displayed in Fig. 11.2. On completing an empathy investigation, DTers use the insights gained to refine the original problem statement to guide further phases in solving the problem(s).

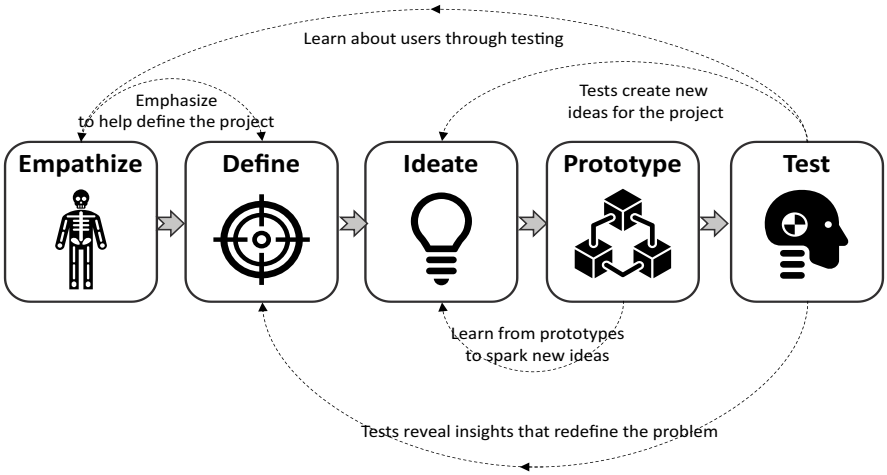

Fig. 11.2 Design thinking (DT): a non-linear, iterative process

Phase II: Define

The Define Phase, according to the Interaction Design Foundation (as cited in Lee, [51], p. 94), involves "creatively piecing the puzzle together to form whole ideas, organizing, interpreting, and making sense of the data we have gathered to create a problem statement". Once DTers have collected the various perspectives, studied and interpreted the needs of the users, and analysed the brief or initial problem thoroughly, five outputs can be developed and visually captured, among them a mutually acceptable problem statement. The problem statement defines a common purpose and a challenge to the DT team to find a desirable solution. David Lee [51] suggests a further two methods to synthesize teams' learning: Story-share and Capture, and Structuring Insights. The Design Academy (Amsterdam) suggest developing three to five key personas that are likely to be key role players in using and adopting the problem solution. We discuss each one of these tools briefly below. (Please note that these are not sequential stages, but tools that can be used throughout the DT process. They are listed here to help you gain a firm grasp on the problem and beneficiaries' needs, desires and motivational drivers.)

II.i Story-Share and Capture

The story-share tool developed by the d.school (Kelly and Brown at IDEO™), helps the participating team members to unpack the insights gained from their interviews, observations and primary research. Team members write concepts or important realizations on sticky notes (ONLY ONE per note). Each sticky note comprises a short title describing an observed activity, action, behaviour and response by the observed stakeholders. Many sticky notes are placed on accessible, visible boards and participating teams create clusters of themes or patterns emerging from the stories. Prominent ideas or recurring themes are discussed to share and synthesize valuable insights. The main benefits are that the entire team compares and contrasts

findings, so that these discussions help to generate new insights and act as catalysts for new solutions.

II.ii Structuring Insights

Once the findings and realizations are visually clustered and displayed, participating DTers turn the findings into insights. The insights, as defined by Matt Cooper-Wright at IDEO™, are realizations that help the team to better respond to the problem or design challenge. Insights normally include the finding and the cause of the finding (the symptom and the causes). An example provided by David Lee ([51], p. 96) states a finding as: F1: Businesses are doing well and remain in this area for years. I1: Business are doing well and remain in the area, because of easy access via bus routes and the highway (cause of behaviour). Cooper-Wright, design lead at IDEO (as cited in Lee, [51], p.97) suggests asking germane questions to determine the quality of the insights: "Do the insights inspire the DT team to start designing for problem solution? Do you have a story that can explain your insight and response? Does the insight have the potential to affect the design? Is the insight relevant to the contact of the design challenge?"

II.iii Problem Statement

A clear, well-defined problem statement helps the DT team to work towards a common solution. Defining the problem well is essential to solving the problem effectively and appropriately. Einstein believed that the quality of the solution is directly proportional to the ability to identify the right problem to solve. Einstein is quoted [52] to have said: "If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and five minutes thinking about solutions." Although most sticky and complex problems will demand more than 5 min of thinking about solutions, the principle of the matter is clearly illustrated by the quote: make sure the problem is the "right one" before embarking on a solution-finding mission. The first (and possibly most essential) part of the problem definition is identifying the user(s). (see the Persona section for more detail). The problem statement takes the original brief or identified concern/issue and turns it into fairly loosely defined problems.

II.iv How Might We (HMW)

Authors Lee ([51], p. 97) and Andersen ([52], p 1.) suggest that a problem statement can be redefined as a "How might we…". This particular wording helps to unite the team in their collaborative effort to solve a common problem and ignites the ideation and prototyping phases. The Design School at Stanford suggest that HMW questions "turn perspective into actionable provocations" (https://dschool.stanford.edu/resources/how-might-we-questions). When the insight is that "Licking someone's ice cream cone is more tender than a hug", some of the suggested HMW questions (based on earlier user observations/identified needs) are: (I) HMW make an "I'm sorry" ice cream cone experience? Or (II) HMW design an ice cream cone that says goodbye? Or an HMW question that challenges assumptions, for example: (III) HMW share an ice cream without a cone or cup? The HMW question needs to be broad enough to inspire and be the catalyst for a wide range of solutions, but narrow enough to provide some helpful boundaries for the team.

If everyone is thinking alike, then somebody isn't thinking. —George S. Patton

II.v Persona

According to the Interaction Design Foundation [53] (https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process), "Personas are fictional characters, which you create based upon your research in order to represent the different user types that might use your service, product, site, or brand in a similar way. Creating personas will help you to understand your users' needs, experiences, behaviours and goals. Creating personas can help you step out of yourself. It can help you to recognize that different people have different needs and expectations, and it can also help you to identify with the user you're designing for. Personas make the design task at hand less complex, they guide your ideation processes, and they can help you to achieve the goal of creating a good user experience for your target user group." Personas provide meaningful archetypes, which you can use to assess your design development against. Constructing personas will help you ask the right questions and answer those questions in line with the users you are designing for. For example, "How would Peter, Joe, and Jessica experience, react, and behave in relation to feature X or change Y within the given context?" and "What do Peter, Joe, and Jessica think, feel, do and say?" and "What are their underlying needs we are trying to fulfil?"

Persona [54] data sheets also provide insight into the way different users make decisions about the design challenge (problem/issue), which pain points they face that are relevant to the problem/issue, and what phases of the service journey are most relevant to the problem, and therefore also the solution. Various templates are available from a diverse range of providers. (Search for them using Google Images). In their article, *Personas– A Simple Introduction* Rikke Friis Dam and Teo Yu Siang [54] explain that the process of creating personas helps creative genii to understand user needs, behaviours, experiences and goals.

The purpose of working with personas is to be able to develop solutions, products and services based upon the needs and goals of your users. So, be sure to collect real data and describe personas in such a way as to express enough understanding and empathy to understand the users [53] (See Chapter 12 on storyboards and online sources [55]).

Phase III: Ideate

Once designers have analysed the observations of the Empathy and Define stages of the DT process, and produced a human-centred problem statement, the team can start identifying possible solutions and concentrating their efforts on idea generation. There are many ideation, divergent and lateral thinking techniques [56–60], such as analogical thinking, brainstorming, Braindumping, BrainWriting, BrainSketching, metaphorical thinking, ideation heuristics such as Random Word Technique (RWT), SCAMPER, Worst Possible Ideas [56], CUPPCO and many more (see tools in Chapters 3, 4, 7 and 10). These enable the DT process to generate as large a range of alternative problem solutions as possible, right from the beginning of the Ideation phase. Towards the end of the process, prototyping and other

techniques should be used to investigate the suitability and efficacy of the ideas and to find ways to circumvent barriers to execution and application. On a cognitive level, ideation means going wide and deep "…in terms of concepts and outcomes. Ideation provides both the fuel and also the source material for building prototypes and getting innovative solutions into the hands of your users." [61]

IV. Prototype (Also phase V of the DT process)

> By taking the time to prototype our ideas, we avoid costly mistakes such as becoming too complex too early and sticking with a weak idea for too long. Tim Brown, CEO of IDEO [61]

Many of the proponents of DT recommend some form of prototyping as an effective way to gain insights into a problem/solution and test the practicability of a solution. "This method involves producing an early, inexpensive, and scaled down version of the product in order to reveal any problems with the current design" [61]. Because consumers and users may find it hard to visualize a new solution, a prototype might help DTers to investigate how a sample of users think and feel about the suggested solution. Prototyping can be used during any stage of the DT process, but is often part of the Define Phase, shared with the DT team itself in order to be examined, improved, accepted or rejected (ACT = accepted, changed, trashed), mostly based on a sample of users' experiences. Providing the prototype for testing and further discussion provides the team with additional insights about how real users might behave (think/feel/respond) when interacting with the proposed solution.

Phase V: Test

> If the user is having a problem, it's our problem. (Steve Jobs, founder of Apple Computers)

After identifying suitable solutions during the prototyping phase (IV above), DTers or assigned adjudicators and evaluators rigorously test the Pareto prototype. The Pareto prototype is a label for prototyping products or inventions that are 80% ready, but all problems or concerns are clearly not yet 100% ironed out). As mentioned earlier, the DT process is iterative and results generated during this test phase are likely to be used to redefine the problem, improve understanding of the way stakeholders perceive and use the new solution, or improve designers' empathy towards the context, in terms of how users think or feel and how they behave, once the solution is available to them. The main desired outcome for this phase is to arrive at an even deeper understanding of the product (designed output) and to rule out possible future problems with the suggested solution(s). Feedback from users and other stakeholders is obviously of great importance to ensure that any unforeseen factors and limitations are cleared up, before launching into production or implementation of the suggested solution. Ditte Mortensen [62] suggests DTers need to use qualitative and quantitative consumer research to test the relevance, desirability, and return on investment (ROI) of proposed designs. Quantitative user research, such as surveys, scenario experiments, laboratory and field experiments, is used in pursuit of statistics, and to measure user behaviour and actions. Usability tests and interviews with future users are examples of qualitative research tools to investigate attitudes, intent, motivation and other emotional aspects. These exploratory user studies seek deep insight into and understanding of future users – both individuals and user groups (Fig. 11.3).

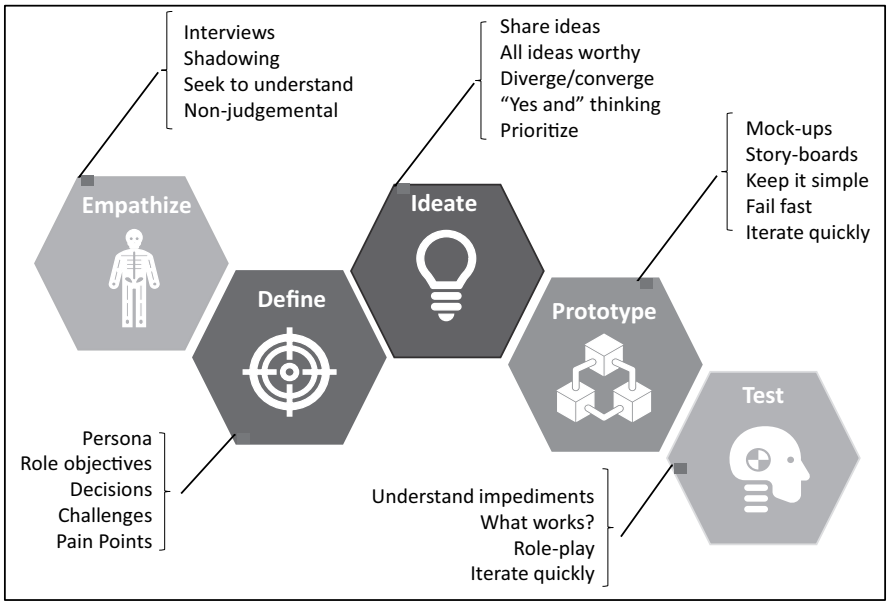

Fig. 11.3 Overview of the Standford d.school DT Process. (Adapted from https://dschool.Stanford.edu) [63]

It is clear that the five stages (illustrated in Fig. 11.4), use a variety of thinking (cognitive) and behaviour (conative) tools to uncover needs, reduce cognitive biases and generate a diverse range of solutions. DT uses a wide range of human resources in the form of collaborators [64] to define and refine problems and conduct human-centred need analysis focused on users; opportunity scouts and creative genii to idea proposed solutions; engineers, manufacturers, product developers and researchers to prototype the viable alternatives; experimenters or research testers to fine-tune and produce alternatives; and finally implementation teams to project-manage the adoption of the solution. An in-depth study by Jeanne Liedtka [65] considers DT as an end-to-end system for problem solving, delivering a bundle of tools, attitudes and approaches to novice and expert multi-disciplinary teams, which combines risk-reducing analytical and creative reasoning to produce solutions. Liedtka [65] considers the managerial roots of DT as it is practiced in highly innovative organizations (HIOs) and finds that many theories are echoed elsewhere in management theory and practice (see Table 11.3).

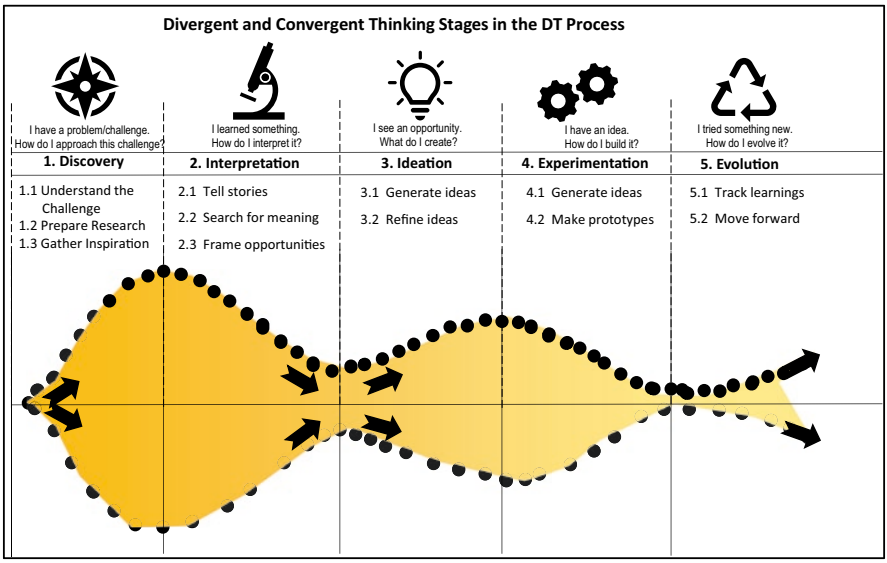

Fig. 11.4 Five stages in the DT Process, illustrating convergent and divergent processes (IDEO™)

Table 11.3 Common design-thinking tools

Common design thinking tools	
1	Visualization involves the use of imagery, either visual or narrative. In addition to traditional charts and graphs, it can take the form of storytelling and the use of metaphor and analogies, or capturing individual ideas on post-it notes and whiteboards so they can be shared and developed jointly.
2	Ethnography encompasses a variety of qualitative research methods that focus on developing a deep understanding of users by observing and interacting with them in their native habitat. Techniques here would include participant observation, interviewing, journey mapping, and job-to-be-done analysis.
3	Structured collaborative sense-making techniques like mind mapping facilitate team-based processes for drawing insights from ethnographic data and create a "common mind" across team members. Collaborative ideation like using brainstorming and concept development techniques, assists in generating hypotheses about potential opportunities. These tools leverage difference by encouraging a set of behaviours around withholding judgement, avoiding debates, and paying particular attention to the tensions difference creates in the process of seeking higher-order thinking and creating more innovative solutions.
4	Assumption surfacing focuses on identifying assumptions around value creation, execution, scalability, and defensibility that underlie the attractiveness of a new idea.
5	Prototyping techniques facilitate making abstract ideas tangible. These include approaches such as storyboarding, user scenarios, metaphor, experience journeys, and business concept illustrations. Prototypes aim to enhance the accuracy of feedback conversations by providing a mechanism to allow decision-makers to create more vivid manifestations of the future.
6	Co-creation incorporates techniques that engage users in generating, developing, and testing new ideas.
7	Field experiments are designed to test the key underlying and value-generating assumptions of a hypothesis in the field. Conducting these experiments involves field testing the identified assumptions using prototypes with external stakeholders, with attention to disconfirming data.

Adapted from Liedtka [28], p. 928

11.6 Conclusion

A well-established body of knowledge confirms the value and usefulness of DT as a methodology and set of tools for HIOs and managers in pursuit of creative solutions to a wide range of problems. Key benefits of this well-tested, human-centred problem-solving approach are that it decreases human thinking errors and biases such as confirmation bias and loss aversion (and a host of thinking errors discussed in Chapter 7), and increases diverse thinking tools, and enhances iterative and reflective habits. DT applies high-fidelity practices from psychology, management, marketing and innovation.

CREATiViTY LABORatory

Activity I: Cognitive Biases

Explain how the DT process will overcome any four of the nine cognitive biases listed below. (Answers can be found in the paper by Jeanne Liedka ([28], p. 930-931) (Table 11.4)

Table 11.4 The relationship between DT and cognitive bias theory

DT relationship with cognitive bias theory		
Cognitive bias	Description/definition and source	How does DT address or reduce this cognitive bias or thinking flaw?
Projection bias	Projecting the past into the future	
Egocentric empathy gap	Projecting own preferences onto others	
Hot/cold gap	Overemphasis on particular elements of the problem or solution	
Focusing illusion	The current state of affairs colours one's assessment of the future state	
Say/do gap	Inability to accurately describe one's own preferences	
Planning fallacy	Overconfidence and unfounded overoptimism about possibilities	
Hypothesis confirmation	Looking only for confirmation of the hypotheses (not contradictory evidence)	
Endowment effect	Decision-makers resist loss and attach more value to what they already have than to new avenues/ways of doing.	
Availability bias	Preference for what can be easily obtained, with regard to resources and solutions	

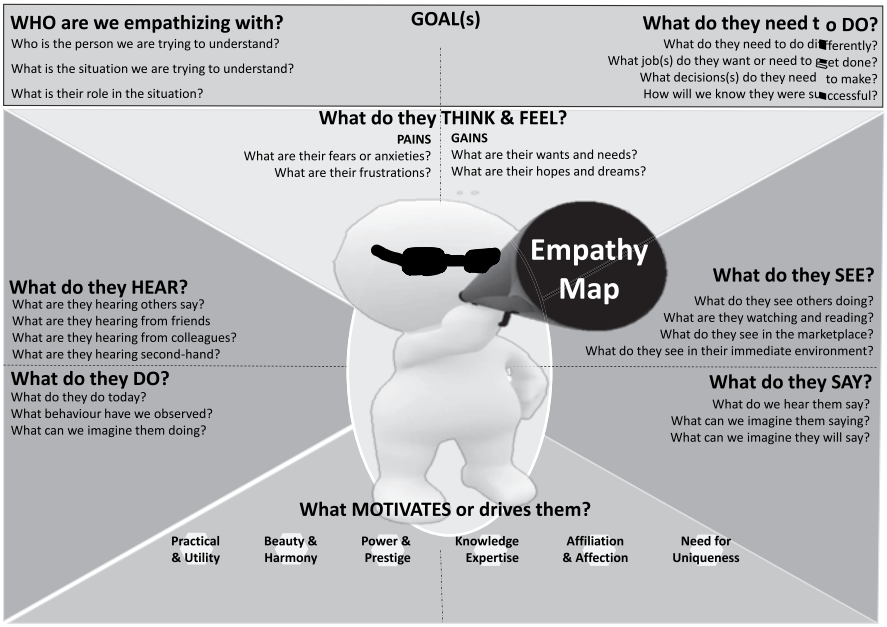

Fig. 11.5 Empathy map to facilitate persuasive idea sharing

Activity II: Empathy Map

Use the empathy map provided in Fig. 11.5 to consider a project or idea you need to "sell" to an antagonist. Try to "wear their/his/her shoes" for a day. Consider their pain points and the gains they might desire. Place yourself entirely in their shoes as you complete this map below. (You might like to copy a bigger version and consider a few rival positions or "enemies of the idea"). How does understanding their motivational drivers and their goals change the way you think about the way you might persuade them to buy into your idea?

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Chapter 12
Elegance of Expression – Aesthetics, Genesis and Persuasion

Rouxelle de Villiers and Louise Luttig

Abstract In this chapter we deal with the third and fourth indicators of creativity (after novelty/new/unique and appropriateness/effectiveness), namely elegance of expression and genesis. The final two pieces of the jigsaw to understand and assess creativity involve firstly a genii's ability to persuade someone that the idea or creative product is valuable and has merit. Secondly, the idea's value is increased, the lifespan extended and its impact on society broadened when the idea leads to further extension, expansion or related novel ideas that germinate from the roots of this new idea.

Keywords Aesthetic criteria · Creative Solution Diagnosis Scale (CSDS) · Elegance · Expression · Generative · Genesis · Speech bubbles · Storyboards · Storytelling · Thought clouds

Learning Objectives
On completion of this chapter, the readers will be able to:

- Apply the Creative Solution Diagnosis Scale [1] (CCSDS) to products or new ideas to determine their creative merit.
- Develop persuasive expressions such as presentations and pitches.
- Apply the tools and tips on using visualization techniques to enhance presentations, by applying the tips and tools on how to use storytelling and storyboards.

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12.1 Introduction

Earlier in this book, we have provided four characteristics to define creative output (product):

(1) Novelty/uniqueness/surprising
(2) Appropriateness (correct/useful/valuable)
(3) Elegance/pleasingness/, and
(4) Germinal/generative

We have covered the aspects of novelty and surprise (unexpectedness) of creative outputs to a fair degree. Suffice to say that novelty and surprise are not sufficient to determine whether an act, product, or output is creative. For example, surprise that is derived from ignorance, lack of discipline knowledge, or blind rejection of what is known or in existence, is merely "pseudo-creativity" (creativity as a superficial experience) ([2], p. 271). Similarly, a high level of fantasy with a tenuous connection to reality (weirdness), is merely "quasi-creativity" ([3], p. 34) and of little value to society because of its lack practical value or uselessness.

In this chapter we focus our attention on two aspects, not yet attended to in any great detail previously, namely aesthetics (elegance of the solution, pleasingness, completeness, recognition), and germinality (genesis, generic or generalizability beyond the immediate solution; infers or prompts even more new alternatives). To illuminate creative output or product (of the 6Ps) further, we cover aspects related to appropriateness (utility, correctness and performance) in a lot more detail when discussing selection, the stage models and evaluation of inventions for commercialization (see Chapters. 14 and 18).

12.2 Aesthetics & Elegance

Aesthetics refers to a set of qualities of something that "excite admiration in the mind of an observer" ([4] p. 155). Bob Slater [5] broadly categorizes three types of open-framed, general aesthetics, namely:

(1) Pure aesthetic qualities (e.g., exquisiteness, gloriousness or gracefulness"),
(2) Formalist qualities (e.g., "unity," "harmony," or "complexity"), or
(3) Technical properties (e.g., "high quality of construction", "skilfulness", or "professional finish").

Perceptions of aesthetics are also situational. This can be easily demonstrated by examples from the domain of photographic art: a photograph of the blood-stained body of a new-born in the arms of the elated mother, versus that involving the body of an infant from a war zone or as a result of a traffic accident might be equally impactful, but not equally pleasing. Contextual information influences (perhaps even totally alters) the perception of observers of the aesthetic value of a phenomenon, product, service or idea. A moth in the context of your outdoor lamp may be a beautiful sight, but a moth in the flour in your pantry is potentially aesthetically displeasing.

Further, the perceived creativity of a product is not an objective fact, like weight or colour, size or dimension (which can be measured accurately with appropriate instruments), but a subjective association, perception or interpretation. Noted scholar Mihalyi Csikszentmihalyi [6] acknowledges that creativity lies in the eye of the beholder and involves a "relative subjectivity", by stressing that creative outputs are domain-specific, and experts in a domain express their (dis)approval thereof. Readers will intuitively agree that creativity in engineering and science will be quite different from say, music or literature.

David and Arthur Cropley [4] believe that a universal set of criteria or standards to evaluate creative product/output between disciplines would be useful, to enable observers to compare outputs from various disciplines. For example, the creative aspects of the Mona Lisa could then be compared (at least using the universal aesthetic measure) to that of the Golden Gate Bridge, and then again to a new technological solution for a manufacturing process or medical phenomenon. So perhaps such a set of measures or standards of universal aesthetics will allow a comparison of artists' creations, philosophers' novel ideas, scientists' original theories and facts, and businesspeople's reimagined products and processes [4]. An attempt at finding such a set of generalized criteria is reflected in the "universal aesthetic criteria" of William Hogarth [7]:

(a) Harmony among the parts of a work
(b) Variety in as many ways as possible
(c) Uniformity, regularity or symmetry, which is only beautiful when it helps to preserve the harmony (in a)
(d) Simplicity or distinctness, which gives pleasure not in itself, but by enabling a beholder to enjoy the work's variety
(e) Intricacy, which makes it necessary for the beholder to think actively about the work
(f) Magnitude or quantity, which captures beholders' attention and produces admiration and awe.

Creative products can, as indicated, be classified according to the four characteristics of usefulness (effectiveness, relevance), novelty, elegance and genesis. Cropley and Cropley [8] suggested a new complete and generalized classification, based on the original definition and the work of Hogarth. In their assessment tool, creative output is classified in a matrix, using the four dimensions discussed throughout this book, by arranging them in a hierarchy from the "routine" product (characterized by the single characteristic of effectiveness), to "innovative" products (characterized by all four characteristics of effectiveness, novelty, elegance, and genesis) with "original and "elegant" in between those two outer extremities. This classification system, named the Creative Solution Diagnosis Scale (CSDS) is shown in Table 12.1, where a plus sign means that this dimension is necessary for this kind of product, a minus sign that it is not, and a question mark indicates that the characteristic depends on the domain or discipline knowledge available or the producers' willingness to ignore or have a tenuous connection with reality.

In some later studies [1, 9] of functional creativity (e.g., consumer products, engineering solutions) the authors suggested five classification criteria (see Table 12.2): propulsion, problematization, effectiveness, elegance, and genesis.

Table 12.1 Revised four-factor CSDS structure for functional creativity

Functional creativity*					
Product/output classification ➔	Kind of product				
	ROUTINE	**ORIGINAL**	**ELEGANT**	**INNOVATIVE**	**PSEUDO- OR QUASI-CREATIVITY**
Effectiveness (appropriate)	+	+	+	+	−
Novelty (unique, new)	−	+	+	+	+
Elegance (expression)	−	−	+	+	?
Genesis (generative)	−	−	−	+	?

*Note: See expanded explanation of the terms in Table 12.2

Table 12.2 CSDS a tool: Levels and kinds of creativity in creative output

Relevance & effectiveness	Problematization	Propulsion	Elegance	Genesis
Performance	Prescription	Redefinition	Pleasingness	Vision
Appropriateness	Prognosis	Re-initiation	Completeness	Transferability
Correctness	Diagnosis	Generation	Sustainability	Seminality
Operability		Redirection	Gracefulness	Pathfinding
Durability		Reconstruction	Convincingness	Terminality
Safety			Harmoniousness	Foudationality
			Recognition	

Adapted from Cropley & Cropley [4], p. 157
*Note: See expanded explanation of the terms in Table 12.3

According to David Cropley [4], novices and those seeking less complicated tools can with much success use the four-factor CSDS matrix 2005, 2008), as covered in Table 12.2. In their 2012 study David Cropley and co-researcher Kaufman [1] suggested an expansion of the original four factors into a five-factor assessment tool. They concluded that the revised CSDS [9] tool "offers product innovation management an important new tool for formulating highly differentiated measures of product creativity that can be used in the development of new products both as a means for stimulating and enhancing creativity and as a diagnostic tool in the process of selecting product ideas". In a revised tool to assist novice and non-expert raters to assess product creativity, Cropley and Kaufman found clear support of a revised and reduced 24-item scale, named CAT (Consensus Assessment Technique).

The complete CSDS tool as displayed Table 12.3 can be used by novices and experts alike, for the consensual assessment of functional product creativity. Table 12.3 reflects both internal and external indicators of creativity products (output) and maps the criteria of creativity and properties of the product(s), indicating effect on the beholder/adjudicator.

According to the authors [1], the indicators in Table 12.3 can be recognized with a substantial level of agreement by different observers, whether domain experts or

Table 12.3 The Complete Creative Solution Diagnosis Scale (CSCS) [1]

Criterion of creativity	Kind of solution	Property of the solution	Indicator
Relevance & effectiveness	Routine	Solution displays knowledge of existing facts and principles and satisfies the requirement in the problem statement	CORRECTNESS (the solution accurately reflects conventional knowledge and/or techniques) PERFORMANCE (the solution does what it is supposed to do) APPROPRIATENESS (the solution fits within task constraints) OPERABILITY (the solution is easy to use) SAFETY (the solution is safe to use) DURABILITY (the solution is reasonably strong)
Novelty	Original	Problematization (solution draws attention to problems in what already exists)	DIAGNOSIS (the solution draws attention to shortcomings in other existing solutions) PRESCRIPTION (the solution shows how existing solutions could be improved) PROGNOSIS (the solution helps the beholder to anticipate likely effects of changes)
		Solution adds to existing knowledge	REPLICATION (the solution uses existing knowledge to generate novelty) COMBINATION (the solution makes use of new mixture(s) of existing elements) INCREMENTATION (the solution extends the known in an existing direction)
		Solution develops new knowledge	REDIRECTION (the solution shows how to extend the known in a new direction) RECONSTRUCTION (the solution shows that an approach previously abandoned is still useful) REINITIATION (the solution indicates a radically new approach) REDEFINITION (the solution helps the beholder see new and different ways of using the solution) GENERATION (the solution offers a fundamentally new perspective on possible solutions)

(continued)

Table 12.3 (continued)

Criterion of creativity	Kind of solution	Property of the solution	Indicator
Elegance	Elegant	Solution strikes observers as beautiful (external elegance)	RECOGNITION (the beholder sees at once that the solution "makes sense") CONVINCINGNESS (the beholder sees the solution as skilfully executed, well-finished) PLEASINGNESS (the beholder finds the solution neat, well-done)
		Solution is well worked out and hangs together (internal elegance)	COMPLETENESS (the solution is well worked out and "rounded") GRACEFULNESS (the solution well-proportioned, nicely formed) HARMONIOUSNESS (the elements of the solution fit together in a consistent way) SUSTAINABILITY (the solution is environmentally friendly)
Genesis	Innovative	Ideas in the solution go beyond the immediate situation	FOUNDATIONALITY (the solution suggests a novel basis for further work) TRANSFERABILITY (the solution offers ideas for solving apparently unrelated problems) GERMINALITY (the solution suggests new ways of looking at existing problems) SEMINALITY (the solution draws attention to previously unnoticed problems) VISION (the solution suggests new norms for judging other solutions existing or new) PATHFINDING (the solution opens up a new conceptualization of the issues).

laymen. According to creativity experts this tool "can be used to judge both amount and kind of creativity". This model is valuable to aid clear discourse and common understanding among creative individuals and stakeholders such as critics, sponsors, and clients to enable them to communicate clearly about their judgement of creative output. In addition, the model and set of criteria assist educators, development officers, trainers, students, the general public and creatives over a whole host of domains with guidelines for teaching and developmental activities.

You will find a case at the end of the chapter, which illustrates how these indicators of creativity can assist in judging two completely different products (as

solutions to the same loosely defined problem). (We acknowledge the verbatim use of the case with the generous permission of the authors.)

12.3 Germinality or Generative Aspects of Creative Ideation

As indicated by the CSDS assessment tool discussed in the previous section, the generative capacity of creative products is concerned with unrelated or marginally related problems, offers new solutions for old/existing problems, and draws attention to future work or previously unnoticed problems or expansion of options [10, 11]. Generalization is a broadening of an application to encompass a larger domain of objects of the same or different type.

What makes the germinality aspect of creative products so valuable is the already included new conceptualization made possible by the novel solution. In the business world, where innovation to keep up with competitors is the name of the game (and probably means competitive edge or survival), this built-in generative capacity of a novel product is very valuable, as it leads to further ideas and possible expansions from which to generate revenue. Take as example the current extensions of Lego™(various construction packs aimed at young builders from 5 to 95 years old, e.g. Hogwarts Extensions™; Lego Movie™ Theme packs) and Monopology™ board games (Little Monopoly™, Socialism™, Game Spice™, Free Parking MiniGame™; or see https://www.youtube.com/watch?v=Fo-W2l60cFw for other varieties).

Staying with the toys and games theme, film franchises seem to have taken generative toys and film-related merchandize to a whole new level. A whole new stratosphere of profit-making was originally launched in 1977, when the Star Wars™ franchise released toys, apparel, video games, and even toasters that burn Darth Vader's face onto your bread. Today, merchandize often rakes in far more money than the original film. Consider Toy Story 3™ as example. In 2019 Disney™ reported that the franchise had already generated $9 billion in global retail sales since its 1995 inception [12] (https://www.bbc.com/news/business-48691854).

But movie-related toys boost more than Disney's coffers. In June 2019, Jill Treanor, business reporter for BBC News, noted those franchises are an important fuel for toy sales in the UK. Market research done by NPD [12] indicates that the total sales for the year 2020 were £3.3 billion, making the UK the fourth largest toy market globally. In total, 23% of toy sales in the UK were generated by franchises – and almost half of that was related to films. According to Nielsen analysts, while The Force Awakens™ earned $2 billion in ticket sales, Star Wars merchandising neared the $5 billion-$6 billion mark in its own fiscal year. Minions™ is an example of how 'merch' makes money for movies … the first movie in the franchise generated $10 billion in global merchandise sales by June 2015.

It is clear that the ability to extend the scope and range of a new idea can not only add profitable extensions, but it will also cut future ideation, prototyping and testing time substantially by including those 'next stage' developments in the first test cycle.

12.4 Putting Image in Imagination: Expression

Although hundreds of definitions of creativity exist, the broad idea is that creativity involves the ability to produce something that is new or original and valuable or useful within a particular domain [13–15]. This output can be produced by individuals or a team of creatives. However, the outcome, output or product is evaluated by a domain audience (group of users, consumers, clients or prospects of products. (Please refer to Chapter 9 for the model of the creative space of novelty, appropriateness & expression). Different groups will value the output differently based on their perceptions and needs. Some will appreciate, reject, embrace, and cultivate or put the creative product aside to be forgotten – in this way creativity is also a sociocultural phenomenon. Part of a creative product's value and longevity is therefore the persuasive power of the communicator (sharer, pitch, marketer, seller) to convince the audience(s) about the value of the novel idea.

In the next sections we look at the social environment for which the creative output is produced. Further, we consider genii's or teams' creative intelligence (CiQ), which incorporates their ability to sell the ideas to others. In the next few sections, we cover pitches, bids, storyboards, white papers and business cases briefly. Each of these possibly deserves an entire chapter (or even a whole book), but the scope of this handbook allows us a mere few key pointers to introduce the concepts. Avid learners can pursue these topics further in the various online and printed guides across various domains such as marketing, advertising, project management, event management and design thinking.

The following section focuses on figurative word picturing, storytelling, and delivering bids and pitches.

12.4.1 Visualization

Visualize or Word Picturing

Adept communicators advise the selection and use of imagery and word pictures the audience (your target audience, i.e. prospects and clients) can identify with [16, 17]. A great example, from a few decades ago, is the comment by Time Inc.'s new president Dick Munro. The New York Times's journalist asked Dick about his plan for his company. His response is quoted as: "We're not going to rebuild the engine; we're just going to play with the carburettor a little bit". Munro understood his readers. Instead of using hackneyed business clichés like "optimize productivity, improve efficiencies" and alike, he chose a phrase that could conjure up imaginative future activities and suggested only minor changes.

Word pictures or figurative language have been part of humanity since the beginning of time. Stage playwriters, politicians, novelists, journalists, and educators have over the ages relied on analogies, metaphors, idiomatic expressions and word pictures to aid audiences' understanding and persuasion. Think of word pictures

like Winston Churchill's "iron curtain", Jacinda Ardern's "our nation, our village", Shakespeare's "world as a stage", JK Rowling's "you … evil little cockroach", Sue Grafton's "books are like movies of the mind", Eric Taub calling large Ford cars "land yachts", Edison's weight measure being equal to "two bags of grain", and Elmer Wheeler's "sell the sizzle, not the steak". (For various examples of a host of other forms of figurative speech such as puns, hyperbole, idiomatic expression, metaphor, simile and personification, see linguistic sites such as www.litcharts.com or https://www.britannica.com/art/figure-of-speech online.)

Scholars [17–20] report on business executives' increasing use of information visualization to clarify complex concepts to convince audiences (employees and customers) and to improve their persuasive abilities. These tools range from common graphs, graphics, PowerPoint™ and Prezi™ as visual aids, to infographics and augmented reality digital visualization tools [17–20].

In this medium, data visualization is moving to the fore as a way to communicate concepts, ideas, and designs, to draw in users and stakeholders and fast-track decision-making by explaining how concepts work in a real user environment.

Visual storytelling is certainly not a new concept. From the earliest communications (cave drawings, historic age-old parchments and scrolls, and hieroglyphics) semiotics, symbols, icons and simple graphics have been used to relay messages or communicate meaning. Visualization using photographs, maps, cartoons, iconographics, symbols and digital tools is also not a new concept, as the 4553 covers of the Times Magazine since 1923 and thousands of issues of *Science* and *Popular Science* (since 1872) will attest [Manovich].

According to a podcast by Eric Rodenbeck [21] CEO of Stamen Design, "information visualization is becoming more than a set of tools, technologies and techniques for large data sets. It is emerging as a medium in its own right, with a wide range of expressive potential".

Sujia Zhu and her co-authors report that, when "[c]ombining data contents with visual embellishments, infographics can effectively deliver more messages in an engaging and memorable manner than tedious raw data" (p. 24). This seems to be a recurring theme in a whole host of domains, besides the traditional media communications and marketing/sales disciplines.

Today, data visualization is used across all industries to increase sales with existing customers and target new markets and demographics for potential customers. Graphs and charts communicate data findings so that we can identify patterns and trends to gain insight and make better decisions faster. One of the most famous information visualizations in the world is the map of the London Underground [22].

With this tool at their fingertips, enhanced by visualization competencies of adept communication teams, businesses today are finding new ways to simplify complex concepts. Messages include explanations of the impact(s) of various options on a project, health and public safety issues, or to present options for cost-efficiency and long-term future proofing that facilitate decision-making and help to sell complex concepts. An example of this would be an interactive way to explain how a train station's layout need to both facilitate train drivers' view of signage, and meet passengers' needs to access the next exit quickly and efficiently. Using game

virtual designs and visual technology, decision-makers can be immersed in a real-world experience of the station layout, to understand the impact of small design changes, and to factor in the cost of such changes in terms of long-term benefits such as passenger safety and ease-of-use.

Imagination being Engineered = Disney Imagineering[1]©

Readers may or may not agree, but for my two daughters and I (now grown-ups with their own little die-hard Disney fans), Disney parks, Disney Magical Worlds™ (in themed parks called (Disney World™, Disney Kingdom™), Disney movies or PC games are some of the most imaginative and exciting spaces in the world of entertainment. These resorts and attractions (including Disney [23] Cruise ships, various games and the profit engines of movies and merchandise) are entertaining, educational and creatively inspiring.

In the world of business and innovation (as business focus for creative ideas), the ability to excite and delight literally millions of consumers across the globe across cultural constraints, is truly the magic of Disney ventures. The Disney Imagineers™ include a team of thousands of creatives (engineers of all kinds, and artists) who work in close-knit project teams to turn ideas and events into stories, designs, buildings, and products that sell! Disney Imagineers literally on a daily basis invent new technology, tools and ways of communicating ideas.

A common theme that emerges from reading/watching the Disney Imagineers' shared lessons is that the ability to communicate ideas (i) using stories with both cognitive and emotive impact, and (ii) experienced through multiple senses is at the heart of audience engagement. Various techniques are discussed and can be accessed at https://www.khanacademy.org. Treat yourself and learn something new today. (Remember to leave a small token of appreciation in the form of a no-obligation donation.)

In the next few sections, we will cover the two key abilities of visualization and engaging storytelling in more detail.

12.4.2 Various Visualization Tools & Techniques

Image Streaming (MIST Technique)

Bryan Mattimore [24] offers creative techniques for conjuring up word pictures or finding appropriate figurative language to "sell" an idea. In his book *99% Inspiration* Mattimore suggests "image streaming" and picture-cut-and-paste or visual narrative analysis (VNA in qualitative research) as tools to consider. Image streaming is, simply put, the process of allowing one's mind to conjure up images related to the communication problem under consideration. The first part of the process is a

[1] Walt Disney Imagineering© "is the creative engine that designs and builds all Disney theme parks, resorts, attractions, and cruise ships worldwide, and oversees the creative aspects of Disney games, merchandise product development, and publishing businesses".

simple, effortless imagination of images in the form of a passive visualization process. The second part is the more critical synthesis phase, where verbal descriptions of the images are described out loud (even when alone), as the images arise in the minds' inner movie. This achieves a type of "synaesthesia or synthesizing of the senses… when you overlap two or more senses" ([24], p. 93). Thus, using more than one sense, and engaging more of the brain at any moment, increases the brain's likely problem-solving capacity. Mattimore reports that studies at Southwest State University in Minnesota find that students can increase iQ-levels by up to "20 points after only 25 hours of image streaming". The Mattimore Image Streaming Technique (MIST) involves four distinct stages:

(1) Ask yourself (or let someone ask you) a question,
(2) Do not attempt to answer the question directly. Instead close your eyes, relax, and without consciously trying to answer the question, begin to describe the images as they appear in your mind's eye. Do this for a few minutes (at the outset a few minutes will be fine, but as you get more experienced use 30 minutes or more),
(3) Record the images on a recording device (voice recording if possible),
(4) Study the images for their metaphorical value. What could the image mean as it relates to your problem? Look for underlying meanings, however silly they might seem initially. (E.g. building a plane as you are flying it… what does that mean?).

Initially this technique might seem strange, even weird, but as you practise it, you will find it useful to solve some sticky problems (whether arranging a party, writing a corporate vision statement, or choosing a career). You will be in great company if you do so. Research indicates that world-renowned scientists and inventors like Da Vinci, Edison, Einstein, and Faraday used visual processing modes in their work. Bryan Mattimore [24] concludes: "… not surprisingly, it was this ability to visualise that these scientists felt was most often responsible for their creative breakthroughs" (p. 84).

Mood Boards or Mood Mirrors (M & Ms)

Interior designers, architects, manufacturing design engineers and other creatives use image boards (also called mood boards since they intend to reflect affect or emotions) to learn about the particular likes and expectations of their clients and to evoke or project a particular style or concept. M & Ms act as tools to communicate concepts and ideas visually. Using this technique entails creating a large display (digital or hard copy) with an arrangement of images, materials, letter or word art and multi-media (the latter obviously when in digital format). The mood board/mirror contains images of relevant objects, text and materials (wood, leather, metal, stone), fabrics (cotton, linen, silk, poly-fibre), technologies (AR, VR, robotics), symbols semiotics, colours, and so forth. (For example, if designing an interior for a client, this might mean colour swatches, fabric clippings, magazine images of furniture, textured wallpaper swatches, photos of door handles, etc.) To design the

Ford Taurus, Eric Taub reports using a variation of this cut-and-paste mood mirror to create the then-revolutionary "car that saved Ford" Taurus design.

Practitioners suggest that mood boards must capture the feeling or emotional response the audience is to experience; they are intended to drive the aesthetic of the pitch and production stages and act as key reference for the emotional impact of the communication. So, production teams must take great care in testing the affective response M & Ms are likely to create in viewers or the audience. To do this, teams must use multiple media, including the more traditional scrapbook or bulletin board - but also consider digital platforms such as Pinterest; programmes such as StudioBinder™, CanvaTM, Pond5™, Flicker™ and Kanopy™ for inspiration. Collaborative content platforms such as Pond5™, EverNote™, AppleNotes ™, and Google Keep™ can be used to share the M & M as widely in the production team as possible for input and comment.

Speech Bubbles & Thought Clouds

Speech bubbles and thought clouds [25, 26] are tools for which participants are invited to either fill the speech bubbles with the hypothetical or imagined voiced opinion or unvoiced thoughts of someone. The speech is either the participant's own or that of an unidentified or imaginary persona, often used as a standard tool in human centred design disciplines based on real data analysis of trends and patterns.

Story archetypes can be helpful to develop personas, antagonists and protagonists for your story-boards [27] (For more ideas see these sources: https://doi.org/10.3390/admsci6020005 or https://www.kirstenenglish.com/uploads/2/5/6/7/25677021/archetypesandsymbols.pdf)

Thought bubbles record the projected private, unvoiced thoughts of the writer themselves or that of an identified persona, e.g. gold-digger, drama queen, or stereotyped job-function, e.g. lawyers, students, or consumer types. Both speech bubbles and thought clouds are used in a variety of settings, such as projective techniques in research, and are often more well-known to the general reader as comic strips, anime or graphic novels. Facilitators use pre-drawn cartoons or pre-staged photographic images that portray imaginary or hypothetical situations [26]. The portrayed scenes or situations are selected for their relevance to the issue or problem or for business pitches – situations where clients use the solution(s) in various contexts (see Fig. 12.1 for thought clouds).

Develop and Express Ideas in Pitches and Client Presentations

Navigating the process from ideation to idea selection, prototyping and implementation is complex and fraught with stumbling blocks. Sometimes really good ideas fail to even make it to the marketplace or once launched, fail in the marketplace. In a large number of cases, ideas fail or get culled because decision-makers (including clients and consumers) do not understand them. Taking an idea from a conceptual entity to a finished solution, creatives have to persuade a whole host of stakeholders to buy into its merit. Stakeholders range from internal clients and decision-makers (including senior management as resource allocators and strategists, investors, funders and bid managers) to engineers, marketing, and the sales force – they all have to buy in to ensure usability and product appeal. External clients (originators

Fig. 12.1 Customer journey in storyboard format: from boring to eternal joy!

or problem owners – giving you the tender or contract) and consumers (buying the solution it brings) must adopt the idea or they will fail to buy (in). If you cannot explain your idea early on or persuade people of its merit, even the best idea will fail. Your brilliant idea my never become thea finished product, unless you are able to persuade others of its merits.

The key to successful pitches is audience engagement – both at cognitive and at emotive levels. Building trust and rapport with prospects and clients are essential for persuasive communication and for building rapport. When service providers (and employers) demonstrate genuine interest, passion, empathy and enthusiasm, they become more likeable and selectable. By aspiring to provide them with the best solution to their needs, by bringing an open mind to understand them better, we are able to best make an impact and build rapport, and develop a creative solution to meet their needs.

Storytelling and Storyboards

"Once upon a time it was a small gathering of people around a fire listening to the storyteller with his tales of magic and fantasy. And now it's the whole world. In Japan and in Finland, in the heartland of America, in Italy and Spain, in Singapore and France … still they gather to hear the stories. But now they gather in multiplexes in Britain, Germany, Spain, Australia … or giant movie places in Mexico. That's what has thrilled me most about Jurassic Park phenomenon. It's not 'domination' by American cinema. It's just the magic of storytelling, and it unites the world. And that is truly gratifying." (Steven Spielberg, Movie Director, quoted in Hiltunen, 2002, p. xii).

One way to impart, index and retrieve information is through stories. People relate to each other and identify with others and with phenomena through stories. Stories are enjoyed by everyone [28]; in fact scholars surmise in their studies on persuasive communication that people "naturally think narratively rather than

argumentatively or paradigmatically [29]. Further, authors Barker and Gower [30] suggest that "the strength of storytelling as a communication method, recognizing all humans as storytellers with the ability to send and receive message that establish a value-laden reality, established a common ground among all participants and provides a faster method of establishing a social relationship" (p. 302). Storytelling in organizations [31–33] serves, among other purposes, to develop trust and commitment, share tacit knowledge and [34] bring diverse cultures together in shared meaning-making. The personal approach of storytelling increases the connection between the storyteller and listeners (strangers, visitors, newcomers).

According to Arch Woodside and his colleagues [35] "lectures [speeches and talking at people] tend to put people to sleep, stories move them to action" (p. 97). Ideas are fragile, easy to kill, in the early stages. One way to develop, express and hand over these delicate idea seedlings to others for progression is to use activating storytelling techniques. Stories provide the framework for selling ideas [36] regardless of medium (legend, myth, folk tale, fairy tale, poem, novel, film, play, blogs, vlogs, photography, journaling, and can be either interactive or digital). In her article named *Adaptability for Innovation*, Lisa Spiller [36] goes as far as saying "Stories can be used to sell anyone or anything … where the stories and characters could easily be created without much background research" (p. 14). As mentioned, there are many media for telling and spreading stories, but two particularly useful tools for communicating during the idea testing and client-convincing stages are prototypes and storyboards. (Prototypes are covered in Chapter 11 of this book).

Storytelling – Lessons in "How to"

Screenwriting coach Robert McKee, who consults with Disney™, Pixar™ and Paramount™ on persuasive presentations, winning stories and scripts, shares his secrets about storytelling [38] HBR, 2003, pp. 51–55] in the Harvard Business Review. We cover the key points here briefly (in the form of lessons), but we suggest that interested readers invest the time to learn more about the art of storytelling from various expert presenters [39] (including fiction writers, presenters, and scriptwriters.)

