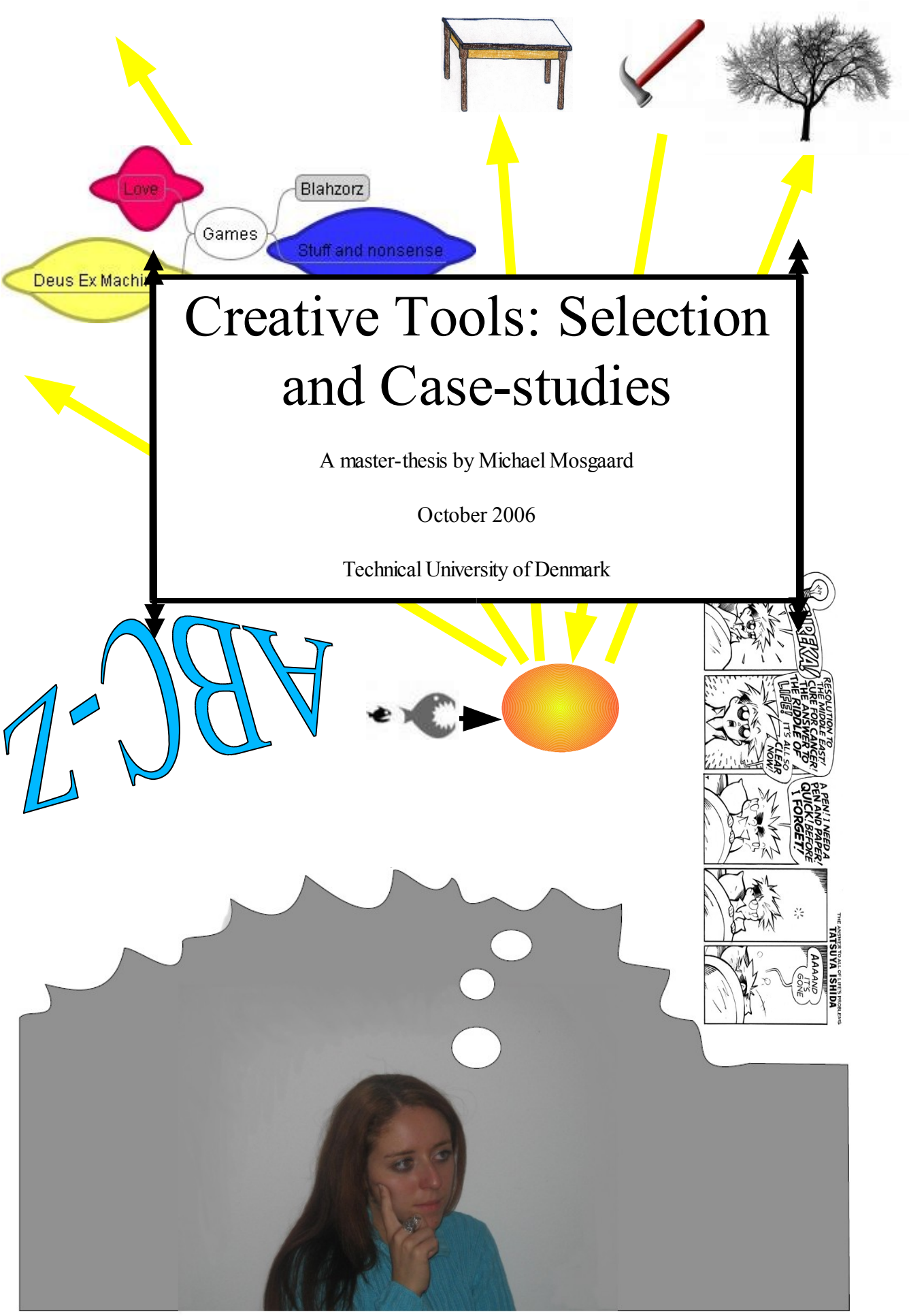


Creative Tools: Selection and Case-studies

A master-thesis by Michael Mosgaard

October 2006

Technical University of Denmark

Preface

This project and report is the completion of my master-thesis at the Technical University of Denmark. It is set to 30 ECTS points and ran from the 1st of March 2006 to the 1st of October 2006.

Writing a master-thesis has been a rewarding and illuminating experience. It has taught me many things, both about the field of creativity, and about myself and the world around me. I therefore look back on this project with satisfaction, happy that it is done, and happier still that I have learnt so much from it.

Acknowledgements

I would like to thank the following persons for their assistance, guidance or all-round help and support, however small it may have seemed:

My supervisor Victor Vidal, for his support, guidance, reminders and confidence in me.

The various people who graciously contributed as case-studies: Agneta Hytten, Nina Grove, Oessur Mohr, the people at InnLink – Allan, Emil, Christian, Gil, JP & Mikkel, the attendants at the Musica Art workshop, and the members of PolyTechnical Fantasy Dome - who are too numerous to list here.

The kind people at IMM.

My family, who supported me throughout the project, in particular my father who enrolled me at the DTU when I had no idea of what a civil engineer did. It is only towards the end of my education that I realised how right he was in doing so.

All my friends at DTU, CafÉ and PFD in particular, without whom I would most likely not have persevered.

The members of the Jademoon online guild - Sai, Tor, Tek, Zaph, Kirs, Tess, Epig, Elt, Onyx, Kiry, Nate, Mal and all the lurkers ;)

Michael Andreas Mosgaard

Copenhagen, 1st of October, 2006

Abstract

Creativity is helpful in a vast range of situations, both large and small, yet as a trait it is generally poorly understood and inadequately used, particularly by people and groups unaccustomed to accepting that they can benefit from creativity.

One option for furthering creativity and benefit from it is to use a range of methods to boost and strengthen the creative processes in a group or individual. A facilitator is generally recommended to help groups operate efficiently together, this facilitator will then attempt to guide the dynamics and processes of the group throughout its work.

This report examines creativity as a process that can be strengthened through the use of the right tools. It presents a range of different models whose purpose is to assist in the selection of the right tool so that it matches the preferences of a particular group or individual. A model is developed for the specific purpose of aiding a facilitator in the selection of the right tools that can help strengthen then creative processes of a group, and a number of case-studies are described to illustrate the use of these selection models. Various other models relevant to the facilitation of groups are also presented.

Finally the benefits and weaknesses of the models for selection is discussed, and the various case-studies that was run are concluded upon.

Table of Contents.

Project Purpose

This project has as objective to investigate the basis for selecting and applying Creative Tools (specific procedures designed to stimulate creativity) by a facilitator (the role of someone who guides a group of people towards a specific goal) to a group, so that the selected Creative Tool(s) is suitable for the mentality of the people in the group.
The product that this project seeks to provide is a range of models, that a facilitator can use as guidelines to determine the preferences of a group or individual for specific Creative Tools.

This report is designed to be read by someone working with, or interested in, the facilitation of groups, particularly groups involved in a Creative Problem Solving (CPS) process. The CPS process is a description for an approach to solving problems which have no well-defined solution that can be discovered by methodical means.

This project is a result of a Master thesis at the Technical University of Denmark (DTU). While the concepts it illustrates can be applied to a broad range of people, the approach to the problem statement is a methodical one involving both theoretical and practical aspects, as benefits a master-thesis at a technical university.

The contents of this report is as follows:

- Chapter I contains the background and introduction to the project and to creativity. It describes four individual people and one group who can be characterised as creative and illustrates the form that their creativity takes.

- Chapter II describes three models usable for selection of Creative Tools, one of these created as part of this project, and several models that describe other concepts related to facilitation.

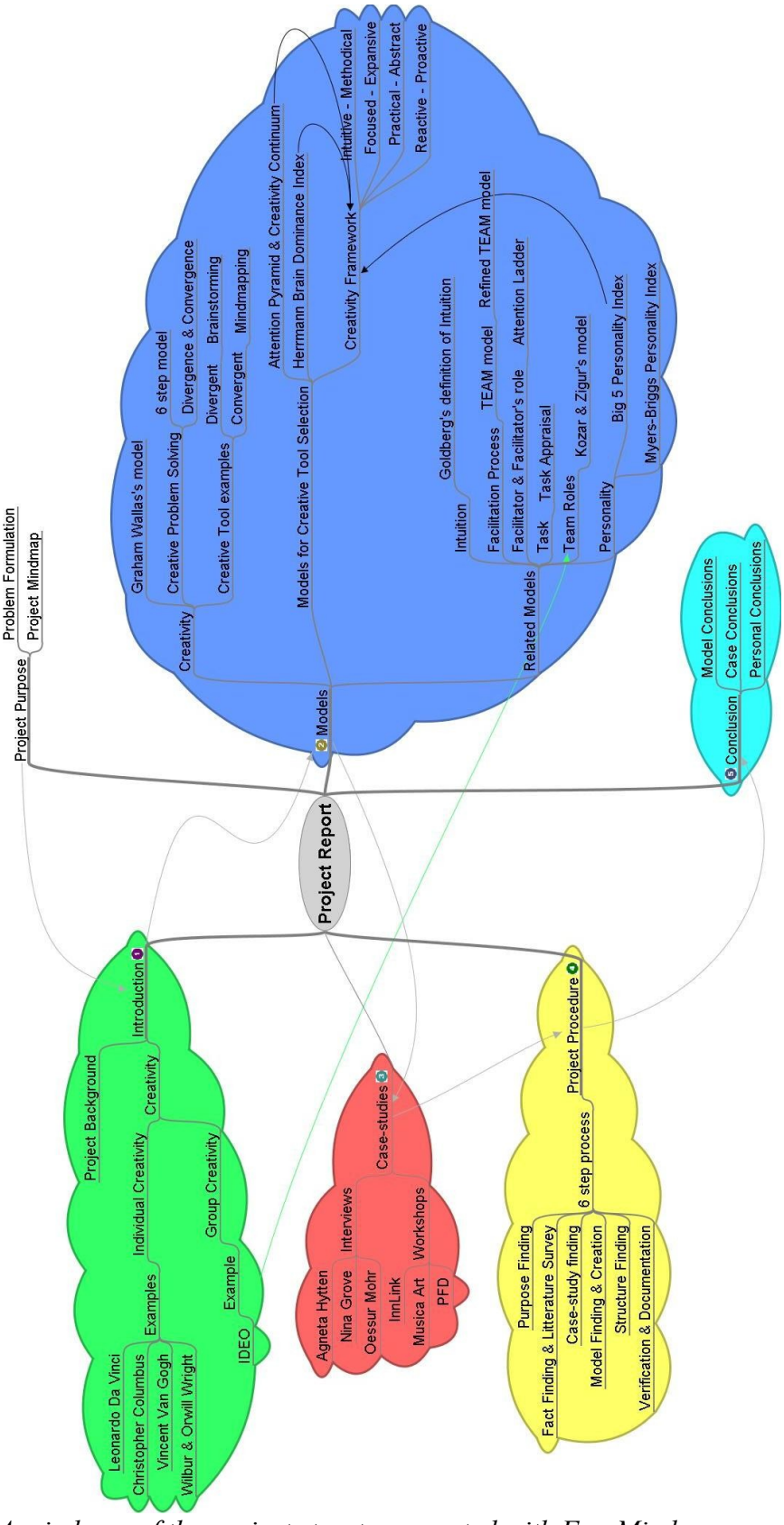
- Chapter III illustrates six case-studies, three interviews and three group workshops, which were run as part of the project and which investigate the elements involved in the Creative Problem Solving process and verify the use of select models for the selection of Creative Tools.

- Chapter IV relates how the projects process and how it was carried out.

- Chapter V contains a discussion about the project and what it has produced.

The chapter contents are illustrated by the following Mindmap (Mindmaps are a way of graphically displaying concepts in a non-linear manner, see further Chapter II)

There are many different elements involved in facilitation of groups. This project is focused on the selection and application of Creative Tools. Other elements will be introduced and discussed, but the case-studies that were examined in this project had selection and application of Creative Tools as focus.



A mindmap of the project structure created with FreeMind

Wordlist & Definitions

This wordlist contains a list of terms or words that require clarification or explanation.

Team – Group.
The words Team and Group are used interchargeably in this report, while acknowledging that there are differences between them.

Technique – Method
These two terms, Technique and Method, are used interchargeably to describe the same thing, the process of a Creative Tool.

Workshop – Session
Similarly, the terms Workshop and Session are both used to described a continous time frame wherein a facilitator is facilitating one or more participants.

DTU – TUD
The Technical University of Denmark (TUD) is abreviated DTU in danish (for Danmarks Tekniske Universitet). The abreviation DTU is used throughout this report.

The reason for this mixing of terms is to ensure better readability throughout the report.

Chapter I: Introduction

Creativity is a concept that encompasses many things and many people. Most people only associate the word “creative” with artists, inventors, outlandish thinkers or such, and rarely think of themselves as creative. But creativity is an element of everyone's daily life, whether we realise it or not. Very few problems or situations faced by people who do not think of themselves as creative can be solved completely in a non-creative manner. Most often, non-linear and non-rational thinking will be needed to solve problems in daily life, both great and small.

There are no equations for how to raise a child for instance, nor are there formulas for proposing marriage, nor models for selecting a hobby, nor schematics for how to comfort a friend, etc.
All such problems are approached and solved in a creative manner. Creativity have to provide a suggestion for a solution based on information and understanding that would be inadequate for a methodical and rational approach. In this way, creativity is a part of everyone's life as a means of approaching situations whose complexity would defeat a contemporary methodical approach.

But creativity is rarely taught. Few schools indeed have “Creativity” as part of their standard curriculum. For all its uses in daily life, creative thinking remains something that is learnt outside the school.

This limitation in the educational system ensures that the people undertaking studies for higher levels of educations are accustomed to reject creativity and think in a standardized, methodical and formulaic way. Such a way of thinking might be excellent for solving problems theoretically on paper, but more often than not it falls short of preparing the student for the life outside the classroom.
What might appear to be a trivial task, the building of a simple bridge for instance, can turn out to be a herculean undertaking when unexpected non-standard elements begin to enter the problem. For a bridge building civil engineer, this could be labour disagreements, difficulties with material deliveries, differences between the map of the construction site and the real site, misunderstandings or inadequacies in the contracts, and so forth. Not even a bridge building civil engineer, no matter how well-developed his or her methodical and rational thinking might be, can live without creativity.

The same applies to many similar individuals who possess an education or background that focuses on rational and methodical thinking. Being unaccustomed to using creativity correctly (or at all) can hamper methodical people significantly.

For this reason, there exists Creative Tools. A Creative Tool is the description for a procedure that is meant to boost the creativity of a user. Applicable to many different aspects of problem-solving, Creative Tools are most commonly found in the management sector and in facilitation of group meetings.
A current limitation of Creative Tools is that there is little dedicated research that focus on which Creative Tool should be selected for a given situation or for a specific group.[29] This report examines various models for creativity and gives a suggestion for a model that can be used to guide the selection of which Creative Tool is most suited for a group or individual.

Creativity is a nebulous word. Having a firm idea of what is meant by “creativity” helps give a solid understanding of what Creative Tools work with.

Creativity

We can ask ourselves: What is creativity ? And who are creative people ?

Creativity is an attribute we apply to human beings, and depending on who it is applied to and who applies it, it can mean a vast number of things. People such as Jung [21] or Myers [33] have described the human mind and the human personality, and Altshuller [2][3] or Osborn [34] have developed tools and methods that allows people that use them to improve their creative thinking. One option for describing what creativity is, is to use the concept of Storytelling.

Storytelling as a concept is the realisation that communication between people often takes the form of stories that both the person talking and the person listening can relate to. By using stories, it is possible to put communication into a context that illuminates and illustrates the concept, thus making it easier to comprehend. [9]
In some ways, Storytelling is a model. By giving an association that can be related to, even if it takes up hundreds or thousands of words, storytelling fulfils the purpose of a model: To transfer information. Unlike mathematical models, this information might be imprecise, since words can have different meanings for different people, and the meaning of words can change over time as well. But as of yet, there is no mathematical formula for what creativity is. So words will have to suffice as a description.

So, in order to illustrate a possible answer to the question “What is creativity ?” through the use of Storytelling, four historic cases will be described. These are the cases of Leonardo Da Vinci, Christopher Columbus, Vincent Van Gogh, and Wilbur & Orville Wright.

Leonardo Da Vinci [30][38]

Portrait in red chalk, 1512-1515. Widely accepted as a self-portrait of Leonardo.

In the year 1481, a letter was brought to the de facto Duke of Milan, Ludovico Sforza. This was a letter of self-recommendation, sent from Florence by a man called Leonardo Da Vinci. In it, he lists his abilities and offers his services. According to the letter, Leonardo is well-versed in many fields, both artistically but particularly militarily. Numerous suggestions and ideas are detailed in the letter, from fortifications to cannons, which the feuding italian city-states would have good use for. The last part of the letter describes Leonardo's expertise within the artistic fields and suggests a commemorative bronze statue to be created in memory of Ludovico's father.

The recommendation must have been accepted, because the next record there exists of Leonardo describes his part of the work on a altar in Milan. Leonardo stayed in Milan for the next 18 years, until the city was invaded by the French and the Duke was driven from his throne. During Leonardo's time in Milan he would create several masterpieces, and would leave descriptive notes for a horde of different ideas and projects.
After he had to leave Milan, Leonardo peddled back and forth between numerous cities in northern Italy offering his diverse talents to a just as diverse assortment of rulers. In 1517 he accepted an offer from Francis I of France to become “Royal Painter, -architect and -engineer”. During the travelling period he would also create several masterpieces, the most prominent of which is the Mona Lisa, painted between 1504 and 1507. During this time, he would also study many different fields such as mathematics, geometry, the flight of the birds, the possibilities of a flying machine and the anatomy of the heart. In each field he would leave a wealth of ideas, Leonardo was a practically oriented person, notes left over from him describe the myriad of different creations he envisioned for one purpose or another. Many sketches are preserved showing such diverse concepts as a hand-propelled tank, a study of the anatomy of the human skull, numerous churches and statues, a low-lying fortification built to resist cannonballs, flying machines, and much more.

Sadly, one of the aspects of Leonardo is also that while he had an incredibly diversity, he also possessed a corresponding lack of ability to focus on any one task for a longer period of time. His first commissioned work, an alter tablet for the St. Bernard chapel in the governmental palace was never completed. Indeed, there is little indication that Leonardo ever started working on it, despite having received payment in advance. Inexplicably, it seemed like Leonardo had left his first major independent work ahead of time. It would not be the first time, few of Leonardo’s concepts saw the light of day.

Regardless, at the mention of the word “Genius”, we automatically picture a person like Leonardo. His many diverse ideas in a wide assortment of different fields, plus his brilliant paintings, created a cultural concept of a genius. Indeed, the term “Renaissance Man” may well have its origins in the world's perception of Leonardo. A Renaissance Man is understood to be a person with varied and diverse interests, combining many different fields, both professionally and recreationally, in an effort to broaden personal horizons. It should be noted that Leonardo did not work alone. Especially in his later period he had multiple apprentices, as was customary for artists and masters of different fields. To what degree these apprentices helped or gave inspiration to Leonardo is debated.

Leonardo Da Vinci died in 1519 in Ambiose, France. Popular legend would have it that he was so beloved and respected by King Francis I that he died in the liege's arms. But like much about Leonardo's personal life, this seems to have been a myth created around his person at a later stage, Francis I was nowhere near Ambiose when Leonardo died. He might have been buried in the St. Florentine church but, like many of his works, his grave has been lost in time.

Leonardo left few, but very impressive works as a legacy. But perhaps his biggest contribution to society as a whole, is the concept of the creative genius. A person who is capable of conceiving of a wide variety of different ideas, blending and merging aspects from many different places to synthesise new solutions and new approaches to problems. Diversity, is the hallmark of Leonardo Da Vinci, and of our understanding of what a creative person is.

Christopher Columbus [11]

Conjectural apperance of Christopher Columbus

Though archaeological discoveries in Newfoundland have disputed Christopher Columbus's status as the discoverer of America, the world still sees him as being the person who paved the way for colonization of the Americas by the Europeans. To the detriment of the American natives. Columbus's achievement was reached after years of work trying to convince potential backers amongst the royal houses in Europe that his idea was feasible. And afterwards, a hazardous journey across the Atlantic to prove the validity of his claim.

When we picture Columbus captaining his 3 ships across the ocean, we do not immediately associate the word "Creative" with him to the degree that we do with Leonardo Da Vinci. And yet, Columbus possessed one of the characteristics that can be associated with a creative personality: He derived an idea that was foreign to the world he lived in, and he took steps to implement that idea. Columbus, though he was ridiculed by his contemporaries and meet fierce resistance to his ideas, was nevertheless able to persevere through persistence and belief in the validity of his idea. And when he had made his discovery, such was his belief that he refused to acknowledge that it was not China or Japan that he had reached.

In the 15th century, Europeans had limited knowledge of the world outside of Europe. Only a few people such as pioneering Portuguese traders or merchants could claim knowledge of the wider world. Knowledge of the trade routes and sea-lanes that allowed travel were closely kept secrets, deliberately restricted to monopolise the trade. Concepts such as the Silk Road were not actual roads, but rather the general path that goods were slowly moved along as it was sold and resold from merchant to merchant before reaching Europe.

Overland travel was hazardous, but often less so than travel by ship. Ships, especially if they went too far from shore, had a distressing habit of being caught in storms or uncharted waters and coming to a tragic end. And yet maritime navigation was progressing all the time. Ships were getting bigger and sturdier, navigators were getting bolder and the rich profit from a ship that returned to port loaded with exotic goods was prompting more people to invest in trade by sea.

It is into this background that Columbus steps. Born the son of a wool merchant in Genoa, the young Columbus learnt nautical navigation and seamanship as a sailor on-board merchant ships in the Mediterranean Sea. Records of his early years are speculative, but modern historians do know that he appears in 1484 at the court of Johan II, nephew of Henry the Navigator, and the king of Portugal. And it is here that Columbus presents an offer of some curiosity to the king's court.

Portuguese ships had been sailing south along the coast of Africa in an attempt to find a way by sea to the rich eastern lands. The recent rise of the Ottoman Empire and the fall of Constantinople, had made overland trade with the Far East neigh on impossible. Columbus offers the king of Portugal an alternative route: Instead of sailing around the African continent, the extent of which was unknown

in 1484, he proposed to sail west across the Atlantic and reach Asian in less than a month. Columbus's offer was heard, and was then presented to a team of navigators and mathematicians who were to establish the validity of his claim and the calculations Columbus backed it up with. At that time it was generally accepted amongst intellectuals, sailors and navigators that the earth was round, the calculations done by Eratosthenes in the 3rd century BC being accepted as correct (which they were). Ptolemy had proposed a world map where the distance from Europe to Asia across the Atlantic ocean amounted to 20,000 km [11], which even under the most favourable of conditions, were considered an impossible distance to sail across the open sea. Columbus, wilfully or not, had fudged his own calculations in an effort to shorten the distance considerably, and make the Atlantic crossable, at least on paper.

The Portuguese commission recommended that Johan II refused Columbus, claiming that they "… found Christopher Columbus's words empty, since they built on pure fantasy…"[11]. Rejected, Columbus packed his meagre belongings and embarked on a ship bound for Spain, to peddle his ideas to the court of Castile. Spain was swept up in a war against the Iberian moors and had plenty of expenses to meet as part of the conflict.
Arriving in early 1486, Columbus was meet with the same reaction as he had been in Portugal: Vague interest and a commission that would evaluate his work. Contrary to the Portuguese commission, the Spanish one was more politically motivated and less reliant on fact. No formal declaration was ever made from the Spanish commission, but Columbus heard enough to convince him that the commission was hostile to his idea. But Columbus was kept on retainer at the Spanish court, a modest and irregular salary was paid to him by Queen Isabella, possibly to keep him from selling his expertise to other nations. Despite this, Columbus's brother Bartholomew was sent to England and France to present the case there. There was no interest though.
Granada, the last bastion of the Moors on the Iberian mainland, would fall to the Spaniards in January 1492, but Columbus was on his way out of Spain by then, having grown wearing of waiting for a chance that never came. What happens next is a matter of speculation. Historians know that Columbus visited Queen Isabella's confessor, Brother Juan Perez, and that the monk then hurried to the court to urge the Queen to accept Columbus's proposal. What Columbus told or showed Brother Juan Perez is unknown. Speculation abound as to what sort of proof Columbus could have presented that he had not earlier showed either Johan II or either of the two evaluating commissions.
Regardless, his fortunes were now on the rise, and in a display of recklessness, Columbus not only asked for backing and funding from the royal court, but also began making exceedingly high demands on what his reward would be in the case of success. After an initial refusal, Columbus was called back and his demands were accepted, 3 ships would be provided, and Christopher Columbus could set sail across the Atlantic.

The rest, as the saying goes, is history. After a successful first journey, Columbus would mismanage and misconduct the colonies he established. He made three more journeys, each a greater failure than the last, and was eventually shipped to Spain in chains, having fallen afoul of political intrigue and his own inability to administer Spanish possessions in the Americas. Christopher Columbus died on May 20th 1506, all but forgotten by the world. He left behind him a legacy of riddles, secrets and controversy.

To this day, there is speculation if Columbus had a map or not, and if so, how he had acquired it.

Remains of Columbus's diary survive to this day, but it has been altered several times, possibly as a result of the running legal battles after his death. There is also his stubborn insistence on having reached Asia and not a new world, and his expectation of finding primitive natives (he loaded cheap glass jewellery, small bells, mirrors, and other types of goods traded with the African natives) when in fact China and Japan were known from Marco Polo as extremely advanced realms with a powerful military.

These puzzling factors make Columbus a difficult individual to relate to. Was he an reckless dreamer with an unshakeable faith in himself ? Or was he a calculating schemer who had acquired some form of secret knowledge that he sought to exploit ? Regardless, his determination and persistence during the years he sought royal backing, in the face of adversity and ridicule, would change the world. We may not think of Columbus as a creative individual, and indeed, determination is hardly a trait that is associated with creativity. And yet, if one is to be a successful creative person, then determination plays an important factor. All the creativity and ingenuity in the world is little good if every single idea that a person might get is brushed away with the thought that "Its not doable" or "I can't do that". Columbus's brilliance lie not in the fact that he reached the Americas, but that he set sail in the first place.

Columbus is by far the only person whose determination and persistence can be used exemplary, there are many other people both past and present who can be used in such a way. But Columbus is one whose actions irrevocably changed the world and the path of history. Had Columbus not stepped onto the scene with his bold ideas, it is difficult to say what might have happened instead. A fair assumption would be to think that instead of Columbus, some other dedicated individual would have accomplished what he did, by design or accident. But in such case, we would have spoken of this unnamed individual in much the same way we speak of Columbus, and we would have emphasises the same qualities in him that we do in Columbus: Dedication and determination to implement an idea.

Vincent Van Gogh [37][39]

Vincent Van Gogh. Self-portrait, 1887

53,9 million US dollars. It is the price that the painting *Irises* by Van Gogh was sold for in 1990 at Sothebys, the acclaimed auction house. The second most expensive painting ever sold, also by Van Gogh, went for 83,2 million US dollars. These exorbitant sums of money are indicative of the wonder and marvel by which Van Gogh's paintings are held by the world today. Surely, one would think, Vincent Van Gogh must have been highly inspired and creative in a manner that ordinary people cannot fathom, if he were to create works of art that would one day command such mind-boggling prices.

Born the eldest son of a Dutch preacher in 1853. Vincent Van Gogh's early life
revolved around work in an art gallery and eventually his desire to become a member of the clergy. Encouraged by his father, he studied theology at Amsterdam but failed to complete his studies.
Trying to find a position for his son, Vincent's father sent him to the coal mines of Borinage as an assistant to the local preacher. In this squalid place, Van Gogh witnessed the poverty and close-knit family structure of the improvised coal miner families. Being assistant preacher could hardly be an easy job in such a place, and Van Gogh mistakenly began to share in the squalor of the coal miners, denying himself the necessities of life in an effort to win admiration through self-sacrifice. His efforts were not appreciated by his superiors in the clergy though, nor by the coal miners themselves, and he was eventually dismissed from his position in 1880. During his stay in Borinage, he had begun to draw.

Art was hardly something that Van Gogh came to easily. Though he drifted towards drawing naturally, he approached it with the same aggressive passion and fervour that he had approached preaching for the coal miners. He moved to The Hague, and later to Brussels, where he briefly tried to find the courage to apply to the Royal Academy of Art. However, he did not carry through with an application, and was left to languish in the burgeoning suburbs of Brussels, trying to find his feet amongst the artistic community. He became very dependent financially upon his younger brother Theo Van Gogh, who was employed in an art gallery, and would provide him with money and encouragement. Theo Van Gogh saw potential in his elder brother. He encouraged and supported Vincent's attempts to become a professional painter. Throughout their lives they kept up an extended letter correspondence, which is largely preserved and forms the foundation for what is known about Vincent Van Gogh as a person.

During his early artistic years, Van Gogh received little in the way of artistic training or tuition. His drawing skills were mostly practiced via a number of self-study books, and a brief meeting with his cousin-in-law Anton Mauve, a professional painter with a stormy temper, who encouraged him to experiment with colours and paints. He admired impressionist painters of the time and recognized Monet and Rembrandt as great painters.

Yet for all his initial lack of uniqueness in the artistic field, Van Gogh developed a style that became his very own. Being unbound by any formal tuition, he developed a style of art where the

painting, through its colours and style, intrinsically shows what sort of emotions the painter himself was feeling when he was creating it. The term “expressionism” did not come into being until after Van Gogh's death, but his works would be a great source of inspiration for the expressionist movement.