Lesson 1: Focus on emotion, not mere facts

A well-known quote attributed to Carl Boehner states that "People may forget what you said, but they will never forget how you made them feel." Six months from now, it's unlikely that anyone will remember more than 2% of what was said in your presentation. But, if you get it right, the audience will not forget how you made them feel. So, when planning your presentation, ask yourself, "What emotion do I want to elicit from my listeners?" "How do I connect with them?"

Lesson 2: Apply visuals

Visual presentations such as photos, videos, graphs, and PowerPoint slide presentations can add a creative touch to your informative speeches. Remember, 75% of your audience are visual learners. It is also reported that humans engage with, process and understand information faster if it is presented as images and pictures.

So, it is really a no-brainer to add visual or graphic content to your presentations. Graphics, symbols, charts, pictorial elements, video and interactive visualizations add interest and digestible concepts and help to ingrain information much faster and better, keeping the audience engaged throughout the entire process. Visuals also aid recall and recognition – very useful in later stages of the persuasion cycle. Be careful to only use relevant, pertinent visuals that help to buttress your points – especially where text is too lengthy. And use visuals in a consistent brand-specific way. Less is more, in presenting content visually.

Lesson 3: Personalize your call to action

Let your call to action be relevant to the audience - something they can easily associate with. Any pitch or message intended to persuade needs to focus on the audience. The key is to understand and link to the audience's needs – a solution that resonates with a problem they have. Deep understanding of the intended audience(s) is a key success factor in bidding. An analysis of the buyer personas is often carried out when preparing a pitch. This involves a study of each decision-maker's wants (desired outcomes), needs (desired outcomes) and fears (what they do not want to happen.) This, together with an analysis of what may be key issues in their business, then shapes the framing of the message, as well as key concepts (and images) included in the communication. This method covers client issues, strategies to resolve those issues, outline the benefits to them, and providing proof of your ability to resolve the issue(s), and is therefore also known by the acronym ISBP. This forms your value proposition. In essence it is a form of storytelling, linking solutions in a simple and understandable way to a need they have.

Adept communicators know to support the unique value proposition (UVP) with smart visual images that capture the essence of the story, but keep it simple, smart and to the point. Do not clutter the content. And most of all, stay on brand, as this underlines the quality of your offer and helps you build a rapport with your audience.

Be unique: do not use very well-known or boring everyday visuals. The call for a response should stir emotions and spur action. The first and most important law of powerful public speaking, is to share something actionable with your audience. The audience cares about "what's in it for them; help me solve my problems". When you conclude your speech, every member of the audience should think to themselves, "Man! I can't wait to get out of here so I can go and implement what they just taught me."

Lesson 4: Speak with passion and utter Conviction (capital C intended)

People want to support people they trust – those with a sense of future success and products or services they can rely on. Word choice and rehearsal are important to deliver a professional and polished portrayal. Once the audience conclude that you are an industry expert, placing you in a unique position to offer something of value that resonates with their need, they will gladly patronize you without constant reassessment. The onus is on you to make sure you offer an understandable concept that is clearly linked to a specific need or approach.

Coming back to word choice. Qualtrics Business Advisors, in their booklet "The power of storytelling in business" suggest words that can prove pivotal in audience engagement during business presentations. These words are "eliminate, expand, ignite, reduce, create, manage, lead". Numerous other examples exist; often audiences respond to the concepts of Why, Who, What, When and How to help them understand the narrative and connection to their own reality.

Emotion connects, but it must be relevant to the audience. A common trap speakers fall into is to give speeches and presentations about topics for which they have no conviction. Really only talk about ideas you truly believe in, or whatever concerns you very much, lights a fire in your belly or makes your heart sing. Choose to only tell stories that have real meaning and value to YOU and then make them valuable to the audience. So, by using a personal story that resonates well with the audience, supported by visual imagery, the speaker builds that connection and raison d'etre [37].

Lesson 5: Prioritize the information and value (WIIFM – what's in it for me, the listener?)

You most certainly will be given a specific timeframe for the presentation (or, if writing, a limited page number or word count.) If not, self-police and keep it as short as possible. Before you start preparing your presentation, you should take into consideration what is the most interesting and valuable point for you AND the audience. Build some milestones to hold the audience's attention and keep their interest. Place the most vital information at the front end and at the back end (first and last 30 seconds of the presentation). Arrange each point of your presentation in order of relevance, starting from most essential to the least relevant. Close the circle by ending with the most vital fact or value point. It is very good practice to offer a concise summary of all the information you just provided, but take care not to put any new information in this summary. This will help your audience to retain the key points long after the presentation is done.

Effective visual presentations (like using slides in Microsoft Office PowerPoint™), often use visual prompts such as themes and relevant, expressive images that serves as talking points. Often emotive images, in contrast to lists ("death by bullet points") are far more engaging. Graphs, emoticons, iconographics and other expressive visual symbols are more effective than long typed phrases or summarized bullet points. An example is the use of a photo of an iceberg to indicate visible and invisible dangers of a process or approach; or a long winding mountain pass to illustrate a hazardous journey.

These days, a handful of slides to move you from concept to concept is enough: it shouldn't be necessary exceed 15–18 slides. Remember that your presentation is a conversation that you are having with your client, to sell them an idea, rather than a drawn-out lecture about the pros and cons of your creative solution [40]. Once you have sold the main concept and core solution to their problem, they will give you additional time to provide contractual details and various detailed project plans.

Storyboards

Storyboards are uniquely useful to share research and design insights in a compelling and effective way. They also offer a visual way to help a team develop a concept or an approach, such as in bidding, advertising or website design or content layout. A storyboard is a series of cells (drawings, photographs, paintings, separated by a gutter or white frame) physically arranged to tell a story in a specific sequence (very often used in the advertising and film industry to outline a developing narrative). These days, storyboards are used for business purposes as well, to create an outline of a client pitch or presentation, i.e. to develop a plan to present both text and graphics to convey the key messages the sales team wants to share with the client. Storyboards can use images as simple as stick figures or be as complex as a film frame. They may also incorporate text, word bubbles or thought clouds, infographics or sidebars.

Most people at one stage or another have conjured up storyboard sequences in their minds. This happens when we've anticipated events, visualize possible results of future events, or reflect on past events. Historic storyboards date back as far as 30,000 years with cave drawings depicting a sequence of hunting events, from hunters leaving for the hunt to returning with their kill. Just as these drawings were probably used to enhance the fire-side stories told verbally, businesspeople can use storyboards to enhance the oral telling of creative solutions. As storyboarding continues to evolve to include pert charts, flow diagrams, and other visual representations often used by management executives, it is gaining acceptance in high corporate levels. Today, digital media and visual aids such as interactive charts and graphs, 3D maps, live dashboards, and other visualizations are playing a huge role in the continual evolution of storyboarding [40].

The story framework often used by design thinkers is that of a journey, as used by Tim Brown, Yale School of Management, CEO of Ideo™. The journey is a simple description of a consumer getting from the point of identifying a need … to satisfying that demand by paying for a valuable solution. The story is used to indicate the safe (if rocky or tumultuous) journey upon the route from need identification to need satisfaction. In Fig. 12.1, Rouxelle de Villiers does a mental run-through in storyboard format using a combination of stick figures and basic drawings. Rouxelle visualizes the consumer's journey from realizing her need to decorate her boring office, purchasing some indoor plants online, waiting for the courier delivery, to the positive outcome of shared joy due to the installation of the plants in her office for infinite joy!

In the past you have probably done many mental storyboards but considered this activity "simply thinking things through." You may also consider this activity "beyond you", or your first response to reading this section is: "I cannot draw". Let me assure you that you can! Multiply types, from stick men to pictures in cartoon-like fashion, or more detailed sketches, are options. This activity is much less about your drawing than visualizing the story you will be telling and the relevant layout to plan your web or word pages. (There is also no reason why you cannot get help from professional artists or clippings and online sources to finalize your story. Many

software options and drawing apps for free download are available at your fingertips.)

As illustrated by the stick figures and very basic drawing in the storyboard above, even the most basic drawings can illustrate the points to get across to the audience quite adequately. Do not underestimate the imagination of your audience(s)!

12.5 Conclusion

Storytelling, storyboarding and other visual forms of imparting new ideas are very valuable in relating to various internal and external audiences. Using visuals helps to tangibilize an idea and turn it into something more realistic and more relatable (showing photographs and other graphics, videos, awards and recognitions, testimonials, and other elements e.g. menus, as a tangible way to showcase the organization's services or business outcomes.)

Each person will have their own unique style in telling a story and practising your own style will ensure that your voice is heard. However, good storytellers always consider their particular audience and ensure that the listeners can identify with the story. There are numerous sources novices to compose and tell engaging stories that effectively transfer the intended meaning.

Note that the elegance of storytelling is not in the grandeur or artistic elegance of a drawing, but rather in the creative use of simple, relatable story-elements that the audience can associate with. We urge to your practice storytelling and stick figure or cartoon drawing. We are sure that you will enjoy them both and take great pleasure from the reaction of audiences (especially the young members).

We have covered a few tips and techniques in this chapter, but readers will do well to invest more time to hone their storytelling and visualization skills. You will surprise and delight yourself and your clients with your ability to excite and delight. Try some of the CREATiViTY LABORatory DIY assignments here below.

CREATiViTY LABORatory

Activity I: Consumer's Journey Depicted as a Storyboard

Use the partly drawn storyboard provided in Fig. 12.2 and practice some basic drawing skills to visualize a consumer's journey in approximately five steps. Try to copy the cartoon style, but if you do not succeed, change to the stick-figure style as displayed in Fig. 12.1 of this chapter.

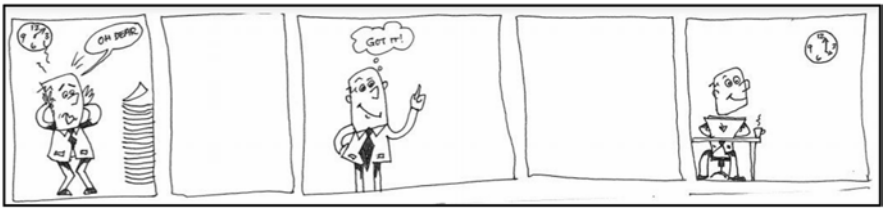

Fig. 12.2 Creativity Laboratory DIY Storyboard

Activity II: Ferrari & The Mousetrap

Try the Ferrari & The Mousetrap case study below to see how the principle of elegance applies. Can you draw a storyboard to illustrate the students' journey?

Permission to used granted by David Cropley, extracted from ([4], pp. 159–160).

Ferrari & The Mousetrap

A simple case study gives some indication of how the indicators can be applied in practice. Students in an engineering class [41] were required to design and build "a wheeled vehicle powered by the energy stored in a mousetrap and capable of traveling at least one meter." The students were provided with an everyday, spring-operated wooden mousetrap. Despite the fact that they were told that creativity would bring the best grade, most students assumed that the vehicle had to be four-wheeled and had to run on the ground like a car or truck. In addition, most focused on the energy stored in the spring as the source of power, as well as consciously opting for a vehicle that was effective in the sense that it could cover a meter and was socially acceptable in that it looked like existing vehicles. The outstanding example of this was the "Ferrari" already mentioned above: This was a quite stylish model of a real-looking Formula 1 racing car made of red Lego bricks, with the mousetrap mounted inside the model, with its spring connected to the car's rear axle by a string wound round the axle.

Only a few models broke away from conventional thinking. One used the mousetrap's spring to operate a pump that inflated a balloon attached to the car. When the balloon released the air, it propelled the car by means of a jet effect. Another launched a model car through the air, using a catapult powered by the mousetrap's spring. One model involved a large hollow wheel set rolling by a weight mounted in its interior and wound into position by the trap's spring. These models all focused on the mechanical energy of the spring. Greater novelty was generated in a model that involved setting fire to the wooden base of the mousetrap and using the heat generated by the flames to fire up the boiler of a steam locomotive, thus using the chemical energy stored in the wood rather than that in the spring.

Another solution was in some ways the most radical: A wheeled cart was attached to the mousetrap by a string. When the mousetrap was thrown off the table on which the vehicle stood its weight pulled the cart along as the trap fell to the floor, thus using the gravitational force acting on the mousetrap's mass as the source of energy that drove the vehicle. The only limit on the distance this method could propel the vehicle was the height of the surface from which the mousetrap was thrown, and the length of the string.

The final example we will give went beyond using less obvious sources of energy stored in a mousetrap. It involved a redefinition of wheeled vehicle and a novel means of propulsion, although it retained the potential energy stored in the mousetrap's spring as the source of power. The spring was used to drive a fan, and the wind created by the action of the fan was used to propel an ultralight cylinder (a large wheel). This vehicle was referred to above as the Fan car.

The indicators in Table 12.2 can now be applied to these models. We will do this by comparing the Fan car with the Ferrari. The latter was a wheeled vehicle and moved at least a meter. Thus, it successfully took the first hurdle and displayed Relevance and Effectiveness by revealing "Knowledge of existing facts and principles" (correctness, performance, and appropriateness. However, in the case of "Problematization," or "Developing new knowledge" it did not visibly demonstrate concern about problems with existing approaches or improve them in any way. It did, however, add to existing knowledge, because, although the use of Lego to make models is commonplace, it is not usually used in university classroom assignments (i.e., there was replication). The mousetrap was also used in a way not usually associated with mousetraps (redefinition) and there was a new combination of already-known elements (model building with Lego and mouse-trap), while there was perhaps incrementation (use of the mouse-trap spring was extended, but in an existing way, since the well-known snapping shut action of the mousetrap was retained). Thus, the Ferrari scored four points in all for Generation of Novelty. In the area of Elegance, this model scored well: It evoked recognition of its appropriateness, and was convincing, pleasing, complete and harmonious—five points. In the area of Genesis, however, results were scored zero, because it did not display foudationality, transferability, germinality, or seminality. This yielded a total score of 12, largely obtained via elegant use of the known. The Ferrari was thus praised for its formalist and technical aesthetic properties but criticized for lack of novelty. The Fan car moved one meter and showed "Knowledge of existing facts and principles" (three points). In the area of Generation of Novelty it displayed "Problematization" and received points for diagnosis, prescription, and prognosis, because it drew attention to the need to change from vehicles with a power source that travels with the vehicle, indicated a possible line of improvement (ultralight vehicle) and showed roughly how these two ideas might be combined: three points for "Problematization." In the case of "Adding to existing knowledge," the lever action of the trap's spring was used to drive a fan (replication[2]), wheeled vehicle was defined in an unusual

[2] Replication, redefinition, incrementation, and reinitiation are used in the sense used and defined by Sternberg, Kaufman, and Pretz (2002) [42].

way (redefinition), the combination of mousetrap, fan, and wheeled vehicle was uncommon (combination), and the already-known ability of fans to impart movement to light objects was extended from air or smoke to a wheel (incrementation). In the case of "Developing new knowledge" the known fan action was used in a new way by using it to drive a vehicle (redirection) [42], propelled by and wheeled vehicle were taken in a new direction (reinitiation), and the whole resulted in a solution that suggests a new line of attack: an ultralight vehicle that does not carry the power source with it (generation). Thus the Fan car receives 10 points for Generation of Novelty. In the case of Elegance, the Fan car elicited recognition and a feeling that it was clever (pleasingness), but was perhaps not convincing (two points for "External elegance"). It was also only fragmentary and rather crude and scored zero for "Internal elegance." Finally, this vehicle obtained two points for Genesis by suggesting a new basis for further work (foundationality) and suggesting what this might involve (ultralight vehicles, stationary power source, use of moving air as a driver): a point for germinality. Thus, the Fan car received a total of 17 points, losing points to the Ferrari for its roughness and lack of detail, but gaining more for Generation of Novelty and for Genesis. The builders of the Fan car were praised for the introduction of effective novelty, but advised to try to work out ideas more fully and build a more finished prototype.

Storyboard to illustrate the students' main ideas.					

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Chapter 13
Intention to Create Meaningful Outcomes: Tenders, Bids and Client Pitches

Louise Luttig and Rouxelle de Villiers

Abstract Responding to a brief – a specific response structure – despite the rigor of compliance, has the opportunity for compelling content, focused on addressing the audience requirements in an engaging, informative and convincing way. The aim is to persuade, whether by visual appeal, content structure or clarity of message. Very often this requires a creative, agile work environment focused on targeted delivery within a short timeframe of weeks or sometimes months. The message needs to be highly adapted/tailored to the brief and strategy of the client – whether internal to the organization or an external client, the purpose is to compel the client to accept the pitch or tender and "close the deal", making the offered solution their preferred choice.

Keywords Agile approach · Audience focus · Bid management · Bid brief · Compelling content · Brief compliance · Integrated marketing communication · IMC · Persuasive communication · Value proposition

Learning Objectives
On completion of this chapter, the readers will be able to:

- Develop an understanding of bidding and tender management as a creative enterprise.
- Co-ordinate and manage a complex bid or tender response set in a cross-functional and collaborative team environment.
- Deliver creative outcomes from a cooperative team environment.
- Compose and interpret a creative brief.

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13.1 Introduction

Bidding and Tender Management is a key business function related to the procurement of new goods and services. In its purest sense it involves purposeful business-to-business (B2B) or government to business (G2B) communication, to enable the exchange of goods or services between a buyer and a vendor (or service provider).

The bidding process and content presentation has its foundation in marketing and sales, as it is a persuasive form of writing. However, it is very often leaning towards technical content delivery to present the buyer with a clear and compelling value proposition [1].

Due to their highly competitive nature, bidding pitches can be considered a creative enterprise – the delivery of a key strategic message and price component that have to comply with clients' response requirements and criteria - including a specific format, but articulated and presented in such a way that the buyer organization finds it compelling.

Bid responses vary in size and nature, depending of the scope of the project, and also on the dollar value at stake. The bidding response requirements can be complex or simple. Whether it is procurement of a design solution for a sports complex or a major defense project with stringent performance requirements and an extraordinary level of due diligence, the fundamentals are usually the same.

For the purpose of this publication, the authors have considered high-end bid responses. However, the process and activities outlined are scalable and many of the learnings can be adapted for most types of bidding or client pitches.

13.1.1 A Creative, and Highly Collaborative Enterprise

The cost of bidding is high in terms of resources, time and effort. Bid project teams often spend long hours in a high-stakes environment working in a structured, intense way to meet deadline. As such, this can also become a very collaborative and energetic experience. In fact, the best bid approaches, if managed well, will result in a highly creative output. And that energy (or, alternatively, the lack of both energy and client focus) comes through in the end product.

The client does not merely buy the project, they buy the value offered by engaging with the supplier to enhance their business or solve a problem. A strategic offer hinges on the vitality and insight of an immersed, creative team, following an analytical and targeted approach. The following approaches are typical of a high performing bid team:

- Planning to win by getting the entire bid and sales team involved with the opportunity or future project early, also known as capture planning – getting them on board, intelligence gathering and analysing the opportunity, the client and the competition, and discussing client and project issues to develop a winning strategy – often months in advance [2].

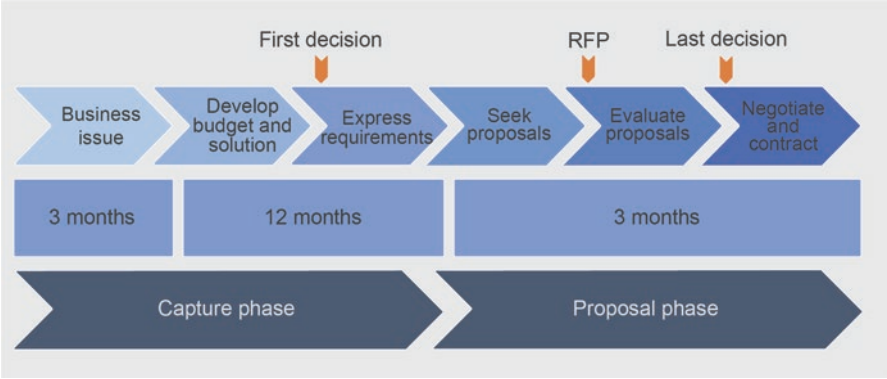

Fig. 13.1 Planning to win stages. (Used with permission: Aurecon)

- Co-location of the bid team – a space where they can work together and provide optimal inputs through opportunity analysis over an intense period of collaborative input.
- Developing an understanding of client needs to determine the optimal client solution, offer and value proposition.
- Building a narrative (win theme) about the value proposition – the aspects that differentiate your bid from that of the next competitor.
- Delivering it in the required format – typically a PDF with supporting documentation, but often involving a presentation to the client. And, in some cases, especially in alliance type bidding, workshopping complex issues with the client – while at the same time being assessed by the client for the collaborative approaches the team brings to the mix.

It may be price, but often what wins bids is the ability to add perceived value for the client. And that, in itself, is a very dynamic, creative process (Fig. 13.1).

13.1.2 Defining Value

Typically, millions of dollars are at stake in clients' decision-making. Whether they are buying a new series of aircraft (e.g., Defense Force bids or Boeings for specific clients), or whether they are trying to find a service provider for re-designing, modernizing or building a new National Health Hospital, or extending roads with bridges and access routes for toll roads for the Transport Service, the buyer needs to be convinced that the supplier is able to deliver value better than any other organization. More than mere price considerations, often intangible service offerings include any or all of the following:

- A trusted team of technical delivery and service staff with a deep understanding of the client's requirements, as well as the technical complications of bringing a

new service into an existing business environment. Very often, the client's existing business context will have well-established practices and operating procedures, with its own set of rules, regulations, and complex technical limitations and requirements, which need to be factored into the solution.
- An innovative service provider who is focused on building a long-term relationship and on proactively resolving any issues that may arise before, during and after the project implementation.
- An innovative, cost-driven approach that will deliver in the long-term for the client, providing a best-for-project solution, rather than just a good-price offer.
- A supplier offering longevity and bringing a partnership approach, rather than a fly-by-night service provider who is not immersed in understanding their business.

In today's highly competitive global marketplace, relationships and attitudes may matter far more to differentiate a business offer, tender or pitch than the dollar value. Obviously, the cost cannot exceed the value perception, but that is quite often a hygiene factor – expected to have a good ratio of cost:benefits, but not exceeding the "within reason" criterion. Of course, it depends on who the client is, and it also strongly hinges on the buyer's view of what value means to their business.

Client knowledge and contextual intelligence, therefore, is key.

13.1.3 Bid Management

Major commercial organizations invest heavily in key competitive bids to win new business. They appoint a focused and experienced sales team, led by a Sales, Client or Business Development Manager who is typically referred to as the Bid Manager, or Sales Account Manager. The Bid/Account Manager is supported by technical staff, bid submission managers, writers, graphic artists and commercial estimators. The dedicated team starts forming and evaluating the opportunity weeks or even months ahead of the opportunity coming to market, developing a win strategy over time. By the time the client procurement documents are released via online portals or to specific pre-selected service providers, these teams are well advanced in their approach in terms of win themes and pricing strategy.

The following are common terminology in procurement documents, and will be referenced elsewhere in this chapter:

- Early broader bid requests require clients to show their capability and expertise such as through an Expression of Interest (EOI), also sometimes known as a Statement of Interest and Ability (SIA), or Registration of Interest (ROI).
- More detailed and very specific information is required in the form of Request for Information (RFI), Request for Proposal (RFP), Request for Tender (RFT) or Request for Quotation (RFQ), the latter with an emphasis on price, rather than capability.

Regardless of the bid or the industry, bidding is an invaluable business opportunity to win clients over in the long term – by fostering strong relationships and also by capturing key information that may be useful to position the organization for future business engagement. It enables the bid manager to demonstrate competitive value.

As explained by Cristina Miller (CP, APMP) of the Association for Proposal Management Professionals (APMP's) Winning the Business platform in this statement in an article on capture management [3]:

> *… a proposal is a marketing, research and customer retention asset. The bidding process is a chance to foster strong client relationships and improve organizational understanding of the challenges your clients are facing now and will face in the future. Proposals proactively resolve potential account management issues with current clients. The data obtained during bid writing can increase the value of research and development (R & D) efforts, create a compelling company value statement and, finally, win future business. This makes even a losing proposal a winning value proposition.*

13.1.4 Compelling Tenders and Bids

13.1.4.1 Shaping the Content

The range of technical content for business purposes is broad. It can be defined as any content that conveys a set of instructions, guidelines, product information, or methodology. It therefore has functional intent.

The applications of such content are numerous. Any range of business guidelines, operational instructions and procedures, handbooks and product sales material will fall in that category. It is content written for the purpose to inform, merely as instruction, or for the purpose of sales and promotion of business.

In itself, because it is focused either on the user or operator (instructions) or on a client (bids, tenders, and sales or capability brochures), it always needs to be compiled with the end user or decision-maker in mind.

Usability of content is therefore the primary purpose. And that requires a user-centric approach. This means that the supplier or service making the bid is intent on understanding the client's vision, mission, project strategic intent, overall goals and milestones such as project deadlines (implementation or project sign off dates).

Second, in an age where such content is prolific and where users/readers are becoming increasingly attuned to visual information sets (e.g. graphs, iconographics, dashboards, infographics, etc.), content authors and editors need to focus on making that content compelling and digestible. In other words, it needs to be believable and convincing.

There is only a limited time (an opportunity gap) in which the attention of the reader or viewer can be captured. Normally, this is rather short (two or three pages to get them hooked to investigate further.) The onus therefore rests on the technical bid writer (supported by an experienced editor or copywriter) to understand how to best convey technical content in a written and visual way that has emotional appeal.

The bid narrative needs to grab and retain the readers' attention, be easily digestible (understandable terminology, logic, flow), and ensure the information it relates is clear, concise and relatable to the brief provided.

> *To achieve that, the content needs to be presented in a compelling way. And to make it compelling, it needs to focus on the client's needs – also known as their drivers for bringing this opportunity to market.*

The methods to achieve these two key drivers (usability and compellingness) vary, and that is part of the purpose of this chapter. Which are the more creative technologies and approaches to apply and that would work in the often constrained environment of sales pitches, delivered in a specific medium – typically as PDF file attachments, and in rare cases supported by client presentations in PPT or video format?

Whether for children, consumers or business executives, shaping a narrative or story in a compelling way supported by content design provides a meaningful connection. In the case of bidding, it focuses on the client, their values, motivations and passions, and their purpose, and links the bid response to that in a strategic way. Your response should reflect both your own and the client's aspirations for the project or opportunity, as well as the way you will work with them to successfully achieve the project outcomes.

People would rather invest in a human than a company, and in fact, some of the most admired and financially successful companies are known for delivering financial returns and building people and society. It is both an ethical and strategic move for businesses to do the best they can to humanize themselves through their messaging… and mean it [4].

13.1.4.2 The Art of Storytelling – A Foundation to Bid Content Development

The art of shaping a story is based on drawing someone into the story with an engaging hook (H), retaining their interest (I) with flagstones to get from one experience to the next, creating a desire to see "what happens next" (D), to learn about the protagonist and antagonist, and a desire to engage and stay engaged (E). Finally, the story will have an ending that either leads into the next episode or closes the loop to fulfil the promise or solve the mystery (S) set at the beginning of the story.

For bids one can follow a somewhat similar recipe to HIDES (Hook, Interest, Desire, Engage, Solve) as explained here. However, for bidding the narrative is 'open-ended, ongoing and progressive' (Aurecon, Future Ready by Design). There

is no clear protagonist and antagonist. Rather, there is a problem that needs a 'rescuer', a solution provider who explores the issues at hand, and builds up an understanding of what needs to be done to relieve the tension. That is the 'story' that needs telling, and needs telling well in sales narrative.

> *In simple terms, the bid story is how your solution will improve their business, by addressing their key issues with clearly stated solution strategies, relating the benefits to their business, and supported by evidence of where you have resolved similar issues for other clients before.*

Also, there is no mystery. The winning pitch is up front, as part of the Executive Summary or opening statement. It should explain convincingly how the bidder will meet the client's stated needs. And that is also true for each section following – the win theme or key differentiator should be clear early on, and not remain as a question in the reader's mind.

The basis of a good bid narrative is to provide *context with clarity* in a confined environment of a prescribed number of words per page or story.

In essence, the bid narrative, similar to any informative piece deliver within the specific constraints of time and medium, such as journalism, answers the basic questions of *what happened, when and where did it take place, why did it happen, who was involved, how was the situation handled* [5].

The bid response requires investigation, it requires workshops and discussions to formulate the response, sifting through options and earlier knowledge to uncover further relevant detail, and understanding technical or legal or commercial complexities to provide context. It also requires good logical and context-driven writing supported by storytelling methods – narrative that draws the reader in. And finally, it requires presentation within the confines of the medium (typically a PDF submission, but on occasion presentation in person) in terms of layout, typography, visual elements, audio or video clips, and weblinks to supporting information.

All this must be produced within deadline, requiring fast turnaround within days or weeks, and with last minute changes not unusual, though undesirable.

Bidding narrative has the following characteristics:

The demands of the medium are specific, and require compliance to the (client) brief.

It requires beating other competing suppliers, not only in time and quality of communication, but more importantly in being persuasive and convincing readers of the value of an alliance with this supplier.

Content has to appeal to the audience, while being logical, clear and factual.

And finally, it needs to be compelling enough to meet its purpose. It requires the user to *act* – whether to apply the procedure, to trust the bidder's approach and

strategy for business improvement or change, or to acquire a product. It morphs into the category of persuasive writing.

> *Good technical, business and marketing content runs on the same principles. It complies to a brief. It responds to a specific medium. It requires a user-focused approach. It needs to engage. It needs to be clear.*

The topic of bid content development and specifically development through leading a business process to enable creative expression, is therefore a key area explored in this chapter.

13.2 Bidding as a Business Function

13.2.1 Overview

Bidding is a structured procurement process by which a business can respond to government tenders, or private sector requests, in order to gain new work or business in a competitive environment. Such bids are prescriptive for the following reasons:

- The aim, especially in government bids, is transparency - to provide an above-board, scrutinizable process by which the entity can be held accountable for their decision to award a government contract to a service provider. It aims to create an equal playing field for all service providers – an equal chance to present their response. To achieve that, the brief tends to be highly prescriptive in terms of what content is to be provided and what values (weightings) are applied to key sections. These prescriptions are careful stipulations that need to be complied with. If not, the bid could be considered non-compliant in its entirety and disregarded. Or it can be compliant, but the impact of non-compliant sections will cause the final rating score to be impacted [6].
- Where bids are by corporate entities or semi-private sector companies like utility providers, the requirements may be less specific, but often a vision is set, as well as a shortlist of requirements. This may be less formulaic, but, in essence, it also makes the job harder for the respondent – how best to respond to a broad recipe, and where should the emphasis be? How can the review panel compare the various inputs, as the guidelines are so broad? While these bids allow more freedom in some ways, they also create greater uncertainty. This is very often where an experienced sales manager needs to reach deep into their client knowledge and prior experience to ensure a sharp response.

So, in essence, bid respondents need to consider:

- *Compliance* – analysing the bid requirements to a high level of accuracy and detail, to ensure that no essential component is missed or misunderstood. Compliance is pass/fail – i.e. the number of pages specified, a specific font size, a limit on hyperlinks, proof of company capability, including company history, financial statements, insurance certificates and Health and Safety and Environmental policies. Compliance also extends to content, making sure that each section is analysed carefully in terms of how the bid is to be scored and weighted to ensure that the response meets the requirements and addresses implicit needs while offering a return on investment
- *Compellingness* – based on an understanding and knowledge of the client, this involves framing the bid response in a way that resonates with the client's needs, both in terms of message content and presentation. And, specifically, offering value for money in such a way that the client has to sit up and pay attention. This is known as your value proposition, of creating a point of differentiation – outlining how your offer and approach will not only provide the desired outcome, but that doing business with you will be like working with a trusted partner who supports and will deliver on the long-term business objectives better than any other supplier.
- *Competitiveness* – a bid aligned with the client's key drivers balanced by an understanding of the client's price point and what they would consider value for money in the current market. Understanding the client's requirements is key, as over-scoping the job may lose you the deal if they are not convinced that your price and service offering are aligned. However, there is also the matter o*f perceived value* - the innovations, cost savings, and specific benefits that doing business with your company will bring.

Delivering on these 3Cs is the primary goal of high-performance bids and the teams who create them.

13.3 Interpreting the Brief

13.3.1 The High Performing Bid Team

Bid teams rely on the drive and input of a handful of people (ranging from the technical team such as engineers, project managers, service experts, cost accountants to client service representatives, creative designers and sometimes photographers) responding to a specific brief within a tight timeframe.

Millions of dollars are at stake in the strategic decisions of the team, acting on the best knowledge they have available. Often, the future of companies is at stake – their ability to keep their production lines running, and their service teams intact. This is

in essence the purpose of corporate sales – providing a continued pipeline of work through winning new contracts. And companies achieve that mainly through selling three things:

- Resources – the people who can provide the service or develop the product.
- Their experience as a business and their track record – the way they have worked in the past and what they are capable of delivering serves as an indication of what service the buyer is likely to expect in future.
- And finally, the approach or methodology or way of engagement with the buyer organization – the how of bringing the product to their doorstep: how the seller will work with the client to achieve *their* goals; how the seller's technical teams will make things happen; how and when certain milestones will be achieved; and how they will interact with the client, providing specific information of who in their team will be taking control of that client relationship and key actions.

This, in essence, involves responding to the brief.

13.3.2 Understanding the Client Requirements

The client instructions inform potential suppliers what is required in the form of a brief, whether as EOI, ROI, SIA or ROI, RFI, RFP, RFQ, or other form of invitation. This brief is available through a government and industry tender portal or issued to shortlisted parties following an initial shortlisting procedure.

Most briefs are dry documents of compliance and requirements, as outlined below. Most also include a client vision statement and a summary of the required scope of service, as well as the key project drivers. Others may include supporting documentation, such as business cases that outlines funding decisions – where the money will come from to finance the upcoming project or business venture.

All include specific instructions for response.

13.3.2.1 Analysing the Brief

A competitive bid is most commonly associated with a proposal and price submitted by a service provider (seller) to a soliciting firm for the purpose of winning a business contract, in any variety of business deals. A competitive bid includes a detailed proposal addressing both operational and cost aspects of a deal [7].

A proposal brief contains multiple instructions and specifications, typically including:

- Quantitative Evaluation Criteria, including:
  - A general overview statement outlining the client's intentions and expectations and an outline of the reason for the proposed contract or scope of works.

  - The evaluation criteria - the set of standards or tests that proposals will be judged against, including preconditions, value for money, capability and capacity.
  - Preconditions (such as indemnity insurance or Health and Safety Policy) and Mandatory Conditions (such as a signed declaration of conflict of interest to be included) that must be met or the offer will be rejected. They are either pass or fail.
- Qualitative Evaluation Criteria, including:
  - technical merit of the solution or offer which determines to what extent the solution or services offered meet or exceed the stated requirements.
  - capability and capacity of the supplier to deliver, including their track record, financial soundness and the relevant experience of key personnel, as well as the methodology/approach by which they will provide the proposed service.
  - value for money – typically this implies the best value to the client over the lifetime of the project, and not just the hard dollar value.
  - financial viability and risk assessment of the service offered assessed as part of the buyer's due diligence [8].

13.3.2.2 Format of Response and Other Stipulations

As part of the brief, the RFP will stipulate the following information that is an essential part of the submission plan and bid management process, and where Bid/Account Managers have to pay close attention to ensure all these stipulations are adhered to:

- The standard specifications for RFT documents (length, font size, format).
- Communications during the tender period – this is important as all government bids have probity laws governing them, and communications therefore may only take place via the proper channels that can be regulated.
- Electronic Information requirements and evaluation model– an outline of what supporting documentation is available and in what formats. (If the evaluation model requires the evaluation panel to evaluate the non-price criteria first before opening the price offer, then the supplier will be required to submit their offer in two sealed envelopes, or in the case of electronic submissions, as two separate files.)
- Pricing guidance and how the procurement decision will take the pricing submission into account (where often price is evaluated only once the non-price documentation has been reviewed).
- A statement providing guidelines on matters of Conflict of Interest, Risk of Bias or Collusion.
- Statements or requests regarding confidential matters such as Non-Disclosure Agreements, protecting proprietary information or similar arrangements.

- Tender Submission Requirements, including:
  - Submission Programme: Key dates in the process including for briefings, site inspections presentations, tender close, tender evaluation period, and pre-letting meetings, and finally the target date for contract award.
  - Tender Submission Instructions: Instructions on how the tender is to be submitted, including the type of responses and the naming convention.
  - Tender Format Instructions: Outlining the response structure, including specific forms to be included such as programme of delivery, resources schedules, conflict of interest declaration, etc., and the number of pages allocated for each, as well as the size of such pages.

13.3.2.3 Client Needs Analysis – Capture Planning

If bid specialists and sales teams only get to know their clients through the procurement documentation, they are at a serious disadvantage. This is because most sales documents are incapable of conveying the full extent of what is known as client issues.

The leading organization representing bid management professionals, the Association of Proposal Management Professionals (APMP) and other leading bid best practice organizations such as Shipley Associates are clear on this point. To achieve a compelling argument or sales pitch, you need to understand the client. Not just the client as entity, but also the intention of the various personas who are buyers in the client organization.

To achieve this, most organizations engage in a process known as capture planning.

The Association of Proposal Management Professionals (APMP) describes capture plan development as "the process of managing and engaging in the pre-competition phase in an organized way that is designed to increase win potential".

Business writer Larry Newman argues that the term's usage increased from the 1990s and that organizations that practice capture planning "win more frequently; win larger, more competitive bids; reduce bid time and cost; and make better bid-, no-bid decisions" [9].

And so we begin our journey through the client's 'mind' by what is known as a capture plan, which requires an analysis along the following lines:

- What does the client require? What is this project about?
- Who are the client decision-makers? What is their position and what are they responsible for? How do they view your company? *Note*: If they don't know you, do you have the opportunity prior to the bid phase to get in front of them and discuss their needs, explain your capability and build a relationship? (Decision makers might include users, a budget controller, an executive with veto power, beneficiaries of your service, and influencers such as lawyers and accountants.)
- How do they view your competition? Is there a logical incumbent organization that is already providing services to the client, and therefore may be preferred? If so, are there any issues with their performance of pricing strategy?

- Can you provide the service or product range in full, or do you need to partner with other organizations? How can you position yourself in this field?
- What are the client's key issues – the main problems they are trying to resolve, such as ageing infrastructure that needs to be refurbished, so delivering the solution will need to extend and enhance their operations? Or is there a complex set of stakeholders who need to be satisfied by the project outcome, such as staff, the public, road users, etc.? What is the client's ultimate goal with the service or product they intend to acquire?
- How can you build your sales pitch around those issues?

It should be obvious that once the bid has landed, these conversations and capture planning should already have taken place. They focus the efforts of the seller by building an understanding of where their organization is positioned in this market and what their key business strengths are. What the pricing strategy should be, and what argument or pitch their team needs to convey to the client the reasons for selecting their offer.

13.3.3 Creating the Right Environment: Bid Management 101

High-performing bid teams work to a plan. They gather information to support their bid effort well in advance, each person in the team understands their role, and early on, the team roles and key responsibilities are clearly communicated.

13.3.3.1 Collaborative Working

Successful bid teams work together collaboratively, within a co-located environment, where there is a high level of communication, with ideas and thoughts being challenged, and regular check-ins on content development and questions that may develop. To be effective, the bid leadership team, including the Submission Manager and Bid Manager/Account Manager, must work very closely with others in the team to ensure that all the various deliverables are being met and evolving issues are closed out early. This requires regular and ongoing communication, a defined workplan, clarity of responsibilities and a common work platform and workflow.

13.3.3.2 The Bid Team

To achieve the bidding requirements, most companies today set up a bid team – a core team of responsible individuals who gear up their thinking and potential response in advance of the bid release. The team gets together, assigns the roles and responsibilities of the individuals who make up the bid team, and creates a platform to share information and start formulating the value proposition.

Typically, this includes running an information-gathering workshop, with the capture plan as the backbone. By strongly analysing client requirements, this workshop should build up a framework of solution interrogation and information capture.

> *The ultimate question bid teams need to keep front of mind in bid responses is 'So What? What does this mean for the client – how will it benefit them?*

The Bid Content Manager and Sales Account Manager need to explore possibilities to enhance the bid using a variety of value-creating content, testimonials, and credential-enhancing content (why the project team is the right one for the client). The bid also needs to clearly link the technical solutions to the reasons why these would be relevant in this particular scenario. *'What difference would it make? What value does it bring?'*

Consider carefully whether there is a way that the sum total of the offer, the value proposition, can be shared in a compelling way. Use graphics and visuals to clarify points, enhance the message and concisely communicate complex content.

This is where the true value and creativity of bidding and the key focus of the sales team lies: in the ability to define the value and the point of difference to the client in such a way that it is compelling, well-articulated and results in clinching the deal.

13.3.3.3 Roles and Responsibilities

In high-performing bid teams, bid roles and responsibilities are clearly allocated, based on several tiers:

- Senior leadership responsible for final content and commercial sign-off and decision-making, typically the Commercial Manager and Sales Lead.
- A bid submission management team responsible for day-to-day bid management and content development, as well as final production and submission, including the Bid Manager (Sales Account Manager), Submission Editor, Submission Coordinator and Graphic Specialist.
- Bid authors for each section of the bid – often each responsible for the input of a team of technical sub-authors.
- Bid content reviewers – each bringing specific specialism or client knowledge.
- Commercial and legal content leads who take responsibility for the pricing strategy and content and legal compliance.

In most bid teams, the Submission Manager and the Bid/Account Manager develop the content strategy, pitch and content presentation. It is the responsibility of the Submission Manager to articulate the message, and work with the team to storyboard the message so that each part of the bid consistently reflects the value of the offer.

13.3.3.4 Bid Plan and Programme

A proposal plan is a project plan, outlining key milestones and tasks and activities over the period of bidding. The key milestone is the date of submission.

Once the RFP or RFT lands, the team swings into gear with a bid submission plan that identifies key tasks and related responsibilities prior to and including the deadline, including:

- A kick-off meeting where the client's bid documentation and requirements are analysed and discussed in the context of the capture plan, and a plan of delivery is developed. At this meeting, roles and responsibilities, as well as the bid plan, are confirmed and agreed on. All bid staff absences over the bidding period are pre-recorded to ensure all are aware of availability conflicts.
- Issuance of templates and writing guides to authors.
- Initial workshops such as finalizing the win themes, content storyboarding and methodology workshops.
- The date of site visits or client-facing discussions (interactive client sessions), as well as when final questions may be asked of the client.
- Key dates for specific content such as relevant skills writeups and Curricula Vitae (CVs) or skills profiles of technical teams, company capability, compliance content and finally, the delivery methodology or approach.
- Content review milestones – normally bids are subjected to review by senior staff to provide feedback and direction to the bid team.
- Commercial review milestones – review and discussion of the pricing strategy.
- Content and pricing sign-offs.
- Final production and editing.
- Submission of content.
- Post bid-management activities, including filing and content capture for future review and debriefs.

This plan forms the basis of all further bid planning meetings and discussions.

The bid plan also clearly outlines where and how content will be managed and what platform is to be used for collaborative working (Figs. 13.2 and 13.3).

13.3.3.5 Shaping the Response

There are three key tools to help shape the bid content in advance.

The first is the *Compliance Matrix* – an outline of the client's requirements with annotation and workflow to indicate how the response will be shaped. This creates a work management tool for the submission team, to check progress and completion against key dates and with author allocation.

Storyboarding – a outline of each section of the bid with page allocation, and at high level, an indication of the win themes and approach for each section, including graphics, call out boxes, maps, charts and lessons learnt stories. (See Chapters 11 and 12.)

	Project Name **Project Code**		**Leave** **Add names of people on leave during bid process, and the dates**			
SUNDAY	**MONDAY**	**TUESDAY**	**WEDNESDAY**	**THURSDAY**	**FRIDAY**	**Objectives**
	Pre-bid activities- list			DRAFT ORG CHART Identify Track Record examples	CVs issued for tailoring	
AUGUST	10	11	12	13 ZZ on leave	14 ZZ on leave	
	RFP released Graphic request placed Bid/ no bid Partners notified **Confirm Track Record examples**	**Bid Kick off / clarify roles and responsibilities /**Win Themes Confirm and notify reviewers WORKSHOP: Why us, team, track record and capability, value proposition				Strategy developed Org chart confirmed Roles and resps clear
	17	18	19	20 XX on leave	21 XX on leave	
	PINK REVIEW 50% Bios draft complete - Personnel references - Snapshots from projects they've worked on	Pink review feedback All reviewers and key contributors	Methodology Workshop			50% Draft **1st commercial review**
	24 XX on leave	**25** XX on leave	**26** XX on leave	27	28	
	RED REVIEW 80% Final bios in place			Documents taken offline **Final Edits - no more changes**	PRODUCTION GOLD 95% quality review	80% document Commercials developed
	31	1	2	3	4	
	SUBMISSION 12pm					

Fig. 13.2 Example of a simple bid plan

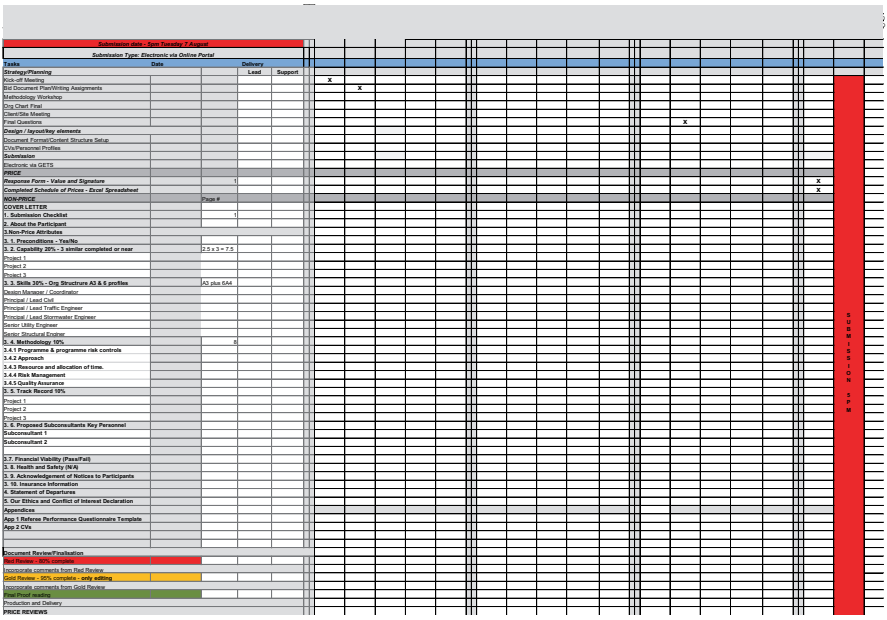

Fig. 13.3 Example of a line item bid program

The *outline template* – a draft master document managed by the submission team, who develop and review content as it is developed over the course of the bid. The team will raise content issues and gaps and will continuously 'massage' the content to fit page count and reflect the key win themes that were decided on in advance of the bid.

13.3.3.6 Agile Project Management (Also See Chapter 18 on Agile Teams)

One way to meet the tight timeframes and mitigate risks is to introduce an agile way of working, a transparent project management process that encourages collaborative working.

The agile approach to project management is highly suitable to projects involving cross-functional teams that require significant flexibility and speed, as is the case in bid management. While the agile approach is typically used in an IT product development environment, its focus on immediate feedback, fast turnaround and reduced complexity in a collaborative and creative project with key milestones and a fixed deadline, has produced excellent results in bidding as outlined in the Aurecon case study below, which was awarded APMP ANZ's High Impact Award in 2019.

Consisting of short delivery cycles, or "sprints", agile is well suited for projects requiring less control while at the same time encouraging a high level of real-time communication. It is particularly effective in self-motivated team environments.

Because of its highly interactive and iterative nature, agile technology allows for rapid adjustments throughout a project that in itself delivers a springboard for creativity, provided there is strong project leadership (Scrum Master or team lead, or in the case of a bid, the Bid and Submission Manager) in place that can balance a certain amount of fluidity with a strong focus on detail and key deliverables [10].

"Agile methods need Agile teams—teams that think differently and work in ways that support responsive delivery. An agile mindset, and a set of shared values, principles and often Agile tools, help Agile teams succeed." [11].

The following agile approaches work well in bid teams:

- Key delivery milestones are set in place in advance, while progress and issues are tracked through daily 'stand-ups' or check-in meetings to discuss progress against tasks, identify any roadblocks or impediments to progress and discuss and agree mitigations around those impediments. Through this daily review process, issues are identified early and mitigations applied to minimize the impact of those issues on the progress of the project.
- Highly knowledgeable team members are jointly tasked in sprints with people in new/different roles within the teams (a technical specialist becomes bid lead, a bid coordinator takes on the role of content owner, a transport planner may be leading the subject matter experts who develop and write up the project methodology, etc.).

- Focused communication and interactions between sub-sets of teams focused on methodology and content solution development.
- Ongoing fast sharing of information and quick reaction sequences to new information from the client or as the solution is being developed.
- Collaborative working, preferably in a co-located work environment, and a high commitment from team members to turn up, be accountable, and avoid other distractions to create a highly efficient and innovative interaction.

Case Study Involving Agile Bidding Approach

Many hours of preparation and late nights in the bid project room led to Aurecon being appointed as preferred tenderer in December 2018 for the Planning and Engineering Services for the Auckland Light Rail project, known as City Centre to Mangere (CC2M).

This complex bid involved an effort over three continents (NZ, Australia and Europe, with some input from Asia), and at one stage, up to 40 individuals from 12 nations were brought together to collaborate in one project office in Auckland. The fast-paced bid program involved a prescriptive SIA, two interactive sessions involving the core bid team, an equally prescriptive RFT, both with page limitations, and one full-day alliance workshop post submission. The team needed to demonstrate innovation and collaboration, together with strong technical capability and the vision for a transformational transport project that would regenerate the city along a 23 km light rail corridor.