Success came slowly, if at all. He was seen as something of a local lunatic wherever he stayed, his insistence on squalid clothing and demeanour marking him out as a strange and eccentric personality.

Vincent Van Gogh was mentally ill, and debate as to the exate nature of his illness is still going on. Some have theorised [4] that his illness was the source of his artistic talents, others the opposite, that his passionate talent and overwork brought on his mental imbalance.
In 1888 he cut off half of his own ear in a fit of madness. Though he continued to paint, his condition deteriorated and he committed himself to an asylum in Provence. Here he would paint some of his greatest masterpieces in-between bouts of suicidal disorders. Finally, in 1890, after numerous suicide attempts, Vincent Van Gogh inflicted a fatal wound on himself by shooting himself in the chest with a revolver. He died 2 days later.

Though several sources praised his work in the early 1890s, Van Gogh could hardly call himself a financial success. His brother had to continually support him with money. Many of his paintings were bartered for food or lodgings, and he only ever sold one painting for cash, for the sum of 400 francs, not an inconsequential sum at the time. After his death, many of his works that he had donated to friends or traded for food or other services were destroyed or lost, their owners not realising that the strange and different paintings would sky-rocket in worth some years later. Van Gogh’s fame is also a result of the aggressive campaigning his sister-in-law did after his death to promote his works.

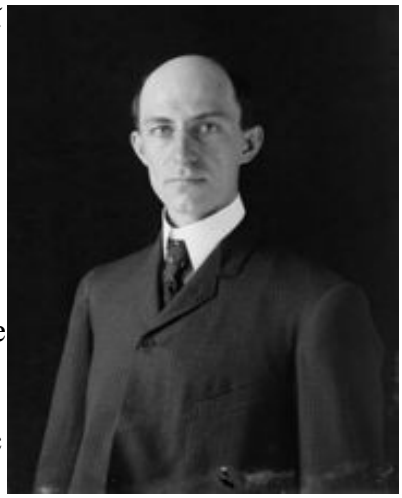
Mentally unstable or not, Van Gogh became one of the forerunner of expressionism, the school of art that encourages the artist to use the artwork to express an inner feeling by exaggerating aspects such as colours or composition. An example of expressionism is Edward Munch and his painting “The Scream”.

Van Gogh was unburdened by artistic theory or tuition, he painted according to what made sense to him, what he felt was correct, what appeared to be right in his eyes. This is the creative genius of Vincent Van Gogh. He did not reason himself towards a conclusion or solution to how he should paint, rather he performed small experiments, observed other painters, and developed his style according to what he believed was right. This intuition characterizes his creative process. As far as creativity goes, Van Gogh was unlimited. Or rather, only limited by himself, and not by any outside influence. And this intuitive approach allowed him to usher in a new artistic movement, and to become a painter known around the world.

The Wright Brothers [32]

Orville Wright

When Orville Wright and Wilbur Wright launched their *Flyer 1* amid the dunes of Kittyhawk on the 17th of December 1903 and became the first to fly a practical heavier-than-air machine, it was a result of a long and arduous process that had involved research, lab experiments, field tests, analysis, trials, and also quite a bit of creativity. ”Inventors” the world have called the Wright Brothers. And what are inventors, if not creative ? Just like Columbus needed to challenge the established world-order, that the Atlantic Ocean was too vast to cross, so the Wright Brothers needed to challenge the belief that no technical device could enable mankind to fly controlled flight.



Wilbur Wright

But the means by which they approached this was far different from those of Columbus. And they were not the only ones in pursuit of the dream of flight. The Wright Brothers used data and prior experiments by many of their contemporaries to establish the foundation for their own flying machine. But when they found that this data did not match up with what they themselves discovered through the use of a wind-tunnel, they rejected it in favour of their own.

The Wright Brothers owned and operated a bicycle shop, and their experience with balance and mechanics gave them an underlying knowledge and hands-on approach that benefited them greatly as inventors. From experimentation with their own kites and gliders, and examination of the available literature, they concluded that the primary problem in building a practical airplane lay in the control system.

Hopeful aviators such as Lillenthal [32] had shown that a correctly built wing was capable of generating sufficient lift to support flight. But they had not developed a control system that could control the flight. Lillenthal, who used acrobatic movements to balance himself in flight and was considered one of the premier experimentors and researchers into gliding, crashed to his death in 1896 when he misjudged a balancing move. The Wright Brothers initially used Lillenthal’s research as basis for their own wings, up until the point where they found that his numbers were in error and they began to build up their own formulas and tables for the relation between a wing’s curvature and the lift it would generate.

The Wright Brothers, like countless other aviation enthusiasts before them, looked at nature’s flyers, the birds, for inspiration. Research into the works of Sir George Cayley and Étienne Marey's photographical work Animal Mechanisms gave them the impression that there was little reason why a man-made machine should not be capable of achieving flight similar to that of the birds. Said Wilbur Wright: “If the bird’s wings could sustain it through the air without the use of any muscular effort, we did not see why man could not be sustained by the same means.” [32]

Contemporaries such as Langley, Chanute and Lillenthal had unlocked the secret of the curved wing as generating lift, but the Wrights were surprised to find that nobody had given any thought to the basic problem of how to effectively control a plane. Some competitors in the race to get into the

air, such as Langley and Maxim, built their machines around the concept that human skill was inadequate for maintaining balance, and thus sought to build balance and stability into the machine itself. While Lillenthal tried to use acrobatic movements on behalf of the pilot to balance a plane in flight, much like a line-dancer with a balance pole would constantly shift her balance around a centre-point.
Observing buzzards in the field, the Wrights noted that the birds, if overturned by the wind, could regain their posture by slightly twisting their wing tips. This seemed to them a more promising solution than acrobatics, to have the pilot control a system that would twist, or warp, the wings to allow control, similar to that of the birds. The problem then became one of building a device light and strong enough to flex the wing.
Since the lightbulb had already been invented, one can easily imagine a lighted bulb appearing over the head of Wilbur Wright in July 1899, when he was absent-mindedly playing with a narrow cardboard box, and realised that the tips of the wing itself could be twisted, much like cardboard. This idea lead to the concept of" wing-wrapping", which the Wrights patented later, as a system of control.

First experimenting with gliders and kites to familiarize themselves with the concept of flying, that utilized their wing-wrapping method of control, the Wrights quickly observed that their control-system required more than just moveable wing-tips to be completely controllable. Adding first an elevator to their unmanned kite, the Wright brothers began to make short leaps and glides with themselves on-board and in control of the glider. Puzzled by numerous small crashes and near-accidents that resulted when the glider began to "slip" sideways, the two inventors eventually added a rudder to their glider. the last crucial component required to control the yaw of the plane.

On their first powered plane, dubbed simply *Flyer 1*, Wilbur Wright flew 39 meters in just 12 seconds. A deceptively simple achievement, since their unpowered glides had taken them further and had lasted longer. But it was the first flight by a heavier-than-air craft that had landed at the same level that it had taken off from. Two creative inventors had accomplished what people had dreamed of for untold centuries.

The case of the Wright brothers show that to be creative also involves progressive development and methodical research. The Wrights were not the only people dealing with the problem of practical aviation, nor were they the most well-suited people to solve the problem. Langly had the resources of the Smithsonian backing him up, as well as funding from the United States Army, Canute had a well-established team of thinkers and experimenters that had been trying out gliders since 1896. And yet, the race to the skies was won by the bishop's inventive sons. Were they merely lucky ? Hardly. The Wrights didn't happen upon their system of control by pure chance. A great deal of research first had to be carried out to understand the problem they faced, then thinking up a possible solution, then verification of the validity of the proposed idea, then numerous experiments to field test the concept, then revision of the concept, or complete scrapping of it, more experimentation, and then finally success. And this process was repeated many times for each of the sub-problems that the Wrights faced in their search for a practical airplane.
The creativity of the Wright brothers lie in the methodical process and their keen analytical deduction of what the problem essentially was. Had they not understood the problem to the degree which they did, it is doubtful they would ever have developed the solution that they did.

Recognition came slowly to the Wrights. At first few people believed that they had indeed accomplished their momentous feat, particularly the sponsors who had backed Langley's failed project, or numerous aviators in France who were beginning experiments of their own. Two more versions of the Wright Flyer were built, with the Flyer III being the most successful and used by the Wrights in a number of record setting flights. Despite their initial success, and the patenting of their control system, the Wrights fell behind in the business aspects of launching an airplane industry. Competitors such as Curtis were quick to copy their invention, despite the patent, and legal issues bogged down the Wrights so that they lost the technological edge in building planes.

Building and flying airplanes have progressed much since 1903, yet for all the advanced electronics and computers that planes possess, it is still the precision touch of the pilot's hands on the control stick that determines the movements of the plane. In much the same way as if he was balancing a bicycle.
Before the Wright Brothers, nobody did anything fundamentally right in aviation, after the Wright Brothers, nobody has done anything fundamentally different

Summation

The 4 people illustrated above give us an idea of how a creative individual can be described.
A creative individual is one who could be…
As diverse as Leonardo Da Vinci,
As determined as Christopher Columbus,
As intuitive as Vincent Van Gogh,
As methodical as the Wright Brothers.

Thus, by associating a concept with a story, a person, or anything else we can relate to, we can form a picture of that concept.

The four cases describe people who have become world-renowned, their achievements or the myths surrounding them having become part of everyday culture.

But is it even possible for a single person to encompass all the qualities associated with the 4 cases above ? Da Vinci, Columbus, Van Gogh, the Wrights, all possessed exemplary qualities, and it is hard to imagine anyone combining the same level of all these qualities as the illustrated cases. Certainly at the same time, since some of these aspects are opposites of each other. Being both as diverse and scatterbrained as Leonardo while at the same time being as focused and single-minded as Columbus seems to be an impossibility.

But these cases illustrate single persons, or in the case of the Wrights, two very close and similarly minded people. What if one were to take Leonardo, Columbus, Van Gogh and the Wrights and put them together in a group ? If they were able to work together productively, what might they not accomplish ?
In this respect, a creative person does not need to encompass all the qualities of the people illustrated above, if he can find a matching person or persons who is able to complement him.

Alternatively, if the different aspects that a person requires can be brought to the surface at the right time, the same result might be achieved. If a single person could be:
As diverse as Leonardo Da Vinci when diversity is required,
As determined as Christopher Columbus when determination is required,
As intuitive as Vincent Van Gogh when intuition is required,
As methodical as the Wright Brothers when methodology is required,
the result might be similar to having put four different people who possessed each quality together.

Group Creativity

The four examples illustrate personal or individual creativity. The different aspects that can form the foundation for creativity. Another foundation lies in the interaction between people. Though the individual members in a group might not themselves be geniuses or fantastically inventive, the dynamics and relationships between the members of a group might spur the group as a whole towards creativity.

Some of the great inventors of the world had a skilled team to back them up. Thomas Edison, the acclaimed inventor of the light bulb, had 14 assistants in his workshop. “Edison is really a collective noun and means the work of many men.” said Francis Jehl, one of the assistants of Edison.
A more recent example is IDEO, a design company formed in 1991 with the purpose of assisting clients with innovating. [23]

IDEO

Tom Kelly, General Manager at IDEO describes some of the key components of IDEO's success.[23] One of these components is what Kelly identifies as a “hot team”. Several elements that make up a hot team are identified, ranging from such diverse items such as morale, environment, and the roles within the team.
Kelly describes some of the different characters and their roles within the hot team structure that IDEO uses. The examples that Kelly presents are all derived directly from people within the structure of the IDEO company. The examples from IDEO are therefore practical rather than theoretical in nature. Eight characters are illustrated by Kelly:

<u>The Visionary</u>
The person that fills this role is the one that gives the overall direction that the team moves in. As the name suggests, it is a person who is able to derive a vision and impart that vision to the team. Kelly uses the term “elder statesman” and suggests that it is the enthusiasm of the visionary for his goal that is passed on to the other members of the team and enables them to maintain the drive towards an overall goal.

<u>The Troubleshooter</u>
“Problem-solver” is another way that Kelly describes this character role. A person who is able to cut out deadwood, optimize procedures, and get the job done, even though it might mean that a few toes are stepped on. The Troubleshooter is a role that is focused on fixing the problems that arise within a team or company. This requires both a willingness to change status quo as well as keen observational skills in order to spot when a situation is unsatisfactory and should be changed.

<u>The Iconoclast</u>
The Iconoclast is the role for the person who is always at odds with the established system, with what is common and habitual. A challenger to the status quo. In this respect the character might mirror the troubleshooter in that they're both capable of presenting different and unaccepted ideas or concepts. Contrary views spurs different thinking and different ideas, and generates debate. Though Kelly does not mention it directly, care must surely be taken regarding this role so that all members

of the team understand that the iconoclast opposes a viewpoint for the sake of generating more and better ideas, and not for the sake of the opposition itself, which would be destructive.
In his description, Kelly also describes how their Iconoclast is able to spot business trends and suggest strategic alliances, obviously a trait of the person that the character role is derived from, but this might be better suited to the Visionary role, as it is that person who has the overall direction of the team in mind.

The Pulse Taker
An observer of details, personalities and humans, the Pulse Taker is the role that associates with people and observes people. Able to provide the team with observations and insights regarding human nature and how a person or group outside the team might relate to what the team is working on. The Pulse Taker brings a practical understanding of humanity to the team and allows for ideas and inspiration that are derived from the little nuances and details that characterize us all.

The Craftsman
A practically oriented person. The Craftsman is the role of the technician, the tinkerer, the person who is capable of providing the team with expertise in the practical aspect of creating something, be it a program, an electronic circuit board, a sheet of moulded metal or any such items that requires a practical application of craftsman skills.

The Technologist
Similar to the craftsman, but focused on the theoretical aspects of what the team is working with, the Technologist centres his or her role around knowing and understanding the different technical aspects within a field. This understanding means that the technologist is in a position to offer ideas for implementation, provide theoretical solutions, and give different insights into the deeper relationships between elements of a product than the team might otherwise have gotten.

The Entrepreneur
Described by Kelly as bright and innovative but not quite fitting into the mould of the company or situation he is in, the Entrepreneur is a person who is capable of understanding and stimulating the processes that exist within a group or a company. This sort of person would provide a group with new approaches, new enthusiasm and new alternatives. Whereas the Visionary maintains a look towards a higher goal, the Entrepreneur focuses on the day-to-day processes and procedures. But like the Visionary, the Entrepreneur is also capable of going off on his own. Kelly mentions that the Entrepreneur in IDEO temporarily went off to found a spin-off company.

The Cross-Dresser
Well-versed in many different fields and with an overview that allows him to make associations between the different elements in the fields, and is able to successfully combine these fields and make relationships between them. Though the Cross-Dresser might not have the skills or understanding of the individual fields that characterizes the craftsman or technologist, by having been exposed to several different fields, the Cross-Dresser is able to make connections and associations that would otherwise have eluded the team. In this way, the Cross-Dresser is able to stimulate the team by offering insights and alternatives from many different fields which might not otherwise have been considered.

These eight roles that Kelly introduces can broadly be divided into two categories, those that focus their attentions towards the team's *task*, and those that focus upon the team *itself*. The descriptions of the Craftsman, the Technologist, the Cross-Dresser and the Pulse Taker all empathise a focus on the task that the team is working towards. The craftsman applies his skills practically to a product or procedure, the Technologist does likewise for the theoretical aspects of the same product. The Cross-Dresser makes relations between the product and other similarities elsewhere, and the Pulse Taker makes relations between the product and its target audience or users.

The remaining four roles are those that are focused upon the team itself. The Visionary, the Troubleshooter, the Iconoclast and the Entrepreneur. These roles are those that stimulate and guide the team and its members, while not relating directly to the product that the team is working on. The Visionary provides the overall direction and guidance, the Iconoclast provides a counterpoint to this direction and to the efforts of the team in general, the Troubleshooter fixes problems that pop up and the Entrepreneur optimizes the processes that the team goes through.

Though a team might not have an explicit use for all eight of these roles, depending on what precisely the team's task is, it is important to note that roles from the two role-categories, those focused on the team's task and those focused on the team's process, are required. If the people that fill the roles in a team only fill those in the team's process, Visionary, Troubleshooter, Iconoclast & Entrepreneur, then the team will not be able to perform its task efficiently. Though the roles are filled that allows the team to function harmoniously over time, without filling the roles that focus on the team's product, the team will not be able to effectively create any sort of product.

Likewise for a team that fills the team task roles but none of the team process ones. Such a team would be able to make a product, but would lack overall guidance for their direction, the ability to fix problems regarding their team structure and process, and would be very static and unoriginal in terms of their evolution as a team. If a single product is all that is required of the team, this is all well and good, but teams are often kept together for longer than just a single project.

Each of the persons that fill the various roles above have opportunities for using creativity to perform better individually. But the way that the different roles relate to each other also allows for creativity for the team as a whole. For example a person in the Craftsman role would be able to gain further ideas by working with a person who fulfils the Cross-Dresser role, or a person in the Technologist role would be able to gain further insights towards his field by working with someone in the Pulse Taker role. These interactions is an example of group creativity, creative processes that exist between the members of a team, and as part of the relationship between team members who fulfil different roles.

The eight role examples from IDEO is just one possible way of describing the roles that exist in a team. In addition to illustrating how the individual roles contribute to the success of the team, they also illustrate how creativity can occur in the interaction between the various roles.

This description of creativity is but one of many. Several descriptions and models exist that attempt to give an answer to what creativity is and how it appears. A range of these models will be presented in the following chapter, and later on some of these models will be “field-tested” in practical case-studies.

Chapter II: Models

Models for Creativity

While the underlying physics of creativity are not yet understood, and most likely won't be until the tools available for measuring the brain are powerful enough to do so continuously in the most minute of details, it is still possible to observe and be aware of the creative process, both in one self and in others. In is in this way that most models for creativity are derived.

Wallas & *The Art of Thought*

One of the very first models for the process of creativity was developed by Graham Wallas. In his work *The Art of Thought*, published in 1926 [44], he describes creative insights and ideas as a 5 stage process:

1) Preparation
   Wherein the persons mind is focused upon the subject or problem, and the various aspects of the problem are acknowledged.

2) Incubation
   Wherein nothing external appears to be happening, but the problem and its context is being explored by the sub-consciousness

3) Intimation
   Wherein the person will consciously begin to feel the coming of an idea.

4) Illumination
   Wherein an idea will suddenly burst into the conscious awareness of the person.

5) Verification
   Wherein the idea is consciously examined, verified, and applied.

Wallas's model describes the process that happens for the individual when thinking creatively. This is a process that everyone goes through continuously. Ideas for solutions to problems as large as world-wide conflicts are processed and generated over a long time in the same manner that a person might quickly decide what to have for lunch. Some of these problems might have well-defined solutions and can be approached in a methodical manner, while others might lack structure, information, facts, or otherwise require a creative approach in order to find a solution. This creative approach can be stimulated by use of a method or procedure that encourages creativity. These methods are broadly called Creative Tools.

Convergence & Divergence

Psychologists in the early 1960s performed studies of creativity. Amongst other things, these studies postulated that creativity was not linked to intelligence as measured by Intelligence Quotient (IQ) tests. Open-ended tests showed that there was a general division of people into two types, those who excelled at formulaic problem solving (and consequently had a high IQ) but were weak in changing their perceptions in approaching a problem (lateral thinking), and those who had a significantly easier time perceiving problems from new angles or thinking up new relationships (high degree of lateral thinking), but weren't so good at structured problem solving (not so high IQ). These two types were called “convergent” and “divergent” respectively.

Liam Hudson [18] performed research that illustrates this separation in divergent and convergent, and how it is a preference, rather than an in-born attribute, and furthermore reliant on situation. Hudson presented British high school students with questions such as “What uses can you think of for a house brick ?” to identify their creativity mindset. He noted that the results paralleled the division that British schoolchildren were divided into from an early age, those taking the more scientific classes and those who favoured the art classes. The ones that had a scientific background leaned towards a converging mindset, while the ones that favoured the art backgrounds had a preference for divergent thinking. But presenting the students with new points of view from which to take the tests, telling them that they should answer as if they were an avant-garde artist or a conservative scientist for instance, showed that the students who had been classified as convergent could perform startlingly well divergently when answering from a divergent role.
This led to the identification that though people had preference for either convergent or divergent mindset though their upbringing, they were able to use either mindset as the situation demanded. This developed into a realisation that convergence and divergence were not only mind-types, but also situational phases that an individual would go through when thinking.

The phase that a person goes through when generating ideas is termed the divergent phase. After an idea has been generated, it is natural to instinctivly evaluate that idea in relation to what is known about the problem. An idea will be considered and determined to be good or bad, feasible or non-feasible, according to the information the person might have at hand. This process of evaluation is termed the convergence phase.

Creative Problem Solving

When creating methods or procedures, Creative Tools, to stimulate creativity, the divergent and convergent phases plays an important part. Solving problems in a creative manner requires a large pool of ideas from which to draw a single idea (brilliant or otherwise) for implementation, this means that the Creative Problem Solving (CPS) process benefits greatly from having both the divergent and the convergent phases in it. [8][35] So Creative Tools should be made or used in such a way that the CPS process contains both the divergent and convergent phase. This will allow both the generation of a large set of ideas, and the selection of the best idea for implementation.

Some of the rules for divergent thinking, as described by Vidal [40] are:

- Imagining, re frame and see issues from different perspectives
- Defer judgement, criticism or negativity kills the divergent process, be open to new experiences.
- Quantity breeds quality, to have good ideas you need lots of ideas
- Hitch-hiking is permitted, in this way a synergetic effect can be achieved
- Combine and modify ideas, in this way you can create many ideas
- Think in pictures, to create future scenarios you can even essay to simulate potential solutions.
- Stretch for ideas, imaging ideas beyond normal limits, and
- Do not be afraid to break paradigms, avoid destructive criticism, and add value to the challenged concept.

Like divergent thinking, Vidal describes a series of guidelines for convergent thinking:

- Be systematic, find structure and patterns in the set of produced ideas
- Develop ways to evaluate ideas, assess qualitative and quantitative measures of ideas.
- Do not be afraid of using intuition, this is the way how most important decisions are taken.
- Avoid quickly ruling out and area of consideration, take your time or better sleep on it.
- Avoid idea-killer views, try the impossible, do not be afraid to clash a wall it is not sure that the wall will always hold.
- Satisfy, do not expend too much time in looking for the optimal solution of an ill-structured multi-criteria problematic
- Use heuristics, use common sense and experience based rules, and
- Do not avoid but assess risk, does not mean being blind to risks, for serious consequences be sure to have a contingency plan.

These two phases are an intrinsic part of all creative problem solving processes, often occurring multiple times in a row, such that ideas are generated and evaluated, and based on the evaluation the ideas are refined or new ideas

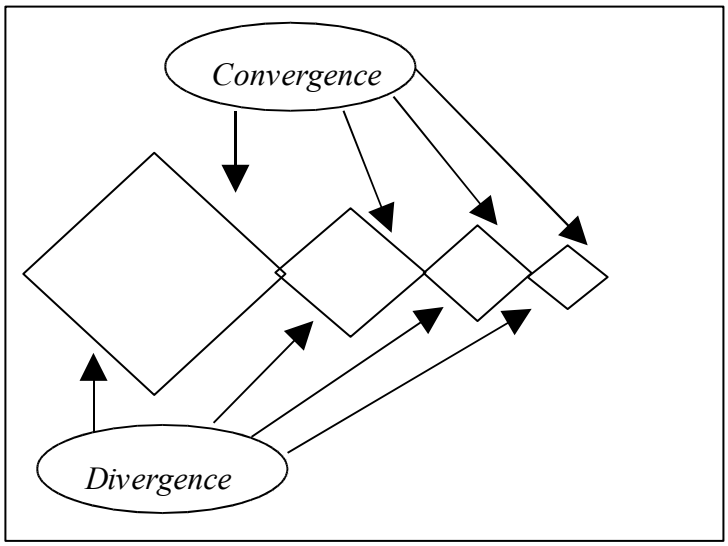


Figure 2-1: An illustration of the convergent-divergent process

generated, these are in turn evaluated anew, etc. The process can be visualised by a series of diamonds linked together. See Fig 2-1.

The overall creativity process that the divergent and convergent phases are part of, the CPS process, have been describes by a number of researches [43] though a 6-step model. This model is the result of several ideas and basic steps initially presented by Osborn [34] and since refined into models with 4, 5 or 6 steps.

The most general one is the 6-step model, here described according to Vidal [43], and aims at identifying a systematic approach in the Creative Problem Solving process. Each step contains a divergent and a convergent part.

1. **Mess Finding:**
   - Divergent: Broad problems, or messes, should be found. These are problematic situations that often have no easy answer.
   - Convergent: Establish an order of importance to the problems that have been found. Select one for further work.
2. **Fact Finding:**
   - Divergent: Collect as much information as possible about the situation. Collect all information and data that can be reached.
   - Convergent: Structure the information according to its importance and relevance to the situation. Identify the most important facts about the situation.
3. **Problem Finding:**
   - Divergent: Consider the different ways that the situation can be described, approach this from many different points of view and establish many difference specific problem formulations.
   - Convergent: Establish which of these problem descriptions describe the overall situation best.
4. **Idea Finding:**
   - Divergent: Develop ideas for the problem formulation. Seek options, alternatives and different approaches.
   - Convergent: Arrange the developed ideas and establish which of them might contain potential solutions within them. Select a few of the best ideas for further examination.
5. **Solution Finding:**
   - Divergent: Consider the selected ideas from different points of view, attempt to modify the solutions they suggest according to new relationships.
   - Convergent: Establish what the consequences for the different ideas are, assess the risks. Combine or select solutions to formulate an action plan for how to solve the problem.
6. **Acceptance Finding:**
   - Divergent: Generate ideas for implementation of the selected action plan. Expand upon these ideas to try and improve upon the implementation of the action plan.
   - Convergent: Develop a functional and practical way of implementing the action plan in the best way possible.

Each stage in the 6-step model has both the convergent and divergent phases in it. In order to utilize these two phases efficiently, Creative Tools can be employed such that a tool that assists in

divergence is used to strengthen the divergent phase, and a complimentary tool whose method is oriented towards convergence can be used to help converge towards specific ideas.

Creative Tool Examples

As examples of the tools used for divergent and convergent thinking, the tools Brainstorming and Mindmapping will be detailed here:

Brainstorming

In 1953, Alex F. Osborn published the book *"Applied Imagination: Principles and procedures of creative problem solving"*. Amongst the concepts in this work is that of Brainstorming as a tool for creativity.
Osborne identified that the education most people are provided with is focused on judgement. As soon as an idea is generated, it is immediately subject to judgement and evaluation, rather than use the idea as a jump-off point for further ideas. This limits and stifles creativity, so Osborn's solution was to develop a method that guided its users to stay in the idea generation phase, the divergent phase, for as long as possible.
This is accomplished by demanding of the users that they do not criticize or otherwise judge the ideas that they developed, but allow them to flow freely, under the realisation that one idea, though unusable, might contain the germ of a concept that forms a better idea.
The process that Brainstorming goes through is overall as follows:

- Factfinding
- Idea Generation
- Solution Search

The Fact finding phase is the preparatory one. In it, the problem to be examined is defined. Brainstorming is most suited to problems that have more than one solution, none of them "incorrect". As part of the Fact finding phase, enough information also needs to be collected so that the users of the Brainstorming have the information they require. It is not the purpose of the Brainstorming to delve deeper into the problem statement and answer unclear questions that might arise. Where possible, the users should have sufficient information that relevant ideas can be generated by relating the problem to other concepts or ideas that the users might be aware of.

The Idea Generation itself has four general rules to it:
Quantity over Quality
The participants in the Brainstorming session are encouraged to propose as many ideas as possible, rather than putting forth only "good" ideas or "well-thought out" ideas. Having a greater sum of ideas gives a greater chance that more of them will be a stepping stone for a truly remarkable idea. Later on, the ideas can be evaluated and refined.

No criticism allowed
This rule, one of the hallmarks of Brainstorming, is aimed at making the participants stay in the divergent phase for as long as possible. By encouraging participants not to pass judgement on ideas, an encouraging atmosphere can be developed such that participants do not feel restricted in what

they may present.

Unusual ideas encouraged
By welcoming unusual ideas, the Brainstorming process can get ideas from a broader spectrum that what might usually be the case. If the problem formulation is one that the participants are familiar with, then they may already have multiple ideas generated before the session. Once these ideas are exhausted, unusual ideas can provide not only a set of ideas that the participants might not have considered as viable for the problem, but also act as stepping stones towards further ideas by way of relationships with existing ideas or concepts.

Combine ideas to improve them
By associating new ideas with old ones, or combining concepts, new ideas might be developed through new relationships. An example would be combining the concepts telephone and computer, which could result in the internet as an idea.

The Solution Search phase is meant to be a time where the ideas that were generated are evaluated or refined. If necessary, a new Brainstorming can then be begun on the basis of the refined ideas. Note that though Osborn is aware of the importance of a convergence phase, he proposes no methods for how to conduct that phase in the manner that he does with the idea generation. Other Creative Tools can be used for this purpose, one of the more commonly used ones is Mind mapping.

Mind mapping

As its name suggests, the concept of Mind mapping is about putting the thoughts of the mind into a fashion where they can be read like a map. Maps are used for communicating concepts related to distance and travel, giving another person (or the original person) a chance to retrace a path at a later time. In a similar fashion, Mindmaps should be able to communicate the mental pattern that leads to an idea so that either the original person or another person can retrace the mental path later. This can be used in order to explore new areas that the original idea drew away from, it can be used to organize ideas and concepts in a non-linear fashion, it can be used in a mnemonic fashion, and so forth.
As a Creativity Tool, mind mapping can be used to complement Brainstorming such that the ideas that are generated during the divergent phase of the Brainstorming session can be organized and classified with a mind mapping technique as part of the convergent phase.

Tony Buzan [7] claims to be the originator of the modern mind mapping technique, though images arranged in a non-linear fashion have been used since much earlier. Buzan proposes that the brain does not scan a page in a linear fashion from top-left to bottom-right by nature, and that a non-linear arrangement of important pictures or keywords would better suit the reading and understanding process.
A mind map is structured around a single keyword or concept drawing. From that central point, lines or spokes radiate outwards to sub-concepts that are derived from the overall concept and illustrate some aspect of the original concept. Each of these sub-concepts can then have further sub-elements derived from them, and so on.

Buzan gives the following guidelines for creating a Mindmap [7]:

1. Start in the centre with an image of the topic, using at least 3 colours
2. *Use images, symbols, codes and dimensions throughout your Mind Map.*
3. Select key words and print using upper or lower case letters.
4. Each word/image must be alone and sitting on its own line.
5. *The lines must be connected, starting from the central image.* The central lines are thicker, organic and flowing, becoming thinner as they radiate out from the centre.
6. Make the lines the same length as the word/image.
7. *Use colours* – your own code – throughout the Mind Map.
8. Develop your own personal style of Mind Mapping.
9. *Use emphasis and show associations in your Mind Map.*
10. Keep the Mind Map clear by using radial hierarchy, numerical order or outlines to embrace your branches.

Mindmaps can be created by hand, taking form through whatever resources a user might have available, both as regards colours and materials, and also as regards drawing skills and skills in transferring a mental concept in physical imagery.
A number of software tools for the computer also exists to assist a user in creative Mindmaps, some of them free, many of them proprietary. One example of proprietary software is the MindGenius software.

To better establish which tools are suited for which phase and why, researchers such as McFadzean have developed models for the categorisation of Creative Tools. Two models are used in this project for the purpose of classifying Creative Tools. These are the Attention Pyramid and the Creativity Framework.

Attention Pyramid & Creativity Continuum

The first model that is used in this project to categorise groups and individuals is McFadzean's Group Attention Pyramid model [26] This model is composed of five heirarchical levels that each describes if a group is attentive to a particular aspect that influences the efficiency of the group. As the levels increase, the aspects get progressively deeper and more demanding to be aware of.

Attention Pyramid

The five levels of the Attention Pyramid are:

Level 1: Attention to Task
Level 2: Attention to the meeting Process
Level 3: Attention to team Development
Level 4: Attention to team Dynamics
Level 5: Attention to team Trust.

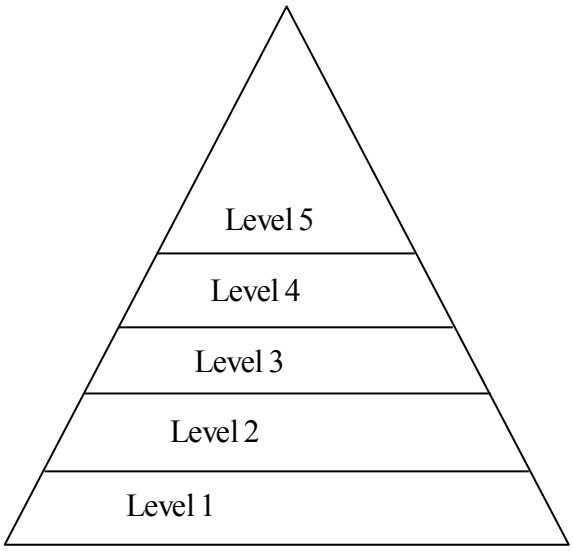


Figure 2-2: The Attention Pyramid

The Attention Pyramid is wholly meant for use on groups. It is constructed with teams within a company in mind. However, many Creative Tools are not restricted to use by teams, but can be used successfully by individuals as well to bolster their creative process. When facilitating for an individual, or when an individual seeks a Creative Tool to use, it would be beneficial to have a model that can guide the selection of which Creative Tool should be used.
However, McFadzean's Attention Pyramid can also be applied to individual persons, on the grounds that the aspect each level in the Attention Pyramid can be translated into a matching level for individuals.

Since this model is used throughout the cases in this project, a brief description of each level is given below along with a description of how each level can be related to single individuals as well as groups. A more detailed description and background for the model is given by McFadzean [26]

Level 1: Attention to Task
Groups require attention to the task presented to them, otherwise little will get accomplished by the group. This forms the basis for the first level of the Attention Pyramid. In a similar manner, individuals can be held to have high or low attention to a task presented to them. An individual who is attentive to a task will be disciplined and focused upon it, whereas someone who is not attentive to a task will be unwilling to dedicate themselves towards the task, possibly characterised as undisciplined.
This characterisation can be different for different tasks or aspects of an individuals existence. It is entirely possible for someone to very attentive to the tasks that their professional work involves, while at the same time possessing very little attention to tasks required or demanded of them by people outside their professional work.
For the purposes of the Attention Pyramid, the first level can thus be applied equally well to both

groups of people and individuals.

Level 2: Attention to Process
In the second level of attentiveness of groups, awareness is made of the process that individual tasks exists inside of. The Attention to team Process level is specifically oriented towards attention to schedules and meeting plans, adding the awareness that the topics discussed during a meeting exists as an overall part of the meeting, and that the meeting itself exists within a greater whole.
This can also be related to individuals, since an individual can also have awareness of the overall process that he or she operates within, or be lacking that awareness. In a similar manner to the group attention, a person who is Attentive to Process will be mindful of times, mindful of the requirements of different tasks and how they relate to each other, process congruence.

Level 3: Attention to Development
This level of attentiveness revolves around awareness of the development of the team. Groups of this level will not only be attentive to the task and process, but also of the requirements that the overall goal sets for the group, and if the group is capable of meeting those requirements. In particular it involves awareness of if it is necessary for the group to invite other participants in order to fill a void that the group members themselves cannot fulfil, or how the group can change itself in order to become more efficient.
This awareness of a bigger picture, awareness of necessary changes to live up to a goal can also be translated to the individual. Though it is not possible for an individual to alter himself to the degree that a group can make alterations in its composition, it is still possible for a single person to be aware of the requirements that a goal will make of him, and how he can improve himself in order to better accomplish that goal. For instance this could be a person who realises that he requires some specific knowledge that he does not possess, and striving to acquire that knowledge for himself.

Level 4: Attention to Dynamics
Called either Dynamics or Effectiveness, level 4 of the Attention Pyramid considers if the members of the group are aware of the relations between themselves and how this affects the productivity of the group. By being aware of this, the group is able to change the relations inside it in order to improve communication and productivity.
The essence of this level is that the group is able to change itself in relation to itself and its surroundings in order to improve its productivity. This can be translated to an individual person to awareness of what dynamics the individual goes through during the thinking process, and how these dynamics can be improved upon. This would be awareness of specific processes (for instance the divergent process) that is performed well by the individual as well as which are not. Awareness of the dynamics that the individual goes though therefore indicates if a single person is Attentive to Efficiency.

Level 5: Attention to Trust
The final level of the Attention Pyramid concerns itself with Trust. In this regard, Thrust is understood to be an awareness and acceptance of the emotions that the participants in the group have between each other. It includes awareness of elements such as presentation apprehensiveness, reluctance to participate in unfamiliar activities for fear of ridicule, difficulty of presenting ideas for fear of having the other group-members frown upon it, and so forth. If a group is aware of these elements, then it can better allow its members the freedom and support they need.

For a single individual, the concept of the Attention to Trust level is similar. A single person is affected by his or her emotional state just as a the members of a group are. A single person can be apprehensive about a new idea, reluctant to pursue an unfamiliar concept simply on account of it being unfamiliar, etc. Awareness of these hindrances will allow a person to overcome them. This person trusts himself. Thus, the fifth level of the Attention Pyramid, Attention to Trust, can also be used for evaluation of single individuals.

On these grounds, the Attention Pyramid is thus used to evaluate both groups and the individuals in this project.

Creativity Continuum

To relate the categorisation that the Attention Pyramid allows to Creative Tools, McFadzean illustrates a Creativity Continuum [29]. This Continuum is a categorisation of the Creative Tools according to if they are Paradigm Preserving, Paradigm Stretching or Paradigm Breaking.
Based upon work by Nagasundaram and Bostrom, the Creativity Continuum is a three category framework that describe the types of ideas that can be generated by using the Creative Tool associated with the category.

The three categories are described by McFadzean using Nagasundaram and Bostrom's classification:

Paradigm Preserving
"Where no new elements or relationships are introduced."
This categorisation deals with the situation where users are disinclined to attempt anything new or look beyond the horizons they can currently see. For various reasons, the members in a group can feel uncomfortable with using imagination, developing new and potentially radical concepts, or otherwise expressing or revealing themselves.
Paradigm Preserving tools are those that allow for this, and seek not to challenge participants to push themselves. Creative Tools in this category can be termed "safe". New ideas and associations can still be developed within the paradigm's that the participants relate to, though these ideas are likely to be evolutionary rather than revolutionary.

Paradigm Stretching
"Where either new elements are introduced or new relationships are conceived. In other words, the problem space or paradigm boundary is stretched to enable group members to consider something new."
Stretching the creativity paradigm deals with viewing a situation from a different angle, or introducing new elements that can be related to from the existing point of view. In this manner the ideas generated will be new, but the process of arriving at those ideas will share similarities to what is already known, thus Paradigm Stretching tools are "safer" than Paradigm Breaking ones, while still allowing more innovation and creativity that Paradigm Preserving ones.

Paradigm Breaking
"Where both new elements and new relationships are introduced. This occurs when the paradigm's boundary is completely broken by the participants."

The most innovative of the three categories are the Paradigm Breaking one. Here the participants are encouraged to “think outside the box” in ways that are as wild or radical as possible. By introducing new elements, and introducing new ways of looking at the relationships between new elements and old elements, a paradigm can be completely broken. Ideas derived from tools in this category are likely to be innovative, surprising, radical, and have elements in them that wouldn't normally appear within the field that ideas are being generated for. Revolutionary as opposed to evolutionary.

The Creativity Continuum is used in selection of the right Creative Tool to match the level of the group as categorised by the Attention Pyramid. Groups of level 3 or 4 are considered suitable for Paradigm Stretching tools, while only groups of level 5 are considered suitable for Paradigm Breaking tools. Groups of all levels should be able to utilize Paradigm Preserving tools. However, there is no further detailing of which of the many tools within a category that would be suitable, this is left for the facilitator to select based upon what goals the Creative Tools is meant to assist with.

A weakness of the Attention Pyramid for the purpose of selecting Creative Tools is that it is created with workgroups in a company in mind. There is therefore an assumption of a certain level of outside pressure on the group on reaching some sort of goal. If this pressure is missing, the group might develop differently than the Attention Pyramid would suggest. For instance it is possible for a group of people to know each other very well and trust each other, therefore be attentive to level 5 in the Attention Pyramid (Attention to Trust), but at the same time be so scatterbrained and undisciplined that they have trouble focusing on any particular task or time schedule, thus making them a level 0 or 1 group.
Such a situation is unlikely to occur in a company or other professional situation, but Creative Tools are meant for use by many different kinds of groups, be they company-groups, political groups, hobby-groups or such.

For these reasons the Attention Pyramid model and Creativity Continuum appears inadequate to completely describe which tool would be most suitable for use by any given group or individual. Though it gives a very good overview and indication of what general style of tools a group might be able to use, McFadzean herself states that *“Research, therefore, needs to be undertaken on how and by whom these techniques* (Creative Tools) *are best utilised.”* [29]

The Attention Pyramid is one element of a model that McFadzean calls the Attention Ladder. The ladder is a series of levels of attentiveness, awareness and requirements for both the goal of the group, the group itself, and the facilitator for the group. It is illustrated how a group should ensure that the level of the goal they have selected for themselves matches with the level of the group. And the facilitator should ensure that the level of facilitation that is provided matches that of the group. For instance a level 1 or 2 group requires different guidance from a facilitator than a level 4 or 5 one does. Thus the facilitator must be mindful that his own commitment is at a level where the group can relate to it.
Though beneficial to be aware of, the levels of facilitation required is not linked with the selection of a Creative Tool by McFadzean, but rather used to describe what the facilitator should focus on. For this reason, these elements of the Attention Ladder are not used in the case-examples of this project, though a description of the Attention Ladder model will appear later in this chapter.

Herrmann Brain Dominance Instrument

The Attention Pyramid and the Creativity Continuum allows for selection of Creative Tools based upon what the members of a group are ready to utilize. But the Attention Pyramid gives little indication of what sort of Creative Tools there might be preference for within the categories of Paradigm Preserving, Stretching and Breaking.
Groups who share the same levels of the Attention Pyramid are likely to be different in many respects. For instance a group of academic people who have worked together for a long time might be aware of levels 3 or 4 in the Attention Pyramid, but they will have a different preference for a group of non-academic people of the same level, such as a group of artists.
To complement the Attention Pyramid, a model for examining the preferences of people are used.

Ned Herrmann [16] developed a model called the Herrmann Brain Dominance Instrument (HBDI). This is a model for the thinking preferences of human beings, based on the duality of the brain and the differences between the right and left brain hemispheres. The HBDI is a quadrant system where each quadrant represents the level of a person's dominance towards a particular field. The quadrants are simply termed A,B,C and D. The A and B quadrants are reliant on the left side of the brain, and the C and D quadrants on the right side of the brain.
The **A quadrant** is understood as being the quadrant for logical preference, facts, analytical approaches and otherwise structured thinking.
The **B quadrant** is similar in that it concerns itself with a structured approach to the world, but unlike the A quadrant which is purely theoretical, the B quadrant is very practically oriented.
The **C quadrant** is the emotional and spiritual one, very oriented towards reality, but a different type of reality than A quadrant. People with a dominance in the C quadrant are those who focus upon the emotions in the people around them and in themselves.
Similar to the C quadrant in that it is based on the right hemisphere of the brain, the **D quadrant** concerns itself with abstractness and ideas. People with dominance in the D quadrant are those who are capable of seeing abstract ideas and thrive on the excitement of new ideas and variety.

A person is “scored” according to a questionnaire of 120 questions developed by Herrmann for the purpose of discovering which quadrants are dominant for a person. Depending on the answers, a person is rated on a scale of 1 to 3 for each

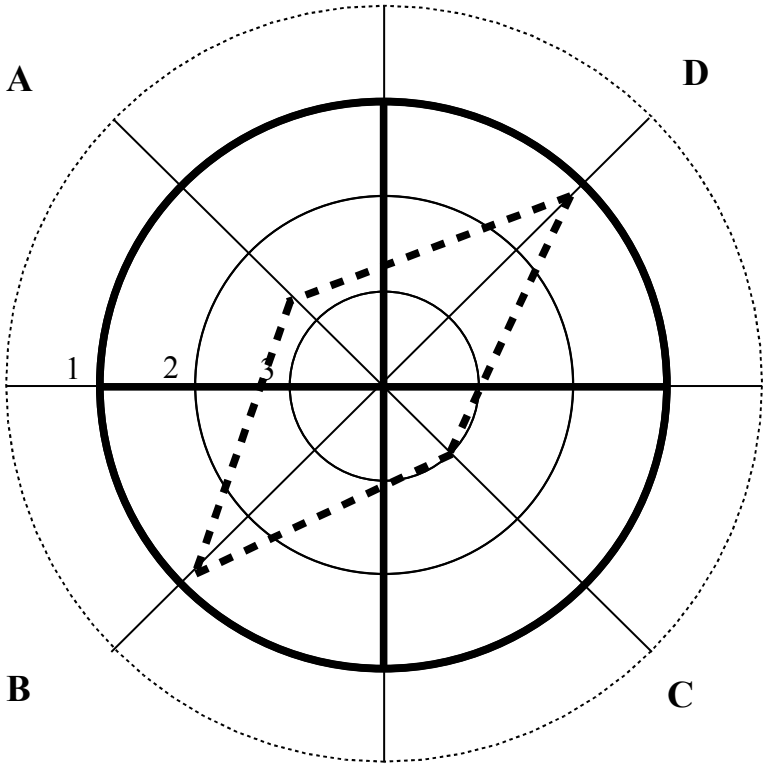


Figure 2-3: An example of the HBDI model. The dottet line represents a person with strong dominances in the B & D quadrants, and weak dominances in the A & C quadrants.

quadrant. With 1 representing high preference and dominance, and 3 representing low or very little dominance. It is possible for a person to have dominances in more than one quadrant, in fact Herrmann speculates that only 7% of the world population is single-dominant.

The HBDI delivers a good detailed answer to what preferences a person has for thinking. However, the HBDI is a very individually centred model. It can be applied on groups of people in such a way that comparisons can be made between their preferences according to the HBDI, but this requires a complete categorisation of all the members of the group. This categorisation can also be a lengthy affair, since each participant must answer a 120 point questionare, which must then be evaluated so that a categorisation can be made. Furthermore, the preferences themselves are not mutually exclusive, as seen by the high amount of people with more than one dominance. Therefore, making a correlation between a set of HBDI preferences and a single Creative Tool can be a difficult affair, since a Creative Tool, depending on its make-up and process, is likely to suit itself more to specific dominances that are in opposition to each other.
For instance, a person who is both B and D dominant in the HBDI would be someone who has preferences for thinking abstractly (D-dominant) and at the same time thinking in manners that are practically related to the physical world, to its limitations, requirements, and opportunities (B-dominant). But these two dominances are in opposition to each other. A process can either be practically or abstractly focused and oriented, but it is difficult to conceive of a process that is both at the same time. The HBDI allows for this sort of multi-dominance since it is possible for a person to use different dominances at different times, one might be used professionally and the other at other times. But for the purposes of selecting Creative Tools, no process that a Creative Tool might describe can be both practical and abstract at the same time.
This makes the HBDI a detailed, but ponderous model, for establishing creativity preferences.

Similar models have been developed by Miller [31] and Myers [33]. Miller's work centres around four styles, modifying, visioning, experimenting and exploring, and the Myer's-Briggs Type Indicator is based on the works of Carl Jung. These are but two more of the many different personality tests and classifications that exists. For this project though, focus was put on the HBDI and Big Five personality test (described in the following section).

Creativity Framework

On the basis of the HBDI model developed by Herrmann and the Attention Pyramid by McFadzean, a new model is developed for categorising the participants in a group such that it may be determined which Creative Tools that they might find preferable. Since this categorisation must be able to be accomplished with limited information and limited time on hand, Herrmann's model itself is unsuited, as it requires a large contribution on behalf of the participants (answering and evaluation of a 120 point questionare) to establish an effective categorisation.
The primary differences between this Creativity Framework and the Herrmann Brain Dominance Instrument is that the Creativity Framework is meant to be a loose and fluid guideline for which Creative Tool can be applied on a group or individual within a single aspect of that person's life, constructed on a very short notice. As opposed to the HBDI which is a specific description of a single person's mental preferences regarding their entire existence, and as the result of a lengthy process.

The overall idea of the HBDI, that people can have different preferences for how they think, is used as a basis for the Creativity Framework. It is established through correlation with the HBDI how a person's preferences for thinking can be categorised in a manner that relates to selection of Creative Tools.

The Creativity Framework is based upon two models for the preferences of the human mind. The first of these is the HBDI as described above, and the other is the “Big Five” personality traits [14]

Big 5 personality description

Several researches have contributed to this model over time and helped it evolved since 1936, here described according to Goldberg [14] The Big Five personality traits are a set of descriptions that indicate a person's preference for Neuroticism, Extraversion, Agreeableness, Conscientiousness and Openness to Experience.
Briefly, these are explained as:

Neuroticism – A tendency to easily experience unpleasant emotions such as anger, anxiety, depression, or vulnerability.
Extraversion – Energy, surgency, and the tendency to seek stimulation and the company of others
Agreeableness – A tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others.
Conscientiousness – A tendency to show self-discipline, act dutifully, and aim for achievement.
Openness to Experience – Appreciation for art, emotion, adventure, unusual ideas; imagination and curiosity.

The model works by scoring a person on a percentile basis on each of the 5 traits, with 50% being average. A high score indicates preference and tendency, a low score indicates no preference or preference for the opposite of the trait.
Neuroticism is neglected for the purpose of the Creativity Framework, since negative emotions do not directly affect creativity except where greater discomfort hinders the creative process. Furthermore, it cannot be the objective of Creative Tools to deal with negative emotions, this is best

left to others.

Otherwise, the 4 remaining traits are related to the Creativity Framework, as follows:

Reactive	Low scores give	***Extraversion***	High Scores give	***Proactive***
Focused		***Agreeableness***		***Expansive***
Intuitive		***Conscientiousness***		***Methodical***
Practical		***Openess to Experience***		***Abstract***

Table 2-4: The derived concepts from four elements of the Big 5 personality description. The table reads from centre to left/right.

From the division of the elements of the Big Five personality description, 4 pairs of dichotomies are established.
The Creativity Framework is composed of 4 bars with, each having two opposing elements, dichotomies, at their ends. Preferences for a particular element are then marked along the sliders. Each of the 4 different pairs of elements are there to provide an indication of which mental and creative preference a person or a group has. These dichotomies are shown in Fig 2-5

Figure 2-5: The four dichotomies of the Creativity Framework.

Intuitive - Methodical

The Intuitive – Methodical bar describes which preference that a group or person has for the manner in which they arrive at their ideas.
An Intuitive person would be similar to Van Gogh. Unreliant on any form of procedure or process, this person would be most comfortable when generating ideas spontaneously. He or she would arrive at a new idea through the same process that Wallas describes, but this process would happen without guidance of any sort. An Intuitive person, whether by instinct or by choice, allows his or her creativity to roam free.
In opposition to Intuition is Methodical preference. With a Methodical preference, a person drifts towards using a set procedure for thinking and idea generation. Progressing from one idea to the next through several iterations and sub-ideas in-between, a Methodical person generates ideas which are slowly refined and evolved over time. Each sub-idea need not be coherent or otherwise make sense, but it will be an intrinsic part of the "search" for the next step towards the final idea.

The time it takes for this to happen can vary greatly, but the process that happens from idea to idea is also that described by Wallas
These two preferences, intuitive and methodical, are mutually opposite. If a person feels most comfortable with gradually modifying an idea according to insights, input and reflection, then he will not have the same level of comfort with spontaneous bursts of creativity that an Intuitive person would have.

Using search space as an analogy to illustrate these two elements of the Creativity Framework, an Intuitive person would be able to make a great conceptual leap from one end of the search space to the other, irrespective of the space in-between, while a methodical person could arrive at the same end result only through a steady iteration of ideas.

Creative Tools can be suited for Intuitive or Methodical thinking depending on the procedure that they use. A tool which works by encouraging its users to think in a free-form and unrestricted manner that is not guided by a limit on the ideas would be best suited for users with intuitive preference. Whereas a method that focuses on iteratively going through a specific mental procedure will be preferred by users with a matching Methodical mindset.
As outlined in Chapter I, an intuitive person would be like Van Gogh, unrestricted by procedure and getting ideas in an almost random fashion until he finds something which he is pleased with. Contrary, the Wright brothers exemplify a methodical mindset. Though they had brief sparks of intuition that allowed them to progress forward. Their work was arranged and accomplished in a methodical manner. Initial ideas were found by set inspiration, be it looking at nature's way of accomplishing the goal, or seeking inspiration from other researchers, and these rough ideas were then continuously evolved, refined and tweaked until a concept was found that could be practically implemented.

Focused - Expansive

As the cases of Leonardo Da Vinci and Christopher Columbus show, people do not always have preference for completing the many ideas they get, or for getting other ideas than the one they're already pursuing. To reflect this, one slider in the Creativity Framework is divided between Focused and Expansive elements.
Expansive thinking is a preference for divergent thinking. Generating a limitless amount of ideas, often before the previous ones are fully thought out. An expansive thinker would be a person who could combine aspects from multiple fields together in the ideas that he got as well as generate a multitude of ideas from a single concept.
The antithesis of Expansive thinking is Focused thinking. A preference for converging. Like Columbus, who only had a single prime idea, but pursued it with reckless determination, a preference for Focused thinking means a person wants to complete the idea or concept he is already working with, focusing on this one particular subject until it has been worked to completion, and sometimes beyond that.
As part of his conclusion, Hudson found that the preference of his test subjects (British schoolchildren) was determined by the “role” that they had assumed. Since the Creativity Framework is meant to illustrate the preference of a person or group in one particular situation, the changing of preferences depending on situation such as Hudson illustrates does not become a problematic issue.

If the search space analogy is continued, these two elements would be illustrated by the spread of different ideas. Focused preference would mean that new ideas lie very close to each other, within the same narrow field. While Expansive preference can be illustrated by ideas generated that lie all over the space of potential ideas.

The different processes of diverging and converging are a central part of Creative Tools. Some tools are better suited for one process than the other. For instance, Picture Stimulation is a tool that works very well as a divergent tool, and is capable of providing many and different ideas, but offers little in the way of convergence towards an end result. To pick tools that are suited for the different processes, it helps to know which process a participant is most suited for. Though it might be necessary to select a tool that lies outside a participant's preference in order to accomplish something, having an idea of which process there is preference for enables tools to be selected that match what a person or group is most comfortable with, and thus has an easier time using.

Practical - Abstract

Herrmann describes a case-example about two people having a practical and abstract preference[16]. In this example, the two people in question are a music therapist and a military officer who have been tasked to find a solution to a problem. The colonel, practically oriented, tries to approach the problem from a methodical basis based on the information he has and the experience he possesses. But this fails to provide a solution, since the information he has about the problem is inadequate to provide a solution though his practical approach. The music therapist however, is able to see a solution, but her idea is so abstract that she cannot express it except by dancing it! Though dancing has no practical relevance to the problem at hand, she is able to associate key concepts between the problem statement and dancing so that a solution idea can be derived.
A similar example for the Practical element is presented by Victor Vidal [43] who, though a workshop with a group of inventors, found that their creative process was characterised by a focus on the practical and material. This limited their divergent phase, since the inventors were reluctant to contribute with an idea that were “too abstract”.

To take into account these two opposing elements, a slider in the Creativity Framework is divided between a preference for the Practical and a preference for the Abstract.

A Practical preference suggests that the ideas and concepts that a person derives are tied to the physical and material world. The idea might be tied to a specific object that the person holds in his hands or it might be related to the memory or mental image of something. Regardless of what it is precisely, the idea is derived, related and built upon this object or concept. A strong preference for the practical means that a person is more likely to associate and relate concepts that are close together or match each other physically. For instance designing air planes and designing windmills share some of the same physical concepts and physics, so these two fields share a similarity on the practical level.

An Abstract mindset is understood here to be one where the person is unbound by a relation to the physical world. An example could be a person who associates the solution to the problem of Airline Management with “the way a rose sings”. This makes no sense in a practical manner, since roses do

not sing, nor would any song, by roses or otherwise, relate to airline management in a practical manner. But associations can be made between subjects that are not directly related, and ideas can be derived from that. In that light the example will make sense. Because certain associations are tied to the concept of a rose, concepts such as love, harmony, gentleness, thorns, etc. And by building on these associations, (if a rose were to sing it might sing of love, it might sing in a gentle manner, etc.) a concept can be derived (for instance to manage an airline in a similar manner to a gardener who gently nurtures and lovingly tends a greenhouse of roses) that relates to the problem specification.

Continuing the search space analogy, Practical preference would mean that a person's creativity would be tied to a subset of the search space that relates to reality. Whereas an Abstract person would not have this relation, his ideas could be in a form that can make no sense when related to the physical world.

The Creative Tools that are tied to a specific object or concept are practically oriented. Though they might seek abstraction by trying to relate concepts which have no practical relation, the practical or abstract nature of the tool will depend on the process that they utilize. Linking a specific problem formulation with a specific object, picture or concept guides the creative process of the participants towards that element. Similar to the way that a person with a practical preference will seek to relate his ideas to a practical real world concept. For that reason, the tool will have a practical orientation. People with Practical preference will understand the way that the tool relates different topics that possess similarities.

Reactive - Proactive

Lastly, an indication of how willing the participants are to participate and if they are comfortable with accepting direction from an outside source that they are not familiar with is provided. This is termed Reactive – Proactive.
A Reactive person would be someone who has preference for only accepting what he thinks is right, or considers what he is familiar with, to be preferable to anything provided to him or advised him by an outside source. Such a person can be very difficult to motivate, often rejecting suggestions or ideas that he hasn't grown familiar with. On the other hand, he will also possess a willpower to drive his own ideas forward.
On the other end of the bar is the opposite of Reactive: Proactive. Such a person is comfortable with being guided by outside influences, even actively seeks them out, and is comfortable with being influenced and motivated towards new concepts. Such a person might even prefer letting others motivate him rather than seeking out what he himself might believe or think.
Regarding Creative Tools, a preference for Proactivity suggests that more advanced tools can be used. A Proactive participant would be more likely to feel comfortable with using tools that break paradigms and require new ways of thinking which are unfamiliar to the participant. And a Reactive participant would feel most comfortable with tools that preserve paradigms and doesn't challenge the way that the participant operates.