The NZ Winning Work (NZWW) team introduced an approach based on Agile Project Methodology principles, including early and continuous delivery of content; harnessing change; frequent delivery milestones; close collaboration with the core team; creating the right environment to motivate and support the team; daily check-ins involving face-to-face meetings; maintaining a constant pace, and continuous attention to technical and content excellence to enhance agility, simplicity, and team self-autonomy and self-management.

Together with a strong focus on driving the bid program this not only ensured a quick start-up to the bid, but also that all parties, including various partner organizations (an architectural and landscape design partner and international urban rail design partner), were held accountable through daily stand-ups (half-hour catchups on a rolling agenda), closely collaborated in one project space, to build a strong team brand and culture. The bid team ran iterative storyboarding sessions to develop the content around an evolving understanding of requirements following client interactives (See the SCRUM examples in Chapter 18).

The NZWW team held the bid leadership team accountable, challenged their thinking and also provided a focus on visual input to make the content compelling, as well as prompts in the bid office to build team culture, and activities that brought the wider team strongly together. The result was a team that literally lived and ate and worked together, often for 12-hour days, and in the last weeks, seven days a week. This cohesive and motivational approach brought the team together in such a

way that the client recognized the evident team culture as a key point of differentiation, which contributed to the bid resulting in a winning pitch.

This agile-based approach has since provided the foundation for all key bids the NZWW team manages, and is continually adapted and revised to suit the particular requirements. The toolkit (which includes among others a program, calendar, bid roles and responsibilities chart) developed for the CC2M project has been simplified, and is customizable to any opportunity.

The team has since also successfully leveraged the content and approach used on this opportunity to further create a knowledge base of bid and reusable visual elements for other bid efforts, always tailored to suit.

13.3.3.7 Value Proposition – Unique Sales Proposition (USP)

At some point, the team of bid professionals will start honing in on a key concept – known as the *value proposition*. The value proposition articulates value to the client, and sets the tone for a bid:

- It identifies what is important to the client.
- It shows how your company is able to provide a differentiator or key service elements which others cannot – outstanding track record, innovative approach, specific cost/benefit ratio.
- It provides factual proof of where you have delivered this value before or an endorsement by another client.

Tom Sant, considered a leading practitioner in proposal writing worldwide, posits that bid practitioners need to be able to clearly differentiate the supplier organization from the competition, and indicate how those differentiators add value to the client. This typically requires a brainstorming analysis of what specifics would offer long-term advantage to the client, and would provide a real point of difference.

> *A value proposition is a promise to deliver specific results that the client desires, backed up by evidence that you can keep your promise. Moreover, a compelling value proposition should demonstrate the difference between a meaningful value proposition and marketing fluff.* [12]

The Value Proposition is captured right up front in the bid, in the Executive Summary, which is considered the single most important part of the bid, as it captures the essence of the offer and is the page typically read by all decision-makers. The Executive Summary focuses on the client and shows:

- that you have understood their key issues and non-negotiable outcomes;
- how you will achieve their goals (processes, procedures, talent in the project team, Gantt project flow-chart illustrating milestones, guarantees and quality control, overall project director's credentials);
- why you are best qualified to deliver the service; and
- a summary of the offer (normally no longer than 2 pages).

The Executive Summary is typically presented as three or four key statements that focus on the client's key issues, and demonstrate why they should select your organization above any others.

It is based on client knowledge and understanding, as well as the client's stated requirements. Bid teams conduct one or more strategy sessions to consider the requirements, analyse the strengths, weaknesses and opportunities of the competition and their own, and then come to a 'Why Us' conclusion to identify their discriminators and resulting win themes. This is a continuation of the capture planning process.

13.3.3.8 Creating Visual Impact

Visual page planning or storyboarding is the process of creating page mock-ups, and is a key part of creating visual impact in bids. It helps the entire bid team to visualize the end result and how their work fits into the overall "look and feel" and story of the bid [13].

The storyboard maps out the bid structure before actual writing starts and creates a visual approach for the team to build up each page in terms of content structure, key theme statements, and graphics and callout boxes to be included. Based on the bid requirements – page count, font size and the client's indication of the value they will attributed to each response section – the storyboard maps out how each page will look, and what content or diagram will be provided to respond to the client's requirements. As such, it focuses the writing effort and allows the lead authors to understand the direction the bid is taking.

In bid sections, the storyboard may indicate:

- Page size and orientation.
- Section headings (and related number of words, as well as the author).
- Key points/theme statement to include.
- Any diagrams to include.
- Any lessons learnt or callout boxes.
- Project photos or visual prompts.

The advantages are numerous – it provides a bird's eye view of the approach and identifies any gaps in the response quickly. It also makes for more economical and targeted content and facilitates content development. And as a result, the bid becomes more visual in terms of its approach, while theming is more consistent, and conforming to the visual brand.

Visual elements, together with text, make the idea or message you are trying to convey more memorable. Also, a polished looking bid shows the buyer that you will provide a polished service [14].

The use of icons and infographics is also hugely valuable in creating pace and interest in a bid. In that respect, often bid teams include a graphic designer or visualization specialists who are briefed on what the Submission Manager wants to

capture in the bid based on the analysis of the client requirements – in terms of both theme and concept. For instance, a bid about urban transportation typically will focus on commuter safety and the complexity of the urban environment. A bid for a hospital development needs to consider the hospital staff and patients as context. And a bid for office furniture supplies will focus on the ergonomic requirements of office staff. All of these visual concepts need to indicate subthemes that are important to the client, such as shared business values, or value for money, safety, security, sustainability, and more. The art, of course, is to define what would resonate with the client while also sharing the brand of the bidding company. In addition, the look and feel of the bid needs to align with the supplier's own brand strategy and overall brand positioning.

Typically, the following artistic and editorial components are used to enhance bid responses:

- Page layout and presentation including a consistent colour scheme and compliant fonts to meet page count requirements, and headers and footers that express both brand identity and vision, with adequate use of white space and typography.
- Content that involves key statements and callout boxes, such as:
  - People profiles supported by a key statement of the value each individual brings to the project.
  - Project profiles with tag lines that capture the essence of their relevant value.
  - Win themes and lessons learnt/short case studies – typically in call out boxes.
- Graphics outlining the bidding organization's project understanding and the methods by which they will achieve the client outcomes.
- Ample use of photos that support key messages, tables, graphs, and bullet points to enhance understanding.
- Interpretative infographics to convey key concepts, and process diagrams and charts with informative captions (Fig. 13.4).

Fig. 13.4 Example of creative use of icons to capture key win theme statements

13.3.3.9 Creativity in Content

There are four key principles to consider carefully in the overall content design of a bid: understanding who you are presenting to; the tone of the bid; simplicity and logic; and consistency of design, content, voice, and general presentation:

Know your audience – Only by understanding the client's needs can you speak to them in a way that they feel they are understood. This is the best way to differentiate your offer. Client understanding requires a needs analysis and then framing your response accordingly. Bid professionals spend years developing this as a skill – probing the sales team for information and then articulating it in a convincing manner.

Get the tone right – This is a conversation with your client, focused on their needs. It is not a mere sell, it needs to reflect understanding and focus. Avoid flowery language, dramatic statements, marketing speak or jargon. Good bid writing is indeed an art. It requires clear, simple English that focuses on the value your offer brings to the client – meeting their specific needs.

Simplicity and logic are key – Compelling bids are not cluttered, the graphics are simple and yet clear and comply with a colour scheme, the content is well laid out, headings are interesting and engaging. But overall, the layout and presentation need to be simple, they need to engage rather than distract the reader, with adequate white space to allow the text and graphics to 'float'. Keeping it all hanging together in a simple layout with visuals that support the text requires a good eye for format and presentation, and adequate time in the bid program to strip away and smooth out superfluous content or reshape visual ideas until they fit with the rest of the theme. Clarity of response is equally important. Bid writing teams often use a basic outline or formula for writing methodology to make it quite clear what the offer entails. And finally, the use of simple English and avoidance of jargon is key to bidding. Jargon and acronyms and complex language tend to confuse and obscure, whereas bidding requires clear and specific content, with a friendly and open tone to build trust.

Review for consistency – An editorial review to help simplify language, avoid use of the passive voice, ensure correct grammar and spelling of words, with the use of acronyms in a consistent manner, and a consistent tone (as often text by different authors needs to polished to appear as from once voice), and also check that a standard set of fonts and document format, including numbering and bullet point styles and punctuation, is being applied throughout to avoid distracting the reader.

13.4 Conclusion

Bidding as a business function is complex, and very often involves a specific and detailed methodology developed by each company. As such, content covering the topic in depth is often bespoke, or the topic of specific literature.

This chapter attempts to link an understanding of bidding and the requirements and challenges thereof to the opportunity that it presents in terms of creativity within

the structure of a brief. While it does not try to provide a methodology for bidding, the authors have attempted to provide an overview of the requirements, the process and specific initiatives within the process to enable bid teams to lift their game and think more creatively about their response.

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Cases & Discussion of Issues

CREATiViTY LABORatory:

Activity I: Storyboarding

Form a team of 4–6 members. Using a client brief, create a storyboard for a 10-page bid response to match the brief requirements (compliance). Use a visual outline that includes graphics, content headers and callout boxes, and win themes.

Activity II: Bid Plan

Form a team of 2-3 members. Using the process described in 13.3.3.4. develop a bid plan for a 3-week period with key dates and deliverables, including bid reviews and activities, as well as key tasks.

Activity II: Agile Methodology in Project Teams

Form a team of 4–6 members. Review the various sections and reference pages dealing with agile methodology. Discuss the pros and cons as it would apply in a project or bid team environment.

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Chapter 14
Idea Testing & Selection

Rouxelle de Villiers

Abstract The main focus of this chapter is to discuss appropriate tools, and the various models and frameworks to use in determining which of the ideas generated during earlier creative thinking phases are worth short-listing. Additional tools, both qualitative and quantitative, to further investigate the resulting short list, are covered after sorting or clustering ideas. Shortlisted ideas are considered for in-depth analyses to find "winning ideas" worth pursuing, as they are viable or of strategic value to the organization. This chapter offers a brief overview of the available tools that can be used to sort and select the best ideas for invention and implementation.

Keywords Classification trees · Concept combination matrix · Idea reduction · Order · Priority matrix · Profitability · Relations · Stage gates · Structure · Viability · Voting · Weighted decision matrix

Learning Objectives
On completion of this chapter, the readers will be able to:

- Apply decision and voting tools to select the most viable ideas for new ventures or innovations (in the form of inventions, radical, incremental, or disruptive innovations).
- Co-ordinate and manage complex idea selection processes across various teams.
- Deliver short lists of ideas for further investigation or to take to market.
- Use several tools and frameworks effectively to select feasible, acceptable, and desirable ideas for invention and intra- or inter-organizational implementation.

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14.1 Introduction

An idea becomes an innovation or invention only once it is implemented. After all the exhilarating creative thinking work, the project needs to move to the implementation stage to turn ideas into products or to result in positive changes in processes, procedures, behaviour, or habits. Many project managers will confirm that it is quite challenging to decide which ideas to pursue, as one must achieve balance between the excitement and novelty of the idea, the appropriateness of the idea (for adoption, profitability, and a host of other criteria) and forecasting the likelihood of success in the long run. During the idea selection stages, decision-makers must overcome procrastination due to unavailable or scarce facts and data, the inertia of fear, and the stumbling blocks of limited resources that may prevent radical, transformative ideas from being implemented. These blocks result in many good ideas gathering dust in a folder on a shelf. Unfortunately, limited resources restrict everyone – artists, musicians, business executives and even government units – from taking all "good" ideas beyond the "ideas world" and deploying them in the "real world" of work and play. Determination of a small set of worthy ideas to take to the next stage of further investigation and forecasting is not only the crucial next step but also one that requires mental groundwork. This is where a concrete and positive selection process is necessary.

During the ideation phases of creative processes, creatives need to remove barriers, think positively and openly and limit selective thinking. During the idea selection stage, however, critical thinking, judgement and probabilities come into consideration and all these need to be bolstered by a good dose of enthusiasm and inspiration for implementation. To select which ideas to take ideas to market, decision makers need to consider pros and cons, evaluate ideas and the have the guts to say "no" to some and "yes" to others, but the first step – even before selection – is to sort the ideas into logical categories or clusters of similar ideas.

14.2 Idea Clusters or Categories

14.2.1 Sorting Ideas

The first step in selecting ideas to implement or to "kill off" is to classify or sort the entire list of generated ideas to get an overview of the scope and span of possible solutions. This may be a very daunting task, as hundreds of ideas could have been generated, spanning a large range of possible solutions [1]. Not only is there likely to be a long list of possibilities, but those generating the ideas are likely to have some special affinity for a few personal favourites– we call those "Little Darlings". It is very hard to kill off "Little Darlings", even for a team who might not have been

directly involved in contributing the Little Darling. It is obviously important to respect all contributions, but unfortunately not all creative ideas are equal. Ideas that meet three basic requisite conditions: feasibility (the business can afford to take the idea to the next implementation stage); acceptability (the ideas satisfy predetermined strategic objectives); and desirability (project teams and consumers want what the idea offers) are best suited to take forward to the resource-intensive stages leading to implementation. Adept project managers and implementation teams suggest whittling the list down to a manageable quantity; i.e. a shortlist of between three and six ideas.

Chris Griffith [4] suggests the first step in getting to a shortlist of three to six ideas is *sortingideas*. Various scholars offer ideas on how to cluster huge lists (sometimes thousands of ideas) into categories. Such clusters could, for example, be arranged by investment size (more expensive or less expensive to initiate or implement) or capability needs – whether the firm already has the capabilities or must build the requisite capabilities [5] [Moore, 1962]. Another set of clusters could involve organizing the huge list by client or customer requirements or benefits, e.g., practicality, differentiation, fun, safety, or compatibility. Another framework suggested by Chris Griffith [4] groups ideas by the type of innovation being promoted: i.e., product, process, technical or technological, organizational, managerial, or organizational.

It is hard for decision makers to keep the selection and discard process simple, as many ideas are in their infancy and may require a lot more investigation to determine just how "good" or valuable they might be. Practitioners suggest a positive mindset (not being too harsh by culling meritorious ideas that simply need more refinement or polishing), and a key principle for effective sorting is to be guided by the original problem/opportunity and use a set of positive judgement criteria (including the strategy). Once categories/clusters have been formed, whole clusters can be screened quickly and, if not aligned with the original brief or main foci, scrapped.

A huge stumbling block and complication during the sorting of ideas is that new ideas are often formed by creating new combinations of prior or existing solutions from various domains – resulting in concerns over the classification of these multifaceted alternatives. Sometimes novel ideas relate to fragments that could be considered part of sub-problems of the original problem, making the span of ideas even wider. If these novel combinations were to be placed in multiple categories of possible solutions, the huge numbers of combinations would be utterly confounding and result in even more difficulty in selecting a suitable, appropriate, viable and feasible short lists of solutions. In the discipline of product design and development, authors Karl Ulrich, Steven Eppinger and Maria Yang [2] offer two tools, namely the Concept Classification Tree (CCTree) and the Concept Combination Matrix (CC-tools, see Table 14.1) to deal with this complexity. We also discuss a third structural classification framework designed by Gerard I. Nierenberg, named the ROS framework, after the two CC-tools.

Table 14.1 Responding to the problem: Feral cats catch and kill native birds

Tame cats go wild	Native birds	Humans1 (pet owners)
Breeding- too many cats	Poor sight and hearing	Cats as pets – Neglectful
Natural hunting instinct	Almost no natural enemies	Cats as pets – Freedom givers
Quiet when hunting	Bright colours – Easy to spot	Cats not neutered – Costly in time $
Nocturnal hunters	Many natives are nocturnal feeders	Bird feeders/fruit near homes
Large hunting territories	Not in contained areas – Fly far/ wide	Cats left unattended over holidays

14.2.2 Concept Classification Tree (CCTree)

The Concept Classification Tree described by Ulrich et al. (2019) divides the entire space of possible solutions into distinct classes. The selected classes are independent categories that should enable comparison and thinning out of the vast range of alternative ideas. (When used for combining ideas, these separate categories of concepts may lead to even more creative ideas.) Just like a tree, the core or primary concept establishes the central theme from which various branches extend. These branches should be independent concepts/categories that are easily identifiable (defined) by the participating think team. One possibility is that each branch is considered an alternative solution to the problem. Alternatively, each brand represents the needs/benefits of a particular stakeholder group. (For example, the tree related to the problem of "feral cats catching native birds" may branch out into six key areas: cats, birds, owners, veterinarians, council, and conservation; or perhaps activities such as walk/prowl, jump, fly, and hop; or solutions related to three basic areas of training, policing/licensing, and conservation.) Another theme or basic structuring/clustering device is the likely task team or strategic business unit (SBU) that will deal with the implementation of that particular solution. If a solution sounds particularly promising to more than one team, the draft or preliminary solution can be allocated to more than one team to work on independently for an adequate period. Independent and autonomous teams are likely to pursue creative ideas and bring new ideas or fine-tune and tweak sub-concepts to ensure an even better overall solution. Let us return to our feral cat and native bird problem. Say one solution tendered suggested implanting cats with an IT device and tagging birds with an alarm-generating device that interacts with the cats' devices to generate a buzz or loud sound, thus warning birds when cats are nearby. For this possible solution using augmented reality (AR), both the IT and the bio-engineering team might consider working on the next stage of idea refinement.

Interestingly, studies indicate that trees where the branches represent subproblems in a highly constraining manner are more likely to generate creative outcomes [2]. Some benefits of using a CCTree are: (i) non-meritorious branches of ideas can be easily identified and pruned; (ii) independent approaches to the

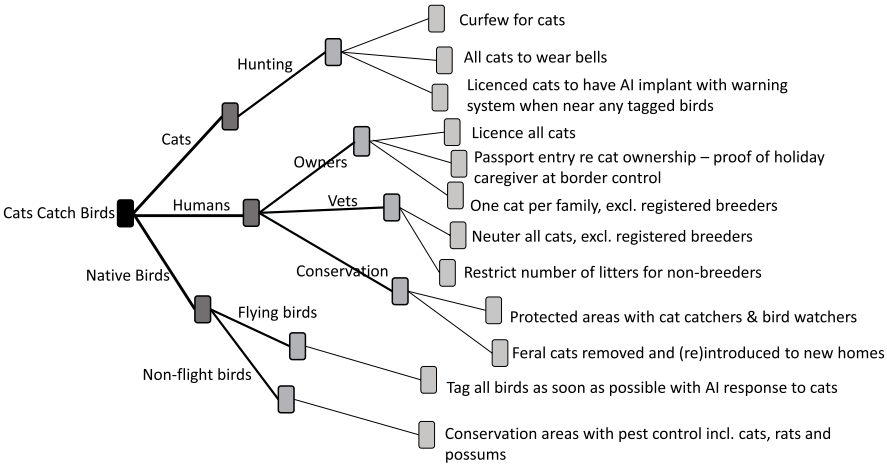

Fig. 14.1 Cat & bird concept classification tree

problem are likely to be identified during and after the branch-out phase, when separate teams work on the sub-solutions independently; (iii) the process identifies inappropriate over- or under-emphasis on branches; and (iv) facilitates requirements for further refinement into additional sub-branches (Fig. 14.1).

14.2.3 Concept Combination Matrix (CCMatrix)

A CCMatrix is quite like a CCTree, except that the CCMatrix has the columns of the matrix corresponding to the sub-problems (e.g., cat, bird, owners, vets, council, conservationists), whereas the rows are created by considering fragments of each problem (down the relevant column). After creating the CCMatrix, solutions are considered by creating combinations between and across columns and rows to create new items that will replace two or three of the previous sub-solutions with one "newly- combined" solution. (Our cat/bird dilemma is illustrated in table CCCM). A solution that might "appear" from combining item three in column one with column two item one, would be to ensure that cats wear something that emits a warning sound that birds can pick up when a cat is nearby.

14.2.4 The ROS-Model

The acronym ROS relates to the three aspects of relation, order, and structure. According to Gerard Nierenberg [3], one can best understand structure if one understands relation and order. Judging concepts or constructs via the lens of past

experiences, we can make sense of an idea/concept/construct when there is a relationship or similarity, and a sequence in time or space. Lower-order structures are combined to achieve a higher-order structure (e.g., five toes, heel, arch, making a foot) and our understanding is substantiated by the understanding of order and relation (foot, heel, calf, shin make the lower leg, as part of the lower body, which is part of the structure of the whole body). For example, to understand a higher-order construct well (e.g., a flower) it is easier and useful to understand the function and design implications of lower-order constructs such as stem, stamen, petal and sepal. Similarly, deconstructing a problem, (e.g., too many feral cats catch native birds), into its key parts (such as (i) cats, (ii) birds, (iii) local council, (iv) nature conservation, and (v) human owners), and knowing each component, either via past experience or by exploring them thoroughly in a variety of ways, will help creatives and problem solvers to explore possible solutions systematically and sensibly. When solutions need to be classified or categorized, a clear understanding of order, relation and structure will be helpful (Fig. 14.2).

Clustering ideas truly depends on perspectives. The ROS-model illustrates how we can separate ideas into less obvious relationships/categories – changing one's perspectives help to see things in a new light. According to Nierenberg, there are

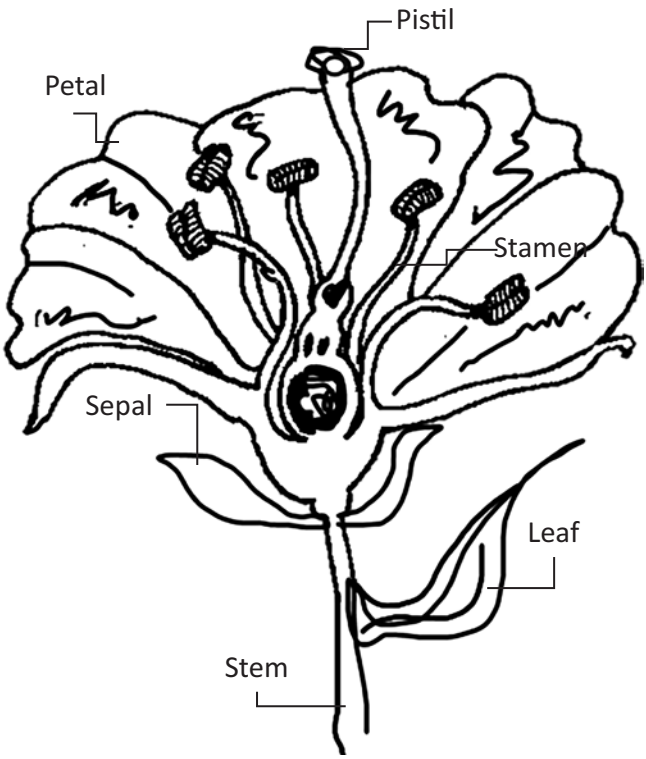

Fig. 14.2 Parts of a flower to illustrate structure

three areas creatives consider: knowing differences (structures); knowing similarities (relations); and knowing changes (order). According to Nierenberg, the order in which the three areas are applied is unimportant.

14.2.4.1 Order

Order signifies a change. The change may relate to time (sequence) or space (growth, transformation, development, evolution). Applying order to concepts or ideas requires consideration of before/after, earlier/later, beginnings/ends and stages, sequences, cycles, and space. Korzybski writes in "Science and Sanity" that "order seems neurologically simpler and more fundamental than relation". He states the order is central to our earliest experiences, as we possibly perceive through our sensory experiences of hearing and feeling our own rhythmic heartbeat and our mother's heartbeat and breathing. The first visuals will be 9–12 [inches] from the baby's eyes to his mother's face. Two further illustrations of the impact of order are poets' sonnets and artists' ability to create aesthetically pleasing artefacts by ordering junk in arrangements that are worthy of notice, providing meaning and new aesthetic appeal to viewers. The ROS-model offers a range of questions, phrases, and words to aid our insight into and develop our skill of ordering (set out in Table 14.2).

Table 14.2 Nierenberg's ROS Model to categorize concepts

ROS-concept	Concepts, words, phrases	Useful questions to utilize the creative skills of clustering
Order	Change in time and space	What are the interactions – Cause and effect? What are the inter-workings… before/after? What are the phases and steps? (enlarge, reduce, speed up, slow down, distort affect, rotated, direct, evolve?). Can it be expanded – added to in time and space? Repeated, intensified, thickened, built up? Ingredients increased?
Relation	Similarities, connections, affiliations	What is it part of? What is it a class of? How are they similarly qualified? Are there comparisons or similarities? Spatial similarities: Left to right, top to bottom, front to back, inside out? Symmetrical, mirror image? Can it be reversed? Reordered? Rearranged in different directions? What are the integrated units in time? Can it be divided?
Structure	Differences, contrasts, distinctions	Can it be adapted? Does it copy anything else? What is it similar to? What does it do? What is it for? What are its properties? What is its character? What is its kind? What is its type? Can it be sorted separately? Does it have logical sensory and/emotional qualifications? What is its substance? What is its shape/size/number? What is its effect on sensations? What is its effect on emotions?

14.2.4.2 Structure

Structure deals with *differences (contrasts/distinctions).* In contrast to time and space, structure tends to be timeless and without space constraints. For example, we think we can hear a melody, but we only hear one note at a time. Memory to some degree anticipates structure – even vision, with 80 eye movements a minute, tends to complete structures that are not in focus for even a nanosecond. We can see structures at multiple levels: sub-atomic to universal; abstract to logical; imaginary to real; sensory to verbal – and we build cumulative structures. In our perception of a melody, the order (timing) of related parts (notes) provides higher structures (dimensions) to round out the conceptualization of a still higher structure (melody). The mind can hold contradictory structures at the same moment in time and over time. For example, something may taste good but be bad for one's health; or may be attractive as a whole, but ugly in its components (e.g., crafted objects made up of waste materials).

14.2.4.3 Relation

Relations deal with how issues, objects, people, and problems relate to each other, in terms of similarities, connections and affiliations. Relationships exist between humans (family members, employees in hierarchies), objects and humans (my doll, her car, his ball) and multiple objects (the river's bank; the bowl on the table and the bucket next to the well). But, as the questions in Table 14.2 illustrate, verbal logic provides relationships too; e.g., we know when knowledge is tacit or explicit, and when dangers are overt or covert. Relations can be perceived at a cognitive level and on an emotional level, e.g., love versus hate; dislike versus enjoyment; pleasure versus pain. The construct of relation also deals with classes, parts, and connections.

After sorting ideas into clusters, trees or categories, idea selection or short-listing takes place. It is very hard to suggest how many ideas should make the short-list, but experts suggest considering both heart- and head-favourites for the short-list, while not exceeding single digits (have fewer than 10). What they mean by heart and head collections is that both the ideas the decision makers are passionate about (often based on no more than gut feelings) and those that perform well in purely analytical tests, should make the very short list. It is often useful to do this first-tier screening in a group, as the process of explaining to other team members why an idea is worth pursuing helps to crystallize thinking and usually contains the important FAD elements [4] discussed earlier. Next, we discuss a few 'head' or 'left-brain' screening tools: the weighted priority matrix (or WDM), followed by early tests for idea viability. (Remember the "left-brain" statement is merely an analogy!)

14.3 Selecting Ideas – Taking Only Some Ideas Further Towards Implementation

Even the most experienced creatives, despite their best intentions, have some bias towards their own ideas or ideas that fit with how they operate [7]. As a slight exaggeration and generalization, we offer these examples as explanation: engineers prefer highly technical innovations; marketers prefer ideas that serve customer needs; salespeople like ideas likely to sell well; and accountants like ideas that make it easy to control costs. During the important and exciting ideation stage, the purpose is to generate large numbers of novel, inspiring and divergent ideas —potentially building better ideas. But a critical next stage is to converge or reduce ideas down to the best, most practical, or most innovative ones. There is some risk during the idea screening stage, as valuable ideas may be lost, or less valuable ideas may absorb finite and expensive resources for long periods of time; therefore the opportunity costs may be very high. For this reason the selection process often uses a combination of qualitative and quantitative procedures to select ideas to implement ('go') or reject (cull/kill/'no go'). Many practitioners use a simple voting system before a more intensive or robust screening process – simply to check if there is some agreement already, to bring vast quantities of novel ideas down to a reasonable list of likely prospects, or to focus on those with gut-feel support or gut-feel aversion. We cover a range of simple voting systems in the next section. Selecting ideas to take to market takes logical AND emotional thinking: heart and mind! (Fig. 14.3).

14.3.1 Simple Reduction by Voting

Step 1: Select a Set of Qualifying Criteria The ideation stage in creative and design thinking results in multiple solutions to problems – as many as possible and as wide a range as possible. There are many alternative sources of ideas for consideration, such as specific ideas generated by R & D teams, and general ideas offered by frontline or sales staff (based on own experience or feedback by staff). Sometimes even the family members of employees see ways in which the organization can alter or re-design offerings to suit needs better. But ideas by themselves have little to no value. What needs to be done once you have a huge list of ideas? Some ideas may be interesting, fun and even exciting, but how do organizations identify ideas that have business or societal value?

For whittling down a list of very varied ideas to the "top 10" (or so), practitioners offer easy-to-vote tools. It is essential for the screening team to establish the voting criteria before getting to the most likely ideas to shortlist. These criteria will differ vastly over a range of purposes, from simply an idea that is a "good one", such as the choice most likely to surprise customers, or the most unexpected and therefore most differentiating one, to the most delightful/fun/exciting one that best fits with

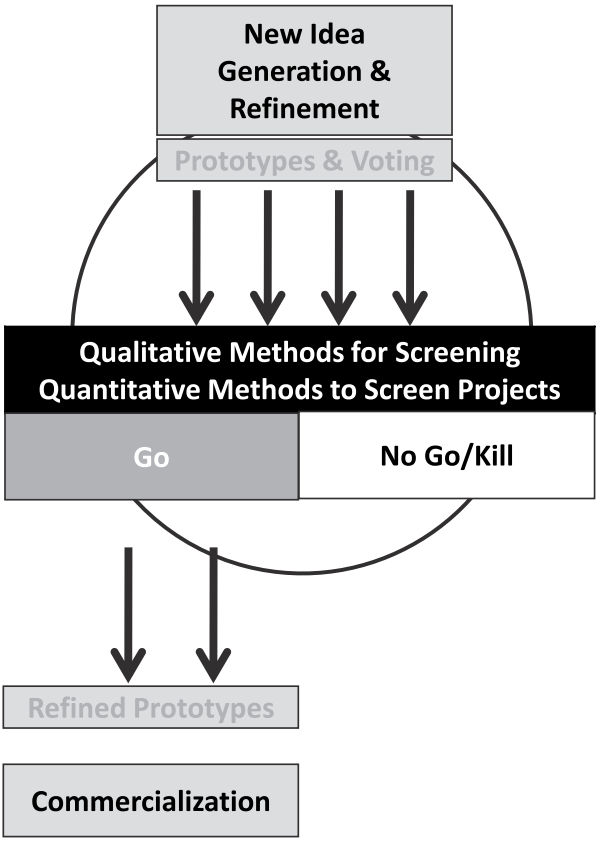

Fig. 14.3 Screening projects

the brief. For product development, good ideas might be the least costly to implement or the most likely to succeed in the target market.

Step 2: Choose a Voting Method and Vote In this step, the facilitator needs to consider whether voter anonymity needs to be maintained, either to achieve confidentiality or to prevent bias or unnecessary pressure to conform to the will of the group or the most senior participant,. These voting processes are designed to allow every participant to have an equal say in choosing the shortlisted ideas. Table 14.3 explains a few common voting types.

The above voting tools are all easy to use and aim to reduce the number of ideas to a quantity that the team can develop further or take to the next step. Some idea-generating teams use this voting as the last step in the ideation process, while other teams separate out the voting to another day and regard it as part of the evaluation or solution refinement stages. The two schools of practice differ in their views on the benefits of each. Project teams who like to end by voting or categorizing ideas

Table 14.3 Descriptions of various reduction tools

Option	Description
Post-it voting	Each idea is put on a separate Post-it™ note. Team members place a dot on the Post-it they want to vote for. Each team member gets to vote for a certain number of ideas (2–4 usually). Participants can put all their dots on their one most favourite idea OR spread them wider, or use only one dot per idea (to end with a shortlist). Criteria such as "ideas with fewer than 10% of participant votes will not be accepted for further review" OR "Only the top 3 ideas will move forward" need to be agreed before voting starts.
Bingo selection	Team members split ideas into different categories. Categories might range from the likely target market (for new products) to potential applications in a physical marketplace or online marketspace, all the way to current foci of business units within the business.
Attribute diagrams	Participants group similar ideas together, thus allowing patterns and common themes to emerge. These themes prompt participants to identify new combinations and possibly even prompt ideas about technical limitations or simultaneous inventions required to make the new invention a reality (or well aligned with consumer needs)
How? Now. Wow!	Participants divide the list of generated ideas into three categories. 'How?' ideas are innovative, but difficult to implement. 'Now'. ideas are not innovative, but easy to implement. 'Wow!' ideas are novel or unique, and reasonably easy to implement.
10:5:3 or Dot vote	This number model represents the number of ideas the full set is whittled down to, using a voting process. At each voting stage only the TOP 10, then 5 and then 3 ideas go forward for further voting. For the first voting step, all voters get 10 dots to allocate. Again, they can allocate all 10 dots to one idea or spread their dots as they see fit. (Some teams only allow one vote per idea per person,) Once all votes have been cast, the facilitator extracts the top 10 ideas onto a new list and gives each participant only 5 stickers to allocate. The process is then repeated with 3 dots per voter. The voting is complete when only 3 ideas remain on the board. These three ideas may then be ranked or (dis) qualified, using a different set of criteria and different voting methods
PMI or Idea Affinity	The participants use plus, minus, interesting(PMI), in combination with De Bono's red-hat gut sense thinking hat. Each participant gets a full list (on individual post-its/cards/paper strips) to place on a grid with the three sections clearly demarcated. Individual team members identify and categorize ideas into the three sections: PLUS (P), MINUS (M) and INTERESTING (I). Those ideas perceived as possessing mostly positive or likely- to-work attributes are categorized as PLUS; ideas that seem to have more negative attributes are MINUS attributes, with concerns over likely impacts and implications for the firm; and ideas that are novel, unique, and interesting are categorized as INTERESTING attributes that need further consideration before choices are made.

(continued)

Table 14.3 (continued)

Option	Description
Bingo	Each idea is given a number. Each team member is given a number of ideas they can select as their favourites to implement if they were to project manage the innovation. Each idea, now indicated by either a number or a letter of the alphabet, can be given a sub-rating related to a selection criterion (e.g., alignment with a strategic purpose, or how costly it will be to implement). All ideas are rated on this ONE criterion with an absolutely defined rating, e.g., very costly is 10/10 and low cost to implement is 2/10; or time to implement is stated in months, e.g., 14 months is recorded as AC14).
#TESTTYPES	All ideas are divided into a matrix of three types: a physical prototype (customer experience, CXP); a digital prototype (user-experience prototype, UXP), and a sensory experience prototype (SXP). The resulting matrix lists the ideas to the left in the rows, and the prototype to the right in columns. Team members either decide on which prototype is most valuable to the organization or SBU, OR select the top ideas that meet all three prototype requirements to provide maximum opportunity to succeed.
Four categories	Four categories range in abstractness from highly abstract to most rational: "long shot" (also called CAMELs); "fair chance" (FAIRY/fairies); "likely to delight" (LOLLIEs); and "Favourite" (also called DARLINGs), Participants get to select, from the overall ideas list, only two ideas to place in each one of these four categories. This method encourages a range of ideas and further debate about merit, alignment with the brief, and the strategy [6–9] of the organization.

feel that the ideas are fresh in their minds, and they are still clear about what the proposer of the idea meant when the idea was raised. Teams who prefer voting as a next stage report that a period of distancing themselves from the suggestions allows time for incubation, new perspectives, and some percolation in their own minds – and therefore better insights. They also feel that they are more removed from who offered the idea, and therefore less biased. It is probably a matter of choice for your own team. Obviously as time is always an expensive commodity and a finite resource, too lengthy or too hasty decisions both have serious implications for limited resources.

14.3.2 Weighted Priority Matrix (aka Weighted Decision Matrix WDM)

It is not easy to select the optimal solution or design alternatives in inventions, new product development, or during the design thinking selection process. Concept selection can be a time-consuming activity, due to the to the many variables that are involved in the selection process, as alternative solutions are considered against multiple factors including the cost of manufacturing, manufacturability, cost of assembly/de-assembly, maintainability, tooling/manufacturing complexity, and functional requirements. Each of these over-arching factors can be sub-divided in

turn. For example, functional requirements and the desirability of a problem solution can depend on multiple factors including ease-of-use, reconfigurability, ease of (dis)assembly, robustness/damageability and weight, to provide a very short selection from a host of possible functional requirements of users, clients, and other stakeholders [4].

Similar lists of requirements are likely to exist for manufacturability, logistics, and assembly. The items in the list (criteria)will vary vastly for different projects when setting up the matrix, and these items should represent your evaluation set. Experts suggest that more than three criteria deliver the most benefit from this process. The criteria can be selected from a very wide range of evaluating items. Some of the most common criteria are:

- Relative Benefit (to the business and customers)
- Relative Penalty (if not included)
- Relative cost of implementation
- Relative risk of implementation (relative to the cost)
- Degree of tactical and strategic alignment
- Time to implement
- Percentage of users impacted
- Number of resources required
- Volatility (potential for the item to change or the rating to change)
- Urgency (How soon is the item needed?)

Each of the criteria need to be scored (either out of a fixed amount like 10 or 100; or relative to each other), giving the maximum rating to the highest ranked or most important.

Olabanji and Mpofu [10] developed the columns of the weighted decision matrix (WDM), scoring the criteria using five levels: highly important, important, very necessary, necessary, and not necessary. The levels are awarded grades from (5) to (1), corresponding to highly important (5) to not necessary (1). To determine the weight, the percentage weight score of the requirements/criteria are given for ALL the considered criteria/requirements as a score out of 100. (See Table 14.4). Concepts are all compared using the same 1 to 5 scale and the percentage weight of each concept is determined and listed in the first column of the matrix. Each concept is scored carefully relative to each measure/criterion. This process is repeated over all the proposed alternatives (in this case A to D). In the table, M, A, E, S, Q, F and T are the factors considered in the implementation of each proposed solution. Weight, in column two, is determined as a percentage to reflect the importance to the firm in its decision to adopt, reconfigure or implement the proposed alternative(s). The score for each concept is independent of any other concepts and is not linked to the weighting at the point of determining the score. This score is a predicted value, determined by the experts in the selection team or the team charged with investigating the concept at different stages of the design or ideation. To get the utility value, the weight is multiplied by the score, and totalled for each concept. The highest total represents the highest utility and therefore the ranking of each of the concepts, relative to the key criteria. It will be apparent that because the product/service/process

Table 14.4 WDM to illustrate weighted scores for a range of decision criteria

Requirement or criterium	Weight	**Concept A**		**Concept B**		**Concept C**		**Concept D**	
		Score	Utility	**Score**	Utility	**Score**	Utility	**Score**	Utility
Material costs (M)	21	**5**	105	**8**	168	**5**	105	**10**	210
Strategy alignment (A)	19	**7**	133	**3**	57	**5**	95	**10**	190
Ease of built (E)	13	**8**	104	**8**	104	**6**	78	**7**	91
Set-up cost (S)	14	**14**	196	**4**	56	**3**	42	**3**	42
CiQ required (Q)	12	**10**	120	**5**	60	**3**	36	**2**	24
Safety (F)	15	**5**	75	**4**	60	**3**	45	**7**	105
Time2Build (T)	6	**6**	36	**4**	24	**3**	18	**9**	54
Total	100	**Max /15**	769	**Max /9**	529	**Max /7**	419	**Max /10**	716
		1st choice		**3rd choice**		**4th choice**		**2nd choice**	

is still in the proposal stage, many of the scores are conjecture, or at best reasonably qualified projections and thus cannot be guaranteed to be correct.

The process described here is based on human calculations, projections, and estimates. Artificial Intelligence or machine-based learning models can duplicate the WDM-processes easily, as demonstrated by the work of Olabanji and Mpofu [10] and various supporting scholars [11, 12] who confirm that "To reduce human reasoning and computation during selection of concepts, different methods of concept selection have been developed" [10]. We cover some tests for selection and implementation in the next few sections.

14.4 Early Tests for Idea Viability

Since the defined purpose of the ideation processes is to deliver novel, unusual, and even wacky ideas, not all generated ideas will make it to the business case (a white paper proposal for senior management's consideration) or to concept-to-marketplace implementation. Many of the creative ideas (even some of the "best" ideas that inspire the creative think tank) may not be technically feasible, may not align with the strategic direction of the business, may not yet be acceptable to a wide enough target audience, or may simply not get sufficient capital from venture capitalists (or the budget controllers) to be carried to fruition. Technology Management scholars [13] estimate that only one in 3000 raw ideas generated by serious business processes will result in a commercial success. Highly innovative organizations (HIOs) accept that this high rate of idea demise is quite normal. HIOs recognize and accept the juxtaposition of having many ideas in different stages from ideation to "go-ahead", and the importance of regularly pruning back on prototypes that are less than promising or have only weak likelihoods of success in the marketplace. To find this balance between a full pipeline and a shortlist of commercially viable ideas,

organizations have a range of practices and procedures to determine which ideas to cull and which to take to the next stage of implementation. We cover some of the more well-known practices (e.g., idea funnels, stage gate models, financial models and research methods) in the next section of this chapter. Stage-gate models, idea funnels, financial models; qualitative questions; competitor analysis; and focus groups.

14.4.1 Stage-Gate System

In the 1980s Robert Cooper designed the stage-gate system (SGS), were assessment points act as elimination stages to sift weak ideas out from those that are candidates for probable success. Worthwhile ideas are scrutinized at various stages, working down from a large number to a small, affordable, and feasible proportion that the project team will put forward for execution (normally this proposal is called a white paper or business case/plan). Each gate represents a checkpoint where decision-makers (either the i-project leader or the senior executive) determine whether the proposal should be (i) culled; (ii) further investigated and refined; (iii) subjected to projections for resource and strategic implications, or (iv) fast-tracked for implementation (test fast, fail fast or drive to market). The stages between gates represent periods of development work, e.g., from raw idea to technical specifications; developing and testing a prototype; reporting on a focus group; producing a white paper; investigating resource availability. Some organizations use a 5-stage model: scoping; building a business case; development, testing and validation; launch; post-launch review (Fig. 14.4).

For most organizations, the first gate is the screening gate, which only promising ideas get past, to avoid wasting valuable resources on non-workable ideas. For all

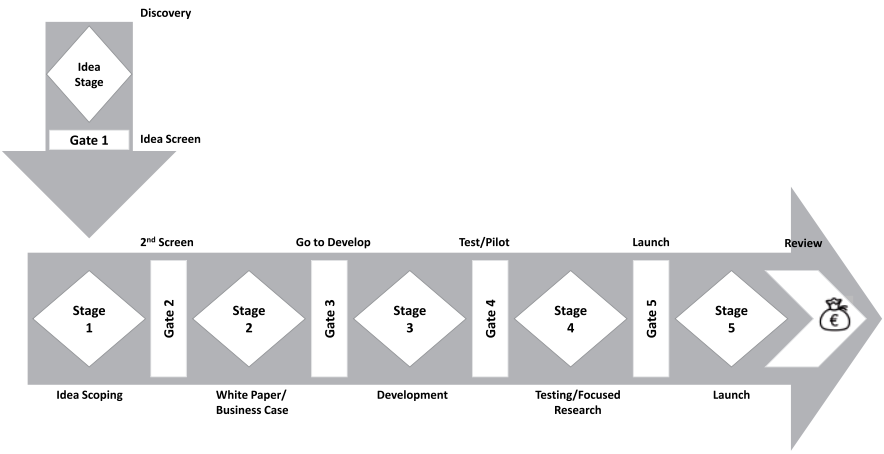

Fig. 14.4 Five-stage five-gate system for early idea evaluation

organizations, the final stage is commercialization. Re-evaluation and review are for some organizations part of this innovation, while others consider the post-launch review a mid-stage between this project and the revised or re-engineered "next new" project.

Innovators suggest a shortened XGate process with fewer than 5 stages for projects of mid-range risk, such as extensions, modifications, or alterations to already launched innovations. Some sales and marketing product or service changes are so minor or such incremental innovations that the Stage-gate Lite® model is suggested, where only one gate is necessary, at which the decision team basically decides either for or against the project and limits the resources allocated to the project.

Cooper investigated go/kill screening at the various stages and found that many firms use the gated approach, breaking proposed projects into stages, with each stage being more costly than the previous one [14]. Each stage is preceded by a gate and each successive gate demands a more reliable set of data, since the following stages demand more resources. The initial investment decisions thus do not need the rigor of later-stage decisions in order to proceed to the next stage. (Cooper suggests that screeners think of the idea-to-launch process as "buying a series of options on the project, rather than buying the whole project outright". The gating/options approach helps to manage the risk in breakthrough development projects.

Cooper and Edgett [15, 16] created scorecards to use at the different stages of the screening process. Innovation managers rated these scorecards as more effective than financial tools for early-stage project selection.

"Research-based scoring criteria for evaluating major initiatives include [16]:

- Does the project align with the business and innovation strategy? And is it strategically important to do?
- Is there competitive advantage—for example, a unique superior product with a compelling value proposition for the customer? Will the product deliver real benefits to the user?
- How attractive is the market, in terms of market size and potential, growth, margins earned, and the competitive situation?
- Will this project leverage core competencies in marketing, technology, and manufacturing?
- Is the project technically feasible, considering the size of the technical gap, technical complexity, and technical uncertainty?
- What is the potential for reward? Is the project worth the risk?" (p. 28).

The quality and composition of the decision-making team is of paramount importance to the stage-gate system. Those determining the composition of the team should consider whether the proposed team members have: authority to allocate resources; clear insight into the organization's strategy; clear understanding of the marketing strategy and niche foci; objectivity and the ability to see past political pressures; accountability for the decisions they make.

Luecke's book *The Innovators' Toolkit* [17], suggests that there is no magic bullet or generic formula for the decision-team to apply, but that the focus should be on

how idea screeners consider and screen ideas presented for consideration [p. 81]: they must balance acceptance and rejection as the innovation budget must neither be spread too thinly over many projects, nor involve placing all their eggs in one basket (betting on one or two big ideas). The screeners must be able to tolerate some ambiguity and uncertainty as reliable data, evidence, or even accurate data are almost never available in the early stages of a project. Luecke suggests that some qualified assumptions will need to be made regarding anticipated technical problems; the ability to solve those technical problems with advanced technologies; competitor activities (or responses); and the capabilities of the teams and any new recruits. A key factor in the decision for or against a proposed project is the project's alignment with the organization's strategy and brand positioning within the marketplace.

14.4.2 Idea Funnel

The Idea Funnel (IF) can be thought of as an analogy for taking a great many ideas and reducing them to a handful likely to achieve commercial success. Visualizing a school science project for purifying water, using a funnel, cotton wool, multiple layers of sand and some filter materials in multiple layers, may provide a helpful analogy of how the IF works to remove "noise" or "clutter" and produce potentially successful solutions to problems. Unfortunately, in our efforts to reduce ideas, we may risk culling ideas that might be once-in-a-lifetime successes, or radical and highly profitable pioneering innovations. It is therefore essential to have quick kills that free up limited and valuable resources, but do not filter out promising ideas that could be profitably commercialized. To ensure that an idea that passes through the IF is a likely winner, the criteria to pass through the successive "filters" become more rigorous and more deliberately aligned with the intent, purpose, problem solving capacity and strategy of the organization. Very few (but most likely the best candidates) ideas should make it through to the final commercialization processes. The Harvard Innovator's Tool [17] (p. 78) lists three important questions to consider when designing an IF:

"What should the criteria be for staying in the funnel ["go"])? How long should development and experimentation be allowed to progress before someone pushes the "kill" button? How should "[go/]kill" decisions be made?" (Fig. 14.5).

An article entitled "There is no fun in the funnel" [18] provides clear direction for innovators regarding the high costs of lengthy commercialization processes for "slow-to-kill" organizations. Given that organizations have limited resources and a limited number of screeners to evaluate and dispose of ideas, the entire development cycle – generally with negative consequences – can stretch. The dearth of winning ideas being commercialized by slow-to-kill firms results mainly from a whole vault of good ideas sitting dormant, waiting for approval, combined with the time and resources the current ideas (even those that will be culled) occupy in the schedules and minds of the development team(s). In contrast, quick-to-kill organizations have short and relatively less costly go/kill-decision cycles, but might alienate ideators

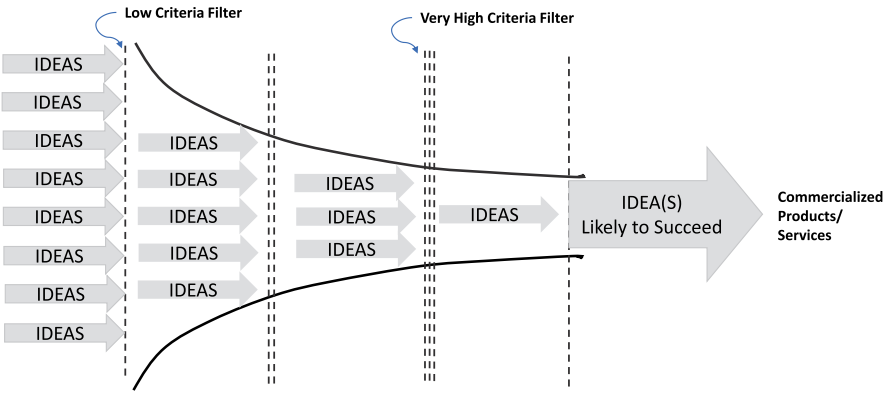

Fig. 14.5 The idea funnel with low and high criteria filters

and create a perception that new ideas are not valued. This might create a culture or view in the organization that senior staff who control the valuable resources do not value innovation.