The categorisations on the four bars of the Creativity Framework are intended to be fluid in nature. Being exposed to new situations, being in a bad mood, or otherwise being affected negatively or positively will affect a person's preferences. Particularly the Reactive – Proactive categorisation is

affected by these things. Also, it should be noted that the Creativity Framework is not meant to provide an absolute classification that persists throughout the person's life. Different preferences might exist for different aspects of a person's life. For instance it is entirely possible for a person to have been trained and educated to perform his work in a methodical, practical and focused manner -and have preferences for this as well- but that he in his free time participates in a hobby where he has entirely different preferences.

To determine a person's preferences requires a number of observations on behalf of a facilitator, or very high honesty and insight on behalf of the participant(s). The Creativity Framework is constructed in such a manner that neither element on each slider is more prestigious or better than the other. Nevertheless, people associate differently, and it is possible someone might perceive for instance Focused preference to be demeaning, and answer accordingly. If possible, the facilitator should observe the participants of the group, perhaps during a warm-up exercise, to establish an idea of which preferences they might have. The participants themselves can also be questioned about their preferences, though this carries the risk of wrong answers being given. The method used for observation and categorisation in this project have been to question the participants about their background and about their work process. Based upon the answers given, particularly regarding the work process, the preferences of the participant(s) can be determined according to the Creativity Framework.

Preferences & Creative Tools

When the preferences of a group or individual have been established, Creative Tools can be selected accordingly. Table 2-6 below gives a quick overview of a range of Creative Tools and which preferences they are suited for. A detailed run-down on the specific procedure of each tool is given elsewhere [25][17], but a brief description of why some of the tools match a specific preference will be given here. In the cases where a Creative Tool is marked as suited for both elements in a row means that the Creative Tool can be suited for either preference depending on how precisely the tool is used.
It should be noted that numerous variations of the different tools exists. Creative Tools are altered an changed in their set-up and procedure according to what a facilitator might feel would suit the situation at hand. The procedures that the categorisation here are based upon are the Creative Tools as they are described in Appendix A.

Method name	*Intuitive*	*Methodolical*	*Focused*	*Expansive*	*Practical*	*Abstract*
Paradigme Preserving Tools						
Brainstorming		**X**		**X**	**X**	
Brainwriting		**X**	**X**		**X**	
Mindmapping		**X**	**X**		**X**	
Force Field Analysis		**X**		**X**	**X**	
Hexagons		**X**		**X**	**X**	
5W+H		**X**	**X**		**X**	
Morphological Analysis		**X**		**X**	**X**	
Word Diamond		**X**		**X**	**X**	
Sticky Dots		**X**	**X**		**X**	
Parardigme Stretching Tools						
Object Stimulation		**X**		**X**	**X**	
Metaphors	**X**		**X**	**X**	**X**	
Rolestorming	**X**			**X**		**X**
Heuristic Ideation Technique	**X**			**X**	**X**	
Reversal	**X**			**X**	**X**	
Assumption Reversal	**X**			**X**		**X**
Pugh Matrix		**X**	**X**		**X**	
Nominal Group Evaluation		**X**	**X**		**X**	
Paradigme Breaking Tools						
Wishful Thinking	**X**			**X**		**X**
Rich Pictures	**X**			**X**	**X**	**X**
Picture Stimulation	**X**			**X**	**X**	**X**
Imagining	**X**			**X**		**X**
Wildest Ideas	**X**			**X**		**X**

Table 2-6: An overview of which preferences a range of Creative Tools match.

Brainstorming:
By encouraging a set iterative procedure with the ideas represented by notes or Post-It stickers, Brainstorming is methodical and practical method. More often than not, the free-form brainstorming where all ideas are welcome is expansive in nature.

Mind mapping:
A more focused form of Brainstorming. Mind mapping shares similarities with Brainstorming, but is intended to be a tool that provides depth and focus to existing concepts, rather than generate new ideas through the linking of existing ideas. By asking participants to think about the object of the mind mapping in a progressive manner, it is a methodical and practical tool.

Force Field Analysis (FFA):
FFA works by examining the best possible and worst possible scenarios. In this respect it is methodical, since participants are guided towards dividing ideas according to which scenario the ideas fit, and are steered towards these two scenarios. The Practical nature of the tool is also due to this focus on two very specific scenarios.
The participants are required to use imagination to picture the scenarios, sometimes in ways that are unrelated to the current situation. Participants have a free hand in describing the best and worst scenarios and the tool therefore leans towards the expansive preference.

Object Stimulation:
By asking the participants to relate to a specific object that they have selected and describing this in detail, Object Stimulation becomes a Methodical and Practical method. Since it allows participants to broaden their ideas by relating to something that would initially seem unrelated to the problem specification, it is also an Expansive method.

Metaphors:
Metaphors is an Intuitive method, on account of the way the participants are asked to select a metaphor and describe it. Similar to, but essentially different from, Object Stimulation. The difference lies in that in the Metaphors method the participants are asked to relate to a broad concept, instead of an object ("Nature" is a concept for instance, while "Hammer" is an object). This allows the participants to generate ideas which are only limited by what they themselves understand about the concept. Depending on the metaphor selected, the tool can be used in a Focused or Expansive manner. The relation to a specific concept gives Metaphors a Practical inclination.

Role storming:
With Role storming, the participants are allowed to choose anyone person or being, fictional or otherwise, and associate that character with the problem. Role storming is Intuitive, Expansive, and Abstract. Intuitive since the participants are allowed to pick any approach or character, Expansive since it is meant to generate ideas, and Abstract since the ideas generated will likely not make direct practical sense (For instance, deriving from the character Superman the concept that "Superman can smash a meteor away from Earth" is unlikely to be practically related to the problem of Airline Management)

Reversal & Assumption Reversal:
The Reversal method and its sister method Assumption Reversal are both intuitively and expansively oriented. They both rely on generating ideas without giving the participants a specific guide for which ideas should be generated or how. Though Reversal asks the participants to specifically start from a reversed problem statement, the following idea generation is not guided by any method, and so is reliant on the intuitive creativity of the participants.
With its attachement to a specific problem statement and its reversed counterpart as basis for the idea generation, Reversal is practically oriented. Assumption Reversal however, is more abstract in its procedure, since it encourages the participants to generate a set of assumptions and reversed assumptions that might not be related practically to the problem statement. The encouragement of abstract concepts is what makes Assumption Reversal abstract in nature.

Picture Stimulation:
Presenting the participants with a picture, and asking them to generate ideas based upon the concepts that they perceive in the picture facilitates an intuitive mindset. There is no set guideline or procedure to tell a participant how to perform this association. Since ideas are generated without a specific end-goal in mind, the method is Expansive in nature. Depending on the picture that is used, the method can be either practical or abstract. In particular, if a picture is chosen that illustrate concepts which the participants have a strong relationship with the method can be used in a practical manner. However, the nature of the Picture Stimulation method is generally Abstract.

Wildest Ideas:
The Wildest Ideas method works by prompting the participants to generate the wildest ideas they can imagine, breaking rules, laws, natural order, customs and good sense. By asking the participants to develop wild ideas that can have little to no relation to the practical world, the Wildest Ideas method is Intuitive, Expansive and Abstract in its composition.

These models, the Creativity Framework and the Attention Pyramid, are used in this project to empathise the selection of Creative Tools. But there are other elements in the field of creativity that are worth mentioning. Selection of Creative Tools is only a subset of the processes that make up group work, facilitation of groups and creative stimulation.
Regarding facilitation of creativity groups, in addition to the element of selecting Creative Tools, there is also the facilitation process as a workshop is conducted or a group is guided, the facilitator and his or her specific role, and the task of the group itself.
These elements will here be described, though as it is remarked in the problem-formulation, they did not serve as the focus point for the case-studies in this project.

The facilitation process

A description of the facilitation process that a facilitator goes through when facilitating for creativity groups can be based on the works of Briggs & Nunamaker [6]. They developed a model and theory (called the TEAM theory, for Team Economics of Attention Management) that describes how the fundamental level of any group involves the mutually exclusive processes of accessing information, deliberating that information, and exchanging it. These processes are exclusive on the presumption that if the group is exchanging information then it cannot at the same time be accessing new information or deliberating found information. An upper limit to the group's productivity is given by how much attention the members of the group are willing to spend on the group in total, under the assumption that attention is a limited resource.

Having a goal upon which the group can focus allows for directed efficiency, since more of the work accomplished by the members of the group will be in the direction of the determined goal. Briggs & Nunamaker also illustrate how distractions can detract from the productivity of the group, by sapping the attention that the participants have and direct it towards elements that are not directly related to the goal of the group. The facilitator is given the task of ensuring that the attention of the group is focused towards the goal, and that internal and external distractions are kept to a minimum. Briggs and Nunamaker have developed their TEAM model on the basis of groups within a company. See figure 2-7 for Briggs & Nunamakers model.

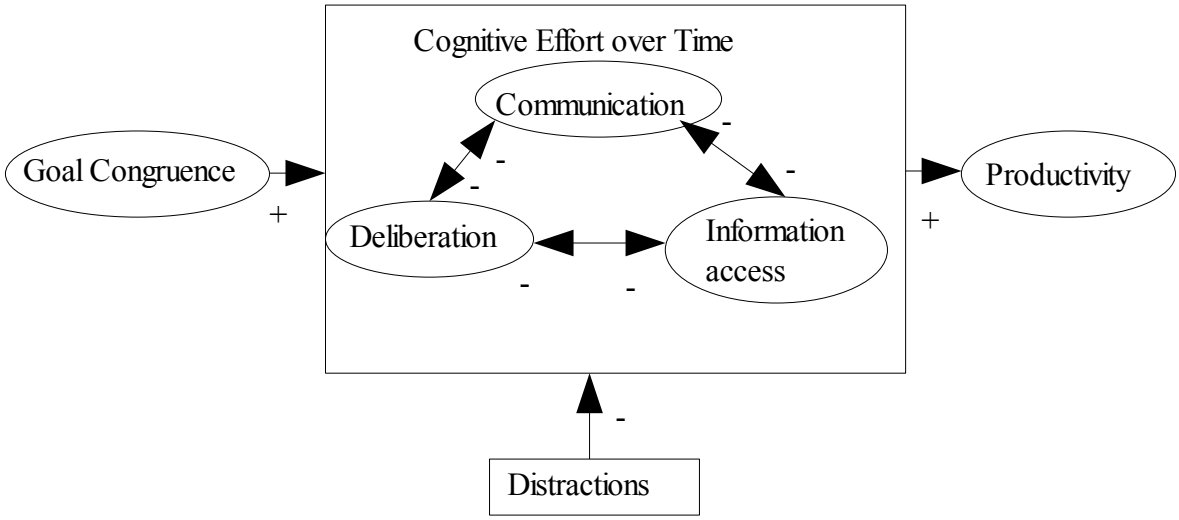


Figure 2-7: The TEAM model by Briggs & Nunamaker

These groups, and the TEAM model that is derived from them, are problem solving groups, rather than creative problem solving groups. This difference is vital, since one of the hallmarks of creativity is that it does not have a linear relationship between the attention invested and the results and ideas that are generated. In particular, distractions can serve as inspiration or motivation for the participants in the group. At the same time, it is possible that the participants in a creative problem solving group can have their attention lessened by distractions that does not serve to give inspiration or increase motivation, this could be a distraction which the participants are familiar with and cannot form new insights through. A difference must therefore be made in Briggs & Nunamakers model when it concerns creative problem solving groups, that distractions can be of a positive or negative kind, either boosting the inspiration of the participants, or misdirecting their attention.

Based on the TEAM model and the work of Schwarz[36], Hunter et al[19] and McFadzean & Nelson[28] , McFadzean have derived a conceptual model for how facilitation of groups is performed. This model involves three stages: A Pre-planning Stage, a Facilitation Stage, and a Post-Session Stage. See Fig 2-8.

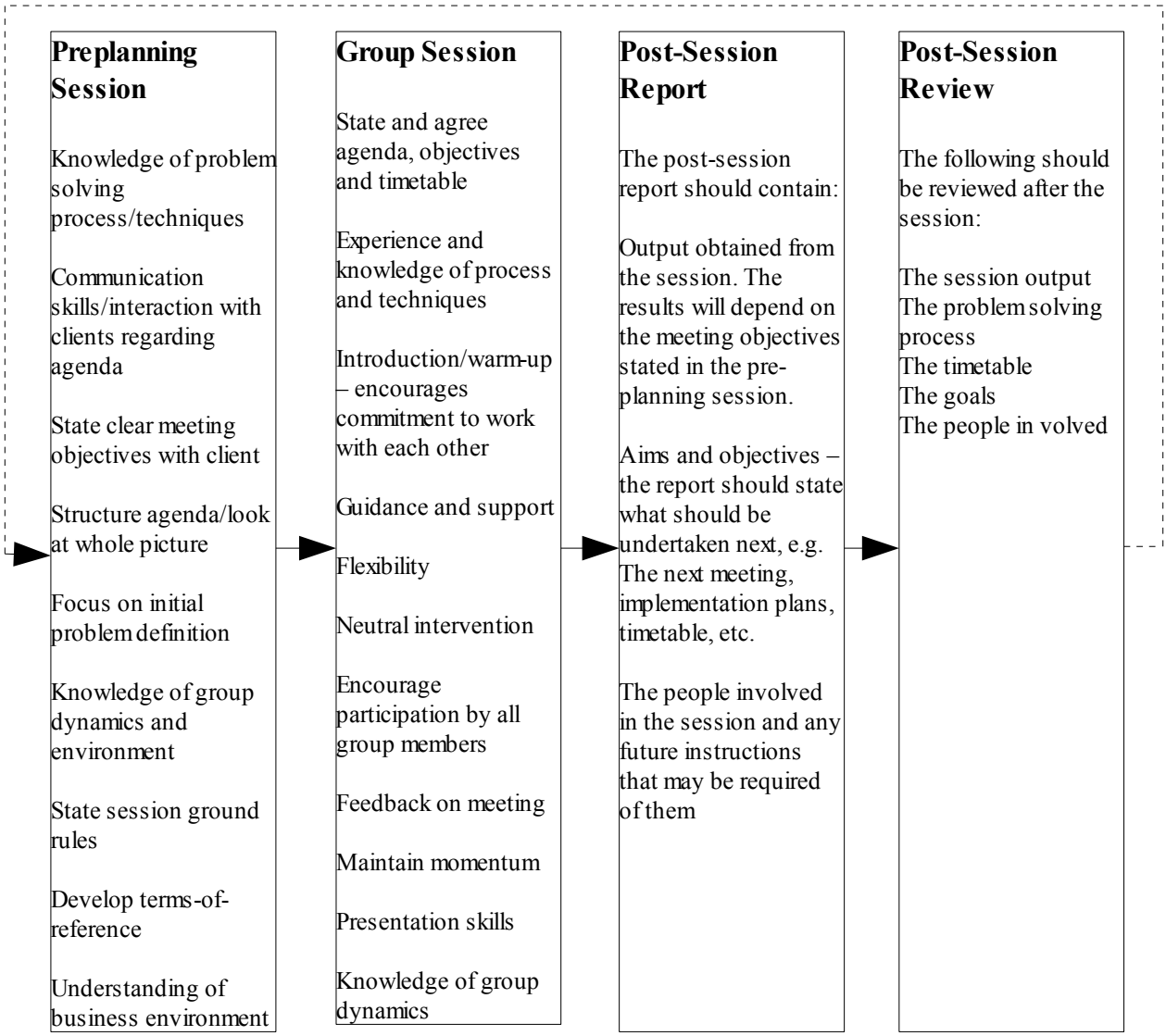


Figure 2-8: The model presented by McFadzean for the facilitation of a group solving process

Preplanning.

In order for the facilitator to ensure that he understands the nature of the group and thus is able to facilitate it correctly, a pre-planning stage is necessary During this stage, the facilitator should try to establish a meeting with an authoritative representative of the group that the facilitator will be guiding. This meeting should provide the foundation and background for the facilitators knowledge about the group and the purposes of the workshop. The facilitator should attempt to acquire knowledge of the current situation, and understand the grounds for this situation. This can be more difficult than it seems, since it is possible the representative of the group will have a biased view or biased information regarding the correct situation. The facilitator must use intuition [43] to determine to what degree the information is correct, and how well it reflects the group as a whole as well as the individuals within it. There is also the added difficulty that a facilitator is often brought into a company or established group in order to solve a problem situation that the company itself is unable to resolve, sometimes as a result of an unwillingness on behalf of those in charge to accept change. During the Pre-planning phase it is therefore possible that the facilitator will determine that additional information regarding the current situation should be acquired from other sources. It is also possible that the representative with which the facilitator meets will have his or her perceptions changed as a result of the meeting.

Arrangements should be made for when and where a workshop or group-facilitation can take place, as well as establish what the goals are that the group-members must be guided towards. It is important that agreement is established regarding the role of the facilitator and the objectives of the workshop. In particular it is necessary to identify what precisely should be the objectives of the tasks the participants are presented with, as opposed to the objectives of the workshop as a whole. McFadzean terms this the “session desired state”, and empathises that it determines whether or not the overall objectives of the workshop or session have been achieved, and this will likely (though not always) include the objectives of the tasks the participants are to be presented with. Note that it is possible to have workshops wherein the objective is to raise the awareness of the participants regarding a particular subject, and that the tasks the participants are presented with guide them towards this awareness indirectly, in effect a sort of “placebo” tasks.

Particular attention is paid by McFadzean towards the material components of the workshop. In particular the environmental surroundings are underlined in their importance, details such as having the correct tools (coloured pens, paper, etc.) available, as well as finding the correct locale in which to arrange the workshop. All this contribute to the atmosphere in which the workshop will be held, and thus should be arranged in the pre-planning phase. Eden [11] is related as describing a situation where the rooms provided to him are very different from what he was proposed, and it thus takes longer to generate the correct atmosphere.

This is again another matter wherein the intuition of the facilitator plays a significant part. The facilitator needs to be aware of which impression and atmosphere that a locale generates, and most particularly, if this impression that the facilitator gets will be shared by the participants in the group. It is possible that a locale might give the participants an entirely different impression that it does the facilitator.

Facilitation

The meeting and facilitation phase is where the workshop itself is conducted. The purpose of the facilitator is to assist the group members in maintaining an efficient process and momentum. The facilitator achieves this by guiding the members of the group in how they approach the processes involved with the group work, and intervenes when he determines that the group is straying from effective group work. In particular the facilitator should focus on the meeting process, the content or task of the workshop and the dynamics in the group and relationships between the participants. Three separate steps in the facilitation process can be identified:

- Introduction. Presenting the participants to each other
- Facilitation. Conducting the workshop itself
- Wrap-up. Establishing conclusions.

The **Introduction** serves as the first step. Regardless of if all the participants know each other very well and the facilitator too, some introduction will be necessary, not only to the goal of the workshop but also to the rules and guidelines under which the workshop will be run.
The goal of the workshop should be presented to the participants, so that they are aware of what they are working towards. Along with the schedule and time frame for the workshop and the guidelines and rules that the participants should follow. The participants should also be introduced to the different roles that the workshop requires them to fulfil, so that there is awareness of what is expected of them.
If the group members are not familiar with each other, an "ice-breaking" tool can be employed at this stage as a warm-up activity to allow the participants to become familiar with each other. Ice-breaking tools are small group activities where the participants are tasked to do something in unison that is easy for them to approach. Often these tools involve a bit of fun and light-heartedness, and allow all the members of the group to participate in some way. Sometimes the ice-breaking tools can be considered similar to small parlour games. Asking the participants to in turn describe their pets or which pet they would want if they were to get one is an example of an ice-breaking tool.

The precise manner in which the **Facilitation** stage is run depends greatly on the facilitator, what his or her preferences are, what intuition tells him, what was agreed on during the planning phase. Flood [12] describes three styles of facilitation: "How?", "What?" and "Why?" styles.
The How-style casts the facilitator in the role of both an expert on the subject that is under discussion, as well as a conductor of the dynamics of the group. In this capacity, the facilitator can influence and intervene both regarding the content of the workshop as well as the way the participants act and follow the process. Care must be taken however, that the facilitator is able to maintain an adequate amount of respect and neutrality, otherwise he will become too involved with the specific content in the workshop, becoming essentially a super-participator instead of facilitator.
The What-style focuses on keeping the facilitator neutral. The specific content that the participants explore as part of the workshop should be left strictly to the participants, with the facilitator only interfering to guide the participants towards the goal of the workshop, and not interfering with group dynamics or workshop content. This means the facilitator will be more focused towards enabling the participants to indirectly learn from the workshop and allow them to correct their dynamics and steer themselves towards the goal of the workshop.
In the Why-style, the facilitator does not maintain neutrality, but instead focuses on guiding the

participants in detail and steering the dynamics of the group towards the goal of the workshop. This may involve supporting participants who have trouble participating and ensuring that apprehension or presentation fear is not hampering the workshop.

It is during the facilitation stage that the use of Creative Tools becomes applicable. Given the information from the planning stage, the facilitator can select one or more Creative Tools for use during the workshop, or if the workshop is not focused upon developing a creative solution but has a different focus, use one or more of the various problem solving tools available.

One of the primary ways that the facilitator is able to influence the participants is through intervention. By this is meant the action where the facilitation disturbs or interrupts the group members (during a pause in the conversation or idea generation for instance), and provides them with input regarding the direction that the workshop is moving in. See further Friedman [13].

As the workshop session draws to a close, a specific **Wrap-up** phase should be held. An overview of what has been accomplished in regards to the goals of the workshop can be given, allowing the participants to achieve a sense of closure regarding the workshop and summing up what has been accomplished. This is best done with the workshop is still fresh in the mind of the participants. At this time, feedback can also be received, both by the participants and by the facilitator. This will be helpful for further workshops or for allowing the participants some guidelines for how their group efficiency can be improved.

Post-Session

The Post-Session phase is where the results of the workshop are discussed and evaluated. This can be done with the participants of the group, but more commonly with the same representative with whom the preparation was done or left to the facilitator alone. McFadzean recommends that the facilitator alone carries out the main part of the Post-Session phase, which will include material closure such as compiling notes, Post-It notes, drawn plans, etc. as well as the writing of a report. McFadzean's model of facilitation is built with facilitators for companies in mind, hence the aspect of the report is greatly underscored. It emphasizes that the facilitator should be able to clearly and consicely convey the information that has been derived from the workshop such that it is easily understandable by the participants.

As part of the Post-Session phase, a post-session review is suggested. Carried out together with the participants in the group that was facilitated for, the post-session review can allow for discussion of the outcome of the workshop, implementation of the ideas generated as part of the workshop, what the next steps are for the group and how further workshops can be improved. Subsequent meetings with either the representative from the group or the full group itself can also be used to refresh the participants memories and keep focus upon the various ideas and solutions that were generated. Otherwise there is a risk that when the workshop is done and the facilitator has departed, that the participants allow themselves to “fall back” into their previous habits and neglect to follow up on the ideas that were generated in the workshop, seeing the workshop as simple escapism from their habitual processes, one without meaningful influence upon their familiar surroundings.

The Facilitator & the Facilitator's Role

According to Schwarz[36], facilitation of groups is “a process in which a person who is acceptable to all members of the group, substantively neutral, and has no decision-making authority intervenes to help a group improve the way it identifies and solves problems and makes decisions, in order to increase the group's effectiveness.”

The Attention Pyramid model described by McFadzean[25] is part of a larger model that encompasses not only the group and its members, but also the facilitator and the task of the group. This model is called the Attention Ladder by McFadzean [26], and uses the Attention Pyramid as a major element, but also expands upon it. Unlike Briggs & Nunamakers TEAM model, the Attention Ladder is created with creative problem solving groups in mind.

The level of the group according to the Attention Pyramid establishes what the requirements and roles are for a facilitator.
Note that the goal of the workshop is the overall deciding factor for how the group should be facilitated. A group that is below the level required by their goal (for instance a group that is only level 1 but tries to deal with a problem that requires a level 3 group) will find their process cumbersome and ponderous. Either the level of the group must be raised to match the level required by the goal, or the goal must be reduced in scope in order to allow the group to attend to it effectively.
And a group that is above the level required by the goal is unlikely to need facilitation that matches the level of the group, though it is possible that the group may be able to approach the task more efficiently if they are allowed to do so from a level that matches the level that the group is. Doing so would mean that the participants in the group feel that good use is being made of their talents and skills, and that the goal is challenging enough for them.

In a level 1 group, where there is only attention to the task at hand, the facilitator must be careful to prepare with this in mind. It is necessary for the facilitator to be aware that the individual members of the group might have different perceptions of which task they are to complete and how they are to approach it. Goal Congruence must be established, a general consensus of the goal of the workshop that all involved agree upon, either implicitly or explicitly. During the workshop itself, the facilitator must have this goal in mind and ensure that the participants are guided towards it. Provided that the group does not have a goal that requires attention to a higher level of group awareness as illustrated by the Attention Pyramid, the facilitator must provide facilitation that is of a matching level to the group. That is, the group's level precludes the facilitator from needing to involve higher-level aspects such as facilitating the trust between the members of the group.
On account of level 1 group being capable of attention to its task, the facilitator should guide the process and intervene such that the perceptions, attitudes and approaches of the participants are made to serve the purposes of the task at hand.

A level 2 group will posses attention to the task, and to the process it goes through. On top of the requirements of a level 1 group, the facilitator must now also facilitate the group according to a set agenda. This agenda is best developed with the authoritative representative in the planning phase. An agenda, timetable and a session plan can be agreed upon at this time. Additionally the facilitator should now seek Process Congruence in addition to Goal Congruence. This involves agreement or

consensus regarding the process of the whole workshop.
As with a level 1 group, during the session itself the facilitator should ensure a smooth flow of the session according to the session plan and the agenda. In addition to keeping the group progressing towards the Goal of the workshop, a level 2 group can be kept to an agenda and time-table. The facilitator should be able to focus on attitudes and mentalities of the participants that hinders their attention to the process, and in the post-session phase provide advice and feedback for how the participants can improve their attention to the process.

Much deeper preparation is required when it concerns a level 3 group. Being attentive to the development of the group will mean that the facilitator is required to plan the formation of the group in the planning phase, selecting the participants of the group according to what is required by the group's purpose, and considering how the efficiency of the group can be aided by inviting in participants from elsewhere that would not otherwise be participants in the group. Presuming that the group has a purpose which also requires attention to the development of the group, it is necessary for the facilitator to ensure that the participants in the group are aware of their roles. Schwarz for instance found that if the participants in the group were not presented with their roles and the purposes of them, as well as made aware of what roles the other participants had, then it was possible for the group members to work counter-productively. In Schwarz's case he found that a senior manager obstructed discussion because no awareness of the roles within the group had been established. [36]
With a level 3 group (and goal), the facilitator should work towards ensuring that the attitudes of the participants regarding roles and participation are conductive for the groups efficiency. Particularly as regards participation, the facilitator should make sure that all participants are aware of, and compliant with, the level of participation that their role requires. Otherwise the efficiency of the group as a whole will suffer.
The post-session phase will likely be concern these aspects as well, requiring the facilitator to advise the group and its participants on how they can improve the way that they fulfil their roles, as well as how the group can be developed on a long term basis.

A level 4 group would require a deeper level of facilitation still. Awareness of the relationship between the groups members and its interplay with the overall efficiency of the group requires that the facilitator is able to prepare from a background of suitable information regarding the personalities of the participants. Clichés, sub-groups, factions and such within the group needs to be identified, and the impact that these different dynamics between the participants is likely to have must be assessed.
Like with a level 3 group, it can be necessary for the facilitator to make the participants aware of the different relationships and how this affects the group overall process so that there is no doubt during the workshop about the inter-group dynamics. Failure to do so when it is required by the goal of the group could lead to that the group's efficiency is greatly hampered by mistaken conceptions of how the group dynamics should function. For instance a participant whose role is to provide feedback to ideas from other participants might mistake the influence he possess on the others and could affect the groups process negatively if he gave feedback in such a manner that it made the other participants feel hesitant about presenting their ideas.
The post-session phase for a level 4 group is likely to be concerned with how the participants in the group can improve their relationships with each other and how this can positively affect the efficiency of their group. As the levels of the group and its goal rises, so different aspects of the

participants begin to take on importance, at the lower levels, functionality is empathised, but climbing the rungs of the Attention Ladder involves progressively more emotional aspects.

A group that is aware of the last level in the Attention Ladder, Attention to Trust, will have a high self-awareness and awareness of their effect upon others. In order to match the group's level, the facilitator will be required to assemble information about the different emotions that motivate and effect the various participants in the group. This is likely to be a trying task for the facilitator, but if the group is attentive to trust, then they should be aware of what motivates then and be able to relate to this in a way that allows it to be communicated to the facilitator. The purpose of the facilitator for a level 5 group approaches that of a counsellor, but care should be taken to ensure that the facilitator does not in fact, become, a counsellor. The facilitator is not there to guide the development of the personalities of the participants, rather his purpose is to guide the group towards better efficiency. In some regards the actions of the facilitator might mirror those of a counsellor, since a stable and positive personality for all the individuals in a group translates directly into better group efficiency. But overall, the attention of the facilitator must be on the goal and purpose of the group and how the group fulfils this, not on the personalities of the individuals within the group.
During the facilitation phase of a level 5 group, the facilitator is likely to guide and intervene with respect to how feelings, fears and emotions affect the participants. And as with lower-level groups, the facilitator should also be mindful of all the lower level facilitation requirements, such as those derived by the task, the process, the development and the dynamics in the group.
In the post-session phase, attention can be made to how the different members of the group are affected by the personalities in the group, both their own and those of the other participants, but again, care should be taken to ensure that the focus of the facilitator is on the overall efficiency of the group as a whole.

In summation, the facilitator needs to be attentive to different things depending on what level of group and goal that is being facilitated for, as described by McFadzean [26]:

- Level 1: Attention to team goals, the facilitator helps the group to develop and maintain its focus on goals rather than processes..
- Level 2: Attention to the meeting structure, the facilitator helps the group to develop and follow a meeting process and structure.
- Level 3: Attention to skills, roles and responsibilities, the facilitator advises the team on the appropriate group membership and agrees with them their roles and responsibilities.
- Level 4: Attention to relationships, the facilitator supports the group and helps to improve the dynamics and relationships.
- Level 5: Attention to team feelings, the facilitator supports the participants regarding their emotions, identity and self-awareness.

This is illustrated by McFadzean in Fig 2-9.

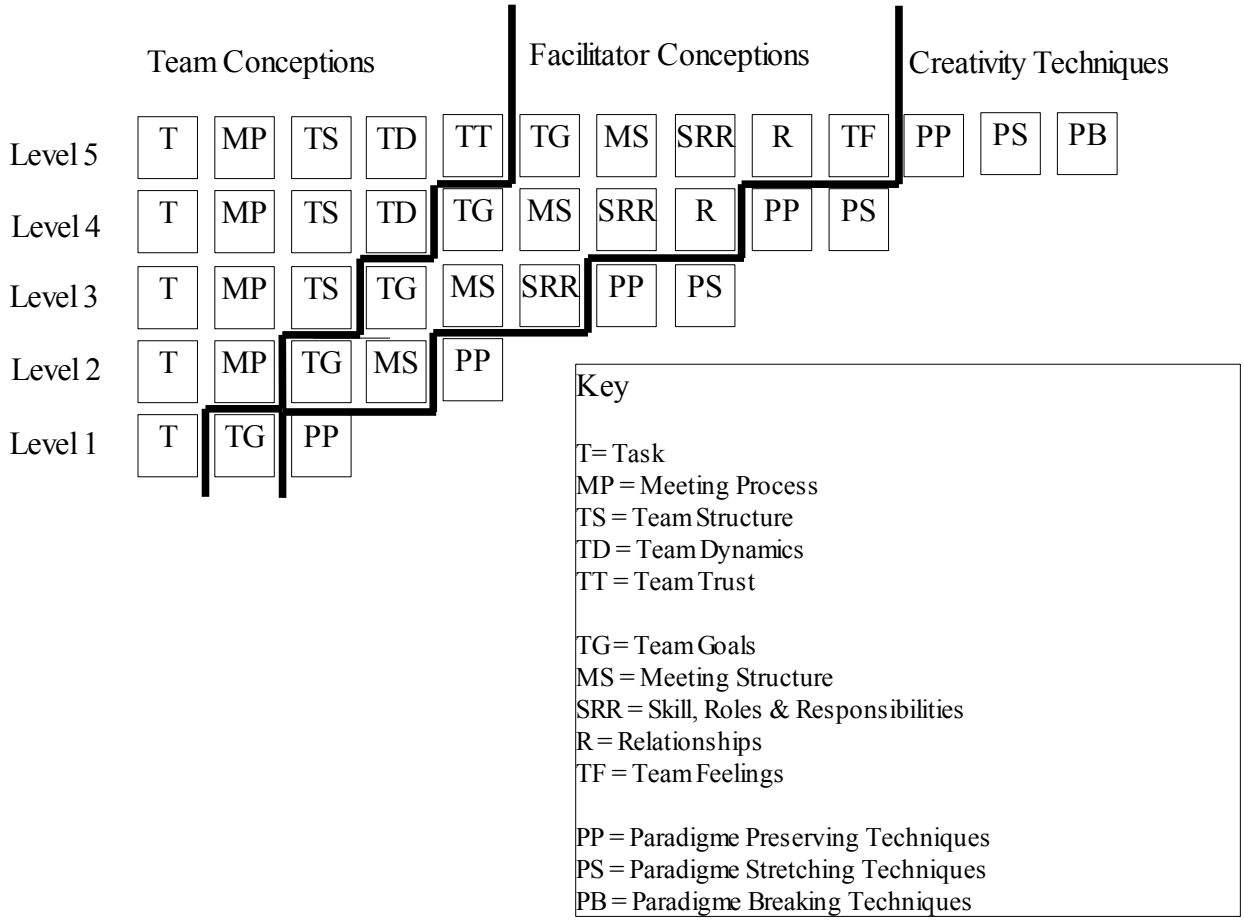


Figure 2-9: The Attention Ladder as shown by McFadzean

Intuition

To fulfil his/her objective of guiding a group effectively, the facilitator has a number of tools at his disposal. Some of these are the models that can be used to evaluate a group or situation, and serve as a guideline. But the premier tool that all facilitators have available is the facilitator's intuition. Additionally, many of the models and tools requires the facilitator to derive or decide something quite quickly in response to changing elements and situations during the facilitation. This places further importance upon intuition as a facilitator skill.

Like creativity, the word "Intuition" is likely to mean different things to different people. Goldberg [15] defines it by what it is not. It is not reason, nor logic, nor analysis or observation. *"The basic sense of the word suggests spontaneity and immediacy, intuitive knowing is not mediated by a conscious or deliberate rational process"* (Goldberg). Intuition is the ability to know something, without knowing how one arrived at that knowledge.

An intuitive decision is a subconscious one. Problems of a rational nature are unlikely to benefit from intuition, but large and complex problems or situations that have to be solved immediately benefits greatly from intuition. Such a situation could be anything that involves contact with other people. Particularly for a facilitator, decisions often have to be made or changed on a very very

rapid basis during the facilitation. Often, there is not time for the facilitator to pause and consider a rational solution, instead, intuition is able to provide an answer. For instance, a facilitator might be baffled or confused by a sudden twist in the facilitation situation and have to make a snap-decision. A rational approach cannot be used, because there is not time for the facilitator to consciously register the concept of the situation, consciously register the emotions and involvement of all the group participants, and consciously decide on a solution that best matches the situation given the registered information.
Instead, an intuitive snap-decision will be made. The facilitator might not consciously register the emotions of the participants, but his/her subconscious are likely to do so. And even if the facilitator's subconscious has not registered enough information (without the facilitator knowing) to derive a logical answer, the subconscious is still able to arrive at a decision by relating to the experience, personality and knowledge of the facilitator.
This intuitive snap-decision is not a random one, rather it is a solution that the facilitator's subconscious can match to the situation given the facilitator's experience and disposition.

Rather than being in opposition to rationality, intuition complements it, by offering different and alternative ways of reaching decisions and goals than the rational and logical approach would. Lacking the information or skill to make a rational decision regarding a problem or situation, intuition will be able to propose a solution since it is much less reliant on having the right information at hand, and can instead make extemporisations and conclusions based on partial information.

The Task

One aspect of the Creative Problem Solving process and something that the facilitator must be aware of, is the recognition of the Task that is the objective of the group using the CPS process. Isaksen [20] proposes inclusion of the term Task Appraisal in current CPS processes and illustrates how Task Appraisal can be used to establish an understanding of the Task that a team faces. Isaksen details four aspects in Task Appraisal that a facilitator should strive to identify before starting to plan a workshop or group facilitation session. These are *Personal Orientation, Desired Outcomes, Situational Outlook* and *CPS methodology*.

Personal Orientation involves establishing an understanding of who “owns” the Task, and to what degree this ownership prevails. Ultimately, it is the purpose of the facilitator and the CPS process to be able to effect change in relation to the Task. According to Isaksen, this can only be done if there is a sufficient level of ownership such that the Task “belongs” to the right people, that is, the objective that the group is working towards is something that is within the reach of said group to effect change on. Otherwise, either the Task or the group will need to be altered to match.

Desired Outcomes requires identification of what the outcome of the Task should be, according to the Task owner, and how this reflects upon the group and the skills that the group possesses. By establishing an understanding of the desired outcome, the facilitator will be able to evaluate how to begin the CPS process with the group and when the CPS process can be considered to be successful.

Situational Outlook focuses on the context that surrounds the Task. Understanding of this aspect

requires knowledge of the outside elements that influence the Task, that is, understanding and identification of the climate and culture that the group exists in, its history and suitability for change, how the Task relates to other priorities that the group and its members might have, and if the material resources the group possesses are sufficient for the Task.

CPS methodology requires an examination of the information gained in respect to the three previous aspects, and on account of that determining the suitability of CPS for the group. The specifics of if and how the CPS procedure should be applied and where the process should be begun is also part of this aspect.

Perhaps the most important aspect of the Task Appraisal component is not so much the 4 aspects described, but rather the metacognitivity that is a result of the Task Appraisal process. Metacognitivity is explained by Vidal [43] as the combination of the two elements "knowledge about cognition" and "regulation of cognition", knowledge being the awareness and identification of a person's cognitive process, and the regulation being the awareness and identification necessary to manage and cause changes in this cognitive process.

Team Roles

Another element in the problem solving process is the roles that needs to be filled within a group. A group is composed of individuals, and these individuals will have different relationships with each other and will also fill different roles within the group. Kozar & Zigurs [24] present a model adapted from Benne and Sheaths [5] that details the roles present within the categories of Group Task Roles and Group Building Roles.
Derived from the processes in a team product review -a group meeting to evaluate a specific product- the model illuminates key roles that are present in many other types of groups. The focus of this model is upon single meetings though, rather than group work as a result of long-term project work. For this reason the dynamics and roles that it illustrates will not quite match if the model is tried to fit to a group that is engaged in a long-term project that does not involve group meetings similar to the team product review meetings that Kozar & Zigur's model is based upon.

Group Task

The Group Task roles are those that contribute to the overall goal that the group is trying to reach. These include an *Initiator* or *Contributor*, whose role is to start the group off with an idea or interpretation of how the group's goal can be reached.
An *Information or Opinion Seeker* whose purpose is to ask questions, question the established status quo and prod the group towards a successful result by making sure that what the group ends up with have been continuously evaluated.
Complementing the Opinion Seeker role is the *Information or Opinion Giver,* who answers the questions posed by the Seeker. These two roles complement each other in that the Opinion Seeker is a divergent role, while the Opinion Giver is the convergent counterpart.
The *Elaborator* is one who provides depth to the subject at hand. By providing examples and rationales, the Elaborator can give the group a deeper level of understanding of the goal or product that they are working towards. This understanding also allows the Elaborator to propose various implementations.

In a similar way, the *Coordinator's* role is to provide an evaluation of the ideas and proposals that the group arrives at. Unlike the Elaborator whose role is convergent, the Coordinator fills a divergent role. The focus of the Coordinator is to relate the ideas or activities generated by the team together in a board overview and clarify the relationship between them.
The *Orienter* works with the results that the Elaborator and Coordinator provides. By examining these results, the Orienter is able to provide the team with an indication of how far they are at arriving at the assigned goal, and if this goal is indeed the one that the group is meant to arrive at.
The *Evaluator* examines the ideas that the group arrives at and subjects them to critique. The focus of the Evaluator is on the product or idea that the group has arrived at, not on the process that the group itself goes through.
Similar to the Evaluator is the *Energizer,* whose role is to stimulate the group towards a higher levels of activity. This stimulation is towards the specific goal that the group is working with, rather than more general encouragement and stimulation of the group as a whole.
Seemingly humble in comparison to the other role, the role of the *Proceduralist* is oriented towards the myriad of routine tasks that makes a group function. This includes all the minor tasks that would otherwise occupy the attention of the participants.
The *Recorder* is the one who provides the memory of the group and its results, this role is necessary for many of the other roles, particularly those who rely on an overview of the group's process such as the Coordinator or Orienter.

Group Building

Group Building roles are those that focus on making the group work smoothly and harmoniously together
The *Encourager* maintains a positive and forward-going atmosphere by praising and stimulating the other members of the group.
The *Harmonizer* is the role of the person who smooths out the difficulties between individual group members and ensures that any tension that arises is dissipated.
While the Harmonizer works on an emotional level, the *Compromiser* works on a factual level. By offering compromises where two or more group members disagree on particularities, the forward momentum of the group can be kept and the group can avoid bogging down in excessive debates on details that can be resolved at later stages.
To keep the flow of the group going, the *Gatekeeper's* role is to ensure that the flow of communication is smooth and that participation of all the members in the group is at the required level.
The *Standard Setter* is the role that is oriented towards maintaining the roles of the group at a sufficiently high standard. This might include guiding the performance of the group members towards specific aspects and maintaining a productive atmosphere.
The *Group Observer* may well be called a facilitator. His or her role is to establish an overview of the group's process, help the group with evaluating its procedures and keeping records of how the group is progressing as a team.
In addition to all these active roles within the group building category, there is also the *Followers*. These are the members of the group who might not necessarily have an interest or willingness to focus on the group's progress as a team. This lack of active contribution means that the Follower serves as a passive audience when it comes to building the group. But this passive acceptance can be useful for the rest of the roles when it come to validating an idea or concept.

Group Task Roles	
Initiator/contributor	Proposes new ideas or interpretations of the problem
Information/opinion seeker	Asks for clarification of facts of opinions.
Information/opinion giver	Provides clarification of facts or opinions
Elaborator	Provides examples, offers rationales, proposes implementations
Coordinator	Pulls ideas or activities together, clarifies relationships
Orienter	Summarizes positions on group goals, reviews progress towards goals
Evaluator	Evaluates group accomplishments against standards
Energizer	Prods group to action, stimulates the group to greater activity
Proceduralist	Performs routine tasks to expedite group movement
Recorder	Makes a record of group deliberations, serves as group memory
Group Building and Maintenance Roles	
Encourager	Praises and agrees with contribution of others
Harmonizer	Mediates differences between members, relieves tension by joking
Compromiser	Offers compromise
Gatekeeper	Encourages and facilitates participation of others, proposes regulations for flow of communication
Standard setter	Expresses standards for group to achieve
Group observer	Keeps record of group process, helps interpret group's evaluation of procedures
Follower	Passively accepts ideas of others, serves as audience in discussion and decision

Table 2-10: The group roles as presented by Kozar & Zigurs.

The different roles can each be spread across many different people, though more often several of the roles will be united in the same person. For instance the roles of Encourager, Harmonizer and Compromiser share similarities and could be filled by the same person. Several people can also fill the same role, however, care should be taken when creating the group that it does not succumb to role overload or role saturation, the cases where too many roles are allotted to a single person or too many persons are allotted to a single role respectively. Judging when a person's or role's limit have been reached in this manner can be difficult since the limits will vary considerably between groups. Good knowledge and understanding of the group in question as well as intuition will be required to project what the limits for a group might be.
The requirements for each of the roles is also likely to vary considerably depending on the make-up of the group and what the group's goal is. Katz and Kahn [22] presented a study that illustrates how a person takes a specific role not only from a foundation of what his or personality is suited for, but also accounts for other people as the source of role expectations, which influences the process of

role selection and assignment.

Myers-Briggs Type Indicator

Another model for thinking preference that mirrors the Creativity Framework in some respects is the Myers-Briggs Type Indicator (MBTI) as derived from the works of Carl Jung [21][33].

The MBTI measures preference for types of thinking. It is based on Jung's theory that the human mind functions in two basic ways, that of taking information and making decisions. Both of these two categories have two separate functions in them.
Information can be taken either via our senses (Sensing) or via our intuition (Intuition), and decisions can be made via logical deduction (Thinking) or via emotional subjectivity (Feeling)

These four functions were theorised by Jung to exist in a tiered hierarchy, where one function was dominant, another was ancillary, the next tertiary, and the inferior being the least present of the functions. In regards to the dominant function, it could be approached in either a Extravert or Introvert manner, extravert being a focus on the outside world, and introvert an inward focus to a persons own mind and thoughts. Myers-Briggs interpreted Jung's theory such that the non-dominant functions were always of the opposite extravert-intravert alignment, but other analysts of Jung's work have disputed this.
In interpreting the daily world around us and relating to it, a person can be either Judging or Perceiving. Judging reefers to the structured orientation, and relies on procedures, while Perceiving is a flexible and spontaneous approach towards the external world.

- Taking Information
  - Sensing
  - Intuition
- Making decisions
  - Thinking
  - Feeling
- Dominant function focus
  - Extravert
  - Introvert
- External world perceptions
  - Judging
  - Perceiving

These four functions allow for 16 possible combinations, but in practice the four possibilities derived only from the Taking Information and Making Decisions categories are the easiest to operate with. These being the Sensing-Thinking, Intuitive-Thinking, Intuitive-Feeling and Sensing-Feeling combinations.

The MBTI shares similarities with the Creativity Framework, most notably in categorising people's preferences through a system of four dichotomies. The MBTI is an all-encompassing model in the sense that it seeks to evaluate a person on the basis of that person's entire life, rather than as part of a specific situation as is the case with the Creativity Framework. Certain dichotomies are shared

between the MBTI and Creativity Framework such as the Thinking-Feeling and Methodical-Intuitive elements. But the dominant function focus and external world perception dichotomies in the MBTI reflect upon the functions of information taking and decision making, rather than standing on their own.

Chapter III: Case-studies

This chapter describes the six practical case-studies that became involved with the project. Three of these case-studies are interviews with people who are perceived to use creativity, and the other three are small workshops were Creative Tools are field-tested by a group of participants.
The purpose of the interviews was intended to be a validation of the use of Creative Tools in the fields that these people worked in, a sort of confirmation if they felt that Creative Tools would be of use to them.

It should be noted that the interviews were all quite short, between an hour and 1½ hours length. Schedules and arrangements by all these people prevented them from being able to devote more time to an interview. It was felt to be sufficient for getting knowledge of how a creative person thought during the creative process and what formed and influenced this process.

The workshop case-studies were of more varying length, the longest lasting more than 6 hours, and the shortest barely half an hour of effective time. The workshops had as purpose to field test the viability of certain well-known Creative Tools, some in situations where the participants had not previously used Creative Tools, others where the participants were more experienced with respect to idea generation and creativity in a group.

Each case-study description will begin with a short description of the case-study and its background, and will then describe how the person was interviewed or how the workshop was conducted. Each case-study will then be analysed according to the Creativity Framework and Attention Pyramid models described in Chapter II.

Briefly; the Creativity Framework tries to establish if the preferences of a person or a group lie towards Intuitive thinking or Methodical thinking, towards Practically oriented thinking or Abstract, and Focused or Expansive thinking, and lastly to what degree the person or group is able to accept motivation and inspiration from outside, categorised as Proactive vs. Reactive preference.
During several of the case-studies, the participants or person being interviewed was asked about their preferences and the Creativity Framework was worked out together with the participants. While this might have allowed errors of judgement, in that a participant might have answered incorrectly because of a desire to have preferences for something other than what he or she had, it was felt that the insights of the participants were valuable. Ultimately, the Creativity Frameworks reflect the observations of the facilitator.

The Attention Pyramid is a hierarchical categorisation that determines the readiness of a group to using tools of varying difficulty. Acceding levels of the pyramid requires attention and awareness to deeper levels of the aspects that influence the group. Such as attention to the effectiveness of the group, and attention to the emotions and feelings of the other participants in the group.
In order to allow a greater degree of depth in the creation of the Attention Pyramid for each case-study, instead of simply answering “Yes” or “No” to if the group was attentive to each level, the attention of the groups to the various levels in the Attention Pyramid were also described by “Mostly” and “Somewhat”, which were understood to be roughly 66% and 33% attentiveness respectively. While these descriptions are less than precise, it was felt that they allowed a greater

choice and depth in the building of the Attention Pyramid.

It should be noted that McFadzean's Group Attention Pyramid is not meant to be related to individuals. As its name suggests, it is designed with groups in mind. Nevertheless, it is used here on the 3 individuals that were interviewed. The reason for this is that although it is not meant for individuals, it was felt that the concepts the Attention Pyramid exemplified could be applied to an individual. This is detailed in Chapter II, but a brief summation is given here.
In the case of the interviews, the different levels of the Attention Pyramid takes on a slightly different meaning. Attentiveness to the task and to the agenda stays unchanged from what it was in relation to groups, while attention to team development and effectiveness becomes personal development and effectiveness respectively. Lastly, Attention to trust is understood to be attention to emotional state of being when thinking, and how this influences the thought process.

Though both models suggest which tools could be used by a group or person, in all cases the models were completed at the end of the interview or workshop, or afterwards. Due to time limitations, it was not an option to have an preparatory meeting and prepare the models for each case-study ahead of time. So the actual tools that were presented or used in practice during the case-studies were a result of the best prior understanding that could be obtained of what the participants would prefer and need. In the case of Polytechnical Fantasy Dome, the tools to be used were deliberately selected to be from different Creativity Continuum categories, in order to verify what would happen if a tool was used that was outside the bounds or preferences of the group.

Interviews:

Agneta Hytten - Musician

In order to gain a better appreciation of the various problems that a creative designer faces in his or her daily work with using creativity, a number of interviews were held with different people. The first of these was with Agneta Hytten (AH). AH is a musician by education and trade, who currently runs a one-person company called Musica Art that specialises in various forms of coaching, specifically through the use of music.

Initially working as a musical tutor, AH decided to broaden her scope beyond just teaching music, and include coaching and consulting as part of her services by creating a one-person consulting company. Musica Art is described as a "knowledge- and teaching company founded 2004 with the vision to facilitate people's contact with musical culture in its splendour.". Specifically, Musica Art offers consulting and counselling for companies with music and coaching as tools, and "choir-pilot" services in the form of facilitation of choirs.

Her model for coaching is derived through experience in teaching music and involves asking penitent questions to the person being coached and by categorising people according to a life-cycle method. This combines to give a structure for the coaching.

Regarding her creative process, AH stated that her main outside motivations and pressures are that her work should have a noticable effect and that she is often under some form of time pressure both from regular deadlines, and also in the taking of decisions. Music is also used consciously as stimuli during the creative process.
From her own experiences and lifestyle, she feels that her creative process is characterised by a desire to achieve quality and to fulfil a responsibility towards others. She feels that the services she provides should have value and meaning for others and therefore seek to ensure that there is a good level of quality in what she provides. She does not feel that she is hampered by these challenges though, rather feels that they are an opportunity for her to learn and enrichen her own experiences and understanding.

As this was the first of the interviews, the discussion was on a very general level and AH was not specifically presented to any tools besides Brainstorming which was used as an example. Later interviews would be presented to various Creative Tools on a more structured level and their input evaluated and used to gauge the viability of the tool in a workshop setting with creative people.

AH already had extensive experience with brainstorming, though she mentioned that it was nice to be presented with the details of it once again. This, and her experience with coaching and facilitation, prompted her to say that Creative Tools were perfectly viable for use in her field.

As the interview was drawn to a close AH suggested that this project could be presented at a workshop that she regularly hosted for a group of consultants. In such a setting the Creative Tools could be practically tested on a group of people that were involved in a broad spectre of fields including creativity and consultancy. The workshop this resulted in is described later in this chapter.

Overall, AH's experiences suggested that Creative Tools were viable to be used with creative people outside the management sector. When this interview was first being arranged the assumption was that it would focus on the use of Creative Tools in regards to AH as a musician and musical tutor. At that time it was not known how deeply AH had gotten herself involved in the coaching and consulting sector. The interview therefore took a surprising turn when it came up that AH was quite well versed in coaching and creative thinking.

Creativity Framework

As part of the interview, AH was presented with the Creativity Framework and her preferences were worked out. This is shown in Fig.3-1

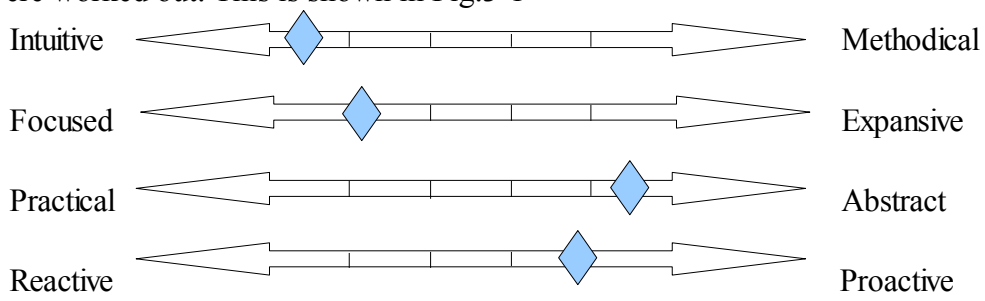


Figure 3-1: Creativity Framework for Agneta Hytten

- As can be seen in Fig 3-1, AH was classed as a person with preference for intuitive thinking. Although capable of methodical work and processes, her preference for reaching decisions and ideas spontaneously and intuitively without resort to a set pattern or procedure was clear. This suggests tools that empathise spontaneous arrival at ideas and concepts, such as Wishful Thinking or Imagining.
- An emphasis on focused thinking shows a preference for converging tools, for instance Metaphors. Though it is likely that AH could benefit considerably from tools that allowed her to think expansively. It should be noted that the Metaphor method can also be used in a divergent manner.
- With a preference for abstract thinking, which is well supported by her musical background, AH would be suited for tools that were unbound by practical necessities or otherwise related to the real world. Wishful Thinking is an option, as is other tools that give their participants the opportunity of thinking up concepts of an unlimited nature.
- A strong motivation and proactive attitude also allows AH a suitably broad spectrum of tools from any of the 3 paradigm categories.

By combining these suggestions together to select a tool shows that no Creative Tool described in McFadzean's compilation fit the requirements of being suited towards Intuitive, Focused and Abstract mentality. The closest would be Metaphors or Wishful Thinking.

Attention Pyramid

After the interview had been concluded, AH's levels of awareness in the Attention Pyramid were also established based on the notes and observations made during the interview. This was plotted out to be as follows:

1. *Attentive to the task presented.*
   AH was well able to focus on a particular task.
2. *Attentive to the agenda*
   Likewise with the agenda, there was awareness of the overall concepts of the interview, as well as the various components and elements of the interview.
3. *Attentive to development –personal development*
   Since her primary field of work encompasses personal development, AH is naturally very observant of her own development, as well as willing to provoke change in both herself and her environment.
4. *Attentive to effectiveness –how to best operate for maximum creativity*
   With her background in music and teaching, AH had awareness of what stimulated her in her thought process, she was well able to communicate that different musical pieces prompted her to operate differently.
5. *Attentive to trust –emotional effect*
   Being aware of how she was affected in her thinking by her emotional state makes AH attentive to trust. She is well able to identify different motivations and how they influence her state of feeling, and how this in turn influences her creative process.

Being aware of all 5 levels in the Attention Pyramid and attentive to them suggests that any tool could be used successfully by Agneta Hytten. Due to time limitations however, no tools were tried out during the interview itself.

Both the Creativity Framework and the Attention Pyramid show that AH would have a significant amount of tools that could be used by her. The Attention Pyramid simply opens the opportunity for all tools covered within it. While the Creativity Framework gives a more narrow indication of that tools in the paradigm breaking category that worked by allowing the user to think intuitively and abstractly could be used most comfortably. Such as Metaphors, Wishful Thinking, or Imagining.

Nina Grove – Clothes Designer

As part of the effort to understand the practicalities faced by people using creativity, another interview was held, this one with Nina Grove (NG) who works as a clothes designer and operates an outlet store on the island of Bornholm.

NG underwent a 2 year education to become a clothes designer. The tuition at the school where she studied focused on the practicalities of making clothes, how to sew in different materials and many such practical manners. However, very little of the education was actually devoted towards making the students more design-oriented. It was very much left up to the individual student to arrive at an understanding of what concepts and ideas worked when it came to clothes design. With such free reigns, the intuition of the students was not guided or restricted. This was very much apparent at the fashion-show that the students would put on at the end of their education. The dresses and clothes designed for that show were very abstract and extravagant, hardly suited for use as everyday wear.

After graduation, NG set up a clothing store in down town Copenhagen where she would design and create clothes. First, NG both designed and created the various outfits she would sell, but as business picked up she eventually outsourced the sewing and creation part. However, designs still had to be created by her in order to view what a certain idea would end up looking like. Without a specific idea from her education of what consumers wanted or what were feasible in the design world, NG had to experiment her way forwards. What worked for a fashion-show that ended an education didn't necessarily work for people who brought clothes with an eye for usability. NG therefore quickly went towards a design style that emphasised practicality and cost/time-effectiveness.

The process that NG goes through in her work is thus characterised by a focus on the end product and a desirability for this product to be both easily created, and easily utilized. Her creative process is restricted in that clothes need to be functional and relatively easy to create, otherwise it simply will not sell or be cost-effective. Furthermore, designing clothes is seasonal work. Winter-clothing and summer-clothing are different things. This is hampered by the fact that the creation process is often quite long, so that a clothes designer needs to start designing collections for the winter in the middle of summer. In clothes design, there is also a desire to create things that go together in the form of a collection, so that individual items form part of a greater whole. This lengthy creation process also favours ideas that are well-thought out before they are committed, since it is difficult to change a design when it is in production. NG commented to this that her way of thinking in terms of clothes design was influenced by this, so that she sought to make an idea as complete and perfect as possible before it was submitted for sewing.