Corporate advisor and innovation consultant Robert Cooper [19] suggests that each stage has a particular purpose, as captured in Fig. 14.6. Cooper highlights the screening information required for the Stage 2 and Stage 3 gates – at the front end or pre-development stage of the funnel. The innovation or selection teams need to consider seven reports (analyses of data or forecasts based on qualified guesses and past experience as set out in the seven grey boxes in Fig. 14.6). These focal reports and analyses are: (1) Customer Needs analyses; (2) Competitor Analyses; (3) Market Analyses; (4) Technical Assessment & Source supply; (5) Concept testing with user validation: (6) Financial Risk Analyses; and (7) Action plans, Teams & Resource Plans.

These analyses, combined with secondary research into consumer needs, competitors, the supply chain, requisite resources, and financial implications, should form the basis of a solid, well-supported business case for consideration. Further testing of and investment in refined prototypes for validation normally only happens after some fairly robust data gathering and analysis, completion of a well-supported business case or white paper, and finally approval by the organization's decision-makers. After passing gate 3, HIOs invest large sums of money and resources in development, testing and validation before being ready to launch. It is therefore imperative that the screening during gates 1, 2 and 3 is highly effective and efficient.

14.5 Resource-Based Idea-selection Decisions (RID)

After completing the ideation and idea refinement stages, innovators need to get rid of bad ideas as quickly as possible. This is because limited resources are diminished, either as opportunity costs or as real costs mount and are then irretrievable

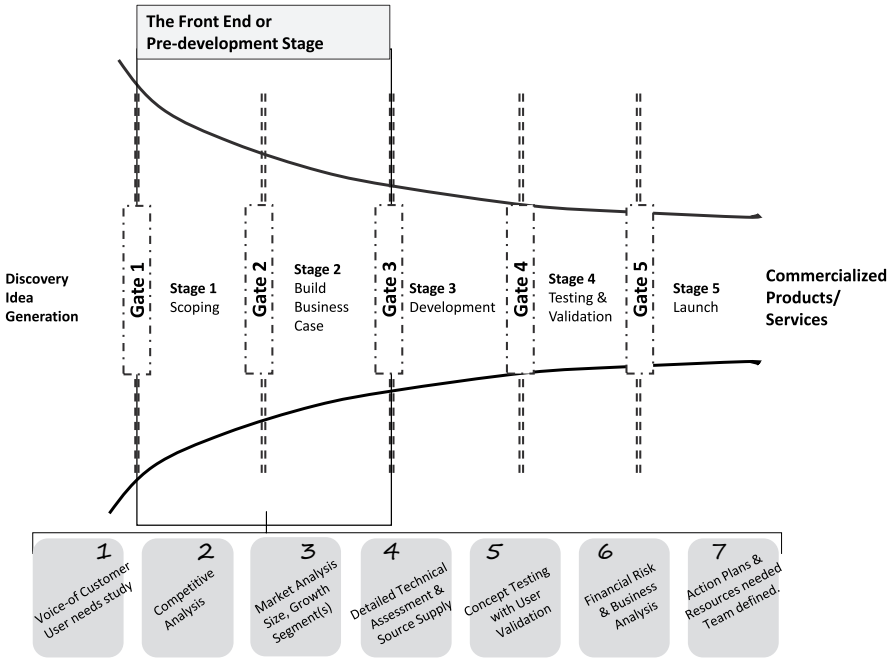

Fig. 14.6 The idea funnel in stages, with stage gates clearly indicated

when half-developed ideas get culled. Many companies use quantifiable financial yardsticks, but innovation researchers [16, 17, 20, 21] often warn that these measures or decision tools should only be used later in the innovation cycle. For radical or disruptive innovations, it is very difficult to guess some of the development costs and to predict the likely consumer adoption levels. It is only when prototypes have been built and tested that solid, credible estimates are possible. However, as innovations move closer to commercialization, the financial projections and analyses predominate. Financial tools such as net present value (NPV) and discounted cash flow (DCF), are used to consider early-stage ideas. We will mention these tools briefly here, as the scope and focus of this book is on innovation and creative intelligence, not financial controls and measures. (Readers may wish to refer to the contextual variables and warnings that users, practitioners and consultants regularly issue related to the ever-changing economic context and socio-economic factors facing innovators.)

Some fairly simple financial measures to consider are: How much will it cost to bring the offering (product/service/system/idea) to market? What price would be reasonable but position the offering well in the marketplace? How many units can the organization expect to sell at a range of prices? What are the overall costs to the organization (including opportunity cost, cost of capital, production, marketing, sales, after-sale-service, and omni-channel promotions) of launching this product?

14.5.1 Net Present Value (NPV)

NPV is a method of determining what value, in terms of income or loss of income, will be generated by all future cash flows, against an initial capital investment. NPV projects all the future cash inflows and outflows associated with an investment, discounted against all the anticipated future cashflows to the present day, and then adds them together. NPV is the resulting figure (value to the organization) after adding all the positive and negative cashflows together. It is clear that a positive NPV is desirable (the bigger the better) and a negative one is somewhat undesirable. However, some firms will still implement projects with negative NPVs, as they might be useful in terms of strategic value, or their value for entering a market not previously served. Also, some projects have long-range intentions and are not based on short-term profitability or cashflow decisions.

As a reminder, the formula for NPV is cashflow/(1-discount rate)n (where n is the number of years between the present and the year in which the cash flow is received; discount rate is normally the present annual interest, or the anticipated interest rate the firm expects for cash).

14.5.2 Economic Value Add (EVA®)

In 1997, economic value added (EVA™) [22] was heralded as the "most exciting innovation in company performance measures" (p. 318). Johnathan Kramer and Johnathan Peters [23] reported on its prolific use by large companies such as Monsanto, Equifax, Lloyds; and Briggs & Stratton, to help them measure their financial performance. Simply stated, Economic Value Added (EVA) is calculated by subtracting the opportunity cost of the capital from profits generated. A formula to calculate EVA ® provided by an organization's EVA is calculated for any year *t* as:

$$\mathrm{EVAt} = \left(rt - kt\right)Ct - 1$$

where r is the return on capital, k is the cost of capital, and C is the book value of Capital. Another more intuitive way is to consider

$$\mathrm{EVAt} = \mathrm{NOPAT} - \left(kt^{*}Ct - 1\right)$$

where NOPAT is the net operating profit, after tax.

14.5.3 Discounted Cash Flow (DCF)

At the core of the DCF analysis is the tenet that the time-value-of-money is important to sustainable ventures and in comparing competing projects, based on their initial capital investment, the cost of capital and the number of years in a preselected time span. The method is premised on the idea that a dollar today is worth more than a dollar received tomorrow, since cash earns interest and can be invested (or loans collect compound interest; business coaches liken DCF to reverse compound interest.) The assumptions made will determine how effective this tool is, as future cash flows can only be determined by somewhat qualified guesswork regarding future cash flow, the number of years you must wait to receive the anticipated cash, and the discount rate. Many readers will be fairly familiar with DCF, but for convenience we recommend an online source of many financial tools and calculators at www.moneychimp.com.

Robert G. Cooper [16], innovation consultant to some of the big Fortune 500 companies, reports on the general increase in product "renovations" – small incremental improvements – rather than radical innovations, due to the risk-averse use of financial instruments in go/kill-decisions. Cooper blames a corporate culture where managers are incentivized by financial ROI and a preoccupation with short-term financial performance, which leads to fast kills of more risky, radical innovations. Although financial measures such as Net Present Value (NVP), the Malmquist productivity index (MPI), payback period and economic value-add (EVA) add rigor to the go/kill decisions, bolder and more risky projects are killed regularly, as these tools result in "sure bets" and focus efforts on smaller, easy-to-achieve projects that have little risk and hence little impact on business and innovation in general. Cooper suggests that a culture of innovation, and a range of alternative tools, such as strategic buckets, expected commercial value and a spiral development processes, be used to allocate resources to more risky but strategic projects. (Read more at www.bobcooper.ca.)

14.5.4 Strategic Buckets

Robert Cooper [16, 19], suggests that organizations create "strategic buckets" (p. 26) for which the basic premise is that funds and other limited resources (talent, time, capabilities) are set aside for specific strategic foci. The distribution of resources is aligned with the strategic direction or goals: buckets mirror the strategic intent or priorities of the business. If these buckets are not created, it is likely that highly profitable, low-cost incremental changes will out-vote the more expensive radical innovations and therefore in the long run override the intended strategy to be innovative. In contrast, business decision teams (with strategic responsibility) make specific decisions about which projects to "go" and which to kill, based on the "good" potential projects in each bucket. Should the "radical" or "breakthrough

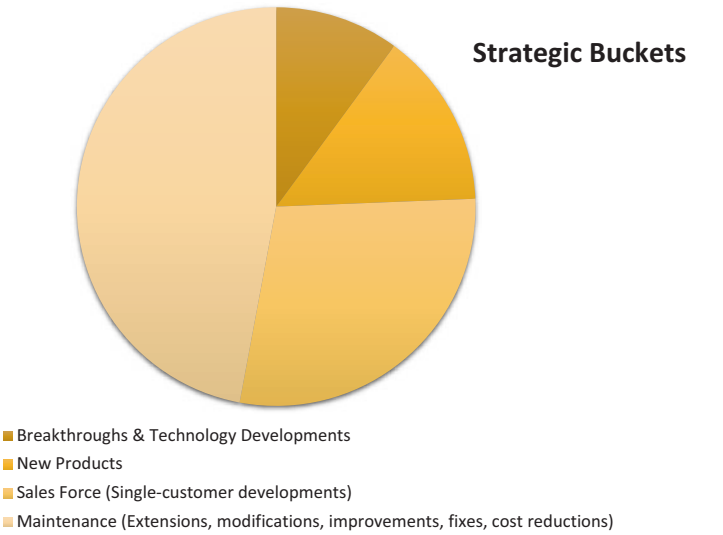

Fig. 14.7 Strategic buckets – focusing on break-through developments

projects" buckets not have enough potential projects, active pursuit of such inventions needs to occur to use the allocated resources. HIOs develop and practice build-test-feedback-revise iterations into their screening procedures and innovation processes to deal with uncertain market requirements and technical solutions (Fig. 14.7).

RWW Model for Radical Innovations

Warton Professor George Day [24] offers a practical alternative approach to go/kill decision-making, as it relates to radical or disruptive innovations. He offers three lines of inquiry and names the model the RWW method, after the three screening question types: REAL, WIN, and WORTH. These three lines of inquiry have probing questions for teams to consider. For some of these questions there will be no definitive answers, as the project is mere speculation or in its embryonic stages, but Day suggest that i-teams get together to find a best-guess consensus. Answers will range from a clear and resounding "yes", through a vague and unclear "not sure", and finally to a clear and unambiguous "no".

Table 14.5 provides a full set of the RWW questions as published in the Harvard Business Review [24] (p.29–30).

Once these questions have been considered with care and qualified answers are provided (to an agreed level of acceptance regarding the forecasts and projections) the various project teams can execute the "go/kill" decisions.

Table 14.5 RWW Questions as Radical Innovation Feasibility Checklist

(R) IS IT REAL?
Is the market REAL?
Is there a real need/desire for the proposed product/service/idea?
Can the consumer buy it?
Is the size of the potential market adequate?
Will the customer buy the product?
Is the product REAL?
Is there a clear concept?
Can the product be made?
Will the final product satisfy the market?
(W) CAN WE WIN?
Can the product be competitive?
Does it have a competitive advantage?
Can the consumer buy it?
Is the size of the potential market adequate?
Will the customer buy the product?
Can our company be competitive?
Is there a clear concept?
Can the product be made?
Will the final product satisfy the market?
(W) IS IT WORTH IT?
Will the product be profitable at an acceptable risk?
Are the forecasted returns greater than costs?
Are the risks acceptable?
Does launching the product make strategic sense?
Does the product fit our overall growth strategy?
Will top management support it?

14.6 Conclusion

It is clearly not possible (and would be a huge waste of time) to use all the tools discussed in this chapter to consider and select so-called "winning ideas". Adept innovators suggest that project teams select a qualitative and a quantitative tool to shortlist ideas. Another way to shorten the timeframe of the idea selection stage is to divide the team into 2- or 3-person sub-teams that are given a limited period to present their conclusions as a shortlist of 3 to 6 ideas. These sub-teams all start with the same overall list, but apply different sorting and selection tools. Either the shortlists will overlap, highlighting winning ideas, or if there is not much overlap, the shortlists generated by the sub-teams can be used to select a final shortlist. Sub-teams can present brief evidence-based rationales to "sell" their ideas to the full team.

In the next chapter readers will learn how to persuade both internal and external clients to accept a shortlist of ideas, either for implementation or for further research and analysis, should additional forecasts or research be required to take the idea to the implementation stage.

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Part III
Highly Innovative Organizations, Creative Leadership & Genii

Chapter 15
The Creative Organization

Philip Dennett

Abstract Encouraging creativity in organizations requires the development of a creative culture that encourages and supports employees to pursue new ideas in pursuit of clearly defined goals.

This culture is an ecosystem consisting of three interconnecting cogs: the management culture of the organization, the environment in which employees operate, and individual creativity.

Keywords Organizational creativity · Creative cultures · Creative ecosystems · 4E's Socratic model

Learning Objectives
On completion of this chapter, the readers will be able to:

- Apply research and interpretation skills in formulating a creative organization culture.
- Co-ordinate and manage a complex project set in a cross-functional and collaborative team environment.
- Deliver creative outcomes from a cooperative team environment.

15.1 Introduction

Organizations are traditionally structured as hierarchies, which is a hangover from the industrial revolution where employees were mainly doing repetitive tasks overseen by managers whose job it was to ensure conformity. This meant that outcomes were highly predictable, which flowed on to the consumer via products that were of consistent quality and presentation.

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In today's world the operating environment has changed. On the organization side markets have become hyper-competitive; this means that offering the best product/service at the best price is no guarantee of success. Consumers are also not just buying something for its utility, they are buying an experience, which includes how it makes them feel, what other people might think of them and, more recently, whether it is good for the environment. Sameness is now a potential weakness, not in terms of quality but in terms of limiting the ability of an organization to add value to the consumer experience and stand out from the competition.

This is where creativity enters the picture. No-one thought, in the mid-twentieth century, that computers would be of any use to the general public. They were machines, housed in climate-controlled rooms, which big businesses used to crunch numbers. In fact, market leader IBM thought they had reached market saturation.

Enter Steve Jobs and Steve Wozniak, who thought differently. Their Apple computer wasn't a business machine and it was housed in a small box instead of a large room, but they were passionate about what they were doing and weren't afraid of failure. Now in the twenty-first century Apple Computer is not only a market leader; it is the largest company (by market capitalization) in the world! All because two young entrepreneurs had an idea.

Perhaps the best representation of this new creative approach was the advertisement Apple created for the 1984 American Superbowl. The ad used an analogy to George Orwell's dystopian novel *1984* and was the genesis of the phrase "Think differently" that Apple used in later advertising. Apple only paid for the ad to be run once during the Superbowl telecast but it is still being talked about (and shown on YouTube) today.

It's not hard to find examples of creative individuals coming up with radical new ideas, but what about organizations? Can an organization be creative as well?

15.2 Building a Creative Climate

Creativity in an organizational context is not something you can mandate. Instead, it is born from a combination of the organization's culture, its leadership, its people and the way in which they're organized. The fear of many corporate leaders is what happens if they try something new and it doesn't work? The result would eat into company profits and potentially cause the decision-makers to lose their jobs. In fact, many successful entrepreneurs only became successful after multiple failures so it's understandable why creativity is so hard to sell. However, as you can see from the examples of companies like Apple, breaking new ground can lead to huge profits.

Let's look at ways we can minimize the inherent risks and create an environment where thinking differently can produce Apple-like results.

In order to build a creative organization, management should consider the following seven questions:

15.2.1 Is the Operating Environment Conducive to Creative Thought?

Imagine a multi-story building where senior management are on the top floor and different departments are on floors below them. If you are in customer service on the ground floor, how easy is it for you to interact with other departments and even senior management? Often creative ideas come out of random interactions and with this type of environment it's difficult for those to occur. People tend to stay in their individual boxes and work on the same tasks day in and day out, which means they have a limited perspective of the organization as a whole.

Compare this with the way Apple is organized (see case study). Instead of business units, staff are organized in areas of expertise, which allows them to be agile and make quicker decisions. They don't work in a "head office" they work on a "campus". How would this make you feel? Would it encourage you to be more creative?

15.2.2 Is the Culture One Where Staff Are Encouraged to Think for Themselves?

In a rigid corporate culture people will wait to be told what to do and therefore will be hesitant to challenge the status quo. Culture is something that comes from the top down. If the leadership says 'We want innovation' but punishes you when something goes wrong, you are not likely to try again.

Of course, CEOs are measured by the value they bring to shareholders so it is easier to consider the short term based on known inputs. However, increasingly shareholders are also interested in corporate social responsibility, which has been shown to create shareholder value and insulate against negative events [1].

Consider an organization you have worked with: how would you describe their culture?

15.2.3 How Engaged Are the Staff?

There is a big difference between someone who works to live and someone who lives to work. That's not to say you have to spend your life working but if you are passionate about what you do you are more likely to be interested in learning all you can and improving what you do. According to Forbes magazine [2] only a third of staff in the US are engaged. They attribute this to a lack of training, fuzzy organizational goals, lack of acknowledgement, limited development opportunities, and micromanagement.

15.2.4 How Strong Is the Self-Belief of the Staff?

Self-efficacy is one of the hallmarks of a creative person. If you don't have a strong belief in your abilities, you are not likely to commit to what you are doing and you're less likely to try new things. You will always have a range of individuals in an organization. Some will be very self-reliant while others will need lots of encouragement. This is where the operating environment can help by having appropriate support structures in place.

15.2.5 How Tolerant Are People of Each Other?

Of course, managers need to tolerate failure if they want people to try new things, but people also need to be tolerant of each other. Imagine you are in a team meeting and you come up with a good idea but your team leader or one of the more experienced individuals immediately says "That's not going to work": how would you feel? Will you be comfortable contributing any further ideas? This situation is common in groups and is one reason why individuals are often able to come up with better ideas by themselves than they would in a team environment.

15.2.6 Do Your Managers Manage or Do They Facilitate?

This is a tricky area and often depends on the way in which a manager's performance is measured. If measurements are primarily about sales and profits, then a manager is less likely to encourage innovation because of any short-term costs and the risk of failure. Sometimes managers are not trained in the art of management so they do not have a framework to work from and sometimes they find it easier to do something themselves rather than delegate. All of this points to the need for specific training and support structures for managers.

15.2.7 How Challenging Is the Work People Do?

Humans like to be challenged. If something is too easy people tend to switch off and become less engaged. On the other hand, if the task is too challenging people will worry about failure. In order to build a creative organization, you need to design tasks that are a stretch but not impossible and think about how you will encourage people.

According to the Harvard Business Review [3] 46% of employees in the U.S. feel they are overqualified and therefore feel they are not being challenged. Some

organizations go to the extent of setting up their own corporate universities to provide personalized development programmes for staff. The Coles Myer Institute established in Australia in 2003 is a good example of this. The Institute partners with Deakin University and offers courses ranging from customer service to MBAs.

15.3 Case Study: Apple's Innovative Culture

Apple University academics, Joel Podolny and Morten Hansen, writing in the Harvard Business Review [4] describe how Steve Jobs, on his return to Apple™ dramatically changed the company's organizational structure to better match its innovative approach to its product portfolio.

At the heart of these changes was a change in management philosophy – from general management to expert management. In 1998 Jobs had eight direct reports who each headed a conventional business unit. His concept of a management structure based on the expertise of managers has resulted in the current CEO Tim Cook having 17 direct reports. For example, the marketing function is an area of expertise (and therefore one of those 17 reports) rather than a sub-function in a number of business units. This has enabled Apple to be much more agile in its decision-making, which is critical in the fast-changing environment in which it operates.

Now senior managers have deep expertise in their own area rather than being management experts. Apple believes that management is a more easily trainable skill compared to domain expertise, which is built up over many years. The result is that today's leaders are immersed in all the details relating to a specific domain and this allows them to question and engage with people at a deeper level. This approach has also resulted in leaders allotting considerable time to learning to ensure their expertise not only remains current, but also helps new ideas to emerge.

The new management culture at Apple is collaborative rather than directive, thus empowering employees to put forward new ideas and at the same time giving them the comfort to advocate for those ideas.

15.4 Organizational Creativity

There are three key inputs into building creative efficacy in organizations [5]:

- Characteristics of the individuals operating in the organization relating to their way of thinking; their expertise in the relevant domain; and their personality.
- Characteristics of teams relating to their composition and the way in which they interact; the task they are working on; and the problem-solving approach they use.
- Characteristics of the organization relating to its culture and the way it is structured and resourced.

It is the combination of these inputs that is most likely to produce creative outcomes and not just the quality of specific inputs. Hence it is unlikely that a highly creative individual will thrive in an organization that is not creatively oriented. Similarly, an organization with a creative culture can potentially offset deficits in creativity in individual staff members.

If you look at the organizational chart for your company the chances are that it shows a typical hierarchy consisting of an overall leader with a small senior management team reporting to them who, in turn, have a team of middle manager reports. Then we have team managers, supervisors and finally teams of workers. Visually, it seems like a long way from the top to the bottom and therein lies the problem: the people making the strategic decisions are far removed from where the action happens – with the customer experience.

It is thus not surprising that in this traditional management model, innovative behaviour is often discouraged. This is a major problem as work is becoming more decentralized, thanks in no small part to the COVID-19 pandemic, which has forced many organizations to consider new ways of organizing. No longer are they able to have constant supervisory control over all their employees, which means individual initiative is often required to solve problems.

There is also another revolution happening. The customer, starved of the ability to shop in the high street, has turned to online shopping to fill many needs, thus limiting (and in some cases, severing) the face-to-face contacts they previously had with many organizations. This is fast producing an operating climate where decisions need to be made instantly, and if employees are not empowered to make them, a competitor is only a click away.

15.4.1 Creative Culture

Harvard professor and author Rosabeth Moss Kanter has five pieces of advice for the development of a creative culture [6]. Firstly, ideas need to be championed, which means they need to be encouraged and given the support required for incubation. Secondly, employees should be expected to act on their own initiative, because without empowerment the status quo will prevail. Thirdly, communication should be open and honest across all levels of the organization. Fourthly, employees' own intrinsic motivation should be actively encouraged, rather than relying on rewards, because if an individual's motivation comes from within they are more likely to persevere when the going gets tough. And finally, be accepting of failure. Often people will fail a number of times before they get it right. It is through the associated learning process that the best ideas emerge.

Kanter's advice is predicated on the idea of employee empowerment. Traditionalists will complain that if we empower individuals to make decisions mistakes will be made; but if we don't tolerate failure even the most proactive amongst

us will become reactive, thus killing any creative thought or action. Therefore, before we consider empowering the individual, we need to develop a creative culture.

15.4.2 Creative Culture Building Blocks

The building blocks of such a culture are freedom, encouragement, resources, recognition and challenge [7]. While freedom on its own might be enough for the more proactive employee to be creative, for the majority, active encouragement coupled with supplying the necessary resources will also be needed. Recognition in the form of feedback helps employees to know when they are on the right track as they have no previous experience to fall back on. Lastly, a challenging work environment helps overcome the natural inertia people feel when deciding to step outside their comfort zones. In meeting these challenges a creative culture needs to consist of a learning environment where individuals can grow with an element of freedom coupled with supportive leadership [8, 9].

This approach aligns with Dennett's concept of a creative ecosystem [10] consisting of three interconnecting cogs (Fig. 15.1).

Fig. 15.1 The creative ecosystem [10]. (Used by permission)

15.4.3 The Creative Ecosystem

Richard Florida [11] writes that creativity is both experiential and social and benefits from synthesizing information based on diverse perspectives in a mutually supportive social environment. In a creative ecosystem an organization's culture is interlinked with a supportive operating environment where individual creativity is able to flourish. However, creative outcomes don't come from a highly creative cohort; rather they come from people with diverse experience and outlooks working together in a social context [12].

A great example of such an ecosystem is Te Matarau a Māui, a creative economic development initiative by Wellington (NZ) region Maori. Their focus is on developing a reliable and resilient operating environment (infrastructure) and at the same time encouraging iwi groups to create positive outcomes through collaboration. This strategy is expressed clearly in the following statement from their website [13]:

> …with discussion comes knowledge, with knowledge comes light and understanding, with light and understanding comes wisdom, with wisdom comes wellbeing.

Another form of creative ecosystem is the modern practice of crowdsourcing, which uses the collective creativity of a diverse group of people to produce a creative outcome. By nature, the crowdsourcing culture and operating environment provide the challenge and the support necessary for idea generation.

15.5 Creativity in Teams

In a review of the literature on team creativity, Dennett [10] found five antecedents to team creativity: co-operation, interaction, flow, divergent and convergent thinking, process.

15.5.1 Cooperation

Cooperative teamwork stemming from openness and engagement has the ability to overcome deficits in interpersonal and environmental dimensions to produce creative outcomes. The necessary cooperation arises from a shared commitment to team processes [14]; however, creativity can be maximized when the team is not hampered by bureaucracy and is focused on a clear goal [15].

This leads to a team operating as a single entity, rather than as a group of individuals, producing a sense of flow [16]. When this happens a highly engaged team is able to produce better outcomes than individuals. In fact, when individual creativity is blended with a positive team environment this combination can lead to creative outcomes irrespective of a lower level of creativity in individual team members [17].

15.5.2 Interaction

Successful team interaction is also dependent on the level of debate within the team – too much can result in limited understanding of views and too little often leads to creative thinking being suppressed [18]. A strong team leader who acts as a facilitator can manage the debate and help integrate (via empowering processes) team members so that enough tension is created to produce discomfort with the status quo, thus producing change rather than a high level of conflict [19, 20]. In order to facilitate team creativity, a leader must question rather than direct in order to ensure all perspectives are considered. This means they must suspend their own judgement and not use their status to influence the result.

15.5.3 *Csikszentmihalyi &* Flow

According to Csikszentmihalyi [16], creativity results from a combination of being engaged in challenging work coupled with the desire to find something new and novel. He identifies critical components of this state of "flow" as:

- Having clear goals
- Immediate feedback
- Balance between skill and challenge
- Singlemindedness
- Exclusion of distractions
- No worry about failure
- Being unselfconscious
- Time is distorted
- The activity becomes an end in itself

Consider a team you have worked with. To what degree have you experienced this state of flow? What components of Csikszentmihalyi's were present or missing?

15.5.4 Divergent and Convergent Thinking

A leader should also understand the kind of thinking that is required at different stages of the creative process. For example, at the ideation stage where the team is attempting to develop new ideas the leader should encourage *divergent* thinking. This is when a team whose members have diverse experience are more likely to excel.

At this stage also, management of the dialogue is critical so that one person doesn't dominate and ideas from the more reticent team members are teased out. The result of this not happening is often group-think, where people agree with an

idea because it is presented forcefully. This is often a problem where the team members have a reporting relationship with someone in the team, as people are often afraid of potential consequences of openly disagreeing with their manager. Common brainstorming models, such as DeBono's six thinking hats, are often used in the ideation stage to help produce a range of ideas and separate 'personality' from the idea presented.

Once the team has allowed each individual to present their ideas the creative process moves on to the evaluation stage. The *convergent* thinking style is used here and is the opposite of that used earlier. Now people are asked to be critical of the ideas and use their evaluative skills, which Guildford says consist of conceptual foresight, the ability to penetrate deeply into an idea, the judgement to redefine and reimagine and a sensitivity to potential problems [21].

In the link below, the authors discuss how to avoid fatal flaws in group decision making and give a list of symptoms to watch out for:

https://www.mindtools.com/pages/article/newLDR_82.htm

15.5.5 Process: Young's Model

One of the most famous creativity models originates from James Web Young from the advertising agency J Walter Thompson. His model has five stages that are not necessarily linear:

- *Preparation* – gain an understanding of the domain through immersion. What have others found? What controversies are there? Are any relevant questions unresolved?
- *Incubation* – mull over what you have found. Keep it in the back of your mind and then consider it again when you are ready.
- *Insight* – This process is usually behind what happens when someone says they woke up with a brilliant idea. It is the culmination of the previous steps and is where new thinking arises.
- *Evaluation* – this is often hard as it forces you to be self-critical and reflective. In teams this needs to be handled carefully so that the focus is on critiquing the ideas and not the person suggesting them.
- *Elaboration* – here we create the link with creativity (the idea) and innovation producing a result that adds value.

While all the steps are important, it is a lack of preparation that often causes a creative process to stall. People will bring their own pet positions to the table and then go off on tangents. If you have a clear goal and a well thought out questioning strategy the team is much more likely to stay focused.

15.6 Facilitating a Creative Team

Researcher Teresa Amabile [22] sees creativity as a 5-step process which is similar to Young's approach:

- Problem presentation.
- Compilation of relevant information.
- Determination of novelty.
- Validation of response.
- Assessment of progress against goal.

In any creative endeavour, the determination of novelty is where the main creative thinking is involved. This is why having a diverse team works best. Some people will be highly creative and others analytical. Once a novel idea is produced analytical skills come to the fore in order to turn a creative idea into an innovation that can produce value for the organization.

However, knowing the process is one thing but actually implementing it is more complex. One of the most challenging tasks for a facilitator/leader in conducting creativity workshops with teams is the questions they ask to stimulate discussion. It is easy for a discussion to move off in a tangent as people get excited by a specific idea and accept its validity without question. This is common when you have strong characters in the team. The result is a stifling of creativity.

15.6.1 Socratic Questioning

By using a Socratic approach to questioning, this issue can be avoided. If done correctly, the team is more likely to generate its own conclusions instead of agreeing to something forcefully presented. If you are a team leader it is often hard to step back and not impose your solution (even if it is the one chosen eventually). Instead, focus on posing questions that expose the range of thinking within your team. This will foster ownership and often highlight a better answer than the one you thought of.

Remember, it is not just the answer itself; it is also the ease and resource cost of its implementation that will determine the most appropriate response.

The steps below provide a guide for conducting an effective Socratic dialogue in a team environment.

15.6.2 Step 1 – Agree on the Topic

Assign a team to discuss an issue that needs a creative solution to solve it. Acting as the facilitator (or appoint one), start by soliciting agreement on the topic itself. This is important in order to ensure that the team actually engage in the process and it is

the first step in encouraging people to work as a team. Make sure you give everyone a chance to speak and don't allow criticisms at this stage.

> Tip: don't start with the most dominant person as the more reticent team members might agree with them to avoid conflict.

15.6.3 Step 2 – Bloom's Taxonomy in Questions

The next step is to plan what questions you will pose at each point of the discussion. This doesn't mean you slavishly stick to questions you've written; it simply provides you with starting points for the discussion. In the worksheet in Fig. 15.2, you will see a suggested approach to questioning at each stage of the meeting. This approach is designed to avoid asking a complex question before the group is ready to consider it.

The worksheet uses Bloom's Taxonomy to structure the questions. Bloom identified six levels of cognition:

- Knowledge – what, where, when, why, who.
- Comprehension – explain, compare, give examples.
- Application – consider, solve, apply (to a new situation).
- Analysis – what are the pros and cons? What is missing?
- Synthesis – what are the links between… and …?
- Evaluation – defend your choice, justify.

From this you can see that early in the process you want to find out about what the participants actually know before you delve deeply into any one area. Often, it's something that seems on the surface to be insignificant that turns out to be instrumental in the final outcome.

As a facilitator you need to be aware of the group dynamic at all times and not just rely on what people are saying. Also avoid simple yes/no questions as they can stifle the discussion, and avoid proposing solutions yourself.

> Tip: watch out for non-verbal communication that is inconsistent with the discussion and be prepared to interrupt to seek clarification.

15.6.4 Step 3 – Unpacking the Problem

Start the discussion by finding out what people know about the issue under consideration. At this point there are no bad ideas and you shouldn't allow any argument. Be aware of compound statements people make. As facilitator you need to unpack them into their constituent parts. For example, your team has been asked to respond to this request for information about your company's capabilities: "Tell us how you propose to undertake the scope of work requested." What will you say in response?

Stage	Question types	Notes
Explore **What do we currently believe about the issue?**	Knowledge: what, where, when, why, who. Comprehension: explain, compare, give examples.	Establish a sense of a shared common goal by beginning with a dialogue to establish agreement on the question itself. Focus on engendering a desire to produce a practical outcome that will improve the likelihood of an idea being implemented.
Examine **What evidence supports that belief?**	Application: consider, solve, apply (to a new situation). Analysis: what are the pros and cons? What is missing?	During the examination encourage personal story telling, which will help to develop a collective consciousness. It is also a way to help members of the group to drop their defenses.
Evaluate **What conflicting views are there?**	Synthesis: what are the links between…. and …..? Evaluation: defend your choice, justify.	Positive feedback is another tool that can lead to increased group efficacy and is particularly important when seeking conflicting views. Focus on separating ideas expressed from the individual expressing them.
Elect **Where does this dialogue lead us?**	Decision and resolution	Collective consciousness (and ultimately creativity) can evolve from a sense that contributions are group ones rather than personal ones. Enhance this sense by a process of summing up at relevant points in a dialogue to show how new knowledge or understanding has evolved from the contributions of individuals to form a collective opinion. This is particularly important during this final stage where you need buy-in to a group agreement.

Fig. 15.2 Guide for conducting team meeting using the 4E's Socratic dialogue [23]. (Used with permission)

Start by unpacking the question:

- What systems and processes will you use in carrying out the work?
- How will you organize your people?
- How will you engage with the client throughout the process?
- How will you mitigate any risks involved?
- What other successful contracts have you been involved in?
- What makes you stand out from potential competitors?

That list is by no means exhaustive but just by unpacking what looks on the surface to be a simple question, you can see how much more detail you will uncover by posing those questions.

15.6.5 Step 4 – Gather Supporting Evidence

Now it's time to examine the knowledge people have exposed by gathering evidence in support. At this point you may find that some previous statements can be discarded because there is no evidence to support them. This is where you move from encouraging divergent thinking and start to focus on convergence. At the end of this stage, you will have a smaller number of statements to focus on.

15.6.6 Step 5 – Pros & Cons & Perspectives

In this evaluative stage the aim is to canvas the pros and cons of the various points being considered. Is there a way of reorganizing them to create a new perspective? What are the disconnects between different ideas? How does the evidence support your new thinking? It is at this stage that people often have a "lightbulb" moment, which seemingly comes out nowhere but is the result of the whole process that has come before.

15.6.7 Step 6 – Potential Solutions

At this point the team may have come up with a potential solution, but this is merely the conclusion of the creativity stage and the beginning of the innovative stage. Where do we go from here? Now the team must consider what the immediate next steps are and who will be responsible for them. It would be unusual to finish a single workshop with a fully formed idea, so to maintain momentum further work is required. What information do we need to confirm our idea is viable? What investigations need to take place?

Ensure that any additional tasks are assigned and that they are quantifiable so that the next time the group meets, progress can be made. Also make sure each team member has a follow-up task to complete. The facilitator or an elected 'champion' should oversee this process and provide encouragement to show that the additional work is valued.

It is at this stage where many brainstorming sessions fail. They result in a plethora of ideas but if this final step is not undertaken the result is often a good feeling amongst participants but no real value is added. This process helps ensure the team remains committed to the overall goal and remains engaged in the creativity process. It also helps give individuals a sense of achievement by highlighting the value each member brings.

15.7 Conclusion

- Traditional hierarchies are the antithesis of a creative organization culture and restrict the ability of an organization to add value to the consumer experience and stand out from the competition.
- Creativity is inherently risky but the risk can be managed by building a creative organization culture that encourages and supports employees to pursue new ideas in pursuit of clearly defined goals.
- A creative culture is an ecosystem consisting of three interconnecting cogs: Organizational culture, operating environment, and individual creativity.
- There are seven antecedents to team creativity: openness to creativity, engagement, integrating processes, goal orientation, positive external forces, group knowledge, and diversity.
- Facilitating a creative team is a five-step process: problem presentation, compilation of relevant information, determination of novelty, validation of response, assessment of progress against goal.
- The problem of group-think in team interactions can be minimized by using a Socratic approach to questioning, which allows teams to generate their own conclusions instead of agreeing to something forcefully presented.

CREATiViTY LABORatory

Activity I: Team Creativity Exercise

Form a team of 4–6 members. Using the process described in Sect. 15.6 above address an issue that is important to your organization or university group. Appoint a facilitator who will lead the group and on completion of the task reflect on the process.

Activity II: Interaction Checklist

Often creative ideas come out of random interactions. As a senior manager, make a list of ways you could encourage random interactions amongst your team.

Activity III: Creative Cultures

Consider an organization you have worked with. Review the questions in Sect. 15.2 and then create a description that describes its culture. How would you change this to build a more creative culture?

Activity IV: Case Analysis

Would the Apple management philosophy – changing from general management to expert management work in a typical hierarchical organization. Why? Why not?

Activity V: Facilitating a State of Flow

Consider a team you have worked with. To what degree have you experienced a state of flow? What components of Csikszentmihalyi's were present or missing?

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Chapter 16
A Climate for Creative Endeavours

Cherylene de Jager and Rouxelle de Villiers

Abstract Organizations that are known to be innovative display specific characteristics. First and foremost, these Highly Innovative Organizations (HIOs) have a *culture* supportive of creativity and innovation. This chapter provides the context of the leadership actions required to establish determinants on an organizational level and an individual level that are supportive of creative endeavours, continual innovation, and viable invention. The notion that informs this chapter is that creativity precedes innovation and that innovation without creativity is sterile (or even just a waste of resources). All the elements are not required should an organization wish to become more creative and innovative. This chapter will explain how the current state of the determinants needs to be assessed, and which interventions need to be designed to either establish, or elevate these determinants, or how HIOs measure and navigate the identified issues.

Keywords Barriers · Climate · Creative endeavours · Cultural sensitivity · Diversity · Higher order thinking · Individual determinants · Organizational determinants

Learning Objectives
On completion of this chapter, the readers will be able to:

- Identify what is required to create a motivating and inspiring environment that establishes a climate for creative endeavours.
- Obtain an overview of the organizational and individual determinants required to establish a climate supportive of creative endeavours.

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- Understand the influence of diversity and cultural sensitivity on creativity.
- Relate to how making mistakes and grappling with them ignites creativity.
- List the barriers and how to manage them to achieve higher order thinking and creativity.

16.1 Introduction

The correct internal environment plays a crucial role to support creativity and innovation in organizations. Creativity and innovation should ideally form part of the organization's DNA, way of thinking, vision, and culture. So, this begs the question: What is required, on both an organizational level and on an individual level, to create a culture supportive of creativity and innovation? Further: Is it possible to create a culture and an environment that motivates and inspires creativity and innovation? What are the determinants of an environment that motivates and inspires creativity? Based on a range of studies of the best and most innovative organizations and global brands today, we offer some insights in the next few sections.

16.2 Motivating and Inspiring Environments

Motivating and inspiring environments that provide the desired climate and fertile ground for creative endeavours firstly rely on leaders who value creativity and creative intelligence, and understand the role of innovation and business success (or survival). These leaders are either the founding members of such organizations (e.g., Google, Apple, Facebook, Virgin) [1] or are leaders who have taken the conscious decision to re-engineer organizations where creativity inspires innovation (e.g., General Electric, 3M, Proctor & Gamble) [1]. The point of departure is how creativity is defined and implemented by leaders in these Highly Innovative Organizations (HIOs).

Creativity and innovation are terms that are often used interchangeably [1]. The view of creativity that informs this chapter is that creativity precedes innovation and that innovation without creativity is sterile, and even a waste of resources in highly competitive environments. Cherylene De Jager and Anton Muller ([1], p. 143) coined the following definition: Innovation is creativity commercialized. It is possible to assess the current organizational environment and to design an intervention to create the organizational as well as the individual determinants required to create a climate for creative endeavours.

16.2.1 Determinants Required to Create a Culture Supportive of Creativity

In the next section we deal with considerations about the determinants to create a culture supportive of creativity. We investigate the requirements when leaders pursue the creation of environments to motivate and inspire Creative Intelligence (CiQ). To aid the discussion, we refer to the definition provided by Cherylene de Jager [1] who defines creative intelligence (CQ) and states that "CQ is the practical application of creativity, innovation, and Design Thinking (DT) addressing customer needs and solving problems in new and novel ways navigating the Fourth Industrial Revolution (4IR) while shaping the future' [1, p. 45]. (Also see definitions for CiQ in Chapters 1, 3, 5, 6, and 16).

Various authors agree that the corporate environment plays a crucial role in enhancing creativity [1–4]. The interaction between the individual and his/her environment is essential for them to be creative. Florence produced great painters such as Leonardo Da Vinci, Raphael, Botticelli, and Donatello amongst others. Is it coincidence or were there some other determinants at play? Florence at the time was an extraordinarily rich city and the elite marked their status by acquiring art in many forms: painting, sculptures, music, performance art, interior design. Artists consequently flocked to Florence to capitalize on the prevailing opportunities. They collaborated and they sought each other's advice and critical feedback and learnt from each other. The cultural and social context in Florence at the time was supportive of creativity. Art and creativity thrived due to the right mix of political, socio-cultural, and economic conditions. Those conditions sadly no longer exist in Florence and the current creative output reflects that. Just as the prevailing conditions in a country or city influence creative output, the same can be said in an organizational context [1].

Although the city of Florence may not have actively cultivated a conducive environment for thriving artistry and creativity, organizations cannot wait for organic or natural development. They need to pro-actively and in some cases rather speedily transform a sales work-environment into one that promotes creativity. This is not an automatic process, and should be actively pursued and constructively created by the leaders in these organizations. De Jager, Muller and Roodt (2020) find that such creativity imparting environments are characterized by trust, openness, the existence of humour, the freedom to experiment and make mistakes, [5] and the comfort to be able to debate issues. There should be enough resources and sufficient autonomy and openness to new ideas to achieve creative results [1, 5].

A plethora of scientific studies confirm that leaders and managers can improve their organization's creative climate [1, 4, 5]. Leaders like Steve Jobs of Apple, Bill Gates of Microsoft, Richard Branson of Virgin, Walt Disney of Disney, or Lee Iacocca of Chrysler change the entire firm, by embossing their beliefs on the company values and culture, by constantly re-engineering, upgrading, updating, and innovating processes, systems, procedures, rewards, staff morale and more. In HIOs, leaders encourage creativity and view it as important for managers to

understand the vision of the leaders and know how to change their organization's culture so that their employees learn to think more creatively and share these thoughts with the HIO. Certain organizational determinants need to be in place to establish a culture supportive of creativity.

The more supportive the current organizational conditions are for creativity and creative endeavours, and the higher the level of CiQ of all individuals and internal teams will be, and the less intense the scope of the re-engineering activities and investments to be taken will be. In the rest of the chapter, we consider some actions to nurture individual creativity and provide guidelines and a framework for what is required to develop and nurture a corporate culture conducive to creative thinking, innovation, and entrepreneurship/intrapreneurship.

16.2.2 Culture, Behaviours, Values and Norms, Vision and Mission

Various researchers [1, 4, 5] state that organizational culture is determined by the organization's vision, mission, strategic intent, behaviours (tolerated and modelled by leaders), norms (what we see as right and wrong in this organization) and values (the actions, thoughts and feelings that are highly regarded and pursued) [5–8]. Katzenbach [9] views culture as the self-sustaining patterns of behaviour and mindsets that determine how work gets done [9]. A definition from leadership and management that focuses on the psychological environment is offered by De Jager and Muller (2020), who define organizational culture as a collection of deeply held attitudes, entrenched habits, repeated behaviours, latent emotions, and collective perceptions of the world. Culture is the shared set of assumptions we all bring when we work together – our unspoken expectations of one another. The fact that culture determines an organization's success is a trending idea, well accepted by some of the biggest global brands. Practitioners suggest that HIOs need cultural insight before they can take cultural action. Culture is mostly defined as "the way we do things around here [5]". It takes patience and perseverance to establish a culture supportive of creativity and innovation. It takes a long time to embed and spread a culture supportive of creativity and innovation. De Jager and Muller (2020) are of the opinion that organizational culture can be inspired by:

- Sharing case studies and success stories, involving known people, and known business units: this is more powerful persuaders than metrics and results.
- Showing off new or suggested prototypes – even testing them on or with staff.
- Training across disciplines and across business units (or projects).
- Fostering a "Let us solve it" attitude (as opposed to "it ain't broke don't fix it" OR "let us wait till the boss tells us what needs to be done").
- Encouraging creative energy at every level of the organization.
- Mapping the informal creativity networks inside the organization.
- Nurturing and embracing the "creativity outlaws" or creative genii.

- Finding out why people within the organization break the rules.
- Regularly revising and questioning why the rules existed in the first place.

Organizations need to unify their people around a common, clear cultural intent, driven by a core of identified keystone behaviours and positive emotions [1, 5] to create a culture supportive of creativity and innovation by focusing on what really matters. An organization has many traits but only a few are vital symbols of the new culture the organization is trying to establish. Leaders need to select the behaviours that need to be adhered in order to establish a culture supportive of creativity and innovation. Managers and leaders pursuing HIOs should encourage the desired organizational behaviours by asking the right questions such as: "What keeps you from being more innovative?" or "How can we encourage people to experiment more?" and "How do we get people to collaborate more?" A high level of empathy, great persistence and resolve, rigorous focus, and a practical approach are needed to be designed to mine and unleash the latent CiQ residing within the organization. You need to find and discover the critical few that have already showcased their CiQ or are constantly trying to show off their CiQ. The creative confidence of the critical few needs to be cultivated and their emotional commitment needs to be obtained. Use your early adopters and explore the pockets in your organization where "CQ@Play" (CQ@Pay being *Creative Intelligence @ Play* and the title of the book by De Jager and Muller) is evident. HIOs celebrate the achievements of their early adopters and keep sharing them in newsletters, at award functions, by having a "high performance gallery of photos in or internal intranet". HIOs also regularly reward and are seen to reward creative and innovative ideas, not just by offering cash or other incentives, but by developing those ideas, creating prototypes, and obtaining feedback from actual users.

In studies of HIOs, evidence shows that some organizations, in an effort to create the right working environment that inspires creativity, establish a special place for innovation to occur, while others design and create the entire office to look like one big playpen. Once the context for creativity is set, creative thinking and the application of CiQ can be introduced several ways. Organizations should ideally select some methodologies, frameworks, techniques, and tools to develop the CiQ of their employees.

For organizations to be successful in establishing a culture where creative performance is not merely tolerated, but is enhanced and optimized on a consistent, structured, and focused manner, senior leaders and operation managers need to consider both the broad organizational culture and the specific individuals (talent sets) employed by the organization (See the first level of Fig. 16.1).

Figure 16.1, adapted from the work of De Jager et al. [5] illustrates the determinants that are required to establish a culture supportive of creativity – a traditional and conventional perspective – that motivates and inspires creativity and innovation.

Figure 16.1 indicates that culture is determined by the behaviours, values and norms that inform the vision and mission. At the first level of understanding the conditions and determinants, are two major foci: organizational determinants and individual determinants. At the next level of deconstruction, these determinants are strategy, structure, leadership, team, support mechanisms, risk taking, learning and

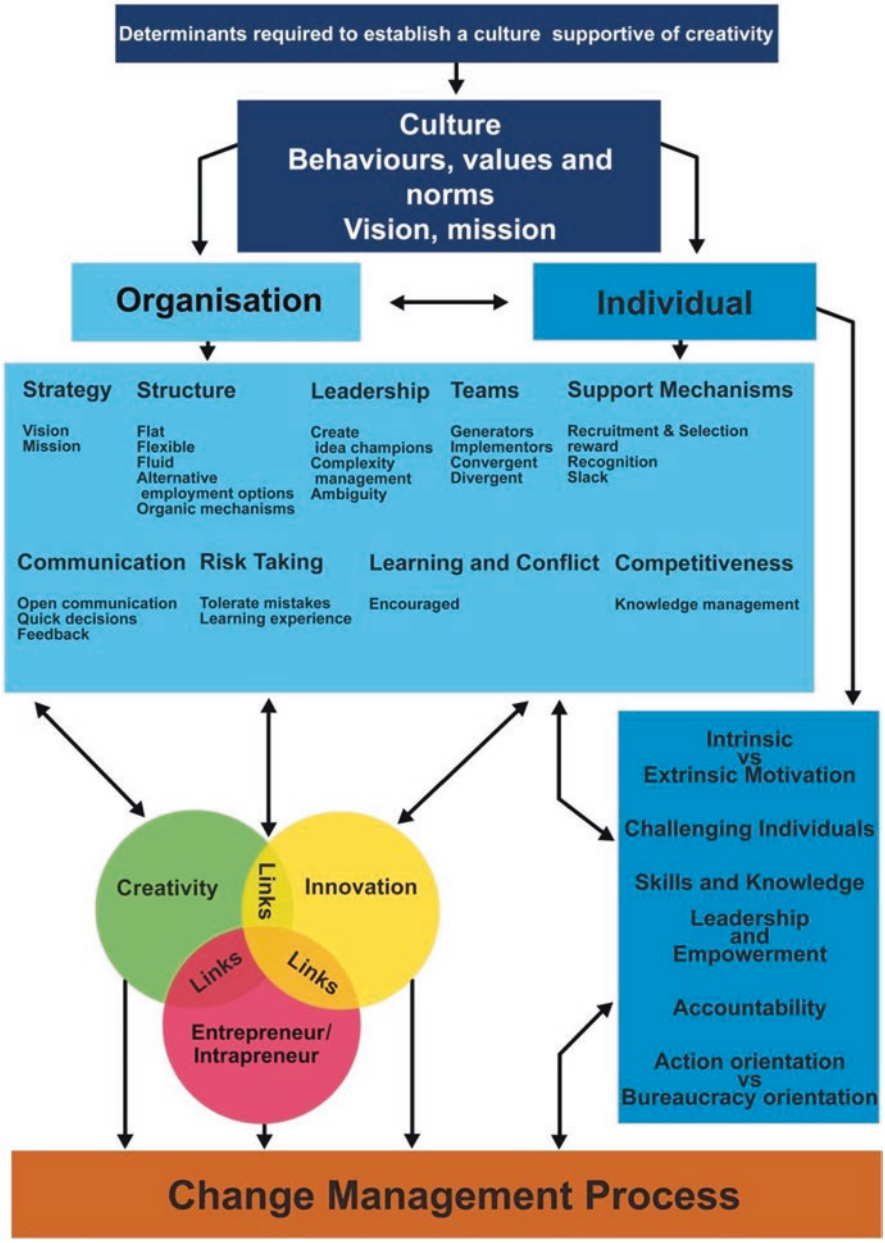

Fig. 16.1 Determinants of a climate for corporate creativity and innovation

conflict, and competitiveness. To achieve these second-tier determinants, the building blocks of motivation; challenges, skills and knowledge, leadership, empowerment, accountability, and action-orientation are required. If the current culture and

other determinants do not support a culture of creative ideation and creative endeavours, change-management interventions will be necessary. The next section will unpack the elements required to create an environment that motivates and support creative endeavours.