After this talk about her background and creative process, NG was briefly introduced to the concepts of several Creative Tools, including Reversal and Brainstorming, and brainstorming was illustrated practically. Creative Tools were not something she had been exposed to previously, so her reaction to them was that it was nice to be made aware of the creative processes and the possibility of guiding them. Additionally, though she would probably not use Creative Tools of her own accord due to limited experience with them, NG said that they were interesting and definitely viable for her as thinking aids. The realisation that her creativity was bound by the practicalities of her work was also enlightening, and she commented that it would be nice to return to a looser and

more free-form creative style than what she was presently used to.

Creativity Framework

During the interview, NG was presented with the Creativity Framework and the theory behind it and her preferences were worked out:

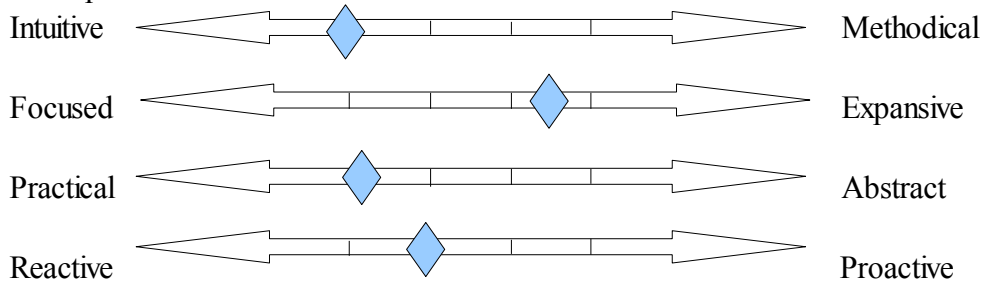


Figure 3-2: Creativity Framework for Nina Grove

- Though strongly limited by the nature of her work in what precisely can be done, NG's preference is for intuitive thinking, by way of arriving at an idea spontaneously and without a set pattern or framework of mind. As with the previous case-study, this suggests tools without a structured approach, where the participant is allowed and encouraged to arrive at ideas without being restricted by a set methodical approach. Wishful Thinking or Imagining are such tools.
- Though her focus is on the end product throughout the design process. NG's preference was said to be on the expansive thinking, since she felt that she had a much easier time thinking up divergent ideas and deriving additional ideas from a concept that she was working on, than she had focusing on details in one design at a time. This suggests that divergent tools would be easier for NG to use and participate in, such as Morphological Analysis or Object Stimulation.
- As benefits her focus on the design of usable clothing, NG is predisposed to thinking practically. This suggests tools with a strong material component, tools that use a way to exemplify an idea in practice, be it by writing in on a piece of paper in the manner of Brainstorming (which isn't her preference since brainstorming is very methodical), or drawing Rich Pictures to exemplify the situation.
- It was discussed with NG how she approached creative thinking, and she found that she was predisposed towards needing external stimulation rather than finding stimulation inside herself. This preference suggests tools in the Paradigm Preserving or Paradigm Stretching categories.

Combing this together and selecting creative tools according to Table 2-1 in Chapter II indicates that the tools Metaphors, Rich Pictures, Reversal and Picture Stimulation should be preferred by a person or group with a Intuitive, Expansive and Practical approach. Of these, Metaphors or Reversal would possibly be the most successful, since they are paradigm stretching tools rather than paradigm breaking ones, and it would be easier for NG to relate to a tool towards the paradigm preservation/stretching end of McFadzean's Creativity Continuum.

Attention Pyramid

Using the structure of the Attention Pyramid to examine NG, the various levels in it would be described as follows:

1. *Attentive to the task presented.*
   During the interview NG was well attentive to the tasks and concepts that she was presented with.
2. *Attentive to the agenda*
   There was understanding and attention to the overall plan and purpose of the interview. Even if this was a very new concept for NG.
3. *Mostly Attentive to development*
   NG was aware of her desire to develop herself personally, but didn't have specific knowledge towards which direction this should take or how it should be accomplished.
4. *Not Attentive to effectiveness*
   NG was aware that she performed better at certain times of the day for instance, but didn't have knowledge of why this was so and only moderate understanding of this concept.
5. *Not Attentive to trust*
   Though she was aware that her emotional state of mind influenced her thinking process, this awareness was at an intuitive level and not a conscious one.

As a level 2-3 person on the Attention Pyramid, NG would accordingly be suited for tools in the paradigm preserving and paradigm stretching categories. For this level, recommended would be methods such as Heuristic Ideation and Pugh Matrix, while all paradigm preserving tools such as Brainstorming and Brainwriting could be used.

Overall, though no Creative Tool was tried out in practice, enough information was acquired to make suggestions at which Creative Tools would perform best when used by NG according to the two different models applied.
The Creativity Framework suggests Metaphors or Reversal, while the Attention Pyramid suggests all paradigm preserving ones.

No Creative Tools were used practically in this interview, but it did offer several insights. The process that NG goes through in designing her collections lends itself well to tools that empathise seeking a good solution with respects to a number of constraining factors, such as SWOT analysis or Pugh Matrix.
In this case-study, although NG felt that a wilder and more free form creative process could be refreshing, any ideas that would be generated must conform to the restrictions of feasibility and cost efficiency. So alternatively a free form method such as Picture Stimulation or Wildest Ideas could be used in conjunction with a convergent and narrowing tool.

Oessur Mohr - Painter

The third interview that was conducted with a creative person was set up with Oessur Mohr (OM), a professional painter from the Faeroe Islands. Originally a soccer judge by profession and a radio technician by education, OM began painting in 1989 on an impulse, and started taking evening classes to learn the technicalities of how to paint. His paintings was first publicly displayed in 1991, and by 1993 his paintings were on display in Denmark at a large art show. Initially painting family pictures, he was inspired by a 3 week stay at an art school to try his hand at nature-paintings. His main inspiration was the *Glottar*, the light-phenomena on the Faeroe Islands. The weather patterns on the Faeroe Islands are very unique and change quite rapidly, often on an hourly basis. These quick weather changes and their interplay with the sun's light form the *Glottar*, a term for how the changing weather and light produce a unique atmospheric effect similar to northern lights.
In 2000 OM became a full-time painter and have focused his art upon exploring the *Glottar* artistically. This has resulted in a large collection of paintings that focus on the motive of the glottar-lights above one of the Faeroe fjords.

The picture "efterårsdis" by OM

When interviewed about his creative process. OM stated that he starts on an intuitive level. His yardstick for measuring the quality of a painting is how satisfied he feels with it. This is weighted against a constant desire to continuously improve upon a painting, to continually try to put on more layers or more details in a never-ending move towards perfecting each painting. He noted that at times he has to wilfully stop himself from working more on a painting, in the worry that any further work on it will dilute and spoil the completeness that the painting has already archived.
This inner pressure is mirrored in an external pressure, most notably that a painting needs to be sold, and as such needs to be meaningful and viewable to other people such that they will desire to

have it and buy it.

As the interview progressed, and OM talked about how he worked on a painting from start to finish, it became apparent that he viewed creativity as something intuitive, something almost divine, and beyond the understanding of humans. Creativity and inspiration was for him something extremely natural, that that simply happened.

The *Glottar* have been the artistic subject that OM has worked almost exclusively with. Initially, his paintings were very alike in terms of composition and were mainly varied on a detailed level or in choice of secondary colours. A change was spurred in this by an invitation to create 55 paintings for an exhibit on the Faeroe Islands, to which OM realised that sending 55 paintings that would be essentially alike to be displayed side by side would hardly be ideal. He therefore broadened his compositions and began to vary the paintings more, though the motive remains the *Glottar* above the fjords of the Faeroe Islands.
Recently, OM combined efforts with the poet Alexandur Kristiansen to publish the book "*Glottar*" (in 2004) which contains pictures of paintings by OM, which are linked to poems by Kristiansen that are printed besides the pictures.

During the interview, OM was presented with the concepts of Creative Tools and the theory behind them. Brainstorming was used as a specific example.
Curiously enough, OM did not believe that brainstorming or any other Creative Tool would be of value to him. It was assumed that he already had his creative process so well-defined that he didn't feel he needed anything in the way of "technical" assistance from Creative Tools. It may also be that his idea of creativity didn't allow for it to be guided or managed through the use of external tools, but that he felt it should rather be allowed to happen spontaneously and naturally.

Creativity Framework

With input from OM, a Creativity Framework was established to gauge his preferences. This is shown in Fig 3-3.

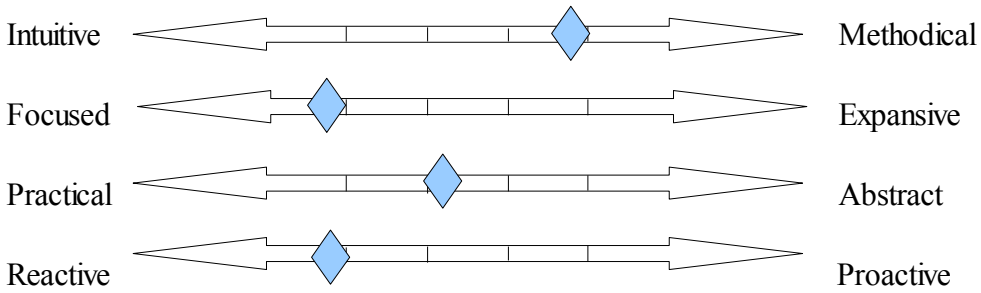


Figure 3-3: The Creativity Framework for OM

- Though one might assume otherwise from his profession, OM works in a very methodical manner. His focus on a particular motive and the gradual development of that motive indicates methodical thinking, and should be matched with a tool that complements such a preference. OM himself felt that he worked and thought in a methodical fashion rather than an intuitive one.
- OM's preference towards focused thinking shows clearly from the effort that must be

extended to stop work on a particular painting at the appropriate time, as well as the focus upon a set motive and concept of art. This gives a strong suggestion for Creative Tools that allow convergent thinking, but it should be noted that OM could make use of tools that foster divergent thinking, though his preference seems to be for convergent thinking.

- As an artist, it might be assumed that OM would be a highly abstract thinker. This is not so, at least not to the degree that a distant observer might expect. Rather, his approach to painting and working is in a practical manner, where he is mainly concerned with practical details in his work, such as colours, composition and frames, rather than concepts. Nonetheless, this practical preference is light, and OM has significant abstract understanding.
- With his disposition towards creative thinking one as an an unalterable natural process, it is difficult to see if any Creative Tools could be suggested to him, as they all require acceptance of their use and function.

With preferences for methodical and focused approaches, the Creativity Framework suggests tools from the paradigm preserving category. These match well with a light practical preference, since most of the paradigm preserving tools are practically oriented in their nature as well. However, OM's reluctance to use Creative Tools and belief that he has no need of them would make it difficult for him to use any tool whose purpose he did not believe in.

Attention Pyramid

According to the model for attentiveness, OM was reasoned to be:

1. *Attentive to the task presented.*
   There was acknowledgement and understanding of the tasks presented and the questions asked.
2. *Somewhat Attentive to the agenda*
   OM accepted the overall purpose of the interview, but it was felt that he did not fully understand the concept behind it, that of the use of Creative Tools to facilitate creativity.
3. *Somewhat Attentive to development*
   OM was aware that he desired to develop himself and his artistic work, but this development was seen as something that would happen instinctively. Nevertheless, he had sought to acquire more or different skills and inputs, as well as steer his art in a general direction.
4. *Not Attentive to effectiveness*
   Though he undertook walks and sought inspiration by observing nature or talking to people, OM felt his creativity was a process that happened and should happen unconsciously.
5. *Not Attentive to trust*
   There seemed to be little concious awareness of the effect that his emotional state of being could have on OM's creative process.

According to the levels given for various Creative Tools by McFadzean, OM should be suited for paradigm preserving tools such as Brainstorming. However, presented by the concepts of Brainstorming, OM did not feel that this tool would be of use to him. This breaks with the theory of the Attention Pyramid.
Likewise, the Creativity Framework suggests the OM would be able to use tools such as Brainwriting or Brainstorming, but his indication that Brainstorming would not be of use to him

contradicts that.

As a whole, the interviews were concluded successfully and though no Creative Tools were used in practice, all three interviews offered various insights into personal creativity and how to present Creative Tools and the theory behind them. In the case-study of Agneta Hytten, the interview led directly to a workshop where a Creative Tool was used in practice.

Workshops

InnLink

InnLink is a group of three graduate students from the Institute of Physics at the Danish Technical University (DTU) that are combining their efforts in the research of Neuroscience. Having written their master thesis's about brain cells (neurons) and offered a proposal for building an electronic chip that could emulate neurons, it seemed natural to them to begin work together for the purpose of exploring this technology.
After a brief period where different concepts were considered, InnLink began in cooperation with Institute of Physics to offer special courses for students at the DTU. Students would participate in a course that related to the fields that InnLink was investigating and would gain credit for that, while InnLink would gain the results of the courses and what insights the students would arrive at. This method of out-sourcing projects to students worked quite successfully, and by 2006, several students have completed the courses facilitated by InnLink and three students have attached themselves to InnLink on a more permanent basis, 2 of them are currently finishing master thesis's in cooperation with InnLink.

As part of their exploration of the field of Neuroscience, the founders in InnLink realised that they needed a methodical way of transferring knowledge between them. Some of the members of InnLink hold different knowledge or are able to see different aspects of various concepts because of the differences in their education. Neuroscience is a large field with many different aspects, including medical, medical technologies, measurement technologies, theories on the structure of neurons, on the structure of the human cortex, etc.
Recognizing that they needed to synthesise the knowledge that they required to progress with their emulation hardware from numerous articles and written works, the founders of InnLink created "Journal Club". Journal Club was conceived of as a reoccurring workshop where the participants would each read and prepare an article for presentation, would present the penitent points of the article to the other participants, and would describe how the knowledge inherent in the article related to the work that InnLink was doing. The purpose of the Journal Club workshop is to let the participants share the knowledge and insight that they possess with the other participants.

It was suggested to InnLink that they could use Creative Tools to enhance this knowledge sharing concept. The person in charge of Journal Club, CB, one of the three founders of InnLink, was interested in this and several meetings were held with him in order to determine what Journal Club required and how it could benefit from Creative Tools and a Journal Club session was observed.

At the time the meetings were held, InnLink was composed of 6 people, three of these were the founding members who had completed their educations, and the three others were the attached students. During the early stages of the InnLink's existence, a division of labour had evolved over time, to the effect that the founding members gravitated towards a managing and supervising role, and the students focused more upon various technical issues and solving of specific problems that were presented to them by the three managers. This matched well with the fact that the three students were all highly proficient within their primary fields, most notably electronics, programming and hardware management, and that 2 of the founders had professional experience as middle leaders.
This difference in focus means that two distinct groups exists within InnLink, referred to hereafter as the Managers and the Technicians.

In his capacity as conductor of the Journal Club workshop, CB sought different means of stimulating the participants in the workshop. Several talks were held with CB and it was decided that he would be presented with a range of different Creative Tools, from which he could then select a Creative Tool for use in his workshop as he found appropriate. Presented was Picture Stimulation, Reversal, Assumption Reversal and Role storming. It was felt that CB already possessed knowledge of Brainstorming and similar tools, therefore the tools presented to him was chosen from the paradigm stretching and paradigm breaking categories. CB felt that the Technicians in the group was only attentive to level 1 or 2 of the Attention Pyramid. The tools presented were nevertheless of a higher level because it was felt that these tools had an opportunity for raising the awareness of the technicians and were better suited for the Managers. There was furthermore some doubt as to the objective in the Journal Club. The stated and communicated purpose was sharing of technical knowledge, but some statements also indicated a desire to translate the knowledge shared directly into ideas or concepts that InnLink could benefit from. During the first observed Journal Club a specific Idea-phase was held where the participants were asked to present ideas acquired from their articles. This early observation run was also held very early in the project, so the concepts of the models used had not been fully established, particularly the Creativity Framework. For this reason the group's preferences according to the Creativity Framework was not established before the workshop but afterwards.
This approach of presenting the tools but not running them was chosen because CB felt that a strong basis in Neuroscience was needed to run the Journal Club. Therefore he desired to run the workshop and the Creative Tool method himself.

After this presentation meeting and prior to the next Journal Club, CB considered which method to use, and arrived at trying Picture Stimulation. He later described how he felt that Brainstorming, Reversal and Assumption Reversal were ill suited to the concept of knowledge sharing, while he felt that Role storming would not match well with the participants in the workshop. He therefore selected Picture Stimulation, on the basis of it being a tool that could be used to illuminate different concepts that the different participants might see in their respective articles.
Journal Club is held over a one hour period, during which several articles have to be presented, therefore the time available for the Picture Stimulation was limited to 10-15 minutes, depending on when the article presentation was done. While this was short and much less than the amount of time recommended by McFadzean, it was felt that the time would be adequate for evaluation of if Picture Stimulation could be used on a regular basis.
InnLink’s Journal Club was commonly held at the Institute for Physics, and it was agreed that CB

would utilize Picture Stimulation during the coming workshop on the 19th of May.

Present at the Journal Club on the 19th of May were 7 people in total, including CB, and Michael Mosgaard as an outside observer. After each participant had presented his article and explained the concepts of it, as pr the usual procedure in the Journal Club workshop, the group was presented for the picture shown below. A projector was used to display this picture onto a whiteboard, so that it was possible to make drawings and text onto the whiteboard which would then appear on top of the projected picture, enabling the participants to use the method as a sort of brain-writing technique. Each participant was in turn asked to step up to the white board, and illustrate a concept or idea that he saw in the picture. The different reaction to this was quite visible. The "managers" universally leaped at the idea and playfully began to describe patterns or aspects of the picture that echoed some concept that they saw in the articles. On the other hand, the 3 Technicians, were very hesitant, tried to pass by saying they didn't have anything to contribute, and were otherwise stumped and puzzled at the suggestion.

The picture displayed to the participants as part of the Picture Stimulation

Several concepts were illustrated, for instance were several concepts from an article dealing with bulberous protrusions on neurons visualised in the image, and associations between the image and the concept of InnLink and potential ideas were also made.

After 2 turns, 2 of the Technicians had grown more confident and were able to contribute,but it was still in a hesitating and self-doubting manner. After the 3rd round, people began to lose sight of the purpose of the Creative Tool. Suggestions became very whimsical in nature, and the whole session took on the air of an elaborate joke. As the Managers began to focus on silly concepts that had little relation to the actual articles, so did the Technicians, and after a few more minutes the session was stopped by CB, since the allotted time had run out. CB rounded off the session and the participants

were asked to give feedback and what their thoughts were regarding the method

After the Picture Stimulation session, the participants were asked to give feedback.
This was quite varied. The Technicians gave responses that Picture Stimulation…

- "Gave a good overview, allowed opportunity for consideration and open questions."
- "Was a good idea somehow"
- "Didn't really mean anything to me"

The feedback by the two Managers was that it was…

- "Useful for giving a an overview and enabled me to better remember what an article was about since it gave a visual reference"
- "A complete waste of time"

CB's own thoughts were that he erroneously allowed the method to become too light-hearted and whimsical. He felt that it would be possible to use the method successfully, but that the participants in Journal Club weren't ready to make full use of Picture Stimulation and that Picture Stimulation wasn't a tool that was well suited to the purpose of Journal Club.
The feedback given by the participants matches well with the observations made during the workshop. Some of the participants were in doubt as to the purpose and point of the method, and therefore were reluctant to participate.

Some weeks after the workshop had been concluded a follow-up meeting was held with CB to provide an evaluation of the workshop, the Creative Tool used, and its impact on the future of Journal Club. During this meeting CB stated that he was quite pleased with the overall idea and concept of Creative Tools. Although he felt that the workgroup itself wasn't ready for using Picture Stimulation fully, it provided insight and allowed reflection. "It was clearly worth using the time for." CB said. CB also stated that he felt that the tool didn't work out because it was oriented towards creative thinking and idea generation, while what he had hoped for was a tool that was focused on sharing facts and communicating knowledge.
Regardless, CB felt it allowed him to gain a better insight into what InnLink was and what its members needed in terms of facilitation and coaching, and while the workshop would probably not have much in the way of strategic importance for what InnLink did and how their approached their concept, it would have tactical importance in how CB himself ran workshops, particularly other workshops with a different purpose, and what he would focus on in the future.

Creativity Framework

After the evaluation meeting, the observations from the Journal Club session was put into the Creativity Framework:

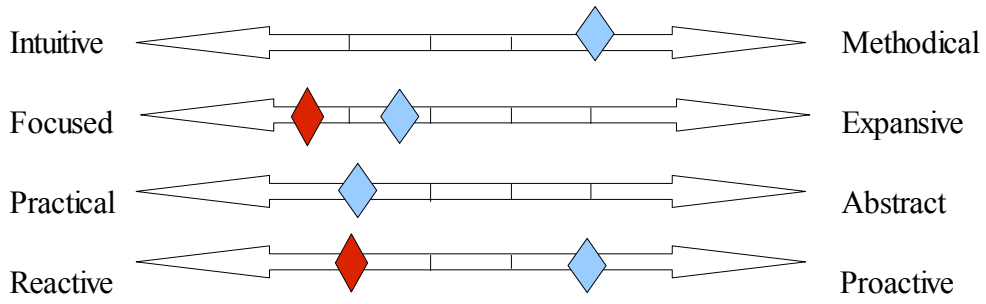


Figure 3-4. Creativity Framework for the InnLink group. Where different from the Managers, the preferences of the Technicians are in red

In Fig.3-4 the blue diamonds show the preferences of the managers and technicians, except where different the red diamonds signify the preference of the technicians.

- Preference seemed to be for Methodical ways of thinking. When the participants were presented with Picture Stimulation, an intuitive tool, it was only the managers who were able to accept and use the tool, but this was done in a linear manner where aspects of the picture were examined one-by-one in a progressive fashion.
- Regarding focused-expansive thinking, the managers were better able to think expansively and draw in new ideas or concepts than the technicians. There was still preference for focused thinking though, since the group gravitated towards focusing upon existing concepts and examine the details in that several times. This suggests that converging tools would be easier for the group to use, such as 5W+H or Brainwriting.
- The group had a strong focus for practical thinking. Concepts and ideas were valued and felt to make more sense if they were related to a practical aspect regarding InnLink. For instance procedures for how to improve knowledge sharing or how to design the details of a hardware component.
- The managers were generally very enthusiastic and willing to try out new concepts and new suggestions. The technicians were much less so and required much inspiration to achieve a comparable level of motivation. This duality presents a problem, since the managers will be well suited for a complex tool from the paradigm stretching or paradigm breaking categories, but the technicians will feel most comfortable and be most able to use a paradigm preserving tool.

Picture Stimulation, although it fit the group's preference for a practical tool, was intuitive and expansive where the group had a preference for methodical and focused thinking. Therefore the tool shouldn't have been used successfully, which it wasn't.
Tools that would comply better with the groups preference would primarily be tools in the paradigm preserving category, 5H+W or Brainwriting. The purpose of Journal club itself also restricts the tools available. As a knowledge sharing session, tools that focus on generating new ideas would not be successful for Journal Club.

Attention Pyramid

This case-study is curious in that there were two distinct groups within the group. The Managers and the Technicians as they have been termed. It would be difficult to unify these two elements in the Attention Pyramid model, so they are presented separately here:

Technicians:

1. *Somewhat Attentive to the task presented to them.*
   These members of the group had a general understanding of the task (reading articles and sharing the knowledge gained) they were asked to perform, but there was a considerable lack of enthusiasm for it.
2. *Somewhat Attentive to the agenda*
   There was a general understanding of the purpose of Journal Club, but little enthusiasm for it or understanding of why exatly it was beneficial.
3. *Not Attentive to team development*
   The technicians were not aware of the development of the group and the members in it.
4. *Not Attentive to team effectiveness*
   For the technicians, there was no awareness of the overall way that the group worked, nor how this could be improved or used to its best effect.
5. *Not Attentive to team trust*
   Though the technicians had very good personal relationships with the rest of the group, there was little awareness of how this influenced the processes in the group.

Managers:

1. *Attentive to the task presented to them.*
   The managers had a significantly higher enthusiasm for the tasks that they were involved in as part of Journal Club than the other people in the group.
2. *Attentive to the agenda*
   They were also understanding of the purpose and concept of the workshop
3. *Attentive to team development*
   The managers are also well aware of the overall direction that the Journal Club workshop should progress in. Even if they are sometimes stumped as to how to move the group towards that direction there is a determination and willingness to try out and experiment with new things and concepts.
4. *Attentive to team effectiveness*
   Likewise, there is a dedicated focus towards examining the effectiveness of the group and how it can be strengthened.
5. *Attentive to team trust*
   The managers have all known each other for a long time and have developed a high degree of trust in each other. There is little fear of embarrassment or anything that otherwise prevents them from expressing themselves. This is recognized and actively used.

Seeing as the group as a whole is split into two distinct and different elements, selecting a Creative Tool for use would be difficult. If a tool was selected that matched the Managers, the Technicians would be left behind and unable to participate, as was the case with Picture Stimulation. If, on the other hand, a low-level tool was selected to allow the Technicians to participate more actively, then it is likely that the Managers would feel that it wouldn't contribute anything or that they were

restricted by the tool.
The Managers should be able to use tools from all three Creativity Continuum categories, but the Technicians would only be able to use paradigm preserving tools successfully.

Although the the method used in the Journal Club workshop was not very successful, it provided a valuable insight for the participants and for the facilitator. Conclusions on this case-study would be that it is a requirement for using Creative Tools that the participants are willing and ready to use a tool. There was great difference in the level of participation throughout the method. Furthermore, in this case-study the participants was lacking a direction. Although they had been given a general idea of the purpose of the method, this had either not been communicated to them sufficiently well or they had not comprehended it completely, as the purpose of the method was lost relatively quickly when the most active participants began to use the method as entertainment.

Likewise, the tool in question must be matched with the purpose of the workshop. In this case, though aspects of the Picture Stimulation were of benefit to the participants, overall the tool did not encourage the right aspect that the group sought, that of better and more efficient communication of knowledge. In this respect, the Desired Outcomes element of Task Appraisal was neglected or misunderstood during the initial meetings.

Workgroup at Musica Art

After the personal interview with Agneta Hytten (AH) had been concluded, AH pointed out that she was hosting a workgroup for women seeking career opportunities within the consultancy sector, career changes, or otherwise wanted to expand their network of contacts. This workgroup is hosted once a month and is composed of a varying number of people, usually 10-12, depending on who can show up and if any of the participants might have invited a guest along.
The primary purpose of the workgroup is to share experience and contact networks between the participants. Participants who work with consultancy services can exchange ideas which can hopefully allow them to achieve conceptual leaps or to see relations between their field of work and other potential areas where their conceptual approach can find application. The participants are also encouraged to demonstrate and tell about their particular field of expertise. Since AH is very musically oriented and numerous of the participants are as well, this often involves using various musically related methods, as well as relaxation and stress-relieving methods.

Present at the workshop was a total of 11 people, including Michael Mosgaard as presenter of Creative Tools, and AH as host of the workshop in her apartment. The participants were a very diverse group of women. Generally, they were all working with consultancy services in some form or another, but their backgrounds were very different. There was one who was a comedian by trade and used methods regarding laughter and fun as part of her consultancy services. AH of course had her focus on music, musical coaching and musical tuition as detailed in her personal interview. A few of the participants had more traditional backgrounds, as personnel managers in companies or state departments. And others had musical or artistic backgrounds.

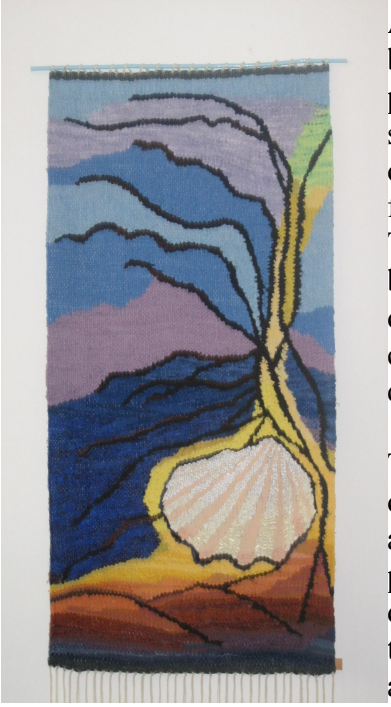
After a quick personal presentation and an outline of the project and its purpose had been given, the workgroup was told about the basics of creativity theory as outline in the Theory section. McFadzean's paradigm concept was explained, as was Ned Hermann’s theorem.
The participants were then told about 3 separate Creative Tools, each from the 3 different paradigms of McFadzean. These were Brainstorming, Reversal (and its sister tool Assumption Reversal) and Picture stimulation. Several minutes were spent on each tool, illustrating the purpose of it, how it was carried out, and what underlying principles it was based upon.

Brainstorming was explained according to the principles of divergent/convergent thinking, and the associative capabilities of the mind. Post-It notes were used to illustrate the ability of the brain to think creatively in a methodical and progressive manner, by explaining how one idea, though it might be far-fetched and completely unrealistic, could contain the germ of a concept from which another and better idea could be drawn. The participants readily accepted this, many of them had experience with Brainstorming as a concept and had used it before, however they commented that it was useful to be made aware of the concepts behind the brainstorming and what the Brainstorming Method relied on in order to be successful.

After Brainstorming had been explained, the methods Reversal and Assumption Reversal was then outlined for the participants.
These method was considerably harder for the participants to grasp. Numerous questions were asked regarding the underlying fundamentals of the Reversal method, and an example was described in detail. Interestingly, the participant who was a comedian stated that the concept of

Reversal was one that was used within the field of comedic stagecraft. By disregarding or reversing aspects of the world that was commonly accepted, one could create an image of a world that was absurd compared to the real world. And the absurdity is a fundamental concept in comedic stagecraft.
In continuation of this discussion, the concept of Reversal was illustrated as being similar to what is seen in a Tom & Jerry cartoon, where absurd things are allowed to run rampant, (Tom gets smashed into a pancake but lives and immediately regains his ordinary form, etc.) and these absurd and unrealistic concepts are used to spur creativity and foster new and conceptually different ideas. This discussion and the accompanying association with the Tom & Jerry cartoons apparently allowed the participants a good understanding of the method.

Lastly, the paradigm breaking method Picture Stimulation was explained to the participants. In order to physically illustrate the concepts of Picture Stimulation, the attention of the participants was drawn to a tapestry hanging on the wall near the round-table the workshop took place at, and it was pointed out how different people with different backgrounds could see different things or concepts in the picture and associate them with different ideas. The tapestry in question is pictured in Illustration 3, the facilitator pointed out how the tapestry reminded him of a tree or the seed of a tree, the blue colour being the ocean, a clear association with some form of undersea farming. The participants were quick to grasp this concept of visualising ideas from concepts that the picture illustrated, particularly those who had artistic experience or background. One of the participants for instance linked the image to that of a clam, another visualised a sunset, and so forth. It was then explained how these different concepts could be related to problem solving by guiding the mind towards linking the picture with the problem formation.



The picture used for demonstrating Picture Stimulation

After this explanation was complete, and a number of questions had been clarified, the participants were asked to select a tool to use in practice, to illustrate it in a practical manner. The participants quickly settled on Reversal, and one of them, a lady by the name of Pia, offered a problem for examination: Namely that she wanted to search for a job that she liked better than her current one.
The problem to be reversed was then “Find a job for Pia” which became “Change the job market so that it fits Pia”, essentially instead of changing Pia and her qualifications so that she matched a job, change the job market so that it matched precisely what Pia was qualified for and desired.

The participants went forward with this quite enthusiastically, many of them had experience with interviewing people for job applications, and the early part of the method turned towards finding out what precisely Pia could and what she desired to do. When a sufficiently detailed knowledge about Pia had been acquired by the participants, they began to visualise what sort of job or function could be built around her qualifications. Pia had experience with health-care, having worked as a nurse, and wanted to work specifically with children and how the health-care system functioned in respect to children's welfare. Numerous generic ideas were put forward, especially by the

participants who had experience with the heath-care system themselves. Eventually, the participants gravitated towards describing a job whose functionality revolved around being a “Health Expert” in regards to children.

Towards the end of the session, it was pointed out to the participants that what they had essentially done was describe the functions of a consultancy job that Pia was qualified for and would be able to provide for schools or health organizations. Speculation then began to drift towards if there was opportunity for such a job in the world, and it was agreed that it would indeed be possible to establish a consultancy job that provided such services, and that there ought to be demand for it.

As feedback, the participants noted that while they perceived themselves to be very creative, intuitive and open to different ideas or procedures, as they went through the Reversal method they became aware that they by default began to gravitate towards procedures that they were familiar with. For instance the people who had experience with interviewing job applicants relied on their experience in that procedure and approached the Reversal method with a set frame of mind in regards to what needed to be done and which order it should be accomplished in.
The method itself was felt to be useful, and numerous participants stated that they had received a better awareness of their creativity.

Creativity Framework

The participants were introduced to the Creativity Framework as part of the presentation, but the analysis of the group according to it was done after the workshop had been concluded.

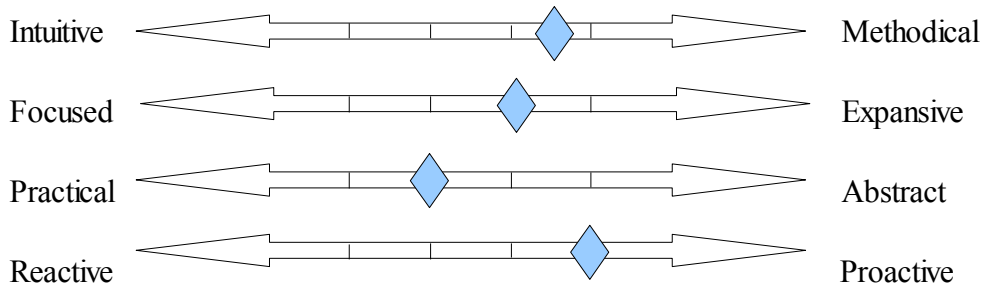


Figure 3-5. The Creativity Framework for the MusicaArt workgroup

- Based upon observations made during the workshop as well as the insights of the participants themselves, an overview can be made of the group according to the Creativity Framework detailed in Chapter II. According to this, though there were several different kinds of people in the group, the overall procedure of the participants leaned towards the methodical. Many of them had a fixed mental framework for how to related to new situations, and this influenced their way of thinking creatively.
- The participants were well able to combine their different backgrounds and experiences together and bounce ideas off each other. There was mutual acknowledgement and understanding that difference in background and experience allowed ideas to be formed that would not have been possible individually. For this reason the group overall leaned towards an expansive way of thinking. Nevertheless, the participants were also quite comfortable

with pursuing a single idea, singling out its components and continuing to pursue a specific line of thought.

- While the participants had many varied experiences and different backgrounds, as a whole they seemed most comfortable when they had a realistic and practical purpose. Observations made in the picture stimulation method were of a material nature, e.g. things and objects that could be seen, touched and felt. There was sufficient experience in fields that are far removed from practical and material procedure that the group was also suited towards abstract thinking. Therefore the group was classified as leaning slightly towards the practical side.
- The participants were very willing to try new things and experiment with new concepts, and they were comfortable with examining themselves and their mental processes. This group would therefore lie towards the proactive end of the reactive-proactive scale, and would be well suited for tools that require a large degree of participation and willingness to let go of bounds.

The methodical focus of the group suggests a tool that works by iteration, such as Brainstorming, Object Stimulation, 5H+W, or other tools that use progressive iterations through a chain of ideas. Though the group leans towards the methodical aspect, it is also capable of using tools that require intuitive grasping of concepts or ideas, such as Reversal or Picture Stimulation.
The participants seemed equally well at ease with using either tools for convergent or divergent thinking. Some of the participants had preferences in one direction or the other, but overall the group seemed capable of fulfilling both convergent and divergent thinking.
A light focus on practical thinking suggests that the group probably benefits most from tools that have a practical or material component to them. Being able to identify an idea by writing it down in a Brainstorming or Brainwriting session for instance, or otherwise link their creative process to a physical object or concept.
The high level of participation and motivation to try out new things suggests that tools from both the paradigm preserving, stretching and breaking categories could be used successfully.

From the Creativity Framework, tools such as Object Stimulation would fit the group's preferences. And the high willingness and motivation in the group also suggests that other tools that lie outside the groups preferences could be used, such as Reversal, which as a Intuitive, Expansive and Practical tool is not very far away from the group's preferences.

Attention Pyramid

If the group as a whole is examined according to McFadzean's group categorisation scheme as outlined in Chapter III, then the group was:

1. *Attentive to the task presented to them.*
   The participants carried our all tasks put before them, whether that included listening attentively and asking clarifying questions when something was presented, participating in a warm-up musical exercise, or trying out a Creative Tool.
2. *Attentive to the agenda*
   The participants had a clear understanding of the purpose and structure of the workshop. The host outlined the plan for the workshop and kept the participants to this schedule, and the participants as well were aware of this. Further, the overall objectives of the workshop

was also kept in mind throughout.

3. *Attentive to team development*
   The primary purpose of the presentation of Creative Tools was to provide a better understanding of self, and give the participants a suggestion for how their creativity could be developed. This was announced to be part of the agenda beforehand. Likewise, the regular meetings had personal development as a clear goal, so this was understood well by all the participants.
4. *Somewhat Attentive to team effectiveness*
   The group itself had no structure to its composition, anyone who felt that they could gain something from the meetings were welcomed. Team dynamics was thus left to evolve naturally in the group. Fortunately, the participants were open-minded enough that they understood that the group was capable of developing ideas and concepts on a level that the individuals in it were not. So there was some understanding for the interpersonal relationships and that these should be kept in mind.
5. *Not Attentive to team trust*
   Though the participants were very open towards each other, many of them seemed to have a need for how they appeared in the eyes of the other participants. The group was composted of people who had no prior experience with each other, so naturally there were some reservations within the group.

Based upon the overview given by McFadzean's Group Attentiveness pyramid, this group would have been well suited for tools from both the Paradigm Preserving and Paradigm Stretching categories, and to a lesser degree, the Paradigm Breaking category.
Reversal would have been well suited to the group, being a Rating 4-5 Creative Tool according to McFadzean. And Reversal was used successfully by the group.
Curiously enough, the groups lack of team trust would have prevented them from successfully using Picture Stimulation. Nevertheless, there was understanding and acceptance of the concepts behind Picture Stimulation, and it is a possibility that the group would have been able to use the tool successfully despite it being a Rating 5 tool and only recommended to groups attentive to team trust. Although some of the participants would probably have been reluctant if the Picture Stimulation method had been used, they might very well have been encouraged to play along by the people who would use it. As it was, during the brief demonstration of Picture Stimulation, several of the participants were eager to get involved.

Overall, this mini-workshop was a good success, the participants were both able to use the tool given them successfully, and received an increased awareness of the creative process and how it can be strengthened with Creative Tools. Although the Creativity Framework for the group was worked out after the workshop and suggested that other tools than Reversal would have been preferred, the high willingness to participate allowed the Reversal method to be used successfully. Though, as the participants also pointed out during the evaluation, they drifted lightly away from the intent of the method in that they fell back on relying on their own established procedures and experiences.

Polytechnical Fantasy Dome

PFantasyDome

The students at the Technical University of Denmark (DTU) are a varied and diverse group of people, interested in a broad variety of subjects and hobbies. To accommodate this, there exists several social clubs and communities at the DTU which are focused towards a hobby or certain aspect of social group work. There is a theatre group, a radio station, a significant number of sports groups, and several gaming groups, ranging from billiard to on-line poker.
One of these game hobby groups is Polytechnical Fantasy Dome (PFD), which is oriented towards table-top gaming, board games and role-playing games. The club is composed of 20-25 people, the exact number fluctuates, who participate to a greater or lesser degree in the weekly evening meetings, as far as their studies, jobs and schedules allow. In addition to a weekly meeting, PFD also arranges a yearly convention for gamers and role players. This convention is focused on table-top role-playing games. A large part of the convention centres around several role-playing games that are written and prepared for the occasion. The scenarios that are played through span numerous RPG (role-playing game) systems, and are characterised as being created exclusively for the occasion so that none of the attendants might know a scenario in advance, and in order to lend an atmosphere of uniqueness.
Therefore, the members of PFD who participate in the convention are required to create a number of role-play scenarios for the games. These scenarios are in essence brief screenplays and guidebooks for the people who will be hosting (called game mastering, or GMing) each of them.

The creation part of these scenarios greatly rely on creativity. The person who writes a scenario must conceive of an idea within the limits of what is feasible during the convention, in terms of time limit, resources, number of players, etc., and must also carry out that idea by writing a brief plot line for the scenario. Just like scriptwriting for the theatre, this plot line needs to be believable within the constraints of the game world and the rules of the game system, and most importantly, needs to be structured in such a way that it ensures that both the players and the game master enjoy playing the scenario.

It was therefore suggested to the members of PFD who were writing scenarios that they could make use of Creative Tools. This assessment was readily accepted, and a time and date was agreed upon for hosting a workshop during which Creative Tools would be presented to the participants and where they could then use one or more Creative Tools in practice for the purpose of generating ideas for scenarios. It was then agreed to arrange this workshop on Sunday the 19th of July, to take place over the course of the afternoon. It was projected that the workshop should start at 12pm and last up to 6 hours, including breaking for lunch. Over the course of the next two weeks, 6 people signed up for the workshop in advance.

At 12pm, present in the club rooms of PFD was Michael Mosgaard as facilitator, and a grand total of one person, who was sleeping off the effects of a hangover on a couch. Sadly, the plans for the workshop had been hamstrung by the fact that there had been a world-cup semi-final in soccer the evening before. This disrupted the schedule a bit, since the participants had to be called and

reminded of the workshop. 3 people did arrive a bit belated of their own accord, and the remaining 2 were reminded by telephone. The start of the workshop was therefore delayed an hour while people tinkled in, but this was seen as acceptable since it allowed people to rub the sleep out of their eyes and to get settled.

The participants were given a short introduction to Creative Tools, their purpose and how they worked. Specifically Brainstorming, and Reversal were mentioned, as was Picture Stimulation to illustrate the associative capabilities in the creative processes.
On account of the glorious weather, the workshop was moved outside, and two of the participants who were working on a scenario each described what it was, their overall idea, and what their vision of the end result was.

To progress forward with this, two Brainstorming sessions were held, side by side. Since there were 6 participants, three of which were working on scenarios, and the other three participants that were there to offer their ideas and contributions, it was decided by the facilitator that a brainstorming could be held for the first two scenarios simultaneously, so that the participants could hop back and forth between the two and contribute ideas to each. This was readily accepted by the participants, and the concept of hopping from different brainstorming sessions worked quite well. The overall objective of the two brainstroming sessions were similar enough that it was felt the participants could contribute ideas to both brainstormings or be inspired by one of the brainstormings in the ideas generated for the other brainstorming.

One of the two participants whose scenario was in focus noted that he had the overall concept and idea of his scenario worked out already. What he lacked in the scenario-creating process was a number of detailed ideas for what should happen in-between the start and end of the scenario. What he sought was both a convergent process and a divergent process, since he knew the frame within which he needed ideas, but did not have specific ideas that could be chosen from, as is usually the case in a convergent process.
To accommodate this, the end point of that scenario was described on a post-it note and placed at the end of the table. While the start of it was placed at the other end of the table. The idea therefore being that the ideas to be generated should bridge the gap between the starting point and the ending point in the scenario.

A picture of the brainstorming session in progress

As the method progressed, it became clear the participants were quite able to walk between the two sessions, contributing ideas to both.

After a little over an hour had gone, a great number of ideas had been generated, and the pace began to slow noticeable. It was therefore agreed to end the sessions and break for lunch. Transcripts were taken of the

brainstormings and lunch was arranged.

A snapshot of the Post-It notes covering the two tables as the Brainstorming sessions were brought to a close

On account of several people being rather tired, the lunch break took unexpectedly long, upwards of an hour and a half. The second half of the workshop was then started with the participants being reminded of the concepts in Picture Stimulation and its overall function. One of the participants had a 3rd scenario that he was working on and he offered as a focus for the picture stimulation method. At this point, the conversation which took place over lunch had drifted towards Creative Tools and the workings of Picture Stimulation was debated, including how best to go about stimulating ideas for scenario idea generation through Picture Stimulation.
It was discussed how the selection of the picture was highly important, as it would determine the overall direction that people would be guided towards thinking in. Several participants suggested that Picture Stimulation could benefit by letting the participants go off from the workshop for a given length of time, bringing a camera with them, and photograph thinks they saw that they felt were related to the topic or problem at hand. Sadly, this would require a level of resources that wasn't presently available at the workshop, but it was suggested that since the purpose of the workshop was to generate ideas for role-playing scenarios, the method could utilize one or more pictures that related to role-playing. Although the facilitator had brought The Time's Book Of World Architecture along in the belief that it could act as stimulant, this suggestion was readily agreed to.

The precise way that the Picture Stimulation method was conducted therefore ended up with the participants being handed a large stack of RPG rulebooks, which are all filled with many and varied illustrations, to browse through while providing ideas. It was felt that the participants would then be able to draw inspiration from the numerous different concepts that were illustrated, as well as from the different concepts that the rulebooks themselves contained. It should be noted that the participants were all very well acquainted with the different RPG rule systems, and it was therefore easy for them to synthesise what concept the various rule systems represented.

This worked to a degree, the person whose scenario ideas were to be generated for briefly outline the RPG system he was using, the overall concept and story that he envisioned, and what sort of scenario he wanted to build. In this case one where the players were working together, but were also given parts that were at odds with each other, and would then have to role-play towards a conclusion or conflict.

As the participants thumbed through stacks of books in search of inspirational illustrations, it

became clear that they were rather tired and worn out. The concept of idea generation through picture stimulation slowly ebbed out, and the participants gravitated towards a simple brainstorming with post-it notes for keeping hold of ideas, and generating ideas at random rather than through the picture stimulation method. Various ideas were put forward for the details of the scenario that was being focused on, and the participant who was writing the scenario indicated that it was very useful to be able to discuss and share ideas with others. However, the concept of the Picture Stimulation method itself faded away and the last part of the workshop was spent in ordinary discussion and idea generation by brainstorming.

After a total of five and a half hours had gone since the start of the workshop, the picture stimulation method was brought to a close and the participants were asked for their feedback on the workshop. The feedback was generally favourable. The participants stating that:

- "It was interesting to be have it brought to my attention, it created consideration and self-awareness"
- "The processes gave a lot of food for thought, and showed how important a group could be."
- "It wasn't bad, there was a lot of ideas, but none of them really solved my problem"

Furthermore, it was speculated by the participants that the people in the group, being role players and very used to imagining and fantasising, were very creative by nature. It was felt that brainstorming in its concept of structured idea generation was unsuited to highly creative people, particularly since they felt that they were able to relate to numerous different topics and situations and generally could outperform brainstorming.
The participants are likely correct in that they possessed a creativity that was unbound by regular restrictions within their field. But brainstorming has a number of advantages in its concept that still makes it useful to highly creative people. Most prominent is the structured approach to idea generation. Far too often, idea generation takes the form of a discussion or heated exchange, during which ideas fly back and forth and quickly get lost as the discussion shifts between topics and ideas. Relying on the mind to both generate the ideas and to store them is likely to ensure that very few of the ideas are followed up on or even remembered. Likewise, if the participants hadn't used Brainstorming, but a general idea generating discussion, it is unlikely they would have reached the ideas and awareness that they did reach with Brainstorming.

It was pointed out by the scenario-writers at the end of the session that the methods hadn't really given them what they precisely wanted. It turned out that the scenario-writers felt that they had a much better grasp of what concept they wanted than they had indicated, and that none of the ideas that were arrived at really fit into the mould that the scenario-writers envisioned for their scenario. It was acknowledged that some good ideas had been generated, but apparently, none were used in the later stages of the scenario writing process. Even so, the scenario-writers were able to eliminate a set of unwanted ideas.

Overall, the participants felt that it was an interesting approach to problem solving, but that it didn't quite give them what they wanted. The participants who were writing on scenarios had vaguely envisioned that the workshop would have allowed them to fix on specific ideas and plot lines, rather than supply more ideas to choose from. This assumption, coupled with an unclear indication of what those 3 participants genuinely wanted, hampered the workshop. Only one of the scenario-writers specified that he desired a converging process, and even so, didn't have much except an

overall framework to offer initially. For that reason, that brainstorming method were structured to allow divergent thinking while having a set end that it was oriented towards.
Despite this, the workshop didn't manage to solve the problem that people had hoped it would, although it significantly raised the participants awareness of the creative process and the options for structuring and guiding that process. The participants stated that now that they had gotten a taste of what a creativity workshop was, it was certainly something that they were open to using again.

Creativity Framework

Inputting the observations about the group into the Creativity Framework provides the following:

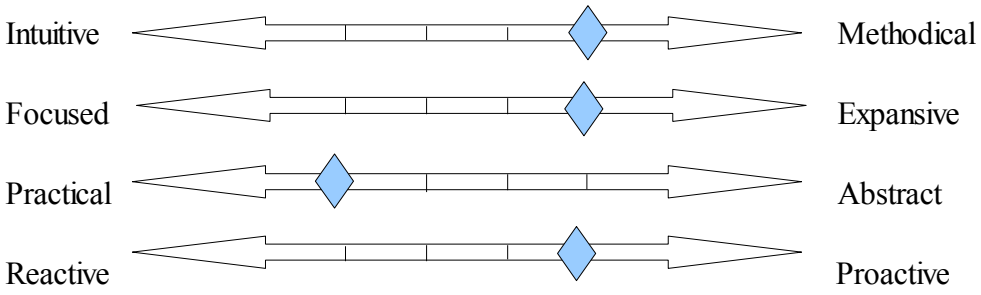


Figure 3-6. The Creativity Framework for the PFD group

As Fig. 3-6 shows, the group was felt to be very methodical in their thinking, very divergent, practical and proactive.

- The majority of the participants had a background in civil engineering or other methodical fields, and it was clear through the Brainstorming sessions that the participants felt comfortable with a set procedure that they could relate to. This suggests methodical methods, such as Brainstorming (which was used successfully).
- It was also observed that the participants enjoyed being divergent more than being convergent. Although convergence was required as the goal of the Brainstorming sessions, the participants naturally drifted towards expansive and divergent thinking. More ideas were put forward, different concepts were suggested, and it was difficult for the participants to be held to a specific focus. This group would therefore find ease with using divergent tools such as Role storming or Assumption Reversal.
- As benefits a group whose members have backgrounds in practical fields, the group was very practically inclined. However, the practical thinking nature of the group was less bound to material and physical concepts, but rather bound to the practical nature of the role-playing games that the group used. When thinking creatively about concepts related to role-playing games, the group had essentially replaced their ties to the concepts of the real world with ties to the concepts in the various game-worlds that they played with.
- The group had high levels of enthusiasm and willingness to try something new. Different suggestions were listened to and accepted very easily, the group had little problem with pushing themselves to try something new. This allows the tools from both Paradigm preserving, stretching and breaking to be used by this group.

The Creativity Framework for the group suggests tools that allows the group to operate in a Methodical, Expansive, and Practical manner. This suggests some of the paradigm preserving tools

such as Word Diamond or Force Field Analysis. The very proactive attitude of the participants suggests that tools from the paradigm stretching or paradigm breaking categories could be used. In that case the selected tool should probably be one that matches the participants preferences as much as possible.
As a side note, though Picture Stimulation complies with the preferences for expansive and practical thinking, Picture Stimulation is a tool that relies very much on intuition. For this reason, Picture Stimulation could only have been successful if it was made more methodical and the participants were given some form of formula for how to use the method. This matches well with how the participants gravitated towards a loose discussion with elements of Brainstorming in it.

Attention Pyramid

The group that participated in this half-day workshop was more uniform than the ones in the other two case-studies. There was of course nuances and differences between group members, but on a general level, the participants were similar in their mentality.

1. *Attentive to the task presented to them.*
   The participants were well aware of what they were asked to do and worked with enthusiasm. Since the theme of the workshop was of benefit to several of the participants and of interest to the rest, the level of attention and enthusiasm for the task at hand was high.
2. *Somewhat Attentive to the agenda*
   Late arrivals and participants who had forgotten that the workshop was to be held showed that the participants attention to the agenda was low at the beginning. However, after the participants had gathered, the level of understanding for the purpose of the workshop rose notably.
3. *Mostly Attentive to team development*
   Hand-picking participants for the workshop wasn't an available luxury. Fortunately, the people who were interested in participating were also those whom it was felt had something to contribute. The participants were very willing to discuss how Creative Tools could be used differently to better suit the group and its problem statement, but there was little awareness of the concept of developing the group as a whole towards problem solution, or of the roles fulfilled within the group by the participants.
4. *Attentive to team effectiveness*
   The participants were aware of the dynamics in the group on a general level. They were able to identify elements in the relationships between them that they wanted to encourage, such as being able to communicate effectively and rationally about ideas and concepts.
5. *Somewhat Attentive to team trust*
   The participants all knew each other very well, and there was a desire to respect each other and the ideas or opinions that each participant held. There wasn't an explicit understanding of this however, it was a result of the participants having intuitively developed a framework beforehand for how to respect and trust each other.

For this case-study, parts of the Attention Pyramid structure seems to break down. The group members had partial or full awareness of the later levels in the Attention Pyramid, and were dedicated to respecting each other and their opinions, but were hampered by a lack of dedication to the agenda.
The participants were easily able to handle the Brainstorming method, and were sufficiently

attentive to be able to discuss the concepts of Picture Stimulation, even though the Picture Stimulation method itself was neglected.
This partial awareness at several levels makes selecting Creative Tools according to the Attention Pyramid a difficult task, since it is unclear what precise level the group occupies.

It is difficult to draw an indication of which tools the group is suited for from the Attention Pyramid Structure. While the Creativity Framework suggests methodical tools such as Brainstorming, 5H+W or Force Field Analysis.

This case-study illustrates that it is important to know what the participants want. Though the Brainstorming methods were used successfully, they did not provide the solutions the participants were looking for. The methods used were not optimal for converging towards a specific idea and scenario-plot line, but neither did the participants provide sufficient information that would have made a converging process possible. If the facilitator had been aware before the workshop began that the participants wanted a converging process and were able to give sufficient information on the ideas they had, then a different set of Creative Tools could have been used to better effect to facilitate this process. Tools such as 5H+W or Brainwriting would then have been suitable for such a process. A dedicated pre-planning session could possibly have identified the desired outcomes of the participants better. Too much divergent thinking was allowed when the Brainstorming methods should have been guided towards a convergent aspect at some point during the workshop. Regardless, the participants gained a higher level of awareness of creativity, and welcomed the idea of future creativity workshops. Since there is now greater understanding of what the preferences and capabilities of the participants are, a follow-up workshop would be able to use more appropriate tools.

Chapter IV: Project Procedure

This chapter will give an account of how the project was carried out. It will describe the methods that were used to arrive at various solutions, the decision points in the project, as well as the ups and downs of the project.

The project was begun on the 1st of March 2006, with the purpose of examining which Creative Tools were suitable for use by creative people normally unaccustomed to utilizing Creative Tools, as well as establishing criteria for the selection of these tools. A working title of ”Creative Design: Tools, Workshops and Facilitation” was established.

The project progress can broadly be divided into the following phases:

- Purpose Finding.
- Fact Finding & Litterature Survey
- Case-study Finding
- Model Finding & Creation
- Structure Finding
- Verification & Documentation

A similarity exists between the phases in this project and the 6-step model for Creative Problem Solving. This similarity is not unintentional, since the project have been a series of diverging and converging phases, each with a different focus.

Purpose Finding

A personal brainstorming session was held in accordance with the guidelines described in Chapter 2, in order to determine what contents the project could contain and which elements it could illustrate, the result of this is shown in Fig 4-1.

The brainstorming gave 2 major avenues of approach, a theoretical study or a more practically oriented study. It was decided that the project would focus on a series of practical case-studies that would involve selection and usage of Creative Tools. These case-studies would be drawn from people with experience in fields where ”design” plays a major part. A requirement of such a practical study would be that it had a theoretical foundation. Therefore, a literature survey was begun in order to give an overview of the research that had been done into creativity and Creative Tools.

Figure 4-1: A mindmap of the initial brainstorming

Fact Finding & Literature Survey

An early inspiration for how creativity could work in practice was provided by Tom Kelly's book about IDEO [23]. With its many descriptions and examples of creativity within the IDEO company, it gave an assurance that creativity could be quantified and approached in a methodical manner. Although the specific example from IDEO that is used in Chapter I to illustrate group creativity is not a theoretical model but rather an evolved understanding of what characters and roles can benefit IDEO and their Hot Teams, the underlying concept that it illustrates, that of group creativity as a series of synergic processes between the members of a group, was felt to be useful for the understanding of how group creativity could be described.

Similarly, McFadzean and her work regarding the Attention Pyramid model gave a foundation for the selection of Creative Tools in the case-studies of the project. While the Attention Pyramid model itself was eventually found to be inadequate for the detailed selection of Creative Tools, the procedure that it illustrated, as well as the complimentary role it served for the selection of Creative Tools, proved valuable.

As part of the literature survey, numerous works and articles were also found that either illuminated the overall Creative Problem Solving process (Vidal[43]), described specific Creative Tools (McFadzean[25], Higgins[17]), provided models for group dynamics (Kozar & Zigurs [24]) for group roles (Isaksen [20]) or for group problem solving processes (Briggs & Nunamaker [6])

The works of Ned Herrmann was also used as inspiration in the early stages of the project, lending weight towards a project that examined the quantification of the mental processes involved in creativity. The HBDI and the numerous examples presented by Herrmann prompted consideration about how people or groups should be evaluated, and if this should be done according to the HBDI or according to some other model or framework.

Case-Study Finding

While the literature survey was still ongoing, a search was commenced for case-studies that could be involved in the project. It was reasoned that the insights gained from the case-studies, particularly ones that were held early in the project process, could be used to give an indication of which direction the project could take. Holding one or more case-interviews early would also give insights that could shape the theoretical framework for following case-studies. Basing a theoretical framework upon a range of erroneous assumptions regarding creative designers could therefore be avoided.

Over time, six specific persons or groups were found that became involved in the project as case-studies. The case-studies themselves and their backgrounds are described in detail in Chapter IV, but a brief explanation of how and why each case-study was included in the project is given here.

Each of the six case-studies involved in the project was involved through an already existing contact network, either a personal one or an extended personal one (With the difference being that personal ones would be direct friends, extended personal ones would be friends of family or other friends) The three earliest case-studies were those with individuals, Agneta Hytten, Nina Grove and Oessur Mohr. While the subsequent later studies were with groups, at InnLink, Musica Art and PolyTechnical Fantasy Dome respectively.