16.2.3 Organizational Determinants Unpacked

16.2.3.1 Strategy

Organizations should ideally design a strategy that is able to convert creative potential into commercial application. Organizations must design a strategy to mine and/or develop the latent CiQ of the employees to enable them to apply their creative intelligence to design solutions of how to navigate the challenges posed by the 4IR. Creativity in organizations and the willingness to apply the latent or acquired CiQ is dependent on the HIO-context.

Creativity consultants operating in HIOs, such as Cherylene De Jager and Anton Muller (2020), Gary Hamel (2000) and Tom Kelley [10], observe that creative organizations have strategies that are built on a flexible but firm context, which includes some or all of the following elements: culture, leadership style, values, structures, systems, skills, and resources. The latter elements should be aligned in a way to form the necessary synergy to foster creativity and to enable the latent and acquired CiQ to effectively play and be applied in organizations [1, 3, 8].

Organizations should design a strategy that creates a climate for creative and innovative thinking and problem-solving. The strategy should be flexible but at the same time contain enough structured guidelines to realize the strategic goals [5]. We cover the design of organizational structure required to support a flexible strategy enabling the practical application of CiQ next.

16.2.3.2 Structure

Structures of creative organizations are flat, fluid, flexible, allow alternative employment options, and evolve organically [5]. Organic structures promote a culture of innovation, invention and challenging the status quo. An organic structure allows for reasonably natural development of inter-functional teams, with a lot of autonomy and with creative interactions and resources. In contrast mechanistic structure focus on rules, procedures and is more rigid. These characteristics of mechanistic structures are not conducive to experimentation, autonomy and open-minded testing of new ideas and therefore oppose a culture of innovation (Table 16.1).

A clear but flexible, agile structure, with boundaries that allow people to work in an autonomous way and apply their CiQ to address client needs and to solve problems, is required for innovation to occur. Next, we consider various answers to the

Table 16.1 Characteristics of an organic structure as opposed to a mechanistic structure

Organic structures	Mechanistic structures
Freedom from rules	Many rules and set procedures
Participative and informal	Long decision chains and slow decision making
Many views aired and considered	Limited views are considered
Face to face communication; little red tape	Communication via the written word
Inter-disciplinary teams; breaking down departmental barriers	Rigid departmental separation and functional specialization
Emphasis on creative interaction and aims	Follow the rules and protocols
Outward looking; willingness to accept external ideas	Internally focused
Flexibility with respect to changing needs	Rigid
Non-hierarchical	Hierarchical and bureaucratic
Information flow downward and upward	Much information flow upwards, directives flow downwards

question: How then do leadership and management styles influence and establish a culture supportive of creative endeavours?

16.2.3.3 Leadership and Management

Leaders and managers need to turn the team experience into an adventure to create the right culture for creative input (into firm's projects) and output (of new projects, ideas, innovations, and inventions). HIOs need to utilize methodologies, frameworks, techniques, and tools to unlock the individual creative potential. Leaders need to enable individuals to believe in their abilities to create and that individual CiQ can be improved by collaborating with the right people. Creative individual talent within the firm needs to extend the ideas generated in a team set-up to achieve innovation at scale.

Researchers Cherylene de Jager, Anton Muller and Bruce Nussbaum report on a highly prevalent current trend of customer-focused (also referred to as customer-centric) innovation. HIOs continuously find the best practices and best methods, systems, and procedures to leverage creative resources in support of organizational goals [1, 4]. This takes continuous vigilance of consumer trends, focus groups, reviewing procedures and the entire value chain to consider improvements valuable to all stakeholders. HIOs and creatively confident CiQ teams are not built overnight.

Empathy is a highly desired characteristic of creatives (see Chapters 8 and 11) and therefore also of CiQ leaders (leaders high in Creative Intelligence), who need to navigate the challenges posed by the highly volatile, uncertain, complex, ambiguous, (VUCA) business environment [1]. This VUCA environment leads to increases in stress-related deaths, toxic workplaces, and bad management. Organizations, institutions, and societies are continually going through one major crisis after

another (2020s COVID pandemic is no exception to the rule of uncertainty in business). For many businesses performance continues to decline, whether measured through return on assets or return on invested capital, despite rising labour productivity [4]. The average life expectancy of Fortune 500 companies has decreased from 75 to 15 years over the past 50 years. Data shows that only 13% of the workforce is passionate about their work despite the resources spent on learning and development (L & D). Global figures show that 80% of employees are less than fully engaged at work. The old leadership model does not work anymore. A big shift in leadership and management is required [1, 4].

The first step is to start with individual leaders and determine their beliefs, goals, ways of handling people and their understanding of strategy. Leaders need to start to perceive their organization as a dynamic entity and not an inert set of assets. Leaders need to possess some degree of intelligence. Leaders need to have a good idea of their weaknesses and strengths. Leaders need to be in possession of information on how all the business units are operating. Coaching is a very efficient tool in which to increase self-awareness and reduce blind spots in leaders and managers [1]. The management shift needed to adapt and HIOs focuses on two determinants: individual and organizational.

For the individual shift, senior leaders and managers need to fully understand their teams and learn how to have noticeable/measurable/real/effective impact on how they perform (cognitive/conative/affective). Research supports the concept of Levels of engagement and performance, ranging from Level 1, which is apathetic, through to Level 5, which is passionate and unbounded. This emergent leadership model draws on social neuroscience and complexity theory, as well as empirical research on employee engagement and organizational behaviour [1].

Each level is characterized by distinct mindsets and behaviours. With coaching and facilitated discussion, people can improve. A significant change occurs when moving from Level 3 to Level 4. This is the key moment of the management shift: the point at which high performance begins. Level 4 is the level at which leadership 4.0 emerges. This level of leadership is needed for surviving and thriving in the 4IR.

The phases that the leader must go through are:

Level 1: Lifeless/Apathetic – “I am demoralized – there is nothing I can do to change the situation”.
Level 2: Reluctant/Stagnating – “I am frustrated – there is no point in trying too hard”.
Level 3: Controlled/Orderly – “I need to be in control – I am reluctant to share information”.
Level 4: Enthusiastic/Collaborative – “We can achieve great things as a team – I respect myself and others”.
Level 5: Unlimited/Unbounded – “I inspire others to achieve their unlimited potential – I am living a fulfilled life”.

The Fourth Industrial Revolution has a disruptive effect on organizations where leadership is based on fear and control – traditional top-down leadership models no longer work. The proposed HIO’s CiQ leadership model is one in which leaders

understand what is happening across their company. Further, CiQ leaders are empowered to lead the organization in line with a defined moral code and guided by ethical choices and responsibilities. A true shift towards humane leadership, where trust and respect permeate organizations, is required in an era where routine and mundane tasks are going to be performed by machines and where the human element is required to create a climate that will support CiQ in action in HIOs [1].

Steve Jobs is an example of a CiQ leader, who convinced people that they could do the impossible and then enabled them simply to do it and carry it off. Today's business leaders need to enhance the CiQ of future leaders by creating an environment supportive of creativity and innovation [1].

The effect of empowered teams permeates the rest of the organization. The enthusiasm and energy ignite underperforming teams to at the very least, try harder. The idea is to ultimately transform a more authoritarian leadership style into a more participative style. This usually inspires a more people-focused culture. A comprehensive approach to the development of leaders, their teams and the wider organization can have a dramatically positive effect [1].

HIO's leaders focus the efforts and resources on talented individuals to build innovative successful groups and teams. Lize Wiseman [11] coined the term "multipliers" and lists the following secrets of leaders who are multipliers:

They attract, develop, and retain the right talent (skills and competencies).
They retain the most creative people and continually develop their CiQ to help achieve their best potential.
They find a larger-than-life challenge that challenges and inspires, and allows participants to feel that they themselves achieved it.
They ignite debates and encourage different views to be expressed.

16.2.3.4 Teams

It is crucial that the right teams are assembled when organizations want to optimally mine and apply the latent CiQ of the individual team members. A creative team, whether musicians, theatre troops or business teams, requires trust, familiarity of members with each other, collaboration, and a shared commitment to the same goals in order to optimally unleash their CiQ [1]. Cognitive psychology and neuroscience indicate that everyone possesses the ability to be creative, and a more sociocultural approach offers insights as to how we must act in a social context to be creative. Then the two key questions to be explored are: "How does creativity emerge from collaboration?" and "How does it thrive in a social context?" [1].

The following requirements and determinants should be taken into consideration when working with teams. It is important to make sure that some members of the team have domain relevant skills. Prior knowledge should be assessed, and knowledge gaps should be addressed. Establishing a culture supportive of creativity and innovation takes time and it can be a step-by-step approach in some cases. Teams

and organizations must realize that technology is not enough anymore – people need to acquire technical business skills and soft skills as well [1].

To enable individuals and teams to unleash their latent creative potential and to share their ideas, support from both the top and the bottom (troops in the trenches as well as the generals) is required. People at every level need to understand how to inflame the culture and cultivate change required when mining the collective CiQ to inspire innovation.

People need to be encouraged to keep working on and improving their CiQ – it is like a toddler learning to walk, a young child learning how to ride a bicycle, or a young adult trying to drive a car. All these activities require lots of practice, repetition, and encouragement [4]. The same is the case with creativity. Keep a strong sense of humour, and build on the energy of others. Minimize hierarchy and value team commitment and trust. Defer judgement at least temporarily. Boost the confidence of the team members by being open to whatever they share, verbally or visually. It does not have to be perfect. It does not have to make sense at the time.

At some stage, a shift from individual creativity and innovation to team ownership is required. The multidisciplinary and diverse teams need to collaborate by optimally utilizing everyone's varied experiences and controversial perspectives. This will help teams to be able to present and implement their creative and innovative ideas in a VUCA world filled with multi-dimensional challenges.

Most teams will have their share of sceptics, cynics, and prophets of doom. These are agents of resistance to change and may be limited by one or several of the creative blocks. Their confidence in their own creative abilities may have been tarred. Their initial creative offerings may have been so severely critiqued that their inner genii may require some serious triggers in order to access and unleash their creativity again. Warren Bennis (cited in De Jager and Muller 2020) states that great groups/teams believe that they can do what no one else can do or has done before. They have plans of action – their goals are "dreams with deadlines". Highly creative teams take ownership of their results. Teams should have the confidence to apply their CiQ to address client needs and solve problems in a climate supportive of creative endeavours.

16.2.3.5 Support Mechanisms

Support mechanisms for the people and talent of an HIO's culture, such as recruitment and selection strategies, reward and recognition, slack-time and integrated social-technical systems, are some organizational factors that can be effectively utilized to develop the HIO culture.

Recruiting and appointing people from diverse backgrounds should lead to richer ideas and processes that should stimulate creativity and innovation. Peter Skarzynski and Rowan Gibson [12] advise that if organizations are serious about recruiting and selecting people to innovate, the following criteria should be taken into consideration:

- People who are divergent thinkers and people who are convergent thinkers.
- People who are more analytical and people who are more creative.
- People who are close to head office and people who work far away.
- People who are younger and people who are older.
- People who understand technology and people who understand people.
- People from inside the firm and people from outside the firm.

If creative behaviour and innovation are rewarded, they will become the general dominant behaviour. Many organizations hope that people will think more creatively and take risks but reward them for well-proven, trusted methods and fault-free work. Various scholars [1, 8] suggest that organizations reward entrepreneurs/intrapreneurs differently than other employees. Jack Welsh understood the value of encouraging entrepreneurs/intrapreneurs to run their branches as if they were their own businesses. In doing so, he retained talent and rewarded these intrapreneurs handsomely [5]. Amabile [13] suggests that too much money or too large monetary incentives to entice talented staff to contribute to uninspiring projects can be counterproductive to creative output by adding stress, tension and unduly high inter-team competition, and therefore do not aid, but rather distract. Studies [1, 5] indicate that the reward and remuneration structure for employees who actively apply their CiQ and produce business results, is still not fully formalized and needs further investigation to be fully understood.

Creating time and space in people's lives for reflection, ideation and experimentation are likely to result in establishing critical preconditions for making breakthroughs happen. An organizational culture that promotes creativity and innovation should allow employees time to think creatively and experiment [1, 5, 10]. In organizations where creativity and innovation are encouraged, personnel are for example, allowed to spend 15% of their time on generating new ideas and working on their favourite projects [14]. Employees also need practical tools, processes, and mechanisms to use daily to turn innovation into a sustainable corporate reality [12].

HIOs place equal emphasis on the technical side and the social side of the organization. In other words, they look to nurture not only technical abilities and expertise, but also promote a sense of sharing and togetherness. In doing so, HIOs foster integrated socio-technical systems. Fostering group cohesiveness firstly requires paying attention to the recruitment process to ensure social "fit" beyond technical expertise, and secondly carefully integrating new individuals through a well-designed socialization programme [5]. Conversely, less innovative firms are more concerned with explicit, aggressive individual goals. Less innovative firms tend to create environments of independence, whereas innovative firms create environments of co-operation [5, 6, 8, 10]. Highly innovative companies also appear to have much more reasonable goal expectations and attempt not to overload individuals with projects. The prevalent belief is that too many projects spread effort too thinly, leading individuals to step from the surface of one project to the next, never getting the time and/or focus to delve deeply into the problems and consider a range of novel solutions. These conditions create time pressures that militate strongly against innovativeness [1, 6].

16.2.3.6 Communication, Risk Taking, Learning and Conflict, Competitiveness

An organizational culture that supports open and transparent communication, based on trust, will have a positive influence on promoting creativity and innovation [1, 8, 10, 15]. To promote openness in communication, managers should model dissent and demonstrate that disagreement is not only acceptable but sought after when complex issues are considered, and new ideas sought. This behaviour offers opportunities to expose paradoxes, conflict, and dilemmas, by promoting openness in communication and transparency in all inter-personal exchanges.

At the same time personnel must feel emotionally safe to be able to act creatively and innovatively and should therefore be able to trust one another, which in turn is promoted by open communication [5]. An open-door communication policy that extends from open communication between individuals, to intra-team communication and to inter-departmental communications, cultivates a supportive culture and helps to nurture and gain various alternative perspectives across boundaries of disciplines and business units, necessary to create a culture supportive of CiQ and innovation [12].

Taking risks and experimenting are behaviours that are associated with creativity and innovation [1, 6, 8, 10]. A culture in which too many management controls are applied will inhibit risk taking and consequently creativity and innovation [5]. Employees must know the level of risks that they can safely take. This helps them to define the space within which they can act in an empowered manner, and the occasions when they must obtain organizational ratification for engaging in actions. For example, employees must understand how much time they can spend on their pet projects, and how much effort they need to ensure that their "routine" operations are not made sub-optimal. They must understand the penalties if inefficiencies creep into aspects of their regular, priority tasks. Understanding risk clearly defines priorities and the allowed space for innovative actions. Without knowing that risk tolerance exists within the organization, employees tend to be unwilling to attempt innovation or to engage in activities that are in any way a departure from tradition [1, 6].

If business leaders and line managers model behaviour that illustrates that only minor risks with a minimum level of potential harm to the organization will be tolerated, personnel are unlikely to take risks or to be creative and innovative by experimenting [5]. It is important that a balance should be reached in the degree to which risk-taking is allowed. There should be a common understanding of risk. This can be achieved by spelling out expected results, assigning the responsibility of monitoring and measuring risk-taking to someone in the organization, creating a tolerant atmosphere in which mistakes are accepted as part of taking the initiative, regarding mistakes as learning experiences, and assuming that there is a fair chance of risks being successful [1, 6]. (See Chapters 11 and 18 on 6Sigma and Agile project teams).

There is obviously some level of risk if an organization seeks to move beyond its tried and tested core business and makes attempts to innovate into entirely new product categories and or new target markets. Senior managers must realize that the

risk can be reduced if the idea can change customer behaviour and industry economics, while at the same time focusing on the core business (e.g., drinking prepaid coffee at Starbucks changes the payment model, changes customer payment behaviour and the industry economics) [12]. A new concept was proposed, the core business remained the same, the business model was revolutionized, yet the risk was reduced by utilizing tried and tested, proven profitable business principles.

Several authors, including Perviaz Ahmed, Cherylene De Jager and Anton Muller, Gary Hamel, Bruce Nussbaum, and Tom Kelley [1, 4, 6, 10] indicate that an organizational culture that supports a continuous learning orientation should encourage creativity and innovation. By focusing on being inquisitive, encouraging personnel to talk to one another and to stakeholders (e.g., to clients within and outside the organization with the main intention of learning from them), keeping knowledge and skills up to date and continuously upgrading creative thinking and problem-solving skills, a learning culture can be created and maintained. Creativity and innovation are encouraged if organizations train highly visible "innovation champions" and "CiQ Custodians" in every part of the organization to guide and mentor employees who come up with brilliant ideas [1, 12].

When there is conflict between different ideas, perceptions and ways in which information is processed and evaluated, the process of handling conflict should be handled constructively to promote creativity and innovation. Understanding different individual thinking styles and training personnel in the process of constructive confrontation will create a culture supportive of creativity and innovation [10].

Research by scholars Cherylene De Jager and Anton Muller, Gary Hamel, Tom Kelley, and Bruce Nussbaum [1, 4, 8, 10] indicate that the most creative and innovative departments in an organization regard competitiveness as an important aspect of their culture [16]. According to Read (1996), competitiveness in organizations has shifted to the creation and assimilation of knowledge. In creating a culture of competitiveness managers should reach out to internal and external knowledge, encourage debating of ideas, create an environment in which constructive conflict will lead to information flow, support projects based on information flow and actively manage the choice of organizational design [1, 4, 5]. Accordingly, Coimbatore Prahalad and Michigan Krishnan (2008, p. 81) state, "competitiveness favours those who spot new trends and act on them expeditiously" [15].

In conclusion, the above determinants have focused mostly on what is required by the organization to establish a culture supportive of creative and innovative thinking and problem-solving skills. Our focus now shifts to the personal motivational factors required to enable individuals to be more creative and innovative.

16.2.4 Individual Determinants

16.2.4.1 Intrinsic Versus Extrinsic Motivation

Intrinsic motivation is a key driver of creativity [17]. In fact, scholars report that extrinsic interventions such as rewards and evaluations adversely affect innovation motivation because they appear to redirect attention from "experimenting" to following rules or technicalities of performing a specific task. Christopher Andriopoulos (2001) argues that money is the most common ordinary extrinsic motivator used to stimulate creativity and innovation [18]. Unfortunately for all those managers routinely using money as motivator, Theresa Amabile (1989) found that on many occasions financial rewards could have a negative effect on creativity, especially when employees perceive the financial incentive as a means of being bribed or controlled. She suggests that financial rewards as such do not necessarily make employees passionate about their work and hence may hinder creativity in the long run, but that alternative sources could be more inducive and more rewarding and thus more successful. These extrinsic rewards include payment (money), promotions and other forms of recognition, increases in status or power (titles, and authority over others); training and development to fast-track progression, company shares, benefits such as a large non-shared office, parking, medical aid, annual leave increases and benefits and a range of other benefits.

Furthermore, apprehension about evaluation appears to divert attention away from innovation because individuals become reluctant to take risks since these risks may be negatively evaluated. Conversely, to be creative, individuals need freedom to take risks, play with ideas and expand the range of considerations from which solutions may emerge.

16.2.4.2 Challenging Individuals

Open-ended, non-structured tasks engender higher creativity than narrow jobs. This occurs by people respond positively when they are challenged and provided with sufficient scope to generate novel solutions. Evidently it is not the individual who lacks creative potential, but it is the organizational expectations that exert a primary debilitating effect upon the individual's inclination to innovate [1, 8].

16.2.4.3 Skills and Knowledge

Creativity is affected by relevant skills such as expertise, technical skills, and talent. However, domain-related skills can have both positive and negative consequences [1]. On a positive level, knowledge enhances the possibility of creating new understanding. On a negative level, high domain-relevant skills may narrow the search

heuristics to learnt routines and thereby constrain fundamentally new perspectives. This can lead to functional "fixedness" [1, 5].

On a macro-level Perviaz Ahmed [6] (1998) suggests that organizations may attract and select persons with matching styles. Organizational culture as well as other aspects of the organization may be difficult to change because people who are attracted to the organization could be resistant to accepting new cognitive styles. When a change is forced, those persons attracted by the old organization may leave because they no longer match the newly accepted cognitive style. Among other things, this culture-cognitive style match suggests that organizational conditions (including training programmes) supportive of creativity will be effective only to the extent that the potential and current organizational members know of and prefer these conditions [6].

A lack of knowledge and skills with regard to utilizing the processes and tools to foster creativity and innovation was cited as the reason why creativity and innovation did not happen in some organizations [1, 5, 12]. To create conditions supportive of creativity and innovation, some organizations embarked on training a multitude of employees and providing them with tools that enabled and empowered ordinary workers to explore their creative and innovative skills and knowledge [1, 12].

16.2.4.4 Leadership and Empowerment

Empowering people to innovate is one of the most effective ways for leaders to mobilize the energies of people to be creative. Combined with leadership support and commitment, empowerment gives people freedom to assume responsibility for innovation. Empowerment in the presence of strong cultures that guide actions and behaviour produces both energy and enthusiasm for consistent work towards an innovative goal. Employees themselves can devise ways that allow them to innovate and accomplish their tasks. One of the problems with empowerment occurs when it is provided in an organization without a strong value system capable of driving activities in a unified and aligned manner to the super-ordinate goals of the organization. Under these conditions, empowerment is little less than abdication of responsibility (and when responsibility and power are pushed downwards, chaos typically ensues) [1, 6, 8, 10].

HIO's leadership actions should ensure a fine balance between empowerment and guidance. Responsibility and power still reside with the leader. It should be properly clarified who is accountable for which deliverables, and which responsibilities and accountabilities remain the leaders' charge. (See Chapters 18 and 19 on additional creative leadership issues for HIOs).

16.2.4.5 Accountability

A very common problem in empowered creativity and innovation is that everyone is encouraged to participate in cross-functional process involvement, often to an extent that almost everybody loses track of who is accountable for what. The result of unrestricted and uncontrolled empowerment is chaos. Cherylene De Jager, Anton Muller and Tom Kelley [5, 10] advocate "chaos within guidelines". Jim Collins [19] refers to the same concept as "freedom within a framework" (p. 123). As new processes are put in place, new forms of behavioural guidance should be provided and accompanied by redefinitions of responsibility. While on the surface, empowerment resembles an unstructured process, it is anything but that. Empowerment is in fact a clear definition of (1) domains in which individuals can exert creative discretion, and (2) the responsibility that individuals must bear while engaging in their total task as employees of the organization [1, 6, 8, 10].

Leaders at Whirlpool™ – makers of whiteware and kitchen appliances – were made "accountable" for helping would-be innovators find time during regular working hours to pursue their ideas [12]. This action reinforces the message that the leaders of the organization are serious about innovation. In some organizations taking ownership and accountability is viewed as too risky because managers realize that they would have to step on too many toes to get the changes completed [15]. From these examples it is evident that accountability requires a complex change initiative.

Innovation researcher Klaus Krippendorff [7] proposes that the innovation should be congruent with or replace three levels of accountability:

- Individual: promises made, should be kept.
- Organization: commitments people make when they choose to join the organization; innovations that conflict with any of these are unlikely to be embraced.
- Societal: organizations and individuals operate in a network of social accountabilities that we have implicitly accepted by belonging to our communities.

For the innovation to stick, you must eventually change, or fit in with the web of accountabilities that hold together your organization, partners, and users [7]. De Jager and Anton Muller [1] support this view and agree that the extent of a person's accountability must be clearly defined.

16.2.4.6 Action Orientation Rather than Bureaucracy Orientation

To ensure that innovation occurs with effective speed and within an appropriate timeframe, leaders must ensure that no bottlenecks caused by unnecessary bureaucracy suffocate innovation attempts. One such delay-causing primary culprit is overly bureaucratic procedures for rubber-stamping approval or reporting requirements. Faced with obstacles such as these, Gary Hamel (2000) and Klaus Krippendorf (2008) concur that many employee initiatives fail. They further state that a large proportion of suggestions or proposed re-engineering or alternatives to

current practices fail, not due to a lack of initiatives or smart ideas, but because the internal organizational protocols either fail to process the ideas with sufficient speed, and/or deliver a favourable or unfavourable response. Employee innovativeness is not always the stumbling block – often the culprits are the organizational processes and structures that are so unwieldy they create high levels of unresponsiveness or instil fear of the burdensome processes, so that employees refrain from acting and proposing ideas. A carefully nurtured commitment by CiQ leaders to re-engineer out unfruitful elements of bureaucratic processes can lay the foundation for a climate of innovation [1, 6, 8, 10, 12].

16.2.5 An Overview of the Determinants Required to Establish a Culture for Creative Endeavours

The above section discussed which determinants, on both organizational and individual level, are required to establish an environment that will promote creativity and innovation and a climate supportive of creative endeavours.

Organizational theorists such as Perviaz Ahmed (1998) [6] and Cherylene De Jager and Anton Muller (2020) emphasize the importance of culture and present a case for organic structures as opposed to mechanistic structures. Popular literature [13] similarly concurs that to facilitate innovation, work environments should be simultaneously tight and loose. De Jager et al. (2010) [5] highlight the dependency of innovation when defining the development and maintenance of an appropriate context within which innovation can occur. De Jager and Muller (2020), and Gary Hamel (2000) present findings from a study of R & D units and compare cultures and climates between innovative and less-innovative firms, arguing that the key distinguishing factor between innovative and less innovative firms is management's ability to create a sense of community in the workplace.

Perviaz Ahmed (1998), Gary Hamel (2000) and Tom Kelley (2001) [3, 6, 8] agree that highly innovative companies behave as focused communities, whereas in less innovative companies' units behave more like traditional bureaucratic departments [6, 8, 10]. The most important achievement will be to create the cultural conditions that can spawn a multitude of new ideas about how to differentiate the company and shape the future of industries [12]. Current literature reviews acknowledge that innovation should permeate the entire organization and be both systematically and systemically implemented [1, 12, 15].

It is evident from the above that the determinants to enable creativity and innovation in organizations are multi-dimensional and complex. Organizations will have to focus on changing the entire culture to establish an environment that supports creativity and innovation. The starting point should be the strategy, followed by structural changes that will allow the organization, as well as the individuals, to support creativity and innovation. The entire change process should be managed, owned, and driven by leadership.

It is possible to establish a climate for creative endeavours. The first step will be to assess the degree to which the required organizational and individual determinants govern what to do to adjust the determinants to enable them to support creativity and innovation.

16.3 Diversity and Cultural Sensitivity

It is important to create diverse organizations and teams. Diversity provides a variety of knowledge, perceptions, experiences, qualifications, and different cultural exposure that allows for a depth of ideas to be mined and utilized. The more diverse the organization and teams, the more diverse the quality of the ideas generated and the higher the success rate.

In highly technological areas, no single team member – regardless of tenure, status, or skill – can have enough knowledge to oversee all areas of expertise proficiently [5]. In building capabilities for innovation in a world of competition, managers need to leverage their knowledge and refine their skills, because creating new knowledge is critical [15]. Managers need to know the capacity of specific individuals to perform under pressure, across time zones, remotely and across cultures [1, 4, 15].

16.4 Making Mistakes, Grapple and Learn

Organizations wanting to foster a climate for creative endeavours should focus on creating a tolerant atmosphere in which mistakes are accepted as part of taking the initiative. Such organizations should regard mistakes as learning experiences [1, 6].

Cherylene De Jager and Anton Muller (2020) [1] express the opinion that the way in which mistakes are handled in organizations will determine whether personnel feel free to act creatively and innovatively. Mistakes can be ignored, covered up, used to punish someone, or perceived as a learning opportunity [5]. Tolerating mistakes is an essential element in the development of an organizational culture that promotes creativity and innovation. Successful organizations reward success and acknowledge or celebrate failures, for example, by creating opportunities to openly discuss and learn from mistakes [1, 8, 10, 20]. An organizational culture in which personnel are encouraged to generate new ideas without being harmed and where the focus is on what is supported instead of on what is not viable, should encourage creativity and innovation [5]. Make mistakes, learn from them, fix them fast and move on [1]. We look at a few other barriers to this corporate climate conducive to ideation, innovation, and invention, and how to overcome those barriers.

16.5 Barriers & Bridges to Higher Order Thinking and Creativity

Even with empowerment, creative endeavours and innovative actions can be incapacitated. In various rigorous research studies across many industries, employees, and senior managers that they often encounter organizational barriers that (i) inhibit employee's willingness to contribute ideas, and (ii) instil resistance to implement innovative ideas [21–24]. This last problem is particularly true for employees in well-established, out-dated, and steep hierarchical structures. The main barriers to the creativity of people were personal inhibitions, fear of being punished, and the fear of looking foolish. Self-imposed barriers include unwarranted assumptions, one-correct-answer thinking, failing to challenge the obvious, and the pressure to conform [1, 5, 6]. Some typical organizational barriers have been covered in earlier but for completeness the next section covers corporate factors found to influence employee motivation, willingness to offer creative ideas, and enthusiasm to implement projects – therefore influencing innovation in the organization.

A critical first step is for leaders to establish mechanisms and design interventions to address these inhibiting barriers. Table 16.2 covers five key areas with the most prevalent intra-personal and inter-personal barriers. These areas are: (1) organizational and management characteristics; (2) corporate constraints; (3) weak or poor project team management skills (4) allocating insufficient resources to support CiQ and innovation; and (5) corporate philosophies and politics. In the second column, scholars [22, 23, 26, 27] offer suggestions to assist readers to improve their personal CiQ and develop an internal workplace culture designed to remove (or at least reduce) these barriers -thereby bridging some intra-personal and intra-team barriers to facilitate a culture of innovation.

16.6 Conclusion

From the various studies covered in this chapter, it is clear that a corporate culture that nurtures creativity can certainly impact the overall creative orientation and habits of creatives and project teams. Developing the creative competency of employees is not only in their best interest due to the demands of future jobs, but the more supportive organizational conditions are, the less intense the scope of the re-engineering activities and investments will need to be for inventions. The future of businesses is highly competitive in a highly volatile marketplace. Organizations will do well to invest much of their finite resources to capture the opportunities and limit the threats mother nature, father time and fellow business executives will throw at the marketspace, by developing each employee's full CiQ potential. This is particularly true for the leaders of the organization, as "a fish rots from its head down". We cover HIO's leadership knowledge, skills and orientations in the next Chapter.

Table 16.2 Internal organizational factors that limit creative engagement and innovation

Barriers & bridges to creative contributions by employees	
Causation(s) of resistance or disengagement	Recommendation(s) to create bridges to HIOs
Factor 1: Organizational and management characteristics	
Inappropriate reward systems and concerns related to evaluations. Fear that something may go wrong or be seen as inappropriate or impractical. Managers/leaders focus on the negative aspects of new ideas (too expensive – too difficult; we do not have the knowledge/skills/time/space) Low or no recognition and appreciation of work done, or ideas contributed. Internal competition and lack of recognition may lead to deterrent. Leaders who fail to recognize suggestions and creative acts may inadvertently limit future contributions of ideas and general goodwill.	Managers/leaders seek the inherent opportunities in the situation. Challenge themselves, their peers, and subordinates to contribute novel ideas. Develop the potential to evaluate the quality and viability of ideas. Provide balanced feedback to highlight positive and point out development areas. Do not use evaluations or performance management procedures to discourage poor ideas. Change the firm's attitude and project teams' attitude to: How can we make this work? How can we achieve it? Hard work must be compensated adequately with financial and non-financial rewards.
Factor 2: Corporate constraints	
Seniors/managers/leaders are opposed to employee initiatives due to fear of being undermined or overshadowed by subordinates. Employees display a tendency to conform to accepted norms of thinking and behaving – these real or perceived rules hamper creative thinking. Management tends to preserve the established traditions – preserve the status quo. Rigid (often outdated) and standardized rules, regulations, and procedures can be another set of obstacles hindering creativity in organizations. When these rules, regulations and procedures become ends in themselves, employees will just rigidly apply them in every situation, even in those that are inappropriate. Lack of opportunity or freedom to explore or contribute ideas. The entire firm resists change: the conservative management culture and rules maintain various processes and systems of the status quo. Organization-wide disinterest in suggestions or proposals; doing tasks in an industrialized or ritualistic manner and opposed to change or long-term focus on improvement and adaptation.	Creative people tend to be disinhibited non-conformists, therefore leaders and managers should expect that environmental control of any sort will be especially hard for them. Although rules, processes and procedures are necessary to manage day-to-day operations, but they should not prevent new ideas and a fresh approach to find effective and efficient ways to do tasks and provide innovative ways forward. Create the physical space and mental orientation for staff to be willing and able to share ideas across domains, across business units and project teams. Allow all members of the firm to contribute or comment on ideas and recognize valuable additions or changes – even if not from the project team or innovation group. Leaders and managers should model and initiate change to conservative attitudes, adapt to the fast-changing environment, nurture open-mindedness, and accept creative ideas. Actively seek and reward new ideas, suggestions for improvement and intrapreneurial behaviour.

(continued)

Table 16.2 (continued)

Barriers & bridges to creative contributions by employees	
Causation(s) of resistance or disengagement	Recommendation(s) to create bridges to HIOs
Factor 3: Weak or poor project teammanagement skills	
Employees not feeling involved continuously reduced their commitment to the organization. If the working atmosphere leads to low morale, employees become less committed to the organization and this intrinsic lack of drive directly discourages them from being creative. They do not want to serve the company whole-heartedly, nor would they like to help the company with creative thinking. Lack of peer cohesion and support tends to lower morale – and when decreased, employees show low commitment to the organization and project teams.	Managers/Leaders: Ensure adequate, relevant, regular, and targeted communication; resolve and limit conflicting goals and objectives; build and maintain peer cohesion and support. Create opportunities for employees to gain understanding of the purpose and long-term benefits of the project. Allow and promote cross-team collaboration and collegial support. Find ways for employees to gain common understanding of their diverse strengths. Celebrate and promote employee diversity within and across teams. Continuously develop the project team and group management skills of key project team staff
Factor 4: Insufficientresources	
Creative endeavours, projects and spaces demand sufficient availability of resources. Absence of adequate resources may dampen the spirit of creativity. A critical resource is time. Too little time to think about a problem, excessively high workloads, too much time spent in crisis management ("fire-fighting") mode or chasing demanding deadlines impair employees' abilities (and eagerness) to contribute creative ideas. When employees are busy tackling the day-to-day problems all the time, it creates a hindrance to creativity.	Employees must be provided with some scope in their weekly schedule to perform creatively – ample time to consider an issue and think, not just "do and run". Projects should allow scope for mind wandering and the mental energy to ideate and "feed the invention soul". Project planning should carefully consider all resources (human, AI, equipment, time, and other physical resources) and adequately provide suitable resources – including the right level of competencies and talents to complete projects within a reasonable timeframe.

(continued)

Table 16.2 (continued)

Barriers & bridges to creative contributions by employees	
Causation(s) of resistance or disengagement	Recommendation(s) to create bridges to HIOs
Factor 5: Contextual and corporate politics	
Political problems or concerns over the well-being and survival of the firm (or the instability of the political environment).	Leaders need to monitor the general well-being of staff regarding the long-term future of the firm and the impact of political unrest and/or marketplace crises (like the 2020-COVID pandemic) on their mental and psychological state. Leaders need to ensure meaningful work, that provide opportunities for genii to express and achieve their full potential, experience unity with others in the team and society, remain true to their own values and feel a sense of purpose and hope [25].

Acknowledgements Some content is this chapter is used with permission from Knowledge Resources Publishing (with slight alterations) from the book: *Creative IntelligenceCQ@ Play Shaping your future in the Fourth Industrial Revolution*.

CREATiViTY LABORatory

Activity I: Your Organization's Climate

Create a template and assess the degree to which the determinants, on both an organizational and an individual level, contribute to a climate for creative endeavours. Rank the determinants for your organization on how they are currently implemented, from best to worse. Take the bottom 10 on this list (the worst), and rank them in order of biggest impact, should they change.

Activity II: Discussing the Issues

Now write a few suggestions on what can be done to improve the CiQ and innovation culture of your firm, using the ranked lists from Activity I. Guided by the models in this chapter, create a plan, over various business units, of the actions a project team are likely to take, or that you would propose to address these issues.

Activity III: Your Turn to Innovate

Consider yourself the leader of a strategic business unit (SBU) within a large organization (578 staff). Your unit is particularly tasked with competitive initiatives to ensure the product offerings of your firm remain relevant, contemporary, and valuable. Design a 12- to 16-question survey to determine what the current status of the corporate climate for creativity is in your unit, and within the firm. Concentrate on those stakeholders who directly or indirectly affect the performance of your SBU. Start by creating a problem statement or the issues you would like to gain insights into. Next, list the 5–8 areas you will investigate. Thereafter, design 2–3 questions per key area to probe employee perceptions and feelings.

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Chapter 17
Entrepreneurship & Intrapreneurship

Philip Dennett

Abstract Entrepreneurship is a blend of the creativity and innovation necessary to start a new business. An entrepreneur possesses strengths in three key areas: psychological capital, human capital, and social capital. These strengths also apply to an employee relationship where the employee is tasked with developing new products, services, or management processes.

Keywords Entrepreneurship · Intrapreneurship · Organizational creativity · Entrepreneurial capital

Learning Objectives
On completion of this chapter, the readers will be able to:

- Apply research and interpretation skills in understanding the traits and behaviours of an entrepreneur.
- Apply understanding through analysis of an entrepreneurial case study.
- Critically examine a scenario where an entrepreneur failed.

17.1 Introduction

Entrepreneurship is a blend of creativity (new ideas) and innovation (putting those ideas into practice). It often starts with the question, "What if…?" that leads to an exploration and then an idea. So far this could be a description of a creative person, but often that is where it ends. The entrepreneurial part comes when someone takes a risk and tries something new, sometimes risking everything they own, their time, and even their reputation.

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Of course, not all business owners are entrepreneurs. The majority set up a business to escape the stresses and restrictions of corporate life or just to earn a living. They start with enthusiasm, ignoring the statistic that 80% of them will fail in less than 2 years.

Do these people lack experience? Perhaps they are under-capitalized? Maybe they suffered from a lack of planning? Some or all those things can be factors, but is there a blueprint for success? Or at least a way of stacking the odds in your favour?

Researchers [1] have found that successful entrepreneurs possess three strengths:

- Psychological Capital (who you are)
- Human Capital (what you know)
- Social Capital (who you know)

However, there is no single solution or best practice as everyone will bring to the table a different set of strengths and weaknesses. There is a range of resources available to help the entrepreneur, but the problem is not the lack of those resources but the fact that the budding entrepreneur is not always sure of what they need.

This chapter will discuss the relative influences and forces that make up each area of capital and provide a useful guide to help build capability.

17.2 Psychological Capital

Not all successful entrepreneurs are extroverts. Some are introverted and looking at them you would not think they would be willing to take the risks necessary to launch a new enterprise. Pick two entrepreneurs and compare them and you will come up with more differences than there are similarities.

However, there are a few traits that they seem to share and one which they all have: *Passion*.

> Here's to the crazy ones. The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules and they have no respect for the status quo. You can quote them. Disagree with them. Glorify, or vilify them. About the only thing you can't do is ignore them. Because they change things. They push the human race forward. And while some might see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world, are the ones that do. -Apple Computer, Think Different television commercial [2]

People who are passionate about what they do tend to develop deeper insights and overcome problems that would cause a less passionate person to give up (Fig. 17.1).

17.3 Five Entrepreneurial Traits

There has been much research into identifying common entrepreneurial traits. While there is a long list of them, there are five that most experts agree on:

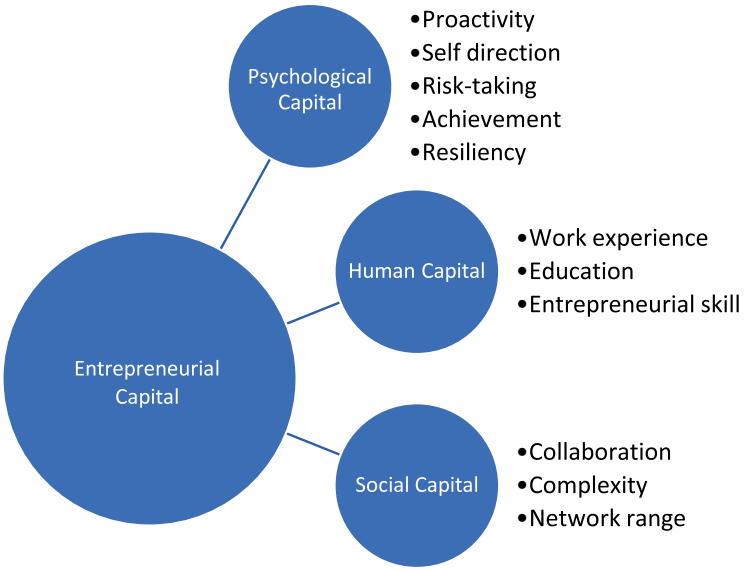

Fig. 17.1 Forms of entrepreneurial capital

- proactive behaviour
- self-directed learning
- risk-taking propensity
- achievement orientation
- resiliency

It could be argued that strength in one or more might overcome weakness in another, but for someone wishing to establish the strength of their psychological capital the important thing is to pinpoint areas for improvement. However, it is important to note that entrepreneurship involves a set of behaviours that lead to a specific goal and therefore a person's traits only amount to a propensity.

17.3.1 Being Proactive

This might seem to be self-evident but a propensity to take action is a vital starting point. There are many people who have had a great idea but have failed to act, only to find out later that someone else had the same idea and has gone on to make a success of it. However, being proactive is not about jumping in blindly; it is about doing things differently (like in the Apple commercial) and being organized. Bateman and Crant [3] identify 7 proactive behaviours that provide a useful guide:

- *Scan for change opportunities* – it is not always a new product or service; it might be a new production method or a cultural change that causes consumers to

act differently. By constantly being aware of what is happening around you it's more likely that you'll notice something you might normally have overlooked.
- *Set effective, change-oriented* goals – goalsetting is a good way for you to remain focused on the longer term. Often, we think only about the next few months or meeting this year's budget, but if you have a clear idea of where you see yourself in 5–10 years, you will be less satisfied with the status quo.
- *Anticipate and prevent problems* – entrepreneurs tend to plan for the unexpected. Get used to anticipating and managing risks.
- *Do different things or do things differently* – in other words don't be happy with the way things are even if you are happy with your situation. Look for "the second right answer" – you might arrive at the same place, but you could do it sooner or more efficiently.
- *Take action* – entrepreneurs are not necessarily smarter than anyone else, but they are prepared to "give it a go". They might fail but in failing learn and evolve. Thomas Edison was famous for saying he failed in thousands of experiments before he successfully created the light bulb.
- *Persevere* – It's very rare for something new to be successful without encountering problems along the way. But make sure you learn from your mistakes, so you are always progressing.
- *Achieve results* – don't just set an end goal, set a few milestones so you experience achievement in the journey itself. It is easy to give up if your goal seems unattainable.

How many of these are you good at? Pick two that you feel need the most improvement and start working on them now!

17.3.2 Self-Direction

Arguably this is the most important trait. If you work as part of a creative team, you often find that a team leader can provide the motivation required. However, as an entrepreneur you must be able to find that motivation from within.

Rock and Schwartz [4] provide neuroscientific support for the value of self-directed learning saying that useful insights should be self-generated. Often the adrenaline rush you get when you wake up with a great idea or solution to a problem stimulates the drive necessary to act.

17.3.3 Risk-Taking Propensity

Entrepreneurs' risk-taking propensity is widely thought to be a key trait. However, researchers such as Norton and Moore [5] say that entrepreneurs tend to take a more considered approach. They tend to conduct a more rigorous risk assessment and act

on that basis, whereas a manager in the same situation has to convince others and therefore may err on the side of caution. So, it is safe to say that entrepreneurs have a preparedness to consider risk and act accordingly.

17.3.4 Achievement Orientation

While in the corporate and military spheres certificates, medals, promotions, and other accolades are commonly used as external motivators, the opposite is usually true in the case of an entrepreneur. External forces are often negative. Along with self-motivation the desire to achieve helps an entrepreneur to keep their eyes on the ultimate goal.

17.3.5 Resiliency

It is very common to hear stories of famous entrepreneurs (like Edison) failing numerous times before they ultimately find success. When asked, Edison said rather than failures he saw them as steps towards ultimate success. This 'glass half full' attitude is important, but it is also critical to have the insight to know when you need to change your approach rather than stick with something that is unlikely to work.

17.4 Human Capital

While knowledge and experience are often a catalyst for entrepreneurial activity, and can be said to be necessary, by themselves they are not enough to predict success. According to Greek Stoic philosopher Epictetus it is what you do with knowledge/experience that's important! Therefore, it can be said that people with a high degree of entrepreneurial capital are able to overcome any deficit in experience or knowledge by befriending experts and/or partnering with people who have what is required. They may also do it by a process of trial and error. The entrepreneurial skill is in the ability to create something new from what is known.

In a corporate context the resources (human, financial and physical) are routinely applied when developing new products and services, whereas the entrepreneur must source many of the required resources externally. Human resources can come from partners or employees and/or from training and practical experience. Financial resources can be sourced through banks or venture capitalists and physical resources can be bought or leased.

According to Marvel and colleagues [6], when evaluating proposals, venture capitalists look mainly at a person's work experience, education, and business start-up/ownership experience. Therefore, it's important for a budding entrepreneur to

identify any gaps in the above and fill them either through their own human capital or that of others.

Work experience is critical because it points to the person's area of expertise. If the experience is technical, how does it relate or add value to the proposed venture? For management experience, does it show a history of managing complex projects or change management initiatives? If the experience is in marketing, has the person launched new products or helped market a new company?

Education is not just a tertiary degree. It is more about showing an interest in life-long learning which will expose an inquisitive nature. Another thing to consider is the application of any relevant education – for example, an Arts degree can be applied in terms of critical thinking skills.

Often an entrepreneur, such as Doug in our case study (Sect. 17.7) might have been in a position as an intrapreneur in an organization, for example, in new product development or proposal writing. These skills are transferable and also show how comfortable the person is with greenfields development.

Venture capitalists know that the novelty or value of the idea itself is not enough; it is the ability to turn that knowledge into a viable business that really counts. That is why partnerships like Steve Jobs and Steve Wozniak work so well – one partner provides the technical input and the other provides the entrepreneurial skill.

> Tip: in your determination of human capital consider factors such as domain knowledge, selling and negotiating, planning, prototyping, decision making, problem solving, teamwork, and communication.

17.5 Social Capital

Having a strong network is critical for an entrepreneur. As they move from the creative phase into the implementation phase, different sources of social capital will be useful, so rather than focusing on the quantum of social capital it is important to focus more on the potential uses. In this way you can match a use to a resource and in the event of a deficit, search for a solution.

17.5.1 Collaboration

Social capital works both ways – in order to get value, you must first offer it [7]. This is how a network typically operates. The value offered by a network is a mix of the tangible (money, equipment, people) and intangible (ideas, emotional support, guidance). While considerable work might be required to access tangible resources, the intangible ones are always available and this is where the entrepreneur needs to build up a strong network.

17.5.2 Complexity

Complexity also needs to be considered. For example, a closed user group where experts freely share ideas is far superior to a loose membership of a broad industry group. The former presupposes a high level of trust and utility.

Another approach is that of the *Creative Commons*, which encourages people to share their creative outputs free of copyright. While the platform is domain-agnostic it is a great way to show your willingness to engage with others.

17.5.3 Weak Ties

Granovetter [8] cautions us against relying too much on close contacts as they tend to share similar information and have similar perspectives. This reinforces the necessity of engaging with a wide range of networks rather than just maintaining a domain-based one.

Tip: Start building your network today:

- Identify relevant industry groups and join them. Don't just join industry-based groups: think outside the box and look for ones that are based around a way of thinking (like creativity).
- Access the resources of local business advisory groups. They can provide access to reports and other useful research and they often have training programmes to help start-ups.
- Have specific expertise? Why not publish a blog or write for a specialist media organization. It could help you profile your expertise and bring you into contact with others who can help you.

17.6 The Intrapreneurial Employee

To understand the intrapreneurial employee we must consider their attitudes, behaviours, and personality traits. While there are several similarities to an entrepreneur the chief difference is that in employee relationships, the sum total of these characteristics can come from a diverse group of people. The result is a benefit to the organization in terms of a new product or service, and to the employee in terms of prestige, promotion and/or other personal rewards.