Agneta Hytten (AH)
AH was a personal contact who, upon being contacted, expressed both a very high level of interest, and described how she had taken her career more in the direction of coaching, rather than remain a musical tutor. For this reason AH was selected as a case-study, so that she would not only be able to illuminate how a person with a musical background would respond to Creative Tools, but also how someone engaged in coaching would relate to the overall concept of the project.

Nina Grove (NG)
Also a personal contact, NG expressed a high level of interest and willingness to participate when told about the project. Since this was in the early stage, she was accepted as a case-study as someone who spent the majority of her time focused on the aspect of ”design”, but had not been exposed to either models of creativity or Creative Tools.

Oessur Mohr (OM)
An extended personal contact, OM initially expressed only curiosity interest in the concept of the project. Nevertheless, OM was selected as a case-study on account of his profession being one that was thought to require significant degrees of creativity, and his specific field was different from those in the case-studies at the time.

InnLink workshop
All the people in the InnLink group were personal friends, so approaching them with the suggestion of becoming a case-study for the project was quite easy. Though InnLink did not directly match with the parameters of a creative design group, there were thought to be sufficient aspects of decision and design within the work that InnLink did, that Creative Tools would be applicable to their work. Furthermore, InnLink was the first group who expressed interest in being a case-study,

and it was seen as important to have one or more case-studies that involved groups rather than individuals. Therefore InnLink was selected as a case-study even though their focus was not specifically on design.

Musica Art Workgroup
After the interview with AH had been concluded, she proposed that a presentation could be held at the monthly workshop that she hosted. The interview with AH had gone very well, and the workshop that she hosted was focused upon people from different fields and with different backgrounds who all shared elements of coaching, group management or innovation facilitation. While it was doubtful how thoroughly they would be able to try out one or more Creative Tools, the group was selected as a case-study because they were a medium sized group who had little experience with each other and were interested in creativity as a field of research. This combination of elements was not present in any of the previous case-studies, so while the case-study itself would be only a short presentation in a larger workshop, the input and insights the participants might offer were seen as valuable.

PolyTechnical Fantasy Dome (PFD) workshop
The last of the case-studies to be selected and run, many of the members of PFD were personal contacts, so approaching them with the offer of being a case-study was easy. However, several of the members of PFD were leery of participating, on account of not being comfortable with the concept of the project. Fortunately, enough people did not share this discomfort that a workshop could be arranged. In this way, the members of PFD who agreed to attend the workshop would be those who were interested in hearing about the concepts that the project illustrated and were willing to participate. This case-study had the opportunity for an extended try-out of one or more Creative Tools, something which had not really been the case with the previous case-studies.

A number of other companies or groups were also investigated to determine if a case-study could be made with them, but these either refused or proved unsuitable as case-studies. For instance, contact was made with IO Interactive (a computer game making company), in the hope that they would agree to be available as a case-study. Unfortunately, IO Interactive refused, stating that they had previously had negative experiences with coaching or creativity facilitation. IO Interactive would otherwise have been a case-study that examined the creativity and creative processes that was used by a company of large size.
An attempt was also made at establishing contact with people in the Design & Innovation study line at the DTU, as well as determining if they had contacts to any companies involved with design. However, the supervisor at the Design & Innovation line who was contacted did not offer any suggestions for companies that might be of interest, or point in the direction of any students or other individuals who might be interested.

Ultimately, the case-studies were selected on a basis of availability rather than by virtue of any overriding plan for what the case-studies should contain. Although the search for people who could participate was intentionally done towards people who used design in their field of work, a lack of quantity prevented any true choice from being present in the selection of case-studies.
If a detailed plan had been worked out in advance for what was required of each individual case-study and how it would tie into an overall plan, the search for case-studies might have resulted in different groups or individuals as case-studies. However, there would have been no guarantee that

these would have been any more or less willing to participate than the people that ended up being case-studies.
Furthermore, getting in touch with people outside an already established contact network who would be willing to participate might have been more difficult than with known people.

Model Finding & Creation

During the early stages of the case-studies, it became apparent that a model for creativity would be beneficial. Both in the literature that had been examined and in the case-studies so far, there had been indication that creativity could be categorised and that this would be beneficial for selecting Creative Tools. This prompted the creation of the Creativity Framework as detailed in Chapter II. Originally based primarily on Herrmann's HBDI and McFadzean's Attention Pyramid, the Creativity Framework was later found to match particularily well with the Big Five personality traits and share many similarities with the Myers-Briggs Type Indicator as derived from the works of Carl Jung.[33]
The Creativity Framework was used to evaluate all six case-studies in the project, though several of the later workshops were only categorised according to the Creativity Framework after the workshop itself, due to the difficulty of establishing a single set of combined preferences that could describe a group, in accordance with all members of that group.
While the Creativity Framework gave an indication of what sort of Creative Tools would be suitable for a particular individual or group, only in the case of the PFD case-study were there sufficient time to thoroughly try out a Creative Tool. An attempt was made in the PFD case-study to try out three separate tools, one each from the three paradigms in the Creativity Continuum by McFadzean, which were also suited to different preferences. Unfortunately, lack of time and energy during the workshop restricted the tools to primarily one of the three proposed Creative Tools. Therefore, the case-study was not sufficiently able to illustrate the different ways that the group might have related to Creative Tools from different paradigms.

Structure Finding

As the case-studies were completed, thought was given to how to structure the project and the different elements in it in relation to each other. Using the Creative Tool ”Metaphor”, the structure of the project was linked to that of a house. In this metaphor, the various elements of the project (case-studies, theory) was linked to the structural elements of a house. A balance would therefore be required between these elements, since too heavy focus on one element would

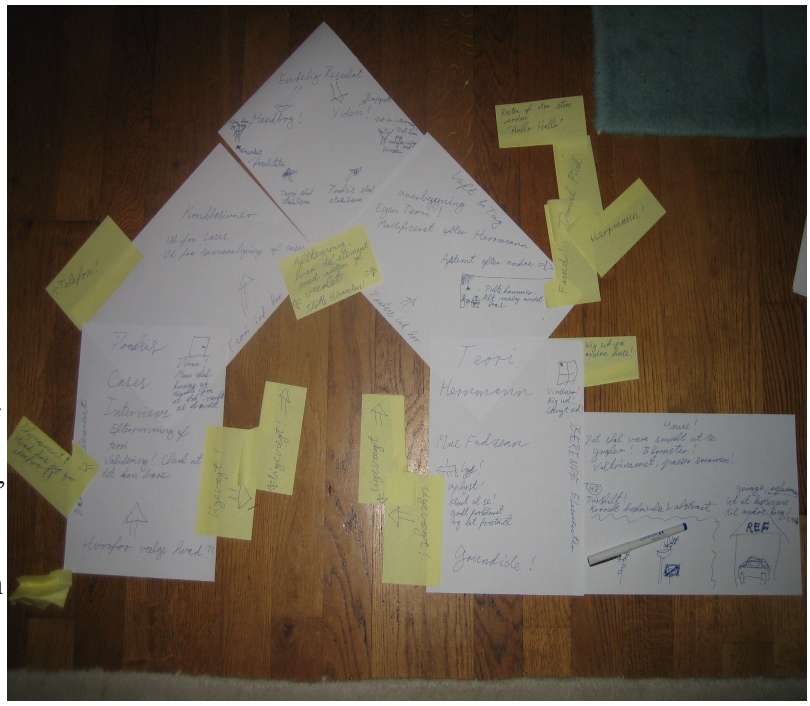


Figure 4.2: A picture of the house metaphor structure.

unbalance the ”house”. While conceptually simple and later on too abstract for the detailed structuring of the project, the metaphor nevertheless served as a guideline for the project's overall structure.
See Fig 4-2.

At the conclusion of the various interviews and workshops, it became apparent that incorporating the aspect of design in the project would become increasingly difficult since little in the way of literature had been found that illuminated the design process distinctly from the creative process, nor did the case-studies themselves properly differentiate between creativity and design.
To account for this, the working title of the project was changed to its final version, that of ”Creative Tools: Selection and Case-studies”. This also matched better with the projects focus upon selection of Creative Tools, though the idea that this should have been specifically for design-oriented people or groups were thus discarded.

Verification & Documentation

This phase of the project involved re-examining all the earlier phases and verifying them.
The whole process of the project, the finding of the focus for the project, literature survey, case-study search, interviews and workshop, and so forth, can be characterised as a non-repeating linear process. A few elements of the project, notably the various models and the Creativity Framework, was continuously returned to and re-evaluated in light of insights gained throughout the process, but this was done in an intuitive and indirect manner, rather than as a result of a dedicated project process. Similarly, the majority of the case-studies were not returned after they had been completed, and no iterative process was undergone with them. Some of the case-studies were not suited for this though, repeating the interviews with the three individual case-studies would have given little benefit unless there had been a desire to make use of Creative Tools in their creative processes.

Process-wise, the project could also have benefited from a more extended use of converging Creative Tools. At several points during the project, progress was quite slow, obstructions in the form of doubts as to which aspect of the project to focus upon became apparent several times. This was most notable during the Model Finding and Verification & Documentation phases. A more methodical use of converging tools to help overcome this could have helped benefit the project.

Chapter V: Conclusion

This chapter runs through the conclusions that were arrived at during the project and discusses their relevance.

This project has presented a range of models for understanding creativity, both individually and in groups, for selecting Creative Tools appropriately, illustrated a number of case-studies that are meant to illuminate the selection of Creative Tools, as well as describing the facilitation of the case-studies in practice.

These models are meant to offer a solution to the decision problem of Creative Tool selection. Some of the models, for instance the Attention Pyramid and HBDI, can either be improvised for use in Creative Tool selection, or provides an unspecific guideline. The model that has been developed as part of this project, the Creativity Framework, provides a greater depth of detail in its suggest for which Creative Tool should be used for the facilitation of a particular group.

Models

Some of the models presented in this project are oriented towards being applicable on as general a level as possible. The HBDI is an example of this, an overarching model that attempts to encompass as many elements of a specific person as possible.
Other models, the group role model by Kozar and Zigurs for instance, are specified towards a certain instance, group or time frame.
These models are useful to a facilitator for establishing an understanding of the group or person that he or she might be working with. But the models do not invalidate or replace the facilitator.

One of the most important tools available to a facilitator is still the facilitator's intuition. It is ultimately the facilitator who must decide if a CPS process is valid and necessary, if a Creative Tool should be used in the CPS process and if so which one. *"Selecting a suitable method or a set of methods is a decision problem that has to be approached in a creative way"* (Vidal) [43]
Like the CPS process itself, this decision process can be guided and aided through the use of models, such as those presented in this project, but it cannot be discarded or replaced. To solve the decision problem of Creative Tool selection requires that the role of the facilitator be filled.

The HBDI, with its questionnaire, might not seem like it is restricted to being an aid to the intuition of a facilitator. But the 120-point questionnaire is instead largely an abstraction of Ned Herrmann's intuition. By creating a questionnaire for using in quantifying creativity according to the HBDI model, Herrmann has systematised the evaluation of a person or group. This systematisation is similar to the process than an experienced facilitator would go through when categorising the creativity of a person according to the HBDI were he not to use the questionnaire. But a static questionnaire does not have the flexibility that a facilitator has. Likewise, any model that seeks to mechanise the design problem of Creative Tool selection through questionnaires or specific processes, while disregarding a human facilitator, will ultimately be trying to replace the flexible human facilitator with an inflexible structure created by a more distant human facilitator.

Likewise, the Creativity Framework cannot and should not replace the intuition of the facilitator, indeed, the Creativity Framework is largely dependent on the intuition of the facilitator in order to arrive at a determination of preferences. The Creativity Framework is instead meant to be a guideline and an aid to a facilitator, allowing the facilitator to have a model for creativity at hand, one that can be easily adjusted and can be used to help the facilitator determine what sort of Creative Tools that a group might be suited for.

One way that the Creative Framework could be improved would be to construct a questionnaire similar to that made by Herrmann, from which could be derived a person's preferences. Such a questionnaire would have to be designed in such a way that a person answering could not immediately interpret the questions as pertaining to a personality analysis. Otherwise, as Herrmann also points out, a person could be tempted to answer falsely in order to get a result from the test that would be more in-line with the persons perception of him- or herself, or which would be perceived to be more prestigious.

Using the Creativity Framework to determine which Creative Tools would be suitable for a group or individual is not the limits of its functionality. The Creativity Framework could also conceivable be used in reverse, to determine before a group was formed, which sort of people would be best suited towards a particular Creative Tool. This would be relevant in the case that a specific Creative Tool was required on account of particularities in the result it might give or the process that would be used in it.

Similar approaches can be taken by many of the different models for creativity and group work. Identification of a person's or group's creativity and preference can be used either to determine if a particular Creative Tool is suited for a specific group, or if a particular group is suited for a specific Creative Tool.

For a complete validation of the Creativity Framework, further testing is required to determine if the Creativity Framework will be able to provide good offers for which Creative Tools can be used by a group or person, and if there are situations the Creativity Framework might not be well-suited for. Since it is reliant on observations and intuitive insights on behalf of the facilitator, a significant part of the Creativity Framework's result will be dependent on the facilitator and his or her judgements. This is similar to the Attention Pyramid, which is also reliant on the facilitator's observations (or very high awareness and honesty on behalf of the group being facilitated) to determine a group's level according to the Attention Pyramid.

Case-studies

The case-studies in the project were categorised with the Creativity Framework and the Attention Pyramid. In all the case-studies the Creativity Framework gave a suggestion for what the creativity preferences of the participant(s) were. The Creativity Framework preferences for the three interviews were established together with the person being interviewed, while the preferences for the three workshops were only established after the workshop. The preferences established for the workshop case-studies were therefore a result of observations made by the facilitator.

As part of the InnLink case-study, the preferences found through the Creativity Framework

suggested that the group would not be comfortable with using the Picture Stimulation tool that was used, this proved to be the case as well.
The Musica Art workshop used the Reversal method successfully, which matched 3 out of 4 of their preferences according to the Creativity Framework.
And in the PFD case-study, Brainstorming was used successfully and was a preferred method as suggested by the Creativity Framework.

Though the Creativity Framework's suggested methods were used successfully when matching a groups preferences and were unsuccessful when not matching, this is not complete proof of the usability of the Creativity Framework. Only one Creative Tool was actively tried out during each workshop, and with numerous Creative Tools available for selection, as well as varying degrees of preferences, three case-studies is a very small selection t base validation on.
While the case-studies are indicative of the usefulness of the Creativity Framework, they are not numerous and mutually exclusive enough to validate it completely. Further testing with more groups would be required for this.

A number of the people involved in the case-studies expressed interest in subsequent workshops. With the experience and insights gained from this project, facilitation of such follow-up workshops can be better oriented towards the requirements of the people desiring follow-up workshops.

The various workshops and interviews in the case-studies were generally of brief duration, and therefore had little opportunity for an iterative selection procedure of Creative Tools, but a pre-session meeting or better preparation could have resulted in a better selection of Creative Tools. As it was, there was often extremely limited time to select which Creative Tools to use as examples or for the participant(s) in the case-studies to try out. Only in the case-studies of InnLink and PFD were there dedicated pre-planning, and in the PFD case-study, this was done largely independent of the people who would eventually participate in the workshop.

Greater experience and practice would allow a facilitator to be better at adapting to changing situations in the facilitation process, as would pre-session meetings and pre-planning. Several of the case-studies might not have supported this very well though, arranging interviews with the three individual people who participated in the early case-studies might have been more difficult if a dedicated pre-planning meeting had been required of them. Likewise, except in the case of the InnLink case-study, the three workshop case-studies were difficult to coordinate in advance.

Personal Conclusions

This project provided an invaluable personal learning experience. Not only did it allow for an in-depth study of creativity and the various models that have been made to describe creativity, but it also allowed for a number of practical case-studies which gave insight and experience regarding creativity as it is applied in general, and of the theoretical models of creativity.

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Appendix A: Creative Tools

This Appendix contains a list of Creative Tools as presented by McFadzean [25] and descriptions of their procedures.

McFadzean refeers to her book ”The Creativity Tool Box” herself [26], . However, this book is apparently very hard to procure. For this reason, this appendix presents the Creative Tools as they appear in “The Creativity Tool Box”.

Paradigm Preserving Tools

Brainstorming

1. Develop a problem statement and write it on a flip chart
2. Reiterate the problem statement to the group, set out ground rules, instruct the group on the purpose and process of Brainstorming and conduct a warm-up exercise, if nessecary
3. Ask the participants to generate possible solutions, without criticism, for about 30 to 45 minutes. The ideas should be recorded on a flip chart. Encourage the group members to continue generating ideas.
4. Lead the group back through the list of ideas and encourage them to combine statements and identify valuable ideas.
5. Designate one person to receive any additional ideas that may occur to the members after the meeting

Brainwriting

1. Display the problem statement. The group members are then asked to write their ideas pertaining to the problem on separate sheets of paper and then to deposit them onto the center of the table (the pool).
2. When an individual needs stimulation or wants to piggyback ideas he or she can exchange their sheet of paper with another from the pool
3. The process of writing ideas and gainting stimulation from other people’s ideas should continue for about ten to fifteen minutes.
4. The ideas are then displayed on the wall where they are explained, discussed and developed further.

Force Field Analysis

1. The group members are asked to write a brief statement of the problem.

2. Each individual then needs to write two scenarios. The first would be a description of what the situation would be like if a complete catastrophe was to occur. The second scenario would be a description of the ideal situation.

3. The catastrophic and ideal scenarios are then places on a continuum with a center line drawn between them. The group members are then asked to list the forces that could contribute to making the situation catastrophic and those that make the situation ideal.

4. Next, the group needs to generate ideas on how to reduce or negate the negative forces and to improve or enchance the positive forces.

Hexagons

Hexagonal Post-It notes can be used to generate ideas, sort them into categories and to develop "maps" of the problem or situation.

1. The problem statement is presented to the group or developed by the group. The group members are asked to write their ideas regarding the problem on separate hexagons and then to deposit them onto the centre of the table (the pool). The facilitator needs to explain that the hexagons should be used with the point (rather than the edge) pointing upwards.

2. When an individual needs stimulation or wants to piggyback ideas he or she can exchange their sheet of paper with another from the pool.

3. The process of writing ideas and gaining stimulation should continue for about ten to fifteen minutes

4. Once idea generation has been completed, each group member reclaims his or her own hexagons and sticks them on the wall. As each hexagon is stuck onto the wall, the writer reads out his or her statement and explains it, if necessary.

5. The group is then asked to browse the wall of hexagons and to arrange them into groups or categories. This may take some time. After this has been completed each category is given a name (written on another hexagon) which is put besides the group.

6. A map can then be constructed using the category names of each group. The map can show the relationships each element has to one another e.g. Category 1 may be more important than Category 2 or Category 3 may need to be implemented before Category 7 and so on. The relationship used will depend on the task given to the problem solving group.

5W + H

The five W's and H stand for "Who? What? Where? When? Why? And How? It is a good method for gathering information systematically.

1. State the problem in the format "In what way might…"

2. Write down a separate list of questions using the 5Ws and H. All judgement and criticism should be withheld at this stage.

3. Examine the reactions to each question. There is likely to be a number of questions in each category. For example there may be five or six Why? questions. Use these questions to generate problem redefinitions.

4. Discuss the different problem definitions. Then can be joined togther or amended.

5. Finally select one definition that captures the main aspects of the problem or issue that is being solved.

Morphological Analysis

Morphological analysis breaks down problems or issues into smaller elements. For example a car showroom consists of cars, salves area, service area, mechanics, spare parts, tools, customers, a coffee area and so on. These in turn can be further sub-divided into even smaller elements. Thus, there are different types of customers, tools, etc. Morphological analysis encourages participants to build relationships between elements that they may not have thought of previously.

1. List all major elements involved in the issue or problem. The facilitator writes them up across the top of a flip chart or whiteboard.

2. Each sub-element is then listed under each element.

3. The facilitator asks the participants to start combining the sub-elements together to try to ascertain some novel ideas. These ideas may be ridiculous or impractical but can be developed or refined at a later stage. It is important, therefore, to suspend all judgement.

4. Step 3 should be repeated until a sufficient number of ideas have been generated.

5. The ideas can then be discussed, developed or refined in order to acquire a novel solution.

Word Diamond

1. The group participants choose four words or phrases from the problem statement.

2. These words can then be place in a diamond shape so that each word or phrase lies at the end of one of the points.

3. The group participants are asked to combine the words or phrases togther and to tell the facilitator the ideas that have occurred due to the combination. The facilitator writes the ideas down on a flip chart.

4. Next, the two words, which were initially selected, are combined with a third word to developed more ideas.

5. Step 3 and 4 are repeated until all possible combinations ae examined and all the ideas have been recorded.

Sticky Dots

This is a simple procedure to allow group members to vote on particular issues or solutions.

1. The ideas generated previously are displayed on a flip chart or pinned to the wall.

2. Each participant is given a number of self-adhesive colored dots (this is usually about 10% of the number of ideas generated e.g. if 50 ideas have been generated, each person is given 5 sticky dots).

3. If you wish the voting to remain anonymous then each person is given the same color otherwise different colors can be given to each person.

4. The participants are asked to vote on the issues by placing a sticky dot beside each idea(s) they prefer. If they really like the idea then they can place more than one dot beside it.

5. The votes are then counted. The ideas receiving the greatest number of votes can either be implemented, developed further or discussed.

Paradigm Stretching Tools

Object Stimulation

1. The problem statement is written on the flip chart.
2. The group members are asked to develop a list of objects that are completely unrelated to the problem.
3. Each individual then needs to select one object and describe it in detail. The group should use each description as a stimulus to generate new and novel ideas.
4. The facilitator should write each idea down.
5. This process should continue until each group member has described an object or until each object has been described.
6. The ideas are then related back to the problem and developed further.

Metaphors

1. The group members are asked to write a brief statement of the problem.
2. The facilitator asks the group to select a metaphor category or he or she can stipulate the category to the group e.g. using the journey metaphor.
3. Each individual then needs to describe the situation using the metaphor category. The facilitator needs to stipulate whether the description should be of the present situation or the ideal situation.
4. Using the descriptions developed by each team member, the participants can generate new ideas.
5. These ideas can then be related back to the problem statement.

Role storming

Role storming involves the group generating ideas, not from their own perspective, but from someone else's. This could be from one of their stakeholder's perspectives such as a customer, a supplier or a subordinate or it could be from the perspective of a fictional or historical character such as Bart Simpson, Robin Hood or George Washington.

1. The problem statement is developed and written down

2. Each group member is then asked to select a character and, together with the rest of the group, generate ideas pertaining to the problem and situation using the character's description or his/her tools and implements. For example, ideas can be generated using batman's Batmobile, Wonder Woman's magic bracelets, Florence Nightingale's lamp or Snoopy's flying goggles as stimuli.

3. The facilitator can either allow the group participants to think up their own characters or he/she can give them descriptions of fictional, historical or present-day characters.

4. The ideas can then be discussed and developed by the group.

Heuristic Ideation Technique

Heuristic Ideation Technique (HIT) can be used to create new concepts or products.

1. The group is asked to generate two lists of objects or concepts.

2. An object from input 1 is then choosen togther with one object from input 2. The group is then asked to force a relationship between the two. For example, scientists have been inspired by forcing togther a fan and a skirt and envisaging a craft that could run across water (the hovercraft). Likewise, by forcing togther the telephone and the computerm scientists have developed the Internet.

3. The group should continue to force relationships between concepts until all ideas have been exhausted.

4. The ideas are discussed and developed into practical, valuable and novel solutions.

Reversal

Reversal is a technique that can help participants look at a problem from a different perspective. Reversing the problem statement can often provide a new perspective and therefore novel ideas.

1. Write down the problem statement.
2. The facilitator now asks the participants to reverse the statement in any way possible. They can change the subject of the sentence, the verb or the object.
3. Using the reversed definition, encourage the group participants to develop innovative ideas. They may not be practical at this stage, but that does not matter. Stress to the group that criticism or evaluation must not be made at this stage.
4. Continue with steps 1 and 2 until enough ideas have been generated.
5. Discuss and develop the ideas into practical and valuable solutions.

Assumption Reversals

1. Write down the problem statement.
2. List all the assumptions that can be made regarding the problem or situation.
3. Reverse each of the assumptions. Do not worry if they seem to be odd or silly.
4. Use these assumption reversals to stimulate new ideas regarding the problem or situation.

Pugh Matrix

The Pugh Matrix is designed to develop a win/win situation. It helps participants to explore all the costs and benefits for each idea.

1. On a large sheet of paper, list all the alternatives that are being considered down the left-hand side.

2. Across the top of the paper list the criteria used to measure the alternatives. These may include resources, training issues, funding, time, etc.

3. Ask the participants to look at each criterion and to list all the positive and negative aspects of each of the alternatives. Some alternatives will have more positive aspects than negative aspects.

4. Develop an extra alternative that incorporates all, or some of, the positive aspects of the previous alternatives and relinquishes all of the negative aspects.

Nominal Group Evaluation

This method of evaluation is designed to produce win/win solutions and to encourage the group to view the situation from other persepectives.

1. The facilitator breaks the group into syndicates of between 4 and 7 groups. Each syndicate is given all the ideas, comments and suggestions generated in the previous idea generation session(s) and instructed to meet in separate rooms.

2. The syndicates are asked to discuss and choose the ideas that they think are pertinent for solving the problem. In addition, they are asked to develop a plan to implement these solutions. This should take about 45-60 minutes

3. After evaluating the alternatives and developing an action plan, the syndicates are asked to return to the main room to present their work. Each syndicate is given ½0 minutes for their presentation. The facilitator may wish to give the syndicates blank overhead slides so that they can display their main points to the rest of the group. The presentations tend to be slightly different since each syndicate will explore the situation from a slightly different perspective. These different perspectives should be discussed by the group.

4. After the presentations have been completed and discussed, a final evaluation and action plan can then be developed by the group taking into account the variety of different ideas and perceptions.

Wishful Thinking

1. The group members are asked to write a brief statement of the problem.

2. The facilitator tells the group to assume that everything is possible. Each individual then needs to develop some fantasy statements about the future using terms such as: “In the future, it would be nice if the organisation did…”, “What really needs to happen to be a great company is…”,”If I were in charge of this situation I would do…”

3. The group members need to examine each fantasy statement and develop ideas on how these can be achieved.

4. The new ideas that have been developed need to be explored and linked back to the present problem situation. This can be achieved by using statements such as: “Although this is difficult to achieve, we can…”,”It might be possible to do that if we…”.

Rich Pictures

6. The group members are asked to write a brief statement of the problem.

7. The facilitator then asks each individual to draw two pictures. The pictures may be a metaphor of the situation e.g. a vehicle or animal. The first drawing would be a picture of how each participant would like to see the situation in the future. The second picture would be a drawing of how the participants see the present situation.

8. Each participant is asked to describe the picture of the present first. Not only should he or she describe the picture but a description should also be given of the properties of the objects drawn and why they have been drawn that way. Next, a description of the picture of the future should be given. Again, the properties and the relationships of the objects should be described.

9. From the descriptions given by the participants new ideas can then be generated.

Picture Stimulation

Like many of these techniques, picture stimulation can be used by both groups and individuals.

1. The problem statement is written down on a flip chart or whiteboard.

2. The facilitator then produces a picture that is completely unrelated to the problem or situation. These can be procured from magazines, clipart, boos and so on.

3. Each participant is asked to describe what he or she sees in the picture. The facilitator writes this information down on a flip chart.

4. The group members are then asked to relate the information gained from the picture to the problem.

5. This process is continued until the group has run out of ideas.

6. A new picture is then shown to the group and the process is repeated until enough ideas have been developed.

7. The ideas are then discussed, developed and evaluated by the group.

Imagining

This technique can potentially be very creative although it can be risky and should not be used with a conservative group. Group participants who are willing to have fun and who have a high degree of trust towards each other and the facilitator should enjoy this creative problem solving method.

11. The facilitator should use "Word Association" as a simple warm-up exercise: A list of about ten words is generated. For example, shepherd, magic, boots, dog, sky, saddle, grass, dream, freedom and match. The facilitator asks the participants to make associations with these words. For instance, using "match", the group may generate terms such as fire, Guy Fawkes, death, angles, clouds, and so on.

12. After completing the warm-up exercise, another word is picked. One participant starts to make up a story around this word. After about a minute somebody else should take over and continue with the story. Anybody can jump in when they please.

13. The participants should be encouraged to be as outlandish, exotic and coloful as possible. They should describe the setting for the story – colors, smells, sounds, feelings and so on. The richer the description the better.

14. Changeover times can be either left to the facilitator or the present storyteller and is best done at the most "inconvenient" times.

15. If the story stagnates, the facilitator can ask someone else to take over and to describe what is happening somewhere else. For example "Meanwhile back at the ranch…"

16. The images can be written down by the facilitator and then used as unrelated stimuli to develop ideas pertaining to the problem, opportunity or situation.

Wildest Ideas

If the group runs out of ideas using a paradigm preserving technique, this technique can help re-stimulate their creative thinking.

1. The facilitator asks the group participants to develop wild ideas about the situation. For example, when looking for parking solutions, a wild idea could be: "Knock down the office building and use the ground for a giant carpark instead."

2. Using a wild idea as a starting point, the participants can continue to generate ideas.

3. Step 2 is repeated until all wild ideas have been used or until there are sufficient practical solutions developed.