17.6.1 Attitudes

The two key measures of the attitudes of an intrapreneurial employee are their commitment to the organization and their level of intention to quit. Both of these relate to the degree to which the organization has a creative culture (as discussed in Chapter 14) and the employee's overall job satisfaction.

A positive employee attitude coupled with a conducive environment leads to an increased likelihood of the employee championing an innovation within the organization. This is particularly true when the employee perceives that the initiative will have significant benefits for the organization [9].

17.6.2 Behaviours

Neessen [10] found that there is a correlation between these behaviours and level of intrapreneurship:

- the degree of creativeness the employee exhibits,
- how proactive they are in solving problems,
- their skill at recognizing and exploiting opportunity,
- their risk-taking propensity, and
- their networking skill.

It is important to consider both attitude and behaviour, because an employee with the right attitude may participate in creative activities but not be prepared to become a champion for them. Therefore, managers need to ensure that creativity is both encouraged and properly resourced.

17.6.3 Personality Traits

This dimension is where entrepreneurs and intrapreneurs closely align with the key personality trait; a sense of self efficacy. Belief in oneself offsets the fear of failure, which is a common trait in less creative people.

Intrapreneurs also have a personality that can adapt to working in a team, which is often necessary in an organizational context. As we saw in Chapter 14, creativity in in organizations usually happens at a team level, where a diverse group of people act as a cohesive team to produce a creative outcome.

17.7 Case Study: From Intrapreneur to Entrepreneur

Woodilla [11] followed the journey of Doug Shick as he went from an intrapreneurial role in a leading technology company to becoming an entrepreneur through the launch of his own business NRS Associates.

Reaching a crossroads in his career, Doug decided to explore the opportunity to start his own business. As part of his decision-making process, he took the following steps in creating a plan and subsequently implementing it:

17.7.1 Capital Raising

In Doug's case he was able to access a personal line of credit and did not have to go through the venture capital pitching process that many entrepreneurs face. Additionally, as Doug's business was a consultancy, he did not require a large amount of capital. His financial risk was limited to the loss of his monthly salary, which would of course be substantial if his venture ultimately failed.

17.7.2 Business Planning

Using his skill as a business case analyst, Doug developed a business plan to determine the scope and growth potential of his business. Coming from a corporate background, Doug was familiar with both the clients and competitors in his domain, which meant he didn't have to rely on secondary research.

The downside of this approach was that his experience was based on the current market and he did not consider what would happen if the market changed significantly.

17.7.3 Market Testing

Doug tested the market by sending his resume to a number of potential clients. As Doug was well known in his profession this approach worked well and he gained a number of interviews. By pitching himself he was able to let it be known that he was available either as a contractor or a potential employee.

This meant that if his business was not ultimately viable, Doug had options to follow up.

17.7.4 Company Structure

Having decided to proceed, Doug investigated the ideal structure for his new venture. As he did not have any partners and he wanted to ensure his operation had the appearance of a company instead of one person, he set up a limited liability corporation.

17.7.5 Resource Requirements

Doug's work often required that he work remotely so he decided to establish a home base, leasing the necessary computer hardware and software as well as establishing a high-speed internet connection. This was backed up by mobile computing capability.

17.7.6 Marketing Planning

Doug's marketing strategy was to establish an expert presence on the internet. He started by creating a website that included links to complementary services that might also be required by potential clients. This networking approach helped generate enquiries.

Doug used his authority rather than any sales skill to sell himself to his customers. He also used his highly developed proposal-writing skills to convince potential clients to work with him.

Based on this approach his consultancy grew by word of mouth, which meant Doug did not have to commit funds to an advertising campaign.

17.8 Case Study: Serial Entrepreneurs

Two Australian entrepreneurs, Mike Cannon-Brookes and Scott Farquhar, founded software company Atlassian™ in 2002. While they are now both billionaires their success is not based on a single good idea; instead, it comes from committing nearly half their revenue to research and development. This level of investment is more than double the industry norm. Now the company has over 50 million users of its software products worldwide.

Another key success factor is their innovative, people-first company culture where they place high value on both their customers and their employees (who act like intrapreneurs). The company has worked hard on this culture as it is easy for competitors to copy their products but difficult to develop a similar culture.

For more information about the company, visit https://www.atlassian.com/

17.9 A Lasting Legacy?

In 1992, New Zealander John Britten designed a world-beating motorcycle made from innovative materials and using a unique design. His ideas have since been copied by major manufacturers but at the time he proved that in a high tech, high-cost marketplace it was possible for an entrepreneur to not only compete but to beat the leading factories.

Unfortunately, John died in 1995 before he could expand production beyond the original 10 bikes he built. John was typical of many entrepreneurs who thrive on developing new products but are not equipped to run a company once they are launched. To overcome this, it's important to bring on board the people with the necessary skills whether it's in marketing, operations, or management.

To learn more about John Britten visit the following link:
https://www.nzgeo.com/stories/the-making-of-john-britten/

17.10 Developing an Entrepreneurial Mindset

If you are planning on embarking on an entrepreneurial journey you should start by taking stock of yourself and your situation to determine what you lack in terms of entrepreneurial capital. For example, you might be lacking in some psychological traits, need more training, or you don't have an active network. Next, make a list of actions you can take to overcome any gaps. This in itself will help by practicing being proactive and self-directed.

While each person's needs will be different there are some things you can do without difficulty:

17.10.1 Intelligence Gathering

Inquisitiveness is something that most successful entrepreneurs have. They ask questions like "What if?" Often an idea will seem to pop into your head in a 'light-bulb' moment, but this is usually because of subconscious processing of information. Identify sources of information that are relevant to your area of interest and scan them daily for insights that could help you in your journey.

Don't just focus on technical sources. Research broadly; for example, review sources that your potential customer base uses. What problems are they trying to solve? How do they use a particular product? What complaints do they have?

17.10.2 Identifying Trends

Innovations often succeed because they address a specific trend. Make a habit of being forward looking. Identify people and organizations who research and comment on trends. For example, https://trendwatching.com/ offers a free monthly trend update. Also look at:

- https://www.trendhunter.com/
- https://www.springwise.com/
- http://joshspear.com/

17.10.3 Become an Expert on Risk

Entrepreneurs are often seen as risk-takers but the reality is that the successful ones take calculated risks by planning in advance. The result of this is that rather than fearing something will go wrong, they welcome it because they know they have a plan to offset it.

Practice risk analysis in your everyday life and work. The process is simple:

- Make a list of everything you think could go wrong in a particular context.
- Rank the risks (using a scale of 1 meaning low risk and 5 meaning high risk) in terms of the *likelihood* that the risk will eventuate and the *consequences* of it happening.
- Pick the top 3–5 risks and develop a mitigation strategy for each. In some cases, you may be able to eliminate the risk entirely. In others you may only be able to minimize any impact.

If you have ever visited Auckland in New Zealand, you will have seen many buildings scaffolded and covered in plastic wrapping. This is an example of a risk mitigation strategy, the risk being bad weather causing delays (and extra cost) in construction. This is an example of a risk that you do not have direct control over; therefore, the solution is to counter it by changing the way you approach the task.

17.10.4 Educate Yourself

Lifelong learning is a concept that recognizes we live in a state of constant change and in order to thrive we need to open our minds to new knowledge. That might be to keep up with the latest changes in an area of expertise or to develop new skills such as marketing or finance.

Universities, technical colleges and private organisations all offer short courses that require only limited commitment. Many of these courses can also be credited towards a diploma or degree.

Some institutions also offer free online courses to give you a taste of a subject. This is a good place to start as you can work at your own pace without pressure. Check out the free offerings at https://www.mooc.org/.

17.10.5 Build a Collaborative Network

LinkedIn (https://www.linkedin.com) is a good place to start. You can establish a profile that helps people find and connect with you. There is a range of special interest groups you can also join. However, as with any network you need to contribute value if you expect any in return. Post useful information, or comment on specific topics where you have an expertise. But a word of warning: networks are not places for you to make sales!

Networks can be divided into three categories:

- *Operational networks* – based around your current work
- *Personal networks* – like linkedin.com
- *Strategic networks* – these are ones that will help in the development of an entrepreneurial endeavour.

17.11 Conclusion

Researchers have identified three strengths successful entrepreneurs possess:

- Psychological Capital (who you are) typically measured by the presence of common traits such as proactive behaviour, self-directed learning, risk taking propensity, achievement orientation and resiliency.
- Human Capital (what you know) consisting of knowledge and experience.
- Social Capital (who you know) in terms of active networks and collaboration.

While there are a number of similarities between an entrepreneur and an intrapreneur, the chief difference is that in employee relationships the total of these characteristics can come from a diverse group of people.

CREATiViTY LABORatory

Activity I: Uber Case Study

Watch this case study of the rise of Uber™ and the journey of Uber CEO Travis Kaslanick.

https://www.youtube.com/watch?v=5NlILBs_5Fc

What lessons can we learn from Travis' journey? Look back at the list of entrepreneurial traits in Sect. 17.3 – can you identify which ones Travis has? Which ones did he have a deficit in?

Activity II: Building Entrepreneurial Capital

In the case study Doug was first an intrapreneur before he set out on his own. Discuss the advantages of this approach and identify ways in which a budding entrepreneur could acquire those same advantages if they didn't have access to an appropriate corporate environment.

Activity III: Identifying Market Gaps

Hyungsoo Kim did what many entrepreneurs do – he saw a gap in the market and designed a product to fit it. However, it didn't work. Read his story in the article below and answer the following questions:

1. Why did Hyungsoo's initial product idea fail?
2. What should he have done to avoid this problem?
3. Why did crowdfunding work so well? https://www.washingtonpost.com/business/on-small-business/a-new-vision-how-one-entrepreneur-changed-his-thinking-about-the-blind/2014/01/10/25b615a4-794d-11e3-af7f-13bf0e9965f6_story.html

Activity IV: Traits or Behaviours?

William Gartner [12] posits that it's impossible to come up with a list of traits that all entrepreneurs have and instead we should be looking at common behaviours of entrepreneurs because actual behaviour determines success rather than any specific trait a person might have.

Do you agree with Gartner? If so, why?

In a group, brainstorm a list of behaviours you believe are necessary for entrepreneurial success.

Activity V: Creative Cultures

A key part of Atlassian's success is in their company culture. Discuss, using examples from their website, the ways in which this culture helps fuel ongoing entrepreneurial activity.

Activity VI: Reflection

Read the following post at lifehack.org and then answer the questions below:
https://www.lifehack.org/286158/8-signs-incredibly-successful-entrepreneurs

1. What are the 8 signs identified in the post?
2. How do these signs relate to your understanding of what makes a good entrepreneur?
3. A number of the entrepreneurs profiled break some of the rules around entrepreneurship. Pick one example and research why their approach has been successful.

Activity VII: Applying Knowledge

John Britten was a successful innovator but was he a true entrepreneur? The Britten motorcycle is still highly prized, but it never went into full production due to John's early death.

Based on your understanding of entrepreneurship what should John have done to lessen the reliance on a single person?

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Chapter 18
Highly Innovative Organizations: Entrepreneurs, Intrapreneurs, Teams & Crowds in Partnership

Rouxelle de Villiers

Abstract We consider two Ps of the six Ps Model in this chapter: Press and Partnerships. Businesses constantly face contextual changes in a volatile, uncertain, complex and ambiguous (VUCA) marketspace. To remain relevant, businesses need to create innovative products, services and business processes. The ability to analyse opportunities and threats, and mobilize teams and whole supply chains to implement ideas is at the core of business survival in today's tumultuous marketplaces. While innovation involves applying creativity to generate unique solutions, entrepreneurship is applying innovations, scaling the ideas, and inspiring others' imagination and stakeholders' commitment to realize the envisaged solution. This chapter looks into the roles of entrepreneurs, intrapreneurs, teams and crowds to source and implement innovations in business, forming various partnerships to collaborate to achieve effective solutions. Key issues such as the skills, attitudes and personality traits of entrepreneurs, and team composition and collaboration tools such as Six Sigma and Kaizen are covered. We look into the role of teams, social webs and crowd sourcing in corporate innovation for today's businesses.

Keywords Crowd sourcing · Entrepreneurs · Intrapreneurs · Innovation teams · Kaizen · Kata · Six Sigma. · Social webs · Sustainable advantages

Learning Objectives
On completion of this chapter, the readers will be able to:

- Explain the role of intrapreneurs, entrepreneurs, ideation and implementation teams in highly innovative organizations (HIOs).
- Identify key factors that influence organizational innovation and

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- Use the tools and frameworks in this chapter to design learning teams within organizations and a team culture that inspire creative innovations and rapid learning cycles.
- Explain human resource practices that inspire creative teams and quick responses to marketplace opportunities and threats.

18.1 Introduction

In an era of constant contextual change, businesses face a surge of innovations and various attempts to remain relevant – adopting new ways to effectively create new products, services and solutions. These contextual changes are labelled "Press" in the Six Ps of Creativity Model. Change provides the catalyst and opportunity to create advantage. If change is not embraced and viewed as a prompt to adapt and respond with agility to marketplace changes, companies and brands die. Competitive advantage is more tenuous and fleeting than ever. Opportunities come and go. Trends change as fast as they rise and durable advantage has more to do with the ability to manage uncertainty, read the marketplace more effectively than one's competitors, and be more adaptable and resilient than competitors. It is this capability to adapt faster than competitors that provides a sustainable competitive edge (also known as a sustainable competitive advantage (SCA)). This ability to analyse opportunities and threats, and capture opportunities faster and more effectively, is the durable, sustainable edge. According to economist Joseph Schumpeter, creativity is the core of capitalism, and business guru Peter Drucker states that business has only two functions – marketing and innovation. According to McKinsey research [1], leaders who act early and decisively during times of economic disruption reap long-term benefits.

Businesses need to find new ways to create growth from innovation – to find disruptive insights and bring valuable solutions to market. Bringing solutions to market faster, at lower cost, and with a higher success rate than competitors, which the literature terms speed and flexibility of market response, has become more important than short-term profits, market share and market value [1–4]. The history of the iterative and progressive nature of innovation in business provides us with useful insights into how organizations apply and implement creativity and innovative solutions to consumers' problems. Most importantly, history shows us that great inventions are never the work of one mind. Every great discovery and every great invention is either the final step of an aggregate of minor inventions, or a series of incremental changes that resulted in one very useful, sometimes highly disruptive innovation that changes the way humans think and behave. Not only are these changes made over time, but most often by great partnerships, which may include R & D professionals, academic researchers, project implementation teams, entrepreneurs, funders, and various alliances over multiple organizations and diverse industries.

Consider the Windows™ operating system as an illustrative example ([5], p. 249). Most people will say Microsoft™ created the Windows operating system. In contrast, loyal Apple Macintosh™ techno-savvy buffs will assure you that most of the distinctive features, such as the graphical user interface, the menus and mouse pointers, integral to Windows, were already features of the Apple MAC™ years before Windows™ (by 1984). In fact, the idea for the windows–mouse user interface was conceived in 1973 by the Xerox™ research centre in Palo Alto (PARC). Since then, multiple competing personal computer software developers have not only duplicated each other's discoveries, but also built on the incremental insights and body of knowledge contributed by university research laboratories. "No one knows exactly which research group first came up with each of these ideas and the origins of many of them are contested" ([5], p. 251). Insights from this history of the windows–mouse interface and other technological advancements highlight five key insights about organizational inventions, innovations and their implementation.

Innovation takes time and is built over a long history of incremental improvements – Although some radical innovations might seem instant to consumers, they rarely spring forth as full-grown innovations. Most often, there is a history of small incremental mini-insights that accumulate or converge into the successful final product.

Collaboration across multiple discoveries – Successful innovations result most often from team-based and inter-disciplinary collaborations: critical ideas from multiple teams can be drawn together to deliver a novel, useful invention.

Frequent interaction and feedback - Alliances and collaborations frequently capitalize on available resources, including expertise from other teams.

Contextual factors are impactful and need careful consideration – Most innovations emerge within a complex social and organizational system. In addition, multiple factors including organizational resources, core competencies, competitive forces, cultural norms and individuals' roles and creative processes may play an important role (See Chapter 16 on Corporate Climate).

People invent either alone, partly alone as team member of a collaboration, or fully as a member of an innovation/project team. We cover entrepreneurs and intrapreneurs later in this chapter, and earlier in Chapters 17 and 18.)

18.2 Corporate Entrepreneurship and Intrapreneurs

Entrepreneurs are people who recognize opportunities in the form of solutions to either old or new problems. Tina Seelig of Stanford University School of Engineering, [6] connects the concepts of creativity and entrepreneurship: "Imagination is envisioning things that don't exist. Creativity is applying imagination to address a challenge. Innovation is applying creativity to generate unique solutions. And entrepreneurship is applying innovations, scaling the ideas, by inspiring others' imagination." Zana Majed Sadq and colleagues [7] defined entrepreneurship as the

way organizations make a difference by exploiting the opportunities discovered in the troubled environments within which the organization operates. Some scholars distinguish between entrepreneurs [8], who establish their own businesses outside of an existing business, and those who establish a new business unit, component or support function within an existing business, for or on behalf of an employer – named intrapreneurs. In the literature this intrapreneurial attitude and set of attributes is also called corporate entrepreneurship [9] and there seems to be no clear distinction between the two terms.

Several important roles/functions within organizations are associated with the success of corporate entrepreneurship. Key roles identified in the literature include: the technical innovator, the innovation champion, and the knowledge broker [10, 11]. Four key competencies to fulfil these roles are well researched and spread over a range of studies in various business publications but they have been reviewed and summarized by Hayton and Kelly [9]. The four key competencies specific to corporate entrepreneurship are innovating, brokering, championing, and sponsoring. The innovator is alert and ready to recognize opportunities, and has the related domain-specific knowledge, cognitive ability, creativity, conscientiousness, and openness to respond. The brokering role serves to deliver new information to the innovator, connect various experts over multiple domains, and to draw information from various sources, for use elsewhere in the broker's network. The championing role entails inspiring and enthusing others with their vision of the potential of an innovation. To achieve these important outcomes, champions show extraordinary confidence in themselves and their mission, thus gaining the commitment of others to support the idea. Sponsors ensure that resources become available, using direct and indirect influence over resource allocation to channel resources to innovation, invention, piloting and execution. The competency model of corporate entrepreneurship is summarized in Table 18.1, noting knowledge, skills, personality traits, and passion.

The Matrix Competency Model (MCM) suggests that broad organizational knowledge across multiple disciplines, connections with social networks, tenacity and passion are central to each of the (corporate) intrapreneurial roles. Scholars suggest that personal specifications for candidates for innovative companies should include individual characteristics, in addition to more immediately desirable job-specific characteristics, as they are more likely to predict innovation success.

Although there some differences between entrepreneurship and intrapreneurship, these two concepts have a common core, as intrapreneurship is consistently positioned as entrepreneurship within organizations [12–14]. In essence the intrapreneur is a entrepreneur with a built-in in-house network of people to support all aspects of the creative endeavour – from problem identification to solution finding and solution implementation. In the next sections we cover the roles of teams and other partners in taking innovative ideas to market.

Table 18.1 Matrix of entrepreneurial competencies, skills, and personal characteristics (MCM)

	Innovating	Brokering	Championing	Sponsoring
KNOWLEDGE				
Specialized core	X	X		
Multi-disciplinary	X	X	X	X
Organizational	X	X	X	X
SKILLS				
Cognitive ability	X	X		
Creativity	X	X		
Analogic reasoning		X	X	
Influence		X	X	
Transformational leadership			X	X
Emotional intelligence (EQ)		X	X	
Networking		X		X
PERSONALITY				
Openness	X	X		
Conscientiousness	X	X		
Curiosity		X	X	
Confidence		X	X	
Credibility		X	X	
Risk tolerance			X	X
Tenacity	X	X	X	X
PASSION	X	X	X	X

Adapted from [8]

18.3 The Highly Innovative Organization – Practices, Policies and Intrapreneurship

It is common knowledge today that entrepreneurship is linked to invention and innovation, and in turn is causally related to organizational productivity [15]. Various scientific, empirical studies considering highly innovative organizations from the USA, Europe and China – such as 3 M™, ABB™, AT & T™, Ericson™, IBM™, General Electric™, Google™, Samsung™ and Xerox – support this causation tenet, and recognize that specific organizational practices foster corporate innovation and intrapreneurship [16, 17]. Organizations create an ethos where creativity is either nurtured and thrives, or where creativity is starved of support, or worse still, discouraged. A corporate culture where employees are distrusted, where individuals lack autonomy or goals are unclear, inhibits innovation.

18.3.1 Key Factors Influencing Organizational Innovation

In this section we will briefly cover seven key factors that will influence organizational innovation and intrapreneurship (shown in Fig. 18.1). Much evidence exists from the corporate world, over a wide variety of industries, indicating that

Fig. 18.1 Factors influencing organizational innovation and intrapreneurship (HIOs)

organizations that fail to innovate risk being outsmarted and outperformed by competitors and eventually becoming obsolete (e.g., Kodak™, FlightStar™). Although innovation is closely linked to gaining a firm foothold in a target market and good business performance generally, innovation alone is obviously not the only factor that guarantees sustained business success and economic performance.

In general, highly innovative organizations (HIOs) outperform non-innovating firms – with evidence from various studies over multiple nationalities confirming this tendency [18, 19]. These studies also seem to agree that in more volatile, unpredictable, complex or ambiguous (VUCA) environments, organizations that are more decentralized, more flexible and have less formal work practices and procedures, will respond more effectively to changes (both opportunities and threats) in the marketplace. Obviously firms that hold monopolies do not invest as much, and possibly do not see the need for such pro-active innovation. Although a specific, dedicated Research & Development (R & D) department is no guarantee of sustained business success, an R & D department is often a good predictor of patents owned and thus levels of innovative activities that result in marketable inventions to take to market. West and Rickards [18] concluded that "evaluation of the cost/benefits of R & D go beyond simple accountancy exercises and seek to establish it as an essential component in knowledge management and strategy implementation" ([18], p. 52). In addition, organizational strategies that drive organizations towards competitive differentiation and include continuous improvement programmes tend to favour innovative organizations. Aligned with continual improvement is a keen focus on quality monitoring, control and management – total quality management systems (TQMs). Much has been written about the so-called Kaizen method of continuous

improvement, based on a central organizational commitment to innovation. These improvements are in product and manufacturing design, technology, quality at the point of production and process control, and a production culture based on continuous improvement in products and processes. Another process improvement system often cited in innovation literature is the Six Sigma (6σ) Improvement processes. We will cover Kaizen, Six Sigma and Agile (another corporate improvement system) in the next section.

It is important to stop briefly to focus on the learning organization as a particular example of HIOs' focus on creating and applying knowledge to inspire creative innovations and rapid learning cycles in order to continuously improve and remain relevant and competitive in the marketplace. Takahiro Fujimoto wrote about Toyota™'s rapid learning cycles and product development and production systems. This learning goes beyond that of the individual, by establishing organizational routines in operating standards that sit above any particular individual: "The process by which we transmit and evolve organizational routines is organizational learning …creating new knowledge is the crux of produce and process development excellence" ([19], p. 214). In their book *Designing the Future*, James Morgan and Jeffrey Liker [19] identify four barriers to effective learning in organizational learning environments. These are: (i) the fear of openly sharing information; (ii) learning is not truly valued; (iii) companies confuse talking and doing; and (iv) learning is not seamlessly integrated into the organization (see Table 18.2).

The formula representing the genuine learning organization is set out as:

Learning organization = culture * occasion * scientific thinking * gatekeepers * communication.[1]

Table 18.2 Roadblocks to effective learning within organizations

Fear of openly sharing	Fear relating to job security makes people hoard information; leaders are afraid to promote a culture of inquiry to protect their own egos or to avoid being identified as wrong or having made a mistake
Learning not truly valued	Making time to learn is often pushed to the back burner; Leaders don't reference knowledge archives; new ideas are rarely given a chance; no time is allocated for experimentation.
Confuse "talking" with "doing"	Presentations and discussions about change replace real change. If being critical is seen as intelligence, then new ideas get cut down and talking becomes more valued than doing.
No integration of learning into the "real work" of the organization	Organizations need to find ways to learn, build it into everyday work and actively pursue learning at all levels. Everyday activities need to be leveraged to promote learning and improvement. Firms fail to find learning opportunities in normal projects, design reviews, testing and other development work.

[1] The expression is stated in Boolean algebra with the * indicating AND to create the success configuration of conditions.

18.4 Innovation Implementation Processes

18.4.1 Six Sigma (6σ)

Six Sigma is a business strategy and a systematic methodology, aimed at monitoring and improving products/services, manufacturing processes, productivity and customer satisfaction in order to gain business benefits and successfully implement innovation. Six Sigma implementation [20] is spreading to many organizations worldwide and success stories are increasing every day, with several cases recording impressive financial benefits.

Six Sigma (6σ) was first implemented in 1986 [21] by Motorola™ as a quality performance measurement, but has since evolved into a statistically-oriented agenda for many companies that are trying to reduce costs and improve productivity [21, 22]. Many of the top manufacturing companies implement thousands of 6σ projects every year and this implementation demands a significant investment of capital. Jones, Parast and Adams (JPA Framework) [23] offer a framework for implementing 6σ (see Fig. 18.2), consisting of eight constructs, leading to organizational performance enhancement.

Executive support: Practitioners and scholars believe that the explicit and tacit support of top management, demonstrated by a balance between innovative 6σ-projects and operational activities of the organization, is essential for the long term success of the organization. This construct measures the level of involvement of senior executives with the projects.

Financial responsibility: This stage measures how project leaders are assessed and held accountable for the outcomes, reporting and rewarded if/when the project goes well. This stage includes forecasts and budgets.

Black Belt Roles: Black Belt executives are appointed as project champions (in some cases improvement specialists) who direct and manage 6σ initiatives [24]. Top management is often not directly involved in 6σ-project implementation; empowered Black Belts accelerate the 6σ processes by bridging the gap between top management and the 6σ team. This construct in the JPA framework measures the degree to which the roles of Black Belts are dedicated to 6σ or whether their

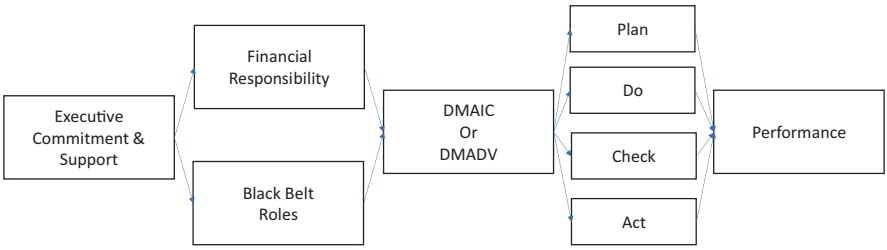

Fig. 18.2 JPA framework for Six Sigma Implementation. (Adapted from [21])

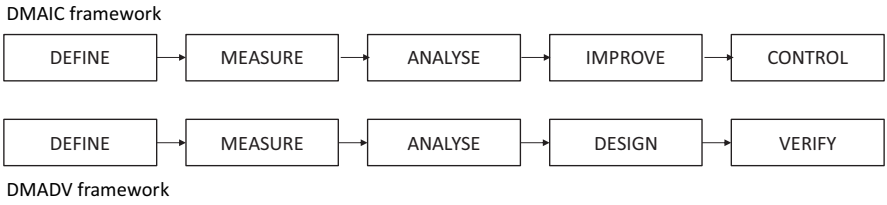

Fig. 18.3 The DMAIC and DMADV frameworks

time resource allocation is split between normal everyday management tasks and 6σ responsibilities.

DMAIC v. DMADV: These two 6σ project processes are designed to be used for specific types of projects. The purpose of this construct is to measure whether they are used according to their intention. DMAIC (Define, Measure, Analyse, Improve, Control) is widely used when a product or process is already in existence but is not performing adequately. DMAIC focuses on eliminating unproductive steps, developing and applying new metrics, and using technology to drive improvement [25]. When organizations develop new products/services, the second 6σ-approach, DMADV (Define, Measure, Analyse, Design and Verify) is used (see Fig. 18.3 for the steps).

Plan: Quality projects follow the 4-stage process of: Plan, Do, Check, Act - the so-called PDCA* cycle [26]. For DMAIC and DMADV, this is the 'define' step. This construct contains the first steps for starting a project, such as project selection, project planning, and project scope and metrics. The purpose of this stage is to compare how organizations actually start projects with how the DMAIC and DMADV frameworks recommend starting projects [27, 28].

Do: This is the second step and for both DMAIC and DMAVD. It's the 'measure' stage of the 6σ project process. Tests, analyses, examinations and measures are performed to determine current performance and highlight necessary improvements on a project.

Check: Over this stage, 6σ-project managers determine whether the improvement or innovation will perform as expected. For this stage, projects check the data with statistical tools to determine which components of the improvement of sources of variation are crucial to the innovation process.

Act: This is the last step in the PDCA cycle and the last two steps of the 6σ-project processes, which are used to set up and implement plans to ensure that the changes or new ideas remain effective and are supported by the team.

In their book *Designing the Future*, authors and executive advisors on lean product development, James Morgan and Jeffrey Liker [19] suggest that PDCA should be adapted to what they call a reflective scientific PDCA (as illustrated in Fig. 18.4). Instead of the more common PDCA of: planning a solution (Plan – react quickly based on current knowledge), implementing it (Do – make it happen quickly and efficiently); then confirming assumptions and checking the outcome (Check – did we win?), and finally making sure everyone follows the

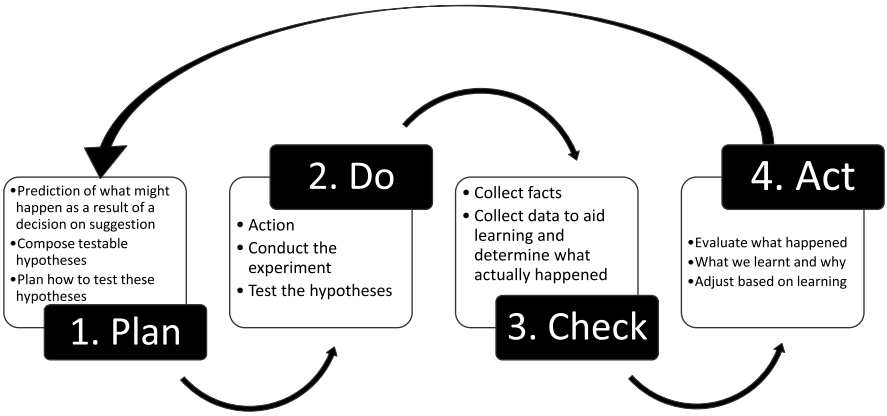

Fig. 18.4 Reflective PDCA with assumed uncertainty and a scientific approach to fast thinking, fast acting. (Modified from [17], p. 227)

plan (Act – control and be ready for the next crisis); they suggest the following similar but more systematic and more consumer-based PDCA:

Plan: Make specific predictions about the result of a decision. Compose hypotheses to be tested.
Do: Carry out experiment(s) to test the hypotheses.
Check: Determine what actually happened, using facts and data.
Act: Evaluate what actually happened, why this was the result, and what we learned from it.

These new, scientific, reflective thinking habits are developed throughout the firm using coaching routines and coaches' feedback on a very regular basis (with probing questions such as "How do you know?", and "How and when did you confirm that assumption?"). This process is called the coaching Kata (after judo and martial arts) and takes the learner through four stages of development: from modelling (via expert behaviour), to routines for beginners, to daily interactions of coaching cycles, and finally routinely repeating the cycle (see Fig. 18.5).

Kata is very well documented, and much evidence exists that this scientific PDCA as a set of thinking/doing habits can replace less effective thinking habits or the more commonly used, reactive, crisis-driven PDCA [29].

18.4.2 Kaizen

Kaizen is a continuous, incremental [30] improvement process, mainly applied to manufacturing settings, but more recently to innovation implementation practices. As philosophy it prompts [31] managers and all workers to continuously improve products, processes and services incrementally, and has been covered in scholarly

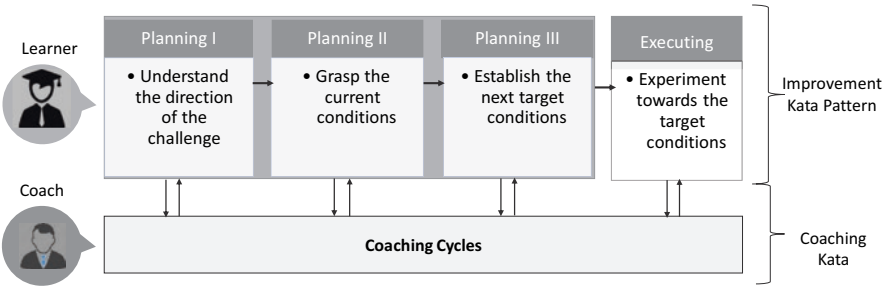

Fig. 18.5 Coaching Kata as implemented by TOYOTA to coach scientific PDCA as complex skills

studies, and scientific journals focusing on quality management (QM) from the 1980s to today.

Continuous improvement is an evolutionary process that should take place over a variety of organizational dimensions, including: value offerings and service to customers; management of all organizational processes; and all aspects of the entire quality chain, leading to improved competitive performance. This total quality assurance model was named Kaizen by Masaaki Imai (1986). It spans all activities of a company and is characterized by applying best practices and continuous improvement to achieve customer satisfaction. Kaizen philosophy is based, mainly, on a corporate culture change that encourages staff to continually improve the activities or tasks they participate in, on a daily basis. Kaizen as a business philosophy means that "not a day goes by without an improvement in the business" to achieve excellence over time. In Japanese, Kaizen means "small steps forward fast". KAI = change and ZEN = for the better, and these phrases are translated as: "continuous improvement". Continuous improvement is considered "an integrated strategy, cross-functional, of the company, aiming at the gradual, continuous improvement of processes: working methods improved; damages removed; reduction of losses; improvement of customer satisfaction, improvement of the labour model; and improvement of leader-subordinate relationships, the quality of products and services, as well as productivity and competitiveness, with the involvement of employees" [32]. Liker ([33], p. 89) considers that the best practices in the field of Kaizen philosophy can be found in the successes of the Toyota Production System (TPS).

Many scholars see Kaizen as incremental improvement rather than innovation (previously called radical or disruptive innovation). Imai (see Table 18.3) sees the two strategies as distinct, with Kaizen being a continuous improvement strategy that seeks gradual, continuous improvement with the participation of all staff (included amongst various other quality control techniques, such as benchmarking, quality circles, and Six Sigma).

Kaizen objectives include [35] building a work culture of change and participation in continuous improvement; improving slowly and steadily; a participative approach focused on creativity, updating designs based on customer requirements and possibly most importantly, zero defects. Figure 18.6 illustrates the four main categories of incremental improvements and the 14 management principles that underpin the Kaizen management culture in Toyota (and other firms).

Table 18.3 Comparing Kaizen and innovative strategies

Cr. no.	Criteria	Kaizen strategy	Innovation strategy
1.	Effect	Long term	Short term
2.	Rhythm	"small steps"	"large steps"
3.	Time delimitation	Continuous	In vaults
4.	Success possibilities	Constantly high	Unexpected, insecure
5.	People involved	Each person in the organization	"Chosen" persons for innovation
6.	Way of action	Systemic actions, groups of working	Individual ideas and actions
7.	Motto	Maintenance and improvement	Renouncement of the previous situation and reconstruction
8.	Success recipe	Conventional Know-how and the existing technical level	Important technological change, new solutions
9.	Effort	Small investments, strong mobilization	Important investments, weak mobilization
10.	Success main factor	Human factor	Technical factor
11.	Assessment criteria	Capacity to get high results	Resulting profit
12.	Advantage	Slow economic growth	Rapid economic growth

Adapted from [34] (p. 48)

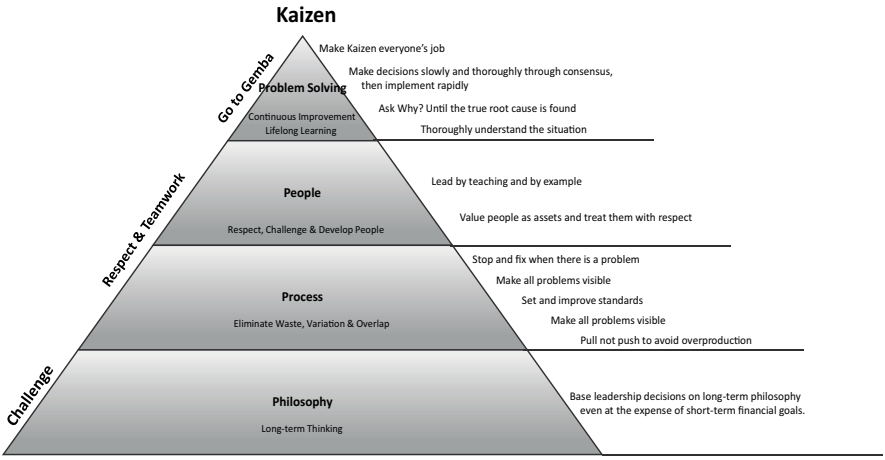

Fig. 18.6 Fourteen management principles in 4 domains known as Toyota's Production System (TPS). (Adapted from Paraschivescu & Cotîrleț [32])

Innovation literature [36] suggests that manufacturers and organizations needing to improve their operational performance, business and competitive performance and sustainability through a culture of innovation and continuous improvement, should invest in establishing the Kaizen principles. Unfortunately, the scope of this chapter does not allow us to expand further on this system, but we hope we have given readers adequate stimulation to access the huge cache of free materials on Kaizen on the internet by typing "implementing Kaizen" or "Kaizen principles" and your industry or subject matter.

18.4.3 Agile

The term 'agile' refers to a multifaceted framework and its elements, which focuses on flexibility, efficiency and speed. Agile development practices have helped many businesses to innovate a host of practices, including software development and various management practices, operations, human resource management, and financial systems. Over the last 25–30 years, agile methodology [37] has vastly improved the quality and speed of getting software developments to market. Originally focused on software innovation and adoption, agile is now becoming a very popular management framework to replace management command/control and is spreading far beyond software development, all the way into the C-suite. Agile methodologies involve mainly nurturing a platoon of eager, willing and able participants, but also rely on shared values, principles, practices and benefits. A principal developmental focus of agile systems is to take people out of their functional silos and place them in multi-functional, customer-focused teams, allowing them to self-manage their progress, aims and goals. This principle builds projects around motivated teams, asking managers to provide the empowered, enabled and fertile environment, and then get out of the way.

Authors and business consultants, Harvard Scholars Darrell Rigby, Jeff Sutherland, and Hirotaka Takeuchi, [37] point out several ways in which executives undermine agile principles, the values and the daily tasks of agile project teams. Executives should identify only one or two main priorities, not countless tasks with multiple tight deadlines. Managers and senior supervisors should NOT get involved with the work of the pre-assigned particular teams, but allow the teams to consider tasks, prioritize those they see fit and put others on the back burner. Executives should not overturn decisions made by agileteams and add layers of controls to monitor teams or micro-manage likely mistakes. If managers allow self-managed agileteams to function with reasonable mandates and autonomy, they will be able to innovate faster, more effectively, and be more closely aligned with customer needs.

These agile practices have been successfully used by corporations such as John Deer (new machines); Saab (innovations in fighter jets); Mission Bell™ (wine warehousing); National Public Radio™ (new programming) and C.H. Robinson (innovations in HR practices for their international logistics company). In their article "The Big Idea: Embracing Agile", authors Rigby, Sutherland and Takeuchi [37] suggest six practices to effectively implement the agile methodology for fast, lean innovation: (I) Learn the three key principles fast and apply them religiously;

(II) Understand what works and what does not work; (III) Start small, grow later; (IV) Allow "master" teams to improvise; (V) Practice agile at the top; (VI) Destroy barriers to agile behaviour ([37], pp. 44–50). Table 18.4 summarizes the main practices senior executives should nurture and support in order to remove barriers and enable successful, fast innovation in their organizations.

Table 18.4 Agile practices and how to implement them with agile project teams

Learn the three key principles fast	Scrum [38]: Creative and adaptive teamwork in solving complex problems (Small team, N = 3 to 9; Cross-functional, mostly full-time in the team; self-managed with product/initiative owner with ultimate responsibility for value; uses DT and crowdsourcing to build a log of ideas; develop the product in short, fast cycles called scrums; resolve problems through experimentation; test prototypes on customers; launch if customers get excited – even if some managers demand more bells and whistles.) Kanban [39]: Reduces work in process and the amount of lead time; managers stop micro-managing projects; Lean: Continual elimination or reduction of waste.
Understand what works and what does not work	Situations typically fertile for agile processes: problem to be solved is complex; product and project requirements could change and are likely to change; small incremental changes are useful and appreciated by customers; work can be broken into smaller tasks and an iterative process of development and improvement is valued; rapid feedback from end-users is possible; creative breakthroughs and time to market are important; creative teams will likely out-perform command-and-control groups. Not very effective for routine tasks; effective for innovations or strategic changes where effort justifies the investment of time and resources; project is built on the support and effort of loyal supporters, not resisters. Cross-functional collaboration is vital. Reponses to changes are better than a firm, structured plan.
Start small, spread the word; get buy-in	Most change projects are massive interventions; in contrast agile should start small and gain support through successes. Success and productivity, customer satisfaction, work velocity and team morale improvements should lead the way for further agile projects.
Allow "master" teams to improvise	If an experienced agile project team wants to adapt procedures or improvise new practices, they should be allowed to do so without being micro-managed by executive members of the organization. Changes should be tested in experiments, and only retained if there are positive results in velocity, satisfaction, motivation or productivity.
Practice agile at the top	Although a large number of C-suite activities are not suited to agile practices (e.g. press interviews, plant visits, performance assessments and other routine/predictable tasks, those that are (such as strategic decisions, resource allocation; innovations; improving alliances and collaborations) should improve by using agile practices. Leading by example will improve leaders' own morale and that of staff, and improve confidence by staff in the agile principles and engagement of managers and staff in priority projects.
Destroy barriers to agile behaviour	Share priority lists throughout the organization and offer some form of matrix management to cross-functional teams; don't change organization structures (right away) – change roles to accommodate cross-functional agileteams. It needs to be clear to everyone who is the sole final decision-maker in the cross-functional team – a single executive sponsor of the innovation initiative. Weigh team results and team cooperation higher than team output and reward accordingly.

Systems, process models and frameworks such as Six Sigma and Agile have proven their worth in a range of industries such as software engineering, technology innovation, engine manufacturing and even music-streaming (Spotify™) and have revolutionized many industries. It is now the job of managers and executives to provide the fertile environment in which to apply the principles and frameworks to a broad range of business functions to improve the speed and productivity of innovation teams. In Chapters 15, 16 and 19 we discuss how creative leadership, and a fertile environment where creativity and innovation thrive, can be created.

18.5 HRM Practices to Build a Culture of Innovation

To remain competitive, innovative organizations invest in technology updates and upgrades, and build or acquire expert knowledge through various human resource management (HRM) practices. These HRM practices include the knowledge, skills, abilities and attitudes the organization chooses, provides feedback on and socializes through the organizational culture. The climate or culture refers to the rites, language, stories, shared meanings and perceptions employees have of their corporate social context and this will influence how they behave, consciously and unconsciously. Advocates for innovation profess a need for an organizational culture of innovation and a tolerance or even an active pursuit of innovation. This culture of continual learning, continuous improvement, fail fast and correct fast reflexive context, is often cited in practitioner and academic literature. To support and develop creativity at work, Highly Innovative Organizations (HIOs) develop support schemes for staff. In Table 18.5 some of these schemes are listed for illustrative purposes. This is not a fully comprehensive list, as companies continually find new ways to inspire and incentivise creative endeavours and idea champions within the organization.

However, authors point out that innovation is a complex issue involving several risk and reward factors and one cannot assume causality, but rather an association and links. We pause briefly at this point to further discuss supportive culture, as much has been written on the topic and this is possibly one area that is more controlled by the manager of the organization.

18.6 Innovation Teams

Oldham and Cummings [40] identified various task characteristics that affect individuals' personal and contextual factors and influence their willingness and ability to innovate. Five key task characteristics affecting individual innovation are: (i) skill variety and challenge; (ii) task identity; (iii) task significance; (iv) autonomy; and (v) performance feedback. We explain each briefly in Table 18.6.

Table 18.5 Highly innovative organizations' staff support schemes

Scheme	Brief description
Rewards	HIOs promote solutions by offering short-term rewards for new ideas. Staff can set up short-term centres to find new ideas. Cash incentives ($100+) are provided for every useable idea. Think tank rooms for any employees at any level are available at all times.
Resources	Committees generate new ideas. Ideas are tested and the best ideas are selected to either prototype or implement. E.g. at Frito-Lay™ Inc. researchers generate hundreds of product ideas each year. Ideas are tested on focus groups every night of the week and the best ideas are implemented.
Best practice(s)	Executives or assigned teams act as knowledge scouts and mystery shoppers to find new ideas, scout competitors' ideas and observe companies renowned for innovation. This is part of their paid role. (e.g. PepsiCo™ has its Senior executives make field trips to HIOs)
Organizational learning	Organizations see all staff as intelligence-gathering officers – both for internal process improvement and for customer and competitor intelligence.
Structure switches	Formation of transient teams to brainstorm new ideas and solve problems. After a pre-determined and dedicated period of time, the team members return to their usual roles within the organizational structure. (Philips™ has 150 transient teams across tenths of divisions, forming problem-solving teams for 5 days a year.)
Innovative structures	Some organizations take customer focus to the extreme, forming new product implementation teams every time a new product is developed. Each division controls R & D, marketing and manufacturing to ensure market alignment, customer adoption and to iron out teething problems quickly, as and when they arise (Illinois Tool Works™ had 90 divisions at one time.)
Continuous improvement programmes (CIPs)	CIPs aim at harnessing employees' knowledge about products and services; improving operations continually; benchmarking strategic plans against top tier global companies; gaining deep understanding of consumers' needs and pain points; fixing any problems fast and correcting mistakes as they appear; and engaging in total commitment to improving quality throughout the organization. (Cadillac™ is a glowing example of CIP implementation.)
Creative departments	Organizations commit resources to dedicated, top-level teams to specifically develop and nurture creativity and innovation throughout the entire organization. The aim is to also promote cross-functional unit collaboration to build relationships to develop new ideas.
Create change Teams	HIOs create cross-functional implementation teams to implement innovations successfully. Teams are disbanded after the successful implementation, but the team members retain some responsibility for monitoring the on-going success of the innovation within their business unit (and some remote responsibility to care for other units' implementation).
Transformation Plans	HIOs are aware of possible inertia and resistance to change. They develop clear communication channels, and change management systems to ensure buy-in from those likely to be affected by the change, to prevent and overcome resistance to change.

(continued)

Table 18.5 (continued)

Scheme	Brief description
VentureTeams	Ventureteams have absolute freedom to establish new venture projects within a company, operating like a separate company within the bigger organization (A ventureteam developed IBM™'s PC).
Idea Champions	Innovations need to be passionately championed to succeed in large organizations. (Texas Instruments™ will only implement innovations if there are champions willing to vigorously support the idea.)
Design reviews as people development	Toyota™ and other "people-centric" HIOs are constantly looking for opportunities to develop people. Leaders pursue continuous improvement of their own skills and increasing expectations for design reviews. This creates an upward spiral of development and creates a tremendous opportunity for leaders to model targeted behaviour such as preparation, collaboration and attention to detail.
Personal pursuit of mastery	Constructive discussions are held to improve motivation for personal mastery: while the organization will provide opportunities for growth, each individual takes personal responsibility for his/her professional development and growth. "This spirit of mastery is a key component to creating something of lasting value, and the pursuit will change the character of both the work and the worker" ([19], p. 156)

Adapted from [19]

Table 18.6 Task characteristics affecting innovation ([40], p. 607–634)

Description of task characteristics affecting innovation	
Skill variety & challenge	A range of talents and skills is required for the task.
Task identity	Being involved in the task from beginning to end: the degree to which the job represents a whole piece of work.
Task significance	The impact of the task on the rest of the team, the rest of the organization and the world.
Autonomy	The degree to which a task provides freedom, independence and discretion – when determining how, when or with whom they do their work.
Performance feedback	Positive 360-degree feedback (including clients, and even from and on the task itself). When feedback relates to the creative effort, it will increase the likelihood of further creative performance.

Many studies on the creativity of teams inform our insight into the composition, processes and characteristics conducive to team creative performance [41–44].

18.6.1 Self-Managed Work Teams

Muthusamy, Wheeler and Simmons [41]offer the following advice to organizations: "for organizations wanting to enhance their innovation capabilities, self-managed work teams offer a structural, cultural and leadership solution to design and formulate innovative strategies" ([41], p. 61). They argue that self-managed work teams

(SMWT) offer greater autonomy, increase communication between team members and intensify their commitment to the team and the organization – which in turn enhances innovative behaviour in such teams. A wider perspective, offered by Mathison and colleagues [45], suggests that practitioners consider the creative processes, team composition and construction, team resources and shared vision and participation of the team members within the creative team. This field study indicates that when there are relationships between creative personality composition and team innovativeness, they are mediated by an innovative team climate. (Quite a lot is known about team climate or innovative team culture and is covered later in this chapter, and in Chapter 16 of this book.)

18.6.2 Team Creativity & Social Web of Experts

Gus Bulbotin [46] entrepreneur, innovator, disruptor and angel funder, suggests that the entire premise of team work needs rethinking. Where current teams are groups of people who have built long-term relationships and have become a well-integrated unit, future creative solutions and problem solving will require adaptable, agile networks of experts, adopting a matrix structure, involving diverse collaborations between a range of experts with a goal in common to find a creative solution to an often complex problem. Collaboration will happen in networks consisting of multiple individuals (nodes) with diverse interests, knowledge, and perspectives (including diversity in age, gender, religion, culture, sexuality and political stance). The nodes need to be many, have regular connections (links between nodes are relationships) and have rapid communication channels in a collaborative web. Several management gurus have argued for decades that looser organizational structures with less hierarchical layering and more organic, decentralized, flexible structures, are more innovative [5, 47–51]. Most break-through results are achieved when information flows through the informal organization in ways that foster unexpected connections between remote domains, disparate ideas and unexpected outcomes [52].

Keith Sawyer [5] explains that new products (innovations and inventions) "aren't created by individual minds – they emerge from a complex network of organizations and markets" (p. 256) – what he calls "collaborative webs". Sawyer provides a great example in the form of the unexpected, unintended, and totally unpredictable development of email as an interface between people. In the 1960s the US Defence Department (USDD) wanted its large mainframes to be networked so that resources could be shared among staff – what we know as the internet today. The intention was to allow users to run programs on computers in a variety of locations. But users soon realized that they could send messages to each other, using this network. So, contractors started sending messages as small files. A developer, Ray Tomlinson, added a small feature, namely the "@"-symbol, before each file name and the author's name to identify the sender. Originally Tomlinson did this programming work unofficially and shared it with a few colleagues in late 1971. Although this activity was originally seen as an illegitimate use of expensive computer resources,

it quickly caught on. Soon, Tomlinson's program was replaced by an e-mail program with dedicated e-mail features that used a different technology. By 1972 it was added to the operating system, and by 1973 more than 75% of correspondence was via e-mail, which was a complete surprise to the Defence Department (USDD). So, it is clear that the USDD creators did not create e-mail. Although Tomlinson created the program, it would not have been possible without the USDD's network.

To understand the role of social networks in creativity and innovation, we need to start by understanding how organizational members (including staff, suppliers and business units) interact with one another, share information, compare knowledge and combine ideas. There are two types of organizational networks: the formal organizational structure (hierarchy and units formally grouped by formal structures) and the informal structure (networks of interactions between organizational members). Studies have found that, for creative problem solving, the informal organization delivers breakthrough innovations and creative solutions to problems more often than formal structures. The reason proposed is that unexpected connections between remote domains or disparate ideas can be made more easily [53]. Further, strong friendships within the organizational structure are not good for creativity and innovation. Although this might seem contrary to intuition, it can be explained when one considers that friends get to know each other well and knowledge and attitudes converge over time. Also, like-minded people with similar norms, interests, likes and values tend to build close friendships. It is therefore less likely that contrary viewpoints or highly diverse perspectives will flow from non-diverse teams of friends or close alliances. Interestingly, weak ties (among people who interact infrequently and for short periods) are more strongly associated with creativity than strongly connected (dense) nodes. So people with more connections (acquaintances), but more distant connections in their network, are found to be more creative. Similarly, projects where managers associate with managers in other units with different knowledge base, lead to more innovative output [54–57]. Managers with dense networks are less adaptable and less likely to change if the environment changes. Research suggests that very tight teams lack diverse ideas, independence, personal autonomy and are more prone to groupthink. If the network is too loose, not enough sharing of ideas and information happens; therefore loose networks do not facilitate effective creative tasks. The ideal network is called the "small world network" and is one in which there are both dense and loose connections, where teams still have independence and autonomy and diverse knowledge, skills, attitudes and ideas [58].

The authors of this book would like to point out some key learnings about creative teams, as covered in the book *Scrum: The Art of Doing Twice the Work in Half the Time*, by Jeff Sutherland [38]. It is a very worthwhile read and we strongly recommend it. We will focus on a few key points regarding teams. Sutherland devotes an entire chapter to the topic of "teams", beginning with the perhaps overly hopeful statement: "Teams are what get things done in the world of work" ([38], p. 41)… and "At certain times in certain places with certain small groups of people, everything becomes possible" ([38], p. 43). Built on the initial work of Takeuchi and Nonaka (cited in "Scrum") we highlight six principles to optimize creative work,

slash costs, and achieve increases in productivity of as much as 400−800%. According to the Scrum guidelines, this level of productivity is made possible by breaking projects into short-term goals and allowing incremental approaches that assess progress in an agile, adaptive, problem-solving manner, which leads to increases in speed and quality of work. The six principles are captured by the acronym: 1TASCK, as described in detail below.

1 = Synergy in the Team; A team acting as one

When a team aligns and synchronizes, something magical happens. An intense focus on a common goal is essential for team success and rapid production of quality work. Teams appoint a Scrum Master to help with this. This role is a combination of coach, team captain and facilitator and has as its main task removing obstacles and helping the team to discover what gets in the way of their success. The Scrum Master's primary job is to guide the team toward continuous improvement by asking: "How can we do what we do better?" (page 62). "Some of the factors that synergize a team come from within (purpose driven; goal alignment; unselfish members and trust), but others come from setting up the right framework with the right incentives and giving [team players] the freedom, respect and authority to do things themselves. Greatness cannot be imposed; it has to come from within. But it lives within all of us" ([38], p. 69).

Teams are urged to do both Sprint reviews and Retrospective Scrum meetings. According to a concise summary and support aid produced by the online providers SLIDEmodel™ [59], the differences between a Sprint Review and a Retrospective Scrum meeting are the intentions behind each meeting. "The goal of a sprint review is to discuss the overall project progress including 'done' things, future project backlog, any bottlenecks, goals, plans, and timing. A sprint retrospective is focused more on inspecting how the work was done during the Sprint. In essence, it's an expertise in process optimization, prompting the team to self-reflect on their actions, analyse the experienced difficulties, and brainstorm ways for improvement… unlike other types of 'reflective meetings', retrospectives are held at regular intervals during the project, not at its very end. Some of the tools to use during this retrospective Scrum are De Bono's Six Thinking Hats™, De Bono's PMI (plus, minus, interesting framework), the Star Framework (Start, Stop, Continue, More of, Less of Wheel); and The Sailboat Metaphorical Thinking Scrum [60]. A short summary is provided by the team at Slidemodel.com as [60].

6 Thinking Hats Retrospective: During the meeting, each team member is asked to wear one of De Bono's thinking hats. The facilitator documents everyone's suggestions and then helps draw the best conclusions.

Sailboat metaphorical thinking: This retrospective play uses a sailboat as a metaphor for the team. As a facilitator, you should help everyone identify the main anchors (blocks and professional inefficiencies) and winds (positive forces) for steering the project in the right direction. (See Fig. 18.7 for an illustration.)

Start, Stop, Continue, More of, Less of Wheel: The facilitator creates a simple wheel with 5 categories (start, stop, continue, more of, less of) and prompts each team member to assess the last milestone using these five categories. This method is

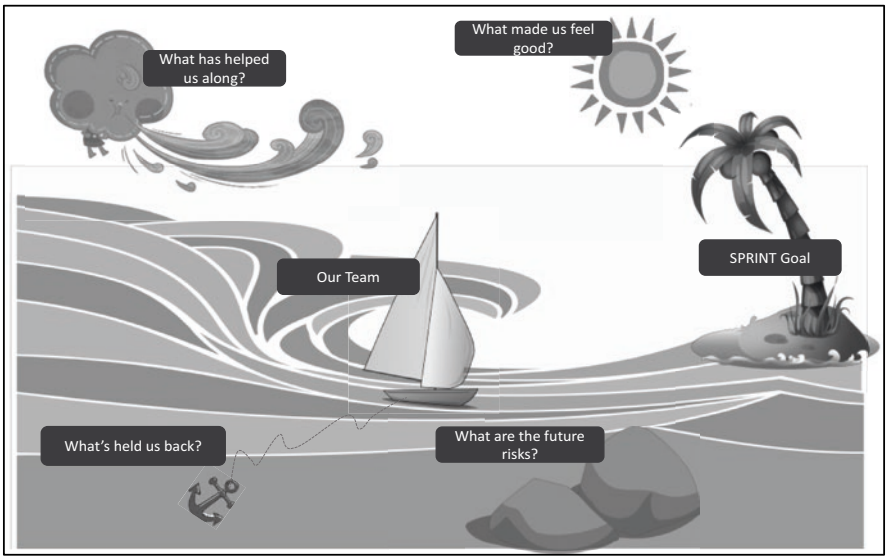

Fig. 18.7 Memory aid for the sailboat metaphorical thinking technique

also called a retrospective starfish. (Webpage: Slidemodel.com/retrospective in scrum.)

T = Transcendent

The team need to consider their purpose as one beyond the ordinary and a common end goal. Their self-determined goal needs to move them from ordinary to extra-ordinary. They need to decide not to be ordinary, and that very decision will be the catalyst to be great. This decision will allow them to view themselves as able to deliver a whole that is bigger than the sum of its parts and change the way they view what they are capable of as a team.

A = Autonomy

An important resource for fast-moving, agileteams is the authority to decide for themselves how they are going to do the work. It is important to select a team that can be trusted with the decisions and actions taken. The team members need to be respected as masters of their craft [53] (p. 70) and as such, be given the ability and authority to improve and respond to contextual changes and stumbling blocks as they see fit. Work teams should meet daily to monitor progress, and more importantly answer two questions: (1) What can we change about how we work? and (2) What is our biggest sticking point? "If those questions are answered forthrightly, a team can go faster than anyone ever imagined" [53] (page 62).

Poor incentive systems reward the wrong behaviours, and incentivize poor, unwanted or simply low levels of performance. Alongside autonomy, senior

managers should reduce bad systems or look for problems with systems rather than searching for scapegoats or bad people (p. 70).

S = Size

Smaller teams work better than larger teams. The magic number is seven, plus or minus two (i.e. between 5 and 9). According to Jeff Sutherland, teams should err on the small side. Research shows that more than 8 people actually slows down the process. Groups of 3 to seven people require about 25% of the effort and resources of larger teams (p. 59). Further, when teams get too large, they tend to break into functional groups likely to work at cross-purposes and cross-functionality is lost.

CK = Cross-functional; K = Knowledge & Intelligence

Teams need to be composed of members (talents or competencies) that can get the whole project done. The ideal team is highly diverse in terms of skill sets, thinking and experience (p.53). Selection of the "right" team should be based not only on diversity, but also on having the knowledge, contextual intelligence, skills and attributes to contribute to the team. To get a team that can act autonomously, solve problems as they appear and fix problems on the move, team members need to be unselfish and cross-functional. For teams to function optimally, it is important to keep the number of roles and titles to a minimum to keep communication flowing (p. 78).

In summary, "great teams are cross-functional, autonomous, and empowered, with a transcendent purpose" ([38], p.39).

Time

Although time is not part of our 1TASCK acronym, it is a highly practical and useful part of Scrum teamwork, so we will briefly cover one key time-related factor. Teams need to meet daily for 15 mins – if it takes any longer they are not doing it right. Each team member must be present every time and report on three questions: (1) What did you do yesterday to help the team finish the project (otherwise referred to as a "sprint": work a short time and see how you have progressed towards the goal or project outcome); (2) What did you do today that will help the team to finish the sprint; (3) What obstacles are getting in the team's way (page 77)? It is also important to do one thing at a time. People cannot really multi-task. When you try to do too many things simultaneously, many remain half done or not done at all, and the quality suffers.

18.6.3 Crowd Sourcing

Jeff Howe [61], the Wired columnist who coined the word "crowdsourcing", defines it as "the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call" (p. 5). Ioana Literat [62] defines online

crowdsourced art as "the practice of using the Internet as a participatory platform to directly engage the public in the creation of visual, musical, literary, or dramatic artwork, with the goal of showcasing the relationship between the collective imagination and the individual artistic sensibilities of its participants" (p. 2962). Obviously, digital connectivity provides a platform to source a multitude of ideas and solutions to problems that stretch far beyond art, through online crowdsourcing. The efficient sharing and generative potential of networked online communities allows the practice of crowdsourcing to become a profitable strategy for harnessing the knowledge and creativity of far-flung creatives to solve problems, perform organizational research and development tasks, and compose and graphically illustrate creative content [61]. But digital networking and concept-sharing can go beyond creative ideas to a whole host of new ventures built entirely on crowdsourcing structures, with prominent examples such as Flickr™ and iStockphoto™ (photographic images); YouTube™ (video and movie content) and Threadless™ (an online community of designers, contributing novel t-shirt designs – created, chosen and mass-produced by an online community) [63].

Literat [62] also records two typical examples of crowd-based artistic practice: digital artist Aaron Koblin, who is also creative director of Google's Data Arts Team in San Francisco; and Tim Burton, the filmmaker who produced Cadavre Exquis (www.burtonstory.com), an experiment in crowdsourcing a movie script via Twitter. For this movie, fans contributed to the development of the script via tweets to hashtag #BurtonStory. Every day, Burton [64] chose one tweet that became the continuation of the story. The opening line was, "Stainboy, using his obvious expertise, was called in to investigate mysterious glowing goo on the gallery floor." Koblin's [65] famous project, The Sheep Market (www.thesheepmarket.com), paid contributors on Mechanical Turk™ two cents to "draw a sheep facing to the left," and aggregated over 10,000 user-drawn sheep into a single artwork (also see Koblin's Ten Thousand Cents; www.tenthousandcents.com project, where artists on Mechanical Turk were paid one single cent to paint a tiny part of a $100 bill). Another great example recorded by Ioana Literat is the film documentary co-produced by Oscar-winning filmmakers Ridley Scott and Kevin Macdonald. For this historical global experiment in crowdsourced material, thousands of amateur video makers (everyday people) contributed to Life in a Day [66].

Contributors from all over the world recorded their ordinary life on July 24, 2010. The 5000-plus hours of video collected in this way were edited into a feature-length documentary, which premiered precisely 1 year later at the Sundance Film Festival™. The project claims to be "a historic global experiment to create the world's largest user-generated feature film: a documentary, shot in a single day, by you" ("Life in a Day," n.d.). Further examples of a multitude of art-related crowdsourced ideas is set out as a typography of art projects in Table 18.7 and details can be found in the paper by Literat [62].

A wealth of literature on the commercial applications of crowdsourcing across a wide variety of domains is available both in contemporary and academic literature [61, 67–75]. Businesses go as far as involving the general digital public to contribute to business models, strategic decisions and fundraising. Note that the term "business

Table 18.7 A typology of online crowdsourced art

Criterion	Categories	Examples
By medium	Visual (drawing, photography, video, etc.)	The Sheep Market, LTLYM, SwarmSketch, Life in a ay
	Musical (music and acoustic art)	Bicycle Built for Two Thousand, The Virtual Choir, In B Flat
	Literary (poetry and creative writing)	Tim Burton's Cadavre Exquis, Protagonize
By the role of the alpha artist	Vertical (giving specific assignments)	LTLYM, The Johnny Cash Project, The Sheep Market
	Horizontal (open-ended)	This Exquisite Forest, Life in a Day
By conceptual design	Transparent (participants know what the end product or output will be)	SwarmSketch, Star Wars Uncut, Life in a Day, The Virtual Choir
	Opaque (participants contribute without knowledge of the final product)	Ten Thousand Cents, The Market, Bicycle Built for Two Thousand
By degree of inter-relation	Dialogic (individual contributions are in dialogue with each other, and participants get to see others' contributions and build on them)	SwarmSketch, This Exquisite Forest, Tim Burton's Cadavre Exquis
	Independent (individual contributions are independent from each other, and participants do not get to see others' contributions until the project is finalized)	Life in a Day, Ten Thousand Cents, The Sheep Market, Bicycle Built for Two Thousand
By end-product	Single (a single collective artwork made of small contributions from numerous users)	Ten Thousand Cents, Life in a Day, The Johnny Cash Project, SwarmSketch, Star Wars Uncut
	Multiple (individual user-submitted artworks prompted by a common assignment)	LTLYM, The Sheep Market
By financial reward	Free (unrewarded)	LTLYM, Life in a Day
	Paid (participants are paid for their contributions)	Ten Thousand Cents, The Sheep Market
	Fee-based participation (participants must pay to contribute)	Radiohead Remix Project

Adapted from [62], p. 2970

models" here describes how businesses create value, deliver and capture value for customers and the way businesses turn opportunities into profit through various activities involving various actors along the supply chain in a variety of collaborations. Thomas Walter and Andrea Back [76] provide a useful set of questions (see Table 18.8) to assess how crowdsourced knowledge can help businesses to create value and optimize opportunities by opening the model to external partners or advisors.

Business strategists and senior executives obviously have to scrutinize the crowd's contributions, but many benefits can be obtained through crowdsourcing ideas for new business models (or product innovations). First, user ideas for

Table 18.8 Business model design using crowd sourcing ([76], p. 558)

Characteristics	Focus
Value creation by crowdsourcing	How can the contributors add value to the product/service? Which task do the crowds fulfil?
Crowd description	What is the size of the crowd? How is the crowd assembled? Are there aspects of lead users/alpha contributors?
Incentives	Which incentives should be provided by the main authors to spur participation? What types of incentives could be used (monetary, acknowledgement, fame, learning, discounts)?
Hurdles	What could be possible barriers to participation? How easy is collaboration or the process to join? Are there any strict limits to participation? Should there be requirements to join?
Technical solution	How is the crowdsourcing process backed up technically? What re-solution to leverage the collaboration is/could be applied?

innovations are likely to overcome intra-firm organizational inertia, in which employees hold on to the old ways of doing things due to personal interest or risks. Second, involving user ideas overcomes the "sticky-information problem" [69] (traditional attempts to assess information as input). Third, novel value propositions will go beyond need- or solution-based information due to the large and diverse crowds of contributors. Fourth, customers' experience with and attachment to the brand motivates and even uniquely qualifies them to contribute consumer-based value-add ideas. Successful examples illustrating the positive effects of such innovative business model process are Apple™, Dell™, eBay™ and Xerox™. It is noteworthy that crowd-sourced business model re-design is a type of business innovation in itself.

As a particular example of the problem-solving abilities of crowdsourcing, we return to the example of Threadless™. To develop products, especially in trendy fashionwear such as t-shirts, is extremely risky and companies strive to align with consumer needs. But this can be expensive, not only since the risk of new product introduction is notoriously bad (there is a 50% or more risk of failure), but also since hyper-competitive markets often demand small niches that increase production costs and an even higher proportion of hit-and-miss attempts. Practitioners blame faulty understanding of consumers' needs and customer demands for this high failure rate, and scholars suggest that the single most important factor to reduce the failure rate is to have current, reliable knowledge of consumer preferences and requirements [77]. Most companies rely on market research, but crowdsourcing provides a novel alternative. Threadless™ has changed this costly information source to one that is not only more timely but also reliable – as evidenced by the business performance. Threadless™ has printed more than 500 designs off more than 40, 000 submissions. The success experienced with t-shirts prompted the company to extend this model to ties, music and polo shirts (15MegsofFame.com and NakedandAngry.com).

Table 18.9 Collective customer commitment

Parameter	Alternatives	
Source of new product designs	Company Ideas	Customer Ideas
Connection with customers	Cooperating with external existing community (e.g., customer opinion platforms).	Build a community for co-creation of new products.
Preselection of ideas	Company panel.	Customer competition.
Minimum order size	Predefined: decisions are based on the development and manufacturing costs of the first production batch.	Predefined: decisions are based on the development and manufacturing costs of the first production batch.
Commitment	Monetary: Customer has to pay at the moment of pre-ordering.	Good practice: Customer promises to buy the product.
Incentives	Not for participating customers.	Special pre-order prices for early customers and awards for user designers.
Reorders	Determined by conventional planning and forecasting.	Dependent on continuous commitment from the community.
Organization	Project- and competition-based.	Ongoing process.
Relation to conventional product development and market research	Supplement the conventional process for developing radical new product concepts.	Replace the conventional process and serve as the underlying business model for the entire company.

Adapted from [63]

Scholars provide insight into a host of corporate collaborations with consumer communities, ranging from new product concepts to market research and business organization (see Table 18.9).

An important last note: Although customers know best what they want, and high votes for an innovative product might mean general popularity, managers must retain final responsibility since they carry the burden of risk and liability. For example, Threadless™ does not produce all winning designs due to a whole range of issues, including copyright issues, range and width of product, and quality, as in timelessness of design. Important business factors need to be considered, which range from factors such as production costs, to reliability of suppliers, impact on sales force, and impact on the firm's brand equity and reputation.

18.7 Conclusion

To create highly productive, highly innovative organizations or teams within business units is no easy task, but using the tools to create diverse and collaborative teams makes it not only possible, but worthwhile. Practitioners and scholars show us that harnessing the tremendous creative capabilities and creative intelligence of

teams, and possibly groups of consumers outside of the confines of the organizations, can lead to responsive, agile highly innovative organizations.

CREATiViTY LABORatory

Activity I: Metaphorical Thinking

Sailboat metaphorical thinking: This retrospective thinking analogy uses a sailboat as a metaphor for the team. Use the graphic and some notes (Post-it™ notes if you prefer) to identify the main anchors (blocks and professional inefficiencies) and positive forces (winds as metaphors for wins) to steer the project in the direction of the SPRINT goal. You may ask team members to do this before every weekly SPRINT meeting (spend 5 to 10 min in isolated thinking) and bring these thoughts to a weekly think-tank to plan the next move (Fig. 18.8).

THE ISLAND GOAL for this SPRINT is: ……

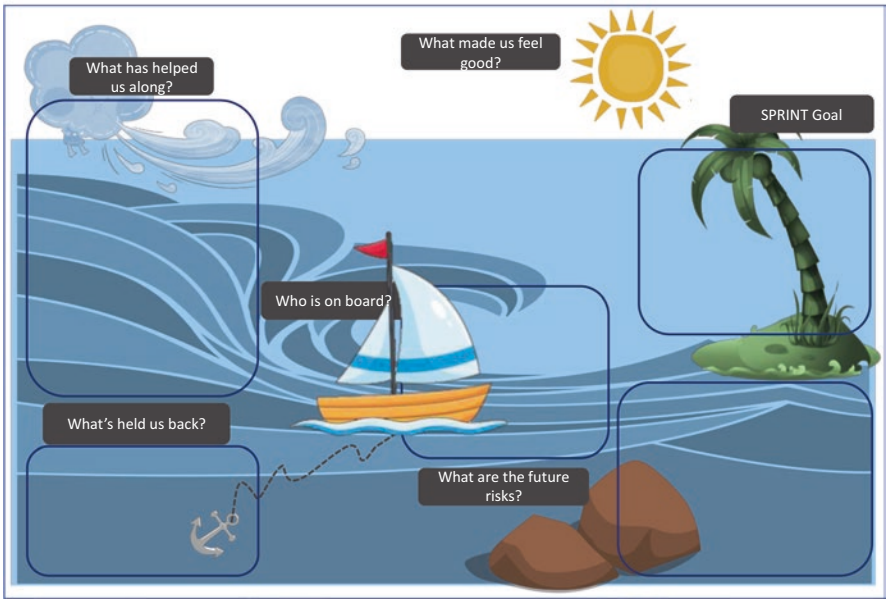

Fig. 18.8 Sailboat technique for SPRINT meetings

Fig. 18.9 Start, Stop, Continue, More of, Less of Wheel

Activity II: More-or-Less Wheel

Start, Stop, Continue, More of, Less of Wheel: The facilitator creates a simple wheel with 5 categories (start, stop, continue, more of, less of) and prompts each team member to assess the last milestone through the lens of these five categories. This method is also called a retrospective starfish. (Webpage: Slidemodel.com/retrospective in scrum.) Create your own Wheel or Starfish below. Consider your next team meeting. How would you cover these five points on the Wheel? Is there a logical place to start in the discussion of these five categories? What would you cover if you were to complete this all by yourself? What do you think different team members may contribute? (Think of specific roles and what you expect to hear.) (Fig. 18.9).

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Chapter 19
Leadership & Creativity

Arpan Yagnik and Louise Luttig

Abstract There is an ever-increasing realization that leaders need to develop and nurture the Creative Intelligence (CiQ) of their teams and for the organizations they lead and guide. This chapter examines the important intersection of creativity and leadership. It covers the three dimensions of creative leadership. Finally, this chapter provides practical recommendations for leaders and managers to inspire creativity within an organization to enable business growth and support business development and thought leadership initiatives.

Keywords Creative leadership · Directing · Facilitating · Integrating · Leadership · Creativity

Learning Objectives
On completion of this chapter, the readers will be able to:

- Define creative leadership.
- Discuss approaches to creative leadership.
- Analyse where creative leadership resides.
- Review and devise plans to inspire creativity in organizations.

19.1 Introduction

> Leaders are the catalysts between what should be and what is. ~Arpan Yagnik

This chapter introduces creative leadership (CL) and its relationship to the roles and responsibilities of leaders to promote, inspire, and support creativity,

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intrapreneurship and innovation within organizations. First, the chapter provides a broader perspective on various leadership dimensions and philosophies in the twenty-first century; thereafter, it discusses details about the implementation and ongoing execution of creative leadership in business enterprises. The chapter ends with practical recommendations for leaders to enhance creativity in teams and organizations.

19.2 Leadership in the Twenty-First Century

Humankind, in the previous century, has enjoyed a considerable amount of comfort, progress and, most importantly, a level of global stability, which was unheard of in previous centuries. Since the Second World War, the majority of humanity has enjoyed peace for a sustained period. This has led to the flourishing of commerce and business, open transaction of goods and commodities, unrestricted movement of individuals between countries and continents, and the birth of countless new business entities on a global scale.

More recently, the accelerated pace of technological advancement invited change and disruption. Businesses merged, industries consolidated, and convergence became a dominant business paradigm. With this convergence came the dominance by some large global business leaders in various industry sectors, such as Apple, Google, Amazon, Microsoft, Samsung, IBM, Toyota, and Coca-Cola [1].

Transformation within and across institutions became necessary for survival, and this gave rise to transformational leader types. Transformational leadership gained substantial momentum and support in the late 1970s and 1980s [2, 3]. It was characterized by intellectual stimulation, individualized consideration, inspirational motivation, and idealized influence and its long-time influence [4]. Transformational leaders are facilitators that enabled change and transformation at the individual and the institutional level [5]. Another breed of transformational leaders is known as change leaders.

Teresa M. Amabile and Mukti Khaire summarize the role of creativity in leadership as follows: ‘One doesn’t manage creativity. One manages for creativity’ [6]. Amabile and Khaire acknowledge the role of collaboration and encouragement of diversity in approach and thinking. But the role of leadership is an imperative in creating the right environment. A good leader can do much to challenge and inspire creative work in progress.

The twenty-first century also marked various shifts in what consumers value. While consumers appreciated better quality products, painless delivery, easy payment options, and no-questions-asked service, their tolerance towards companies that do not care for the planet and the people has decreased substantially, with issues such as fair-trade practices and fair work-for-pay policies.

The notion of triple bottom line consisting of people, planet, and profit has latched itself to the deliverables and watchlist of senior executives, with a fervour [7–9]. Leaders of the previous century who were mainly attuned to profitability find

themselves not as effective, and fail to ensure equal attention to people and planet – in addition to their traditional profit motive. However, understanding the shift in what the consumers value, 181 CEOs signed a declaration in 2019 to demonstrate commitment to business practices that provide equal consideration to people and planet. The extract below is a small portion of the signed statement on the Purpose of a Corporation [10].

> We commit to: Delivering value to our customers…Investing in our employees…We respect the people in our communities and protect the environment by embracing sustainable practices across our businesses…Generating long-term value for shareholders… Each of our stakeholders is essential. We commit to deliver value to all of them, for the future success of our companies, our communities and our country.

For businesses operating in this VUCA (Volatility, Uncertainty, Complexity, Ambiguity) era, the challenge is whether to develop strategic competitive advantages by being innovative in how they approach business (in general), versus finding differentiation through continuous product innovation, and developing distinctive competencies to gain market advantage. Innovations within organizations (intrapreneurial activities), as well as innovative organizations (entrepreneurship) require a constant supply of creativity. And that is why creative leadership has become pertinent for the current times, to guide organizations through the changes required to face a complex competitive market by creating the right environment for innovation and creativity.

One of the major goals of creative leadership is to encourage innovations within the organization and internal teams by stimulating all employees across functions and hierarchical levels to be creative and feel supported in developing creative strategies to generate novel and innovative outcomes, all within the parameters and discipline of sound business operations. These novel outcomes appropriately applied, harnessed and guided within the business operational framework have been proven in most instances to contribute to the strategic competitive advantage.

Despite many approaches to leadership, the future calls for a creative way of leading through and ahead of the marketplace complexities, to drive change and innovation. It is therefore no surprise that creative leadership has gained tremendous traction over the last decade [11, 12] which is why we will discuss creative leadership in greater detail in this chapter.

19.3 Creative Leadership

Researchers Robert Sternberg, James Kaufman, and Jean Pretz [13] summed up the diversity and heterogeneity among scholars with substantial contribution towards creative leadership in two slightly esoteric sentences. “Leadership is not creative or not creative. Rather, it can be more or less creative in different ways.” [13]. This is by no means a viewpoint that is easy to grasp, but readers will attain clarity as we delve further into the leadership literature and discuss the concept in the next sections.

Charalampos Mainemelis, Ronit Kark, and Olga Epitropaki published a meta-analysis in Academy of Management Annals in 2015 [14], where they systematically analysed prior research on creative leadership. They defined creative leadership as "leading others towards the attainment of a creative outcome" [14] which moves the concept from operational issues to strategic outcome-based foci. Min Basadur in his 2004 article in The Leadership Quarterly defined creative leadership as "leading people through a common process or method of finding and defining problems, solving them, and implementing the new solutions" (p.9) [14]. Gerard Puccio and his co-authors defined creative leadership as deliberately engaging one's imagination to define and guide a group towards a novel goal – a direction that is new for the group [15].

A very useful model that includes three categories and eight different types of creative leadership was developed by Robert Sternberg, James Kaufman, and Jean Pretz [13]. Sternberg and co-authors suggest a propulsion model of creative leadership – identifying and expounding eight different types of creative leaders. All these CL styles reside within the directing aspect of leadership, since all eight styles are ways in which a leader with creativity will lead his or her followers in whatever direction he/she has determined for them. The eight styles are broadly divided into three categories of creative leadership styles. Creative leaders who embrace extant paradigms make up the first category. This category is populated by four creative leadership styles (replication, redefinition, forward increment, and advance forward increment). While these creative leaders accept or tolerate the extant paradigms, they aim and work to extend these leadership paradigms incrementally or radically.

The second category of creative leaders rejects the extant paradigms. The redirectors, reconstructionists, and re-initiators either start from a very new beginning or attempt to steer an organization in a totally different direction, away from the existing paradigms. The final category constitutes a single type of leadership, i.e., synthesizers. These creative leaders pick and choose the best from various paradigms and integrate them to steer an organization in a new direction. Table 19.1 summarizes the three categories and eight creative leadership styles. Robert Sternberg also later introduced the systems model of leadership [16].

Most definitions of creative leadership lean towards the tenet that creative leadership inspires creativity among others. Despite all the instances of disagreement or slight paradigm differences of various authors from the various disciplines, as set out in the prior sections, most scholars agree on one critical aspect of creative leadership. This aspect is concerned where creativity resides in creative leadership. Does it reside with the leader or the followers? Scholars agree that it does not reside exclusively in either, but rather in both. Creative leadership exists in the dynamic interaction of the two parties (leader and follower), as well as in their interaction with other contextual factors. Therefore, creative leadership is not the actions or habits of an individual – either leader or follower. Nor can it exist in one or the other individual. Creative leadership exists in the interactions between the two parties – is dynamic in nature – and has impact on people and planet.

Table 19.1 Eight types of creative leadership styles

Three categories of creative leaders	Eight types of creative leaders	Explanation
Accept the present paradigm	Replicators	Maintains status quo, repeat past practices
	Re-definers	Discover alternate rationales to do the same things
	Forward incrementation	Limited progress into the unknown or the uncharted
	Advance forward incrementation	Extensive progress into the unknown or the uncharted
Reject the present paradigm	Redirectors	Drive organizations in different direction
	Reconstructions	Drive organizations in different direction using the past
	Re-initiation	Start all over again
Integrate various paradigms	Synthesis	Lead by integrating best concepts and ideas from many paradigms

Scientific studies regarding current trends impacting CEOs (as business leaders) report that creativity is the most important competency for excelling in business [17]. It is even more important than integrity and global thinking. The 2010 IBM Global CEO Study of 1500 CEOs worldwide reports that creativity is critical for business success and business sustainability. This emphasis on openness, flexibility and curiosity (CiQ) as traits is confirmed in the World Economic Forum's 2020 [18] Report on future leaders' traits and requisite skills in an age of perpetual change. Renata Wagner reports on the World Economic Forum's Annual Meeting in Davos-Klosters in January 2020, and positions this meeting as "the foremost creative force for engaging the world's top leaders in collaborative activities to shape the global, regional and industry agendas at the beginning of each year". Wagner reports that If transformation is continuous, the ability and courage to constantly and radically challenge the status quo and manage change effectively will be fundamental.

Mainemelis, Kark and Epotropaki [14], in their work thematically divided all the existing creative leadership, approaches into three categories: facilitating, directing, and integrating. The three categories are divided based on what does creative leadership concern itself with in terms of accomplishing.

19.3.1 Facilitating Aspect of Creative Leadership

The facilitating aspect of creative leadership concerns itself with the changes in creativity levels of the followers, or in other words, the person becoming more creative. This aspect of creative leadership is almost like the definition provided of creative leadership by Mainemelis, Kark & Epotropaki, except for one critical difference. This difference is related to what creative leaders concern themselves with. In the facilitating aspect, creative leadership concerns itself with the change (mostly

positive) of the levels of creativity of the people, whereas Mainemelis, Kark & Epotropaki's definition concerned itself with the creative outcome [14]. Several Researchers [19–26] have studied both positive and negative influences of facilitating leadership (mainly positive). The focus of this particular aspect of creative leadership is to positively influence the levels of creativity among one's followers by introducing new routines, provocations, or knowledge that enhances creativity, or by creating a safe and nurturing environment within which they can initially think uninhibitedly, and ultimately excel in creative thinking. Teachers in specialized classrooms are good examples of this facilitating aspect of creative leadership, as they are interested in increasing the creative competence and creative learning outcomes of students.

19.3.2 Directing Aspect of Creative Leadership

By enlisting the help and support of followers, the directing aspect of creative leadership concerns itself with the fulfilment of leaders' creative vision. Here the focus shifts from followers to the creative vision of the leader of the organization. In directing, creative leadership is not concerned with an enhancement of creativity, but is concerned with the attainment of the future envisioned by the leader. Researchers [27–32] studied this aspect of creative leadership in different scenarios and different domains (e.g., chefs and orchestra conductors). In these contexts the leader has a creative vision of what product (the dish or the musical piece) should be delivered and how the envisaged outcome should make the recipients (diners or audiences) feel.

The followers need to be enabled to make the creative vision a reality. Should followers require CiQ or enhanced creativity, it will need to be facilitated to achieve the creative vision – but there is no emphasis on the creativity enhancement or developing CiQ of followers for its own sake.

19.3.3 Integrating Aspect of Creative Leadership

The third aspect of creative leadership is integration. The integrating aspect of creative leadership concerns itself with the synthesis of the creative endeavours of both the leader, together with the diverse creative contributions of his/her followers. Researchers have examined integrative creative leadership in contexts such as theatre, filmmaking, television, industrial design, music production and museum settings [33–38]. These contexts lend themselves well to the integration of the diverse creative inputs and abilities of the followers and the creative vision of the leader. In theatre, filmmaking, and music production, the leader develops a vision with very little input from his/her followers. Followers here are neither the primary customers, nor beneficiaries nor visionaries in terms of outcome. Followers are those who are

the actors or musicians who rally behind the vision of the leader and play their part in actualizing the vision. Without lending their creative expertise in different domains, neither followers nor leaders can actualize the creative vision.

It is important to reiterate that in all three these aspects, creative leadership is neither something that a leader possesses exclusively, nor something that one or all of the followers possess exclusively. It is a dynamic, mindful dance. Creative leadership is a contested space. When the followers are working towards actualizing the creative vision of a leader, their creative contribution is naturally of lesser impact or importance than that of the leader. This is the directing aspect of leadership. When the situation is vice versa, where the leader's way of accomplishing something is primarily through enhancement of the creative competencies (CiQ) of his/her followers, then the creative contribution of followers exceeds greatly in significance to that of the leader. This style of creative leadership is the facilitating style. Lastly, when the creative contributions of the leader and the followers are more or less equal in power, weighting, and visionary intent, then that creative system follows the integrative style of creative leadership.

19.4 Role of a Creative Leader in Inspiring Creativity

A creative leader is essentially the catalyst for inspiring creativity within his or her organization. Employees look up to their leader – seeking a role-model to inspire improved behavioural and motivational outcomes, and to emulate them in different contexts. In the VUCA business context of the twenty-first century, such an inspirational creative leader is of great importance to highly innovative organizations (HIOs). The future is likely to bring diverse and novel problems creating unique sticky issues which, along with hyper-competition and a VUCA (volatility, uncertainty, complexity, ambiguity) world, will be under strain of multiple global challenges on the ethical, technological, economic, and social front.

In the next section we cover some of the most pressing challenges leaders of today have to overcome. And, of equal importance, while it is important for a leader to inspire creativity, it is equally crucial to have a leader who seeks inspiration from creativity to inspire a culture of creativity, innovation, and invention within the organization.

19.5 Creative Leadership During Crisis

During and after times of crises – such as during and after pandemics, earthquakes, hurricanes, tsunamis, wars, and other socially impactful events – leaders are agents of change and facilitators for moving forward. Pre-, during and post-event leaders are called upon to conceptualize, co-create, and establish a "new normal" way of thinking, behaving, and feeling. Leadership experts know from past scientific

studies and investigated cases that a major challenge leaders have to face, is to adapt to the newly evolved conditions presented by a crisis, and to create new ways to lead that are agile, flexible and apt for resolving the crisis [39–41]. Drafting a new vision through revised leadership is a challenge for leaders [40, 42] who are absorbed by day-to-day managerial crisis management and dealing with ongoing business issues, while keeping the business on an even keel. Creative Leaders provide a new direction for organizations. They identify new opportunities and steer their organization to explore and examine those opportunities to ensure profitability and sustainability of the organization. Creative Leaders are the first agents of change to visualize and execute the idea of a new normal, which requires them to be inspired by creativity as well as inspirers of creativity in the organization.

19.6 How Can Leaders Inspire Creativity in an Organization?

Creativity, although greatly desired, is not easy to inspire at an individual level. As discussed in Chapter 16, making creativity a part of an existing corporate culture is, as expected, difficult. Leaders can (and probably should) play a pivotal role in inspiring creativity in an organization. The CiQ required to inspire creativity in ever-changing organizations is a stubborn challenge of the twenty-first century. There are clearly many approaches to leadership, and just like not all leadership styles suit all organizations, similarly not all CL styles will lead to HIOs in all business environments. This section presents recommendations for leaders to inspire creativity within their organizations.

19.6.1 Creative Corporate Restructuring

Corporate restructuring is a common practice in business today – including right sizing, down sizing, mergers, acquisitions and various corporate reshuffles to improve productivity, minimize duplication and optimize resources. However, in a large majority of cases restructuring merely becomes synonymous with swapping, or just reassigning within the existing structure. Newer additions to existing structures with the coming to light of various corporate blind spots are not to be considered as restructuring. While change does stimulate a different outcome, more often than not the difference in the outcome is marginal.

To promote corporate creativity, a new structure based on the “what it is” and the “what it isn’t”, recommended [43]. For employees to think creatively, one of the early structural changes could be to encourage a rotating structural setup. For example, in a 10-person team, for a pre-decided tenure, half of the team takes the responsibility of managing the ‘what it is’ aspects of the business. Whereas the other half

are exclusively engaged in the 'what it isn't' business activities. Upon the completion of the tenure, they switch. As a leader, and using your CiQ you can come up with different varieties of new structures that are not just a mere extension or a modification of the existing one. These structures could lead to new networks, alliances and other ways to promote creative partnerships and collaboration.

19.6.2 Incentivizing Creativity

A 'carrot' (corporate slang for an incentive) is sometimes an effective way to promote a certain type of behaviour. Incentives can range from monetary prizes to awards and rewards (Top Achiever, Paid-for travel or conference attendance; VIP parking; dinner for the winner and their partner). However, there is a catch. In most corporates, it is common practice to incentivize successful initiatives and initiators. While helpful, such forms of incentivizing are not effective at cultivating a culture of corporate creativity – and may be a short-term measure or, as some research indicate, even counter-productive, as some employees may find the award distracting them from their key performance tasks. For cultivating corporate creativity, incentives should be tied to the effort of engaging in the process of being creative instead of it being tied with only the successful outcomes. Such fundamental changes to the incentive initiatives are necessary for cultivating and inspiring corporate creativity.

19.6.3 Immunity

Just as a newborn requires protection until it grows and strengthens, similarly a new culture also requires immunity and protection. A new culture is vulnerable and susceptible to dangers. Fear of failing is not the only deterrent to inspiring corporate creativity. The anxiety and the inability to bear consequences post failing are equally powerful deterrents. Thus, for a new culture to flourish, immunity from penalties and protection from repercussions have to be inculcated strongly. Immunity from failure is empowering and encouraging. For corporate creativity to be cultivated, forgiveness should be a given, when in initial stages [1].

19.6.4 Mission

To inspire corporate creativity, its inclusion in the mission of the corporation is an important step. A mission for any organization is like the marching drum that synergizes all its movement. When inspiring corporate creativity is a mission for a corporation, then it also becomes the underlying motivator for encouraging

employees to be creative. The inclusion of creativity in the mission also enables the human resources departments to indulge in more activities that increase corporate creativity.

19.6.5 Creativity Champions

Leaders of corporations should create and invest in a new role within the corporation referred to as Creativity Champions. These individuals' primary responsibility is to champion the cause of creativity within an organization. They work on deputation for a set time in every department. In whichever department they are deputed, they try to work with the members of the department to explore and experiment ways in which corporate creativity can be enhanced. Creativity Champions facilitate the enhancement of creativity by engaging in the learning by developing a creative strategy with the team.

19.7 Ethics in Creative Leadership

> Leadership style can have an impact on employee creativity because the emphasis in ethical leadership is on morality, fairness, autonomy, and people orientation. [44] (p. 1)

Elqassaby states that "ethical leadership is leading in a way that respects the ethical value, right, belief and dignity of others" He quotes Brown, Treviño and Harrison as having "defined ethical leadership as 'the demonstration of normatively appropriate conduct through personal actions and interpersonal relationships, and the promotion of such conduct to followers through two-way communication, reinforcement, and decision-making'. In that, the characteristics of ethical leadership being 'integrity, caring, honesty, openness, trustworthiness, altruism, justice, and collective motivation', it is especially the aspects of caring, such as nurturing a creative open environment that are important. But more so the ability to not only nurture but motivate employee input as a collective effort to achieve innovation and new thinking and approaches underline an ethical approach in creative leadership. Elqabassy argues that ethical leadership is therefore necessary to foster employee creativity as it enhances the employee behaviours and attitudes that support and reward creative thinking skills and intrinsic motivation. He recommends that managers should "develop ethical leadership style by emphasizing morality in workplace, respecting their followers' nature and dignity, empowering and enriching the job significance to encourage their followers to come up with new ideas and put them into practice".

This theory is supported by Shafique, Ahmad and Kalyar who have determined ethical leadership and the associate management practices to be an important predictor of both individual and organizational creativity [45]. Specifically, ethical leadership can affect employee creativity through its basic tenets that create a

culture of knowledge sharing and psychological empowerment. As a result, it has the ability to stimulate organization innovation.

B. Javed, Khan, Bashir and Arjoon concur [46] (Current Issues in Tourism) ethical leadership is founded on trustworthiness, fairness and balanced decision-making, and hence removes the 'risk' for employees to get involved in innovative and creative work which are typically non-routine tasks. Also, Javed et al. states that as ethical leadership provides an environment of psychological empowerment, openness and collaboration in the wider organization, it also by default creates the opportunity for people to work together in creative enterprizes and to share learnings, while encouraging a culture of betterment for the greater good.

Beyond creating the right environment for innovation and creativity, what is the focus of ethical leadership in the creative process? Which are the ethical considerations at play in making such decisions? What is ethical creativity? Bazerman posits that leaders answering ethical questions regarding the ethical decisions of the impact of new technology, such as that of autonomous vehicles, should be guided by the goal of creating the most value for society [47]. Bazerman defines ethical behaviour as "behaviour that maximises 'utility' in the world", or value. In essence, he argues for wellbeing, efficiency, and moral decision-making, while avoiding 'tribal' behaviour, which he defines as nationalism or in-group favouratism. Modern leadership, says Bazerman, should consider how they influence others with the norms they set and the decision-making environment they create, to prompt others to make value-creating decisions.

Shuhuan Duan, Zhiyong Liu, Hongsheng Che [48] observe that ethical leadership is positively associated with the psychological empowerment and willingness of staff to take risks, an inherent facet of workplace creativity, resulting in creative behaviours. They argue that willingness to take risks is a basis of employee creative behaviour, and strongly influenced by the environment and leadership style.

Jie Feng and colleagues, in their study on ethical leadership, [19, 49] caution readers that leadership styles which attempt to control behaviour, suppress intellectual freedom, and autonomy; while openness and acceptance of innovative ideas and recognition of creative behaviours have the opposite effect, namely spur autonomy and freedom to explore on. Citing Amabile's research [19, 50] they argue that beyond creating the right psychologically safe climate to encourage team-level creativity, leaders actively 'articulate the organizational expectations for creativity, discuss creative ideas with their followers, encourage mutual support and collaboration in problem-solving, and provide rewards and tangible resources for creative efforts [50].

At the same time, modern procurement practices, involving that of government entities, place a high value on business innovation in the areas of sustainability, environmental protection, and social outcomes, such as practices which encourage human-centred design and safety. Increasingly, companies are required to prove to their clients that they are leading in innovative and ethical practices in these three key areas. So, to stay ahead of the curve, they need to create the right environment for such innovation and creativity to flourish. This is supported by Gunther Schumacher and David Wasieleski who postulate that to survive in their industry,

businesses must constantly adapt and innovate in order to survive in the long-term [51]. In this, ethics serves the purpose of improving the 'moral conduct' of the business, which supports such long-term goals by acknowledging the impact of business managers' decisions on society. At the same time, the long-term vision favours innovation. And such a perspective is ethically driven. Therefore, the relationship is twofold. To survive in a fast-changing world, innovative and creativity are key to ensure long-term business survival. And, to enable a creative mindset and innovative approaches, businesses need to provide ethical leadership that provides an environment that empowers employees psychologically and frees them up to be creative and innovative.

19.8 Conclusion

Disruption and constant change and "new normal" will be the expected unexpected business environment of the twenty-first century. Due to the overall changes in the global ecosystem and in the socio-economic environment, business leadership too is and will be going through disruptive changes. Consumers are informed and mindful of the impact of businesses on the community, the environment and the entire ecosystem. Consumers expect businesses to be mindful of their impact on society and the environment, and of how organizations protect their people and the planet – in addition to the firm's economic survival and profitability. Deliberate and conscious movement towards organizations' triple bottom-line, makes leadership more challenging. Creative leadership will play a pivotal role in dealing with the many and possibly increasing sticky challenges of the twenty-first century and the fourth industrial revolution.

Creative leadership is likely to be a critical survival tool for organizations. Although many organizations embrace creative leadership on paper, leaders are still selected and elected based on their likelihood to not make any changes to the current systems and structure, or upset the status quo. Their ability to develop and nurture CiQ, future vision, pursuit of wholesome integrative solutions is seldom considered. Creative individuals that are more likely to challenge and alter the status quo or explore new directions are less likely to be promoted or elevated to leadership positions. The means and methods of attaining goals and outcomes of a creative leader are likely going to be unconventional, thus making people uncomfortable. The love for one's own legacy also inhibits current leaders from endorsing those individuals that will not continue or stay loyal to it. This is also reason why we may not see creative individuals rise; however, in the current era that is defined by change and disruption, this is bound to change.

The goal of this chapter is to highlight the role of a creative leader in inspiring creativity in a corporation. The need for creative leaders stems from the fact that we are living in the era of change and transience. Technology, values, and mindsets are

changing often, but what does not change is the need for ethical leadership. Ethics make or break an organization. Ethical leadership affords an opportunity and freedom to pursue creativity, and this is an important part of creative leadership. The presence of ethics in creative leadership is quintessential. The need for creative leadership that can stimulate the organizational culture to rethink, revaluate and reconsider the role of creative teams and a creative organization in the post-coronavirus twenty-first century is paramount.

CREATiViTY LABORatory

Activity I: Prioritizing Leadership Strategies

Of the five given strategies for inspiring creativity in an organization (Creative Corporate Restructuring, Incentivizing Creativity, Immunity, Mission, and Creativity Champions), prioritize the top three strategies that you would immediately apply in your team or organization? Why do you regard these so highly? Are you willing to rank them from 1 to 5? Which criteria did you use to determine this ranked order?

Activity II: Your Natural Creative Leadership Style

Based on your understanding and interpretation of the eight styles of Creative Leadership (in Table 19.1), (i) which of the eight styles, you are closest to naturally?; and (ii) can you identify three team members that possess either facilitating, rejecting, or integrating styles of creative leadership?

Activity III: Areas of Improvement

Identify which areas or functions within your existing business or your business plan can benefit the most from creative leadership. Elaborate on the type of creative leadership likely to have greatest impact on the culture of the organization. (Refer to Table 19.1 for ideas).

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Chapter 20
Nurture the Genii: Possibilities

Rouxelle de Villiers

Abstract In this final chapter, we return to the individual, who is an important cog in the wheel of the business invention thinking machine (Kucirkova N, Littleton K, Cremin T. Cambr J Educ 47: 67–84, 2017). Our problem-solving capacities and creative minds allow us to design, compose, and alter the world we live in. As indicated many times in this book, all humans are born with an inherent ability to be creative, and it is our diverse nature and our diverse insights into problems that allow us to survive and thrive in the harsh reality of volatile, uncertain, complex, ambiguous (VUCA) environments. Business executives in VUCA marketplaces have to become very comfortable with – and perhaps even pursue – constant change and variability. Creative leaders like trying new things; they dislike repetition for the sake of conforming or keeping things as they are. Creative genii never stop developing and never stop learning. Fast-paced competency development and creative intelligence gathering involves doing different, difficult and challenging things sooner rather than later. "Different and difficult serve as constraints that preclude low and promote high variability" (Stokes PD. Creativity from constraints: the psychology of breakthrough. Springer, New York, 2006, pp 135). This chapter is focused on unfolding the last of the seven Ps: possibilities.

Keywords Aha moments · Altered states of mind · Board games · Hypnosis · Play · Puzzles · Quiet mind · Sensory stimulation · Travel · Wise humanizing creativity (WHC)

Learning Objectives
On completion of this chapter, the readers will be able to:

- Consider various tools and techniques to nurture his/her own creative intelligence and that of team members.

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- Produce a personal CiQ development plan that involves both in-work and extramural activities.
- Deliver short lists of ideas that might help teams to create contexts where creativity can prosper and where team creativity thrives.
- Use several techniques effectively to enhance workplace creative endeavours.
- Display an awareness of and ability to engage in ethical co-creation and possibility thinking.

20.1 Introduction

Creative leaders inspire creative followers. We are built to learn from experience and mirror the behaviour of people we admire. In order to be the creative leader of your organization or business unit, you can take some simple, scientifically supported steps to improve your own creativity and revitalize your creative mind. You will find that you need creativity most when your thinking is confounded by your preconceptions, biases or prejudices or by an abundance of complex information. This chapter offers productive techniques for improving your creative output, and through long-range continuous use, realize your creative potential—at home and at work. Please note that the tools and habits covered in this chapter are not listed in any particular order.

20.2 Find Your "Happy Place"

Creative intelligence is most required when there is no prior solution or clear path that allows you to use your well-practiced reflex problem-solving responses. It is therefore important to develop the ability to draw on inner knowledge and experiences intuitively and access a state of mindful, but relaxed alertness [3]. This is called the alpha state of the brain. Behavioural psychologist Susan Weinschenk, in her book *Neuro Web Design*, suggests finding a space where you feel calm and comfortable. This "happy place" will differ for everyone and may range from a soft hollow on the beach to a shady spot in your garden, a noisy coffee shop or a dark, quiet spot in the library. It may even be simply the calmness you find while taking a shower. When you access this happy place, the prefrontal cortex of your brain will allow you to focus your mind and allow impromptu connections between different thoughts. In the book *The Eureka Factor,* cognitive neuroscientists John Kounios and Mark Beeman [3] provide examples of single "aha moments"; moments of creative insight relating to problems that require insight, rather than analytical problem-solving activities. Their study of the neuroscience of this moment of insight [3] finds that a relaxed mind is better prepared for such creative insights than

an anxious (or even neutral) mind. People in a relaxed frame of mind are more likely to solve problems with insight than with analytical thought. In an experimental situation, when a positive mood was induced by watching comedies, viewers were more able to address problems with insight than after they watched neutral or anxiety-inducing movies [4].

20.2.1 Less Focus, More Quiet Mind

Linked to the concepts of "happy place" and "quiet mind", researchers [5] indicate that sudden insights are often associated with shutting out visual inputs – like standing in a shower, staring at a blank spot on the wall, meditating and other "quiet mind" activities (e.g. yoga, pilates, scuba diving, listening to calming music with the eyes closed). As defined by Kounios and Beeman [6], "Insight occurs when a person suddenly reinterprets a stimulus, situation, or event to produce a nonobvious, nondominant interpretation" (p. 71). Studies find that people with less focused attention sometimes perform better on tests of insight and creative problem solving [7]. According to John Kounios, showering releases dopamine, allowing you to focus on internal contemplation rather than on external stimuli. The desired state of mind is often achieved with less focus and more quiet contemplation, which often happens out in nature or in the shower, just before sleep, or sitting quietly in a bus or waiting room.

Even the very act of lying down may stimulate your creativity. Laboratory participants, tested on their ability to solve word puzzles, were found to perform these tasks faster while lying down. Thirty-two healthy individuals were asked to solve 32 five-letter anagrams, such as "osien" (noise) and "nodru" (round). Dr. Lipnicki [8], from the Australian National University, theorizes that humans' ability to solve problems faster while in a relaxed position is likely due to the reduced role of noradrenaline, which inhibits creative thinking, and is released in greater volumes when standing up than when lying down.

Some researchers suggest that people are more likely to be creative at non-optimal, less productive hours. Research by Mareike Wieth and Rose Zacks [9] indicates that our brains work differently during "down time" and that we are most creative at non-optimal times. Problems that require a high degree of creativity are better tackled at the time of day when you are least alert. Experiments find consistently greater insight during problem solving performance at non-optimal times, compared to optimal times of the day. Therefore, readers might do well to reserve peak hours for those tasks that require working memory and analytical thinking, and plan creative tasks for down-time, to allow thinking differently about information – reaching beyond known information to impromptu, intuitive and creative solutions.

Robert Epstein [10, 11] suggests that individuals have their best ideas while in bed, travelling on the bus, or in the bath. Epstein considers fantasizing and daydreaming useful to creative thinking [12]. He further suggests [10, 12], based on careful empirical research, that interacting with a variety of people from various demographics, ethnographies and careers will aid creative thinking. Epstein also suggests keeping provocative items like toys and colourful objects on one's desk. Doing provocative things stimulates transference (transfer of learning from one experience to a new situation or experience) and resurgence (creating interconnections between behaviours). Weibel and colleagues support Epstein's theory (named Generative theory) and suggest that imaginative fantasy will help individuals become proficient in the process of creativity [12]. Harman and Rheingold [13] propose four methods for becoming more creative: imagery, affirmation, alert relaxation and dreaming. The first process, "guided imagery", is to connect to one's inner advisor or unconscious. This harks back to the Greeks' belief in the inner "sage" or muse that will guide your inner eye. The second improvement process is "alert relaxation". This state of calm, relaxed openness (incubation) can help people to evade internal censors. Epstein advises creatives to sit in a quiet environment, relaxing all muscles, focus on a specific mantra or object and assume a passive but receptive state. "Affirmation" is the creation of an inner mantra that combines intense inner resolve, firmly fixed purpose, imagery, will and emotion to help individuals to reprogramme the unconscious allow them to manifest the positive future outcome they intend to achieve. For creative endeavours this might be something like: "I have breakthrough creative insights" ([14], p.349). The final process is "dreaming". Mark Runco suggests that dreams abound with images, semiotics and analogies that can provide useful, even powerful, creative insights. Since we spend between 25% and 30% of our lives asleep, it might be productive to invest in using this often untapped resource. Karl Jung stated, as early as 1960, that individuals can learn a lot by writing down their dreams and reflecting on the meanings behind the images that appear in them. Those individuals proficient in recalling, examining and interpreting their dreams may find them helpful in unconsciously solving problems and facilitating creative thinking.

A lot of creative output theory focuses on effort, using various techniques aimed at cognitive redirecting (convergent or divergent thinking). Parnes [15] called these "make it happen" tactics. Marc Runco [14] suggests that often, all that is required is to "let it happen" (p. 343). Such inherent or organic insights can happen as one plays, walks, showers or just sits and stares – leaving the mind to daydream or using tactical incubation. The mind will find ideas while you are doing something else. For some creatives the place is important (see "happy place"/physical environment later in this chapter). For others, place has little to no importance, bringing us to the value of getting out and about.

20.2.2 Getting Out and About

In a study by Dr David Blanchette and colleagues [16], 60 adult students participated in an experiment where the TTCT (Torrance Test of Creative Thinking) was taken immediately after moderate aerobic exercise, and after a 2-h time lag. Participants' TTCT results indicated lower creative potential when the TTCT was not preceded by exercise (immediate effects). Even more interesting is the residual effect of exercise, in that creative potential was not significantly different immediately following exercise than it was after a 2-h lag time following exercise (enduring residual effects).

Authors of various books and journals agree on the importance of exercise and spending time in nature. Even if you only walk a few times a week, your brain benefits. John Medina concludes from his studies that our unique cognitive abilities are "forged in the furnace of physical activity" ([17], p.11). John Medina [17], David Blanchette and colleagues [16] suggest that as little as 30 min of aerobic exercise will benefit creative thinkers.

20.2.3 Travel to New Places

This last point brings us quite naturally to a commonly known, and much applied, stimulus for discovering new ways of doing and thinking and alternative ways to look at problems and solutions: traveling to foreign places. In his book *Imagine: How creativity works*, Jonah Lehrer [18] suggests that travelling provides different perspectives (an outsider's perspective). Maddux and colleagues [19] suggest that living abroad helps to remove cultural barriers (see squelchers in Chapter 10 of this book) and primes creatives for considering alternative viewpoints. These authors do not cover short-term travel, but the various studies and anecdotal evidence we discuss next may add insights about travel over shorter periods of time.

Many famous creatives used travel to inspire and source new ideas for various art forms. Van Gogh shifted living quarters fairly regularly (though possibly from necessity and financial crises). Ernest Hemingway found travelling to Cuba stimulating... but still had a favourite desk and favourite room to work in. Gaugin, Stravinsky and Hemingway did some of their most famous work directly after travelling. This anecdotal evidence is supported by more scientific studies considering creative performance after travel. A study [20] of the impact of recreational travel on creative thinking reports that two out of three executives believed that vacations and travelling improved their creativity. Recreational travel is likely to reduce stress, offer new experiences and increase positive emotions – all good conditions for creative processes. This longitudinal study [20], using Guilford's Alternative Uses Task, assessed workers' creativity before and after vacations, finding that idea flexibility improved, raising the quantity of cognitive elements, but travel did not necessarily lead to more novel or remotely associated ideas. Simonton [21] indicates that

there is much evidence that cultural diversity facilitates creativity. On a macro-societal level, whole civilizations show increased creativity after influences by foreigners, through immigration, studying under foreign teachers, or travelling abroad. Marc Runco writes: "Shifts can be useful for creative thinking because they suggest new ideas and options and allow an individual to avoid fixity and routine" ([14], p. 333).

However, the idea of travel as a catalyst or stimulant does not suit all individuals. Some individuals find traveling tedious, stressful, or too far from their "happy place" to be conducive to creative work. As noted many times in this book, individual differences in the creative environment will affect different people in different ways [22]. There is no "one-size-fits-all" solution to the creative-environment requirement that will either inhibit or be conducive to creative endeavours.

20.2.4 Exercise Your Senses (and Your Eyeballs)

Shobe, Ross and Fleck [23] investigated the effects of increased inter-hemispheric interaction (IHI) on five creativity dimensions (appropriateness, elaboration, categorical/domain distinctiveness, fluency, and novelty) and found a 30s eye movement exercise triggered IHI in the brain. IHI facilitates a connection between the right and left sides of the brain, boosting creative thinking. So, to switch on the connectivity between your left and right hemispheres of the brain, simply engage in some activity that will, for at least 30s, move your eyes from left to right, and back, and so on. One exercise is to continuously draw an infinity sign (the number 8 lying on its side) on a large white sheet of paper, following each movement closely with both eyes. (Sorry; this exercise has little to no impact on people who do not have a dominant hand; i.e. those who are ambidextrous).

Most readers will have heard the saying "Stop and smell the roses". There is perhaps much truth in this saying, as researchers have uncovered the value of "stopping" (see the quiet mind paragraph above) and the impact of colour, smell and other sensory inputs on creative performance. Perhaps this saying also infers that you have been "going" and can thereafter engage in "stopping" (see the paragraph on activity and exercise above).

Closely related to sensory stimulation is the issue of colour. A study at the University of British Columbia settled the debate about red vs blue in improving brain performance. Research has linked blue and red to enhanced cognitive performance, but the nature of the task or message determine which is most effective. Red boosted performance on detail-oriented tasks such as memory retrieval and proofreading (as much as 31% compared to blue). For creative tasks (e.g., brainstorming), blue environmental colour cues prompted participants to produce twice as many creative outputs compared to red. "Through associations with the sky, the ocean and water, most people associate blue with openness, peace and tranquillity," says Zhu, who conducted the research with UBC PhD candidate Ravi Mehta, "the benign cues make people feel safe about being creative and exploratory. Not

surprisingly it is creative people's favourite colour." ([24], p. 1). So get into the "blue" of the sky, the ocean and perhaps even paint your workspace and creative studio blue. Next time you get out and about, stop. Look up. Take a moment or six to absorb the feel and colour of the sky. Take time to enjoy the green of the garden, the smell of the air and the colour of the sky.

Research from Duke University's Fuqua School of Business and the University of Waterloo, Canada [25] found that exposure to well-known brands (even briefly) can cause people to behave in ways that mirror those brands' traits. Even if you are not an avid fan of a particular brand, brand attributes (e.g. innovation for Apple vs stable and reliable for IBM; honesty and sincerity for Disney vs neutral for E! Channel; performance and achievement for Nike) will inspire people to behave more like that brand. So, if you wish to behave more creatively, surround yourself with visual cues from creatives you admire.

20.3 Physical Environment

Multiple studies have shown that the physical environment for creative endeavours can facilitate or impede the generation of new and creative ideas. These physical stimuli such as colour, architectonic details (e.g. ceiling heights), ambient conditions such as noise or music, and overall workspace design, can impact creative performance.

20.3.1 Colour

A single physical stimulus, such as colour ([26–31] is likely to have a big impact on the individuals in a creative intervention (all humans differ, and colour has different meanings in different cultures, genders, age groups and even sub-cultures, so it's difficult to generalize to all people [32]).

Colour studies have normally related the impact back to the physiological responses programmed into human responses to colour stimuli. Many dangerous or poisonous animals and insects carry red indicators on their bodies. Red denotes anger and dominance, and has been found to support competitive behaviour by enhancing aggressiveness and competitiveness, by increasing heart rate and testosterone levels (in males), and thereby facilitating competitive performance (e.g. in team sports and boxing [33, 34]). Many studies confirm that colour impact is context-specific. Red is given as an example [28, 35] of a highly specific contextual effect. Red has a negative meaning in achievement contexts (e.g. red marks on assignments), but psychologists see red as having a positive meaning (receptive sexual status and desire) in mating contexts. Elliot and colleagues [29] report that red may cause participants to associate the colour with danger and failure, but not

all studies agree with this finding. For our study on creativity, we consider the achievement context, where thought processes require collaboration, manipulation and flexibility. For this type of thinking activity, studies suggest that green or blue colours have a positive effect and advise against the use of yellow for challenging cognitive tasks. However, only a limited amount of empirical research has been done on the issue of colour stimuli for creative work. Mehta and Zu, and Lichtenfeld et al. [30, 35] reported on the positive effect of blue on creative performance. Mehta and Zu [30] concluded that the colour blue has a positive impact on approach motivation (speed over accuracy).

Some authors suggest blue as the optimal colour choice for a creative work location, as it creates a calm space [36]. Elliot and Maiers' 2014 study [36] on ambient colour reports that colour has significant impact on human cognition, emotions, perceptions and behaviour. Colour is so important to us that it even features in our dreams [37] and provides important clues to psychologists and therapists about the state of mind of their patients.

> An important interjection is required here, as scientists point out that colour is a complex construct and has multiple attributes. These attributes are: typicality (is it standard and representative of the colour category); hue (the wavelength and what most people think of when they hear the word "colour"); lightness (brightness or black-white properties); and chroma (saturation, vividness, intensity). These basic properties of colour perception vary between situations, people and contexts. Further, the influence of colour on human functioning is a fairly new research field. Much of the early research did not control for these variations and may therefore not include sufficient control of surrounding colours or colour stimuli beyond the one tested. In addition, many studies produced null results and contradictory findings as they did not control for the multiple attributes and selected colours by merely "eyeballing" them.

20.3.2 Lightness Vs Darkness

According to Steidle and Werth ([38], p. 76). "Darkness and dim illumination elicit a feeling of freedom, self-determination, and reduced inhibition … and promote a risky, explorative, and less vigilant task processing style." Darkness and dim illumination have similar effects on creative performance, in that they provide freedom from constraints and trigger a more risky processing style, enabling the explorative processing that is useful in creative thinking.

20.3.3 No Visuals; No Visual Distractions

In contrast to the visual stimuli discussed previously, creative ideas often seem to appear when we close our eyes, stare at a blank wall, or gaze out of a window—all signs of shutting out distractions and turning our attention inward. Studies have demonstrated that attention-related brain areas are differently active when complex

visual cognitive stimulants are tested in comparison to the absence of visual distractions under laboratory conditions [5].

20.4 More Playing–Less Adulting

Unfortunately we tend to undervalue the role of playing in both adult learning and creative endeavours – especially in the business context. In most business environments the suggestion to use play to solve a serious problem will be frowned upon or ridiculed. However, multiple studies [14, 39, 40] have found that permissive, playful environments stimulate and support original and divergent thinking. One of the reasons cited for play being so useful in creative endeavours is that play focuses on the process, whereas work normally focuses on the output or outcome. Play is therefore often pursued for its own sake and is intrinsically motivated, rather than aiming to gain a particular or pre-specified award. The divide between work and play is now becoming more blurred, especially with the advent of the massification of online connectivity and online social networking. This is especially true for Millennials, who see the activities of writing, drawing and researching as fun and part of play: "working, learning and playing are the same thing to them". They also see the cyberspace of the internet as a virtual playscape, which can be productive. Play is seen as motivational, safe and transformative. Play inspires openness and an environment that promotes serendipity, where people can stumble upon new ideas, strategies, behaviours and ways of thinking.

Organizations are starting to embrace the idea of play, playfulness and gamelike environments to stimulate creative work. Google™ is already well-known for its playful and permissive work culture. Employees are allowed to bring pets to work, encouraged to create their own colourful and playful workspaces, and the company promotes the image of a light-hearted but innovation-driven work/playground [41]. Google™ and LEGO Serious Play™ have relationships managers whose responsibilities include configuring spaces, providing resources, and facilitating play interactions [41]. 37Signals™ fosters a culture of work-play and work-life balance by having a 4-day work week and helping employees pay for hobbies and interests (as long as they share their learning experiences with other staff and their business community). 37Signals™ sees this relaxed culture – as distinct from the conventional workaholic culture and its focus on busyness – as providing an atmosphere conducive to harder work since employees are relaxed, happy and therefore more efficient. IDEO™'s CEO Tim Brown wants staff to feel special, appreciated and nurtured. "When people feel special they'll perform beyond your wildest dreams" ([42], p. 93). People are allowed or even prompted to take time off work to play, attend a baseball game, watch a movie or take field trips. This boosts morale. Unplanned breaks to play hockey, shoot foam balls at each other, ride bikes or generally monkey around are encouraged. A more generally accepted form of play often used by IDEO is role-play. This role-play allows user-experience (UX) designers to build empathy (see Design Thinking in Chapter 11) with consumers, adapt

designs to solve more problems, and be better aligned with consumer needs. Employees can, aided by role-play, truly understand how users see and experience the problem. Charalampos Mainemelis [43] formalizes this statement by IDEO's CEO in a study of play at work, stating that "by suspending ordinary conventions, structural obligations and functional pressures, and by encouraging behaviors whose value many not be immediately evident, play stimulates, facilitates and even rehearses creativity" ([43] p. 81). Further, "while play is a form of diversion from an individual's organizational tasks it fosters the peripheral social-relational dynamics that encourage creativity".

Mainemelis and Ronson [43] suggest that play involves five elements: a threshold experience; boundaries in time and space; uncertainty-freedom constraints; flexible and loose associations between means and ends; and positive affect. While not all five elements need to be present to transform an activity into play, the more of each element, the more play-like the activity becomes ([43], p. 91). Let's start with positive affect. Please note that positive affect does not imply that emotions in play are all positive. Play can involve negative emotions such as anger, violence, and hate (e.g., war-like games), but play more often than not results in some positive affect outcome, such as joy, emotional relief or relaxation (escape from reality). For example, climbing a mountain or playing a hard, competitive game of tennis will have many negative affective moments (anxiety, exhaustion, defeat) but the overall affect is relaxation or a sense of achievement. Play happens in the transitionary space between reality and imaginary worlds or events. Here people can experiment with possible alternative realities and identities [44], but share attributes from both "the real" and "the imagined". The time-factor of play allows people to step out of their normal roles, and for a demarcated time, assume a new self, suspend normal rules, and play legitimized abnormal roles. Otherwise repressed and unexpected behaviours emerge, allowing new thinking to occur. As part of the uncertainty-freedom factor, play normally involves impromptu activities, unexpected surprises, uncertainty, and hence unresolved possibilities [45]. Play imposes its own restraints, which players accept voluntarily, and most often players themselves choose the amount of freedom or restriction, or the degree of arbitrariness they will accept. It is this very nature of play, "within which practitioners can suspend control and some of the everyday impediments to reflection-in-action" ([44], p. 33) that makes organizational role-plays and managerial simulations such powerful projection/action/thinking tools. Lastly, Jerome Bruner describes play as "a crooked line to the end…and a special form of violating fixity" ([46], p. 689) where the means at hand (tools, props, players, artefacts) may shift both the goals and the obstacles en route. Players not only improvise and suspend rationally, but are likely to circumnavigate obstacles created by others or even themselves. This short discussion about play shows that it is a valuable tool for creativity practitioners. A host of scholars suggest that much more research is still required on the impact of gaming (online, board games, gamification of information transfer) on creativity and creative performance [47].

20.5 Games, Puzzles and Simulations

20.5.1 Lego™

Lego™ has become a world-renowned brand for building blocks and their ability to stimulate creativity in individuals of all ages. Teachers from pre-school through to primary and secondary schools and tertiary institutions [48, 49] find Lego™ blocks, Lego™ robotic parts (programmable parts) and Lego™ Mindstorms useful in stimulating "smart play".

Recent findings by Dirk Primus and Stephan Sonnenberg confirmed that Lego Serious Play™ skills-building, as a creative warm-up, had a positive effect on two of the three flow[1] experience elements: individual creativity [50], flow feeling, and flow corridor. Other scholars and educators confirm that the use of Lego stimulates and develops creative competencies, including imagination, collaborative creativity, open-minded playfulness and "a maker culture" [51–53]. Educators also indicate that using Lego™ in assignments creates a useful conceptual space, within which students can explore and apply skills and develop an understanding of their own psychology in creative intelligence and gain control over the meta-cognitive thinking-acting-feeling inter-relationships for themselves and others in their team.

Note that building Lego™ models in itself has some level of creativity, but merely building a well-defined object or artefact as a kitset is possibly not a sufficiently ill-defined creative task to inspire creative thinking. Earlier discussions about ill-defined creative tasks, as we have argued, mean that creatives need to use invention, discovery, imagination, supposition and hypotheses [54] in the act of creative thinking.

20.5.2 Word, Visual and Mind Puzzles and Virtual Games

Brain teasers, puzzles, board games, video and PC games can support players' creativity [55, 56]. Although most research deals with the impact of brain teasers and games on children, adult educators report positive results from as little as 30 min play before doing a range of cognitive tasks. Andragogues (adult educators) suggest that modern workers and students have fewer opportunities to play, to have timeout to solve problems, or to engage in creative thought. So these "stretches of the mind"

[1] Flow theory was first related to creativity by Csikszentmihalyi (1996) and posits that a state of flow enhances creativity. Flow is state of mind where an activity corridor, through a balance between challenges and skill levels, awakens or enhances intrinsic motivation and autotelic activities – where players find the task itself more (or at least equally) rewarding than the solutions or results. In 1996, Moneta and Csikszentmihalyi empirically confirmed that four dimensions – concentration, happiness, wish to do the activity, and involvement – positively correlate with the individual flow corridor. (Flow is represented as a corridor between two other states: boredom and anxiety.)

(akin to an athlete's stretches before a field event) help thinkers to get ready – almost like a brain warm-up.

Blanco-Herrera [57] reports on Minecraft ™, described as a "game with few rules and a high amount of player freedom, Minecraft™ exemplifies a game that fosters players' abilities for creative expression." ([57], p.119). Proponents of the CiQ-building capacity of computer-based games claim that ingenuity, improvement and invention are stimulated in games. These games also promote tenacity and persistence in the face of adversity, and even respect for the adversary. The games instil a belief that humanity has the possibility to triumph over the brutality of nature and the cruelty of humans [58]. However, games are not all good and productive when it comes to simulating play and learning. Video games that foster freedom tend to increase creativity under certain conditions, according to recent research [57, 59]. There are many studies on the impact of online games on the morals, ethical responses and violence displayed by gamers. Unfortunately the scope of this study does not allow us to dwell on this matter as our focus is on the use of games in aiding creativity. However, we consider it our duty to at least provide [60] a cautionary note and suggest further investigation if you wish to consider games' and simulations' psychological and behavioural impacts.

Most games, but especially role-based forms of play (such as role-playing, simulated interactions, networked inter-person games) that involve word games, riddles, and other linguistically-based puzzles, build one of the important intelligences related to creative performance: communication (verbal) intelligence. A lot of the enjoyment and entertainment in video games come from text or dialogue to be read or listened to. Drastic imaginary changes and imaginary worlds, the soundtracks, story lines, graphics, word puzzles, stories and avatars allow players to learn how to escape mental traps and to use conceptual skills and acquire techniques that can enhance their creativity [61].

20.5.3 Music

We could easily dedicate an entire chapter (if not a book) to the creativity of musicians and their creative products. But in this book, and particularly in this section, we will focus on the role music can play in stimulating creative performance and creative intelligence.

Howard Gardner [62] posited that music and science are different types of intelligences, but Robert Root-Bernstein offers the tenet that music and science are two manifestations of common ways of thinking, arguing that both music and science use the same set of "tools for thinking" that unify all disciplines. He explores and supports the notion that creatives are usually experts in multiple domains ("polymaths"), who think in trans-disciplinary ways. We undertook a structured literature review to find links between listening to music and creative processes or activities. In our review we found a glaring gap in this particular aspect of the arts' impact on creativity stimulation, motivation and development. A plethora of articles, books

and blogs relating to [63–66] creativity in music therapy, music composition, and music software writing or performance are available, but it is neither our focus here, nor within the scope of our publication, to cover creativity in the arts. (For details relating to creativity in the arts, music, theatre and science domains, read *Explaining Creativity* by R. Keith Sawyer or *The Encyclopedia of Creativity*, edited by Mark Runco.)

Many students would like their parents to think that listening to music helps them to study and be better problem solvers. A study by Simone Ritter and Sam Ferguson [67] supports their claim, when it comes to divergent thinking performance. A study conducted at Radboud University, Nijmegen experimentally tested whether listening to specific types of music (four classical music excerpts systematically varying in valence, otherwise known as positiveness, and arousal) facilitated divergent and convergent creativity in 155 participants compared to a silent control condition. The study reported that creativity was higher for participants who listened to 'happy music' (i.e., classical music high on arousal and positive mood) while performing the divergent creativity task, than for participants who performed the task in silence. However, creativity tasks can also entail convergent thinking; i.e., the cognitive process of deriving the single best, or most correct, answer to a problem or question [68]. Convergent thinking emphasizes accuracy and logic, and applies conventional search, recognition, and decision-making strategies. Interestingly, listening to happy music did not lead to higher performance on the convergent creativity tasks. The increase in divergent but not convergent thinking after listening to happy music may be explained by the fact that convergent tasks rely less on fluency and flexibility, and more on finding one correct answer. The researchers concluded with a practical suggestion, saying: "Music listening can be easily integrated into daily life and may provide an innovative means to facilitate creative cognition in an efficient way in various scientific, educational and organizational settings when creative thinking is needed" ([68] p.1).

Idea generation is largely the result of divergent thinking: generating alternatives, rather than one right answer. Bedirhan Gültepe and Hamit Coskun [69] investigated the effect on creativity of two classical music pieces providing cognitive stimulation. Participants listened to either Vivaldi's *Spring* (as positive stimulation) or Gyorgy Ligeti's *Lux Aeterna* (as negative stimulation). In this study music was presented as the auditory stimulus, while words were presented as visual cognitive stimuli. The authors reported that music-induced mood/affect (both positive and negative) enhanced idea generation in low cognitive stimulation contexts. In high stimulation contexts (involving lots of other cognitive stimuli, such as random words), music with a neutral affect (such as Chopin's Walzes) enhanced creativity. So perhaps learners are right; when they are bombarded with cognitive stimuli in class notes and textbooks, some music may be conducive to better ideation. Additional research on the impact of various instruments, tones and melodies is needed. The authors [69] speculate that highly arousing music may improve performance in tasks with a low number of stimuli, whereas less arousing music may be beneficial for difficult tasks that demand attention to a higher number of stimuli.

20.5.4 Laugh – The Joy of the Absurd, the Funny, the Unusual

Finding joy and laughter in cartoons, jokes, hilarious videos or funny stories has two main benefits. The first is to reduce anxiety and create a sense of play or spontaneity. Although humour is not synonymous with play, there is an element of lightheartedness and laughter that is linked to play. Creativity literature often mentions the themes of play, playfulness and "not taking things too seriously", or the ability to go against conventions (often an element of humour; laughing at oneself or others). Some studies suggest that humour is a form of creativity and include "a sense of humour" as a trait of the creative personality or creative potential. Paul Torrance specifically noted that the work of creative children includes characteristics of humour and playfulness. Some creativity tests– including Torrence's TTCT and Urban's tests for Creative Thinking [70] have humour as an evaluation criterion. It is also interesting to note that creatives rank the role and attribute of humour in creative endeavours more highly than non-creative people. In contrast, some theories in the field of creativity explicitly exclude humour [71].

Returning to the role of the comic, the unusual and the absurd, studies at the University of California explored the effect of reading unusual and unrelated online content. Professor Barron's findings relate to various literary and high content websites indicate that one can induce a creative response through heightened perception and the resulting unusual thought patterns. However, some of the weirdness found in literature and online sites needs to be controlled. Too much weirdness is akin to madness. Barron [72] posited the theory of controlled oddness. This theory relates to the originality and appropriateness of novel ideas. Barron concluded that some weirdness is necessary in order to be original, but beyond that limit, it is just plain weird and thus unhelpful. It is the intention behind the weirdness that makes it either wacky and mad (in an unacceptable way) or novel, unusual, acceptably and appropriately weird.

Reading different perspectives on life and common life events may allow individuals to see common everyday events from different perspectives. Deviating from the norm into some form of weirdness, marginality or contrarianism is useful for creatives. Contrarianism involves intentionally operating outside of accepted norms or cultural/professional codes. Marginality is normally unintentional [71, 73] and can be professional or cultural. For example, if a Frenchman writes about America, it will be an entirely different perspective than that offered by citizens of America. A key benefit to this unintentional marginality is the ability to see things with fresh eyes – probably not making the same assumptions that those operating daily within the system would make. Or perhaps these fresh eyes would simply notice the assumptions, biases or ingrained habits and question them. There are clearly great benefits to operating outside one's field of expertise or domain - it not only provides new perspectives, but is likely to open up new possibilities and insights as a result of interacting with others, talking with, or more formally, interviewing others to gain their viewpoints on the matter under investigation Nakamura and

Csikszentmihalyi [74] express the opinion that individuals do not have to be marginal to be insightful, but can instead simply work with people from different but complementary fields.

20.5.5 Write, Record, Draw – BY HAND!

Depression experts, husband-and-wife physicians Carrie and Alton Barron, drawing on psychological research, suggest in their book *The Creativity Cure: How To Build Happiness With Your Own Two Hands* [75], that as humans we need to create—to produce something using our minds and hands in order to feel useful and to improve life satisfaction and happiness. Drawing, and writing by hand, connect us to our inner selves and to our environment and offer the deep satisfaction of accomplishment. In our technology-driven, fast-paced, achievement-orientated society, we often neglect this need. Creative processes facilitate insight and healing, connect our mental and physical selves, supply satisfaction and meaning and thereby enhance everyday life.

20.6 Altered States and Mind-Altering Drugs

Supported by innuendo and anecdotal evidence, such as popular media stories covering rock bands, celebrities and various artists, people often believe that many creatives use drugs and mind-altering substances to improve their creativity. Since drugs clearly have an impact on the brain, it is valid to question whether alcohol, marijuana and other drugs have an impact on creative performance, or whether pure sensation-seeking coverage elevates the prevalence of drug use amongst creatives to a higher level than it actually has in reality. Researchers considered this question and examined the effects of hypnosis, marijuana, lithium, alcohol and other drugs, including substances like truffles and magic mushrooms (*Psilocybe mexicana*) on creative endeavours. We cover a small selection of the available research findings here, to give some brief insights into interesting "altered states of the brain" and their relevance to creative performance.

20.6.1 Hypnosis

Scientists describe hypnosis as an induced state that provides a person with the opportunity to relax the conscious, ego-controlling mind, suspending logical observations and thinking processes and enabling fantasy, imagination and unconscious (tacit and internal) material (memories) to surface ([76], p. 10). There are some elements common to both hypnosis and creativity, and therefore it is not hard to see

why scholars might think it worthwhile to investigate the impact of hypnosis on creative output or performance. Note that not all creativity relies on the preconscious [77, 78]. Some creative acts can be intentional or tactical, and are based on active, idea-generation and conscious divergent thinking techniques.

First, the level to which a person is hypnotizable is dependent upon the same characteristics as creativity. Readily hypnotizable individuals display imaginative involvement, absorption, fantasy-proneness, and effortless experiencing (similar to mindfulness and flow) ([79], p.5). Langer [77, 78] suggests that mindfulness is a simple and effortless process that is mostly the ability for drawing novel distinctions and noticing new things, thus giving up fixed ways of looking at the world, and that it leads to mindful creativity. Second, both hypnosis and creativity involve the same brain function, i.e. the preconscious or preverbal realm. Creative individuals often draw ideas and cues from the preconscious [79, 80]. Third, creative inspiration, according to neuroscientists, has its origin in the preverbal realm – the same realm where playfulness, impulse and a-rationality, all part of creative thinking, are situated [81]. Finally, the ability to relax, suppress ego-control and enable ego-permissiveness, which allows the creative individual to create images, ideas and creative solutions, is enabled by hypnosis. Scholars admit that much more research is necessary on this topic, and that there is likely to be a different relationship between verbal and non-verbal material and hypnosis [14].

20.6.2 Cannabis or Marijuana

Researchers have studied the effects of different drugs on creativity, and their impact on attention, inhibition, distortion of judgement and divergent thinking abilities. Studies thus far are not conclusive since mind-altering drugs have different effects on different people, differ between novices and regular users of drugs, and also differ from task to task [82]. Scientists highlight the problem with optimal dosage, as the optimal level of ingestion differs substantially from person to person. Weckowitz et al. [83] found that lower levels of marijuana intake were not associated with enhanced performance in divergent thinking, whereas creative performance was inhibited by higher doses. In direct contradiction, Victor et al. [84] reported that marijuana intake had a generally positively influence on divergent thinking. Findings from 984 school children (8-12th graders) showed that "Increasing frequency of marijuana use was significantly related to increased creativity, adventuresomeness, internal sensation, novelty seeking and impulsivity, and decreased authoritarianism, …but heavier marijuana users earned lower grades in school" ([84], p. 78).

It has been suggested anecdotally that cannabis can assist in overcoming writers' block and generally improve creativity. Researchers [85] investigated this claim in part, by testing 160 participants who spent one day sober and one day engaging in acute usage of cannabis ("intoxicated state"). According to their findings "Cannabis increased verbal fluency in low creatives to the same level as that of high creatives. On the category fluency task, the high creativity group significantly outperformed

the low creativity group on both testing days so performance was unaffected by cannabis use. Acute cannabis use increases divergent thinking as indexed by verbal fluency in low creatives" ([85], p. 292). In contrast, an earlier study found that cannabis did not enhance scores in uniqueness, fluency, flexibility or elaboration during an object description task. So again, further empirical research involving diverse groups, a range of doses/intoxication levels for regular users and non-users and a host of other person- and task-related variables is needed before we can conclude that cannabis is generally effective as a creativity-enhancing drug.

20.6.3 Alcohol

Many studies have attempted to address the impact of moderate levels of alcohol intoxication on creativity. These studies span several groups, years and domains (although mainly focused on poetry and literature) and several stages of the creative process (planning/preparation/incubation/illumination/verification). Although much has been published on the impact of alcoholism on creativity [86–90], this chapter is only interested in the impact of moderate alcohol intake on creative performance, not the effects of alcoholism.

In studies of alcohol and creativity [87], a pattern quickly emerges indicating that moderate intake of alcohol makes the first or preparation phase of creative production more difficult [91]. Moderate levels of alcohol intake make incubation easier through the effects of "letting it go" for a period and increase originality [92], but unfortunately decrease flexibility and complicate the verification phase [91]. These findings are consistent with a biographical study by Finnish authors [90], who found that creative writers specifically recorded that they could not write under the influence of alcohol.

20.6.4 Micro-Dosing with Psychedelic Substances

According to a new study in the European Behavioural Pharmacology Society's Journal (EBPS), the use of minute doses of magic mushrooms and truffles containing psychedelic substances or hallucinogenic compounds such as psilocybin can induce a state of unconstrained thought that may produce more new, creative ideas. It is the first study of its kind to experimentally investigate the cognitive-enhancing effects of micro-dosing on brain function in a natural setting. 'Micro-dosing' in this [93, 94] way may allow people to experience the creative benefits of psychedelic drugs without the risk of the so-called 'bad trips' that often come with high doses of such substances. Micro-dosing should be further investigated for its therapeutic efficacy in individuals who suffer from rigid thought patterns or behaviour, such as those that occur in depression or obsessive-compulsive disorder. We advise readers

not to engage in micro-dosing without the assistance of a trained professional and until more rigorous scientific studies guide practitioners' knowledge about its impact on creative thinkers.

20.7 Fewer Right Answers – Get Comfortable with Ignorance and Mistakes

Our natural drive for one correct answer and quick-fix solutions often prevents us from finding novel, useful solutions. Our minds seek instant gratification, quick fixes and tension reduction. A famous study of toddlers by Mischel [95] over a 3-year period found that those who were able to delay gratification, fared better in life. Those who held out for a longer period to earn two marshmallows, rather than one now, tended to tolerate frustration better, resist temptations, cope with stress and had better self-control. However, denying a fixated or pre-set mind is not an easy task. So creatives need to practice denying the primitive mind not by merely suppressing it, but by choosing different behaviours to replace old, ineffective habits. Dr. Shawn Smith suggests that thinkers have to treat this demanding primitive mind like a noisy dog in the corner of the room: "Ignore it but don't try to eliminate it" ([96], p. 149). The 30% of children who were able to resist the marshmallow in Dr. Mitchel's marshmallow experiment did so by distracting themselves with play or singing. Without consciously knowing, they realized that one can avoid the sensory stimuli (smell and squishy texture, seeing the pink and white softness) of the marshmallow, but not the desire. The avoidance of temptation or wrongful thinking needs to be conscious and purposeful. Smith [96] offers three strategies for purposeful avoidance: (i) remove yourself from the immediate consequences (close your eyes, move away from the smell, remove the likelihood of instant gratification, get out of the physical situation); (ii) remove yourself from self-made excuses to err or repeat non-effective behaviour (assess the usefulness of thoughts like "you always fail at this" or "you've tried before and failed"); and (iii) attempt small steps or bite-size chunks (divide the activity into little wins, e.g. take only the very first step, then focus on the next small step).

Obsessive-compulsive disorder (OCD) exemplifies quick fixes and reducing internal tension. OCD minds are not much different to ordinary minds; they simply demand more action in response to anxious situations and are likely to perceive more situations as anxiety-generating. Treatment for OCD includes controlling immediate impulses by redirecting activity. OCD sufferers' minds can be trained to recognize and appreciate that ritualized behaviours (like washing your hands until they bleed) reduce the anxiety but do not solve the problem, and thus only give the illusion of effective behaviour. The primitive mind that demands instant relief from anxiety needs to be trained, through exposure to facts and habits of delay, to override this compulsion. Practice, in this case (as it does so often), makes perfect. Every

time you deny the primitive brain instant solutions, or force it to think about long-term consequences, you achieve a small win. Any small win brings you closer to new long-term mind habits. Getting better is a matter of higher mind over primitive mind. When primitive habits turn into addictions or compulsions that get the better of us, and defy our best efforts to overcome them, it makes sense to seek professional help.

This issue of "fewer right answers" leads quite logically to the next topic: possibilities – both benign and malevolent.

20.8 Possibilities

20.8.1 Possibility Thinking – Benign and Future-Forward

In this section we turn our attention to the two faces of possibilities in and through creativity. One side of the possibility coin (See Fig. 20.1) considers all the positive contributions of creative solutions, innovations and inventions devised by creative minds to solving humanity's problems; i.e. benign creativity. Most creatives are likely to consider the brilliance of mind, novel solutions to sticky problems and the various possibilities produced by creative genii. We have considered creative work(s) in disciplines such as music, film-making and storytelling, art, science, mathematics and information technology, new product design and various business applications. We have covered a range of antecedent conditions likely to provide

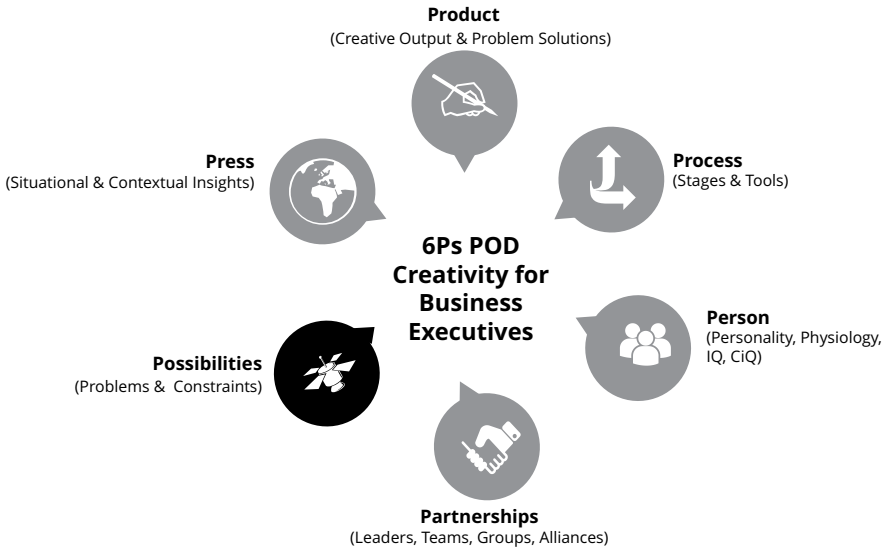

Fig. 20.1 Six Ps model of creative endeavours and intelligence (CiQ)

opportunities, and factors that may retard the likelihood of creative results, including corporate culture, intrinsic task motivation, and domain-relevant skills. A final word of inspiration lies in the mindset that Anne Craft highlights in both individuals and highly innovative organizations (HIOs): an inclination and an orientation that look towards the future with a "What if…?" orientation, rather than "What is" – looking for all the possibilities that could be rather than the current reality with its limitations and problems. This is well aligned with Edward de Bono's yellow thinking hats and possibility theory as posited by Robert Harold Schuller. *Possibility Thinking* is the willingness to see possibilities everywhere instead of limitations [97–99]. Possibility thinking starts with the conviction that you can make a difference; that you are capable of doing greater and greater things. This is an outlook on life that allows genii to attract even more possibilities and opportunities. Possibility thinkers allow big dreams to come true: they make the future, they don't wait for it to arrive.

20.8.2 Possibilities – Malevolent and Harmful

Unfortunately, the darker side of creativity involves the negative, premeditated or unintentional impact of creative endeavours. We now turn our attention to the distinct construct of malevolent creativity (MC), considering the possible intentional production of harmful outcomes in the production of novelty [100]. David Cropley considers MC as distinct from creativity that may unintentionally result in negative outcomes or unintentionally bad product(s): here malevolent intent acts as a driver for malevolent innovation [101, 102]. Cropley's paper [100], titled "Eleven principles of creativity and terrorism", considers the role of creativity in the production of harmful products and what can be done to counteract such malevolent creativity. The study [100], based on the terrorist attacks of September 11, 2001 in the USA, identified eleven principles, and highlights three relevant to deliberate MC: (i) creativity is not exclusively benevolent/good; (ii) creativity in any context is a competitive lever and value can be extracted in a malevolent context – e.g. criminals or terrorists get better at novel lies or methods of killing in order to destroy lives/property; and (iii) the qualities of a creative product – novelty or surprise as examples – are not universally good. Effective creative outcomes are not necessarily good: for example, a new time bomb might be 'effective' in its intended destruction. Similarly, a computer hacker may successfully create innovative malware that infiltrates, steals and destroys private information systems effectively, and is wholly harmful to the other parties affected by it.

It is impossible for me to end this book on such a negative topic as criminal, destructive creativity, so I will flip back to the bright side of the coin, by referring to "wise humanizing creativity" as discussed by educators [97]. Wise humanizing creativity "is creativity guided by ethical action, meaning it is mindful of its

Fig. 20.2 Two sides of the possibility coin

consequences and is empowering, offering … shared hope for the future" ([103], p. 228). Walsh and colleagues plead for a reduction in and deviation from the competitive mentality that pervades most education and business systems and argue for nurturing contexts through action, play, and possibility thinking. This book supports this plea. I add my voice and beg readers to be aware of the long-range impacts of their creative output, and vigilant about its impact on Mother Nature and society as a whole. (See Fig. 20.2 that illustrates the light and dark side of the Possibility Coin.)

20.9 Finally…

Being creative is very easy. You are born with this talent. You will easily recognize it in young children. Their ability to fantasize and solve problems, using old tools for new problems and facing old problems with new tools, is not a concern or stumbling block for them. They come up with solutions and novel ways to address issues without much effort. Unfortunately, quick fixes, instant solutions and the one-right-answer mentality are drilled into us early in life. It feels good to be praised at home and at school for getting the answer "right". So, we are taught to stop searching and move to the next problem/question (especially in tests and examinations where there is a time limit on your efforts). Therefore you can rest assured that you have the inherent ability to be creative. Your challenge is not really to find new intelligences, but to nurture and develop the multiple intelligences you already have, and to hone those intelligences you regard as important to your life, your future career, performance or business success. More importantly, as creative genii, inventors and creative business leaders, we need to relearn to expect the unexpected, to be comfortable with not knowing, being uninformed, or ignorant of areas outside of our field of expertise, and invest in learning. Perhaps when it comes to building CiQ, the most important future skill is the willingness to fail fast, be agile and resilient, and

accept other's mistakes to find best practices and alternative solutions for the betterment of all of humankind. Above all, we need to embrace highly positive, benign possibility thinking.

What if all humans were to achieve their full creative potential asgenii?
Wouldn't that be a smart, bright future!

CREATiViTY LABORatory

Activity I: Puzzles, Role-Playing Games, and Playful Mental Challenges

Find time to playboard games, cards, join an acting class or engage in drama or plays (or simply watch) and find ways to bringplay into your workplace, even if only during breaks. Bring CATAN or other board games to work/class. Download some brain training games from sites like Luminoso. JUST PLAY. Go to the park and watch people play. Buy a kite and try it out. Learn to juggle some balls. You will be amazed at the fun that follows the initial frustration. For guidance, find an online tutorial or YouTube video.

Activity II: Do you Get out and about Enough? Here's a Little Test…

Water lilies double in area every 24 h. At the beginning of summer there is one water lily on the lake. It takes 60 days for the lake to become completely covered with water lilies. On which day is the lake half covered?

Activity III: Fishbowl Drawing Exercise

Find a pen, pencil, fineliner or filtpen you really enjoy drawing with. Then, as first step, fill the round bowl (in Fig. 20.3 or draw your own) with a mom, a dad and a baby fish. Now fill a rectangular fish bowl with a whole school of salt-water fish and some water plants. Add a shipwreck or other underwater item that grabs your imagination. Do not give up on yourself. If you think you cannot draw, ask Google Images to provide a few images you can copy. Or find a child's colouring in book or clipart you can copy by hand.

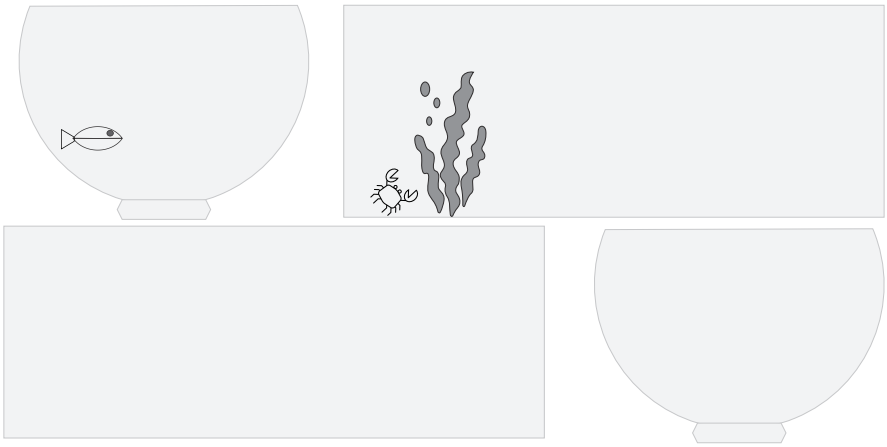

Fig. 20.3 Fishbowl hand drawing exercise

Next, take a complex, intricate object from your office or house (say a kettle, an ornament or figurine). Try to break it down into a whole series of simple graphic forms, i.e. circles, triangles, squares, etc.). Try to draw a simplistic form of that object in the empty rectangle. Now think of your favourite activity (e.g. swimming, dancing, skipping, riding, walking, or diving). In the empty round bowl (Fig. 20.3), imagine and draw a new ornament, by combining your deconstructed object and your favourite activity. Exercise your creative mental muscles and release your inner genii.

The End

Answer to Activity II: fifty nine days, as the day before the very last day, the pond will be half full. By doubling, on day sixty, the pond will be fully covered.

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