Creativity methods in the design of home office seating

Sung-Hyan Kang
CREATIVITY METHODS IN THE DESIGN OF HOME OFFICE SEATING

by

KANG, SUNG-HYUN

February 2, 1998
Approvals

Advisor: Robert Kahute
Date: 2/4/1998

Associate Advisor: Craig McArt
Date: 2/4/98

Associate Advisor: Kim Sherman
Date: 2.4.98

Department Chair: Charles Lewis
Date: 2-4-98

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Date: 2-4-98
ACKNOWLEDGMENTS

I give thanks to the Lord for helping me complete this thesis. He filled me with his wisdom when I lacked wisdom, He gave me rest when I was tired from carrying heavy loads, He gave me peace and love when I was in sorrow. Without his grace, love, care, and guidance, my thesis could not have been accomplished.

The completion of this thesis was possible with prayers and the support of several individuals, which was given in God’s grace and His endless love. I would like to thank my advisors for their continuous support and valuable suggestions: Robert Kahute, Craig McArt, and Kim Sherman.

I am grateful to my wife, SooJin Chang, who always prays for me in love. Without her prayer, love, and warm encouragement, much would be left undone.

In addition, I express gratitude to my pastor, YounHan Lee, elder YoungJun Kim, and my Christian friends for their prayer and encouragement: Sungkyung Choi, SungHo Park, JunSeung Hyun, David Won, Joon Huh, ChangHyun Ko, HyunChael Park, and June Campbell, Campus minister. They prayed for me throughout this writing and held up my often sagging arms.

Finally I thank God for my father, SinKyung Kang, and my mother ByungOck Kim, who brought me up in Jesus’ love and sometimes prayed in tears for me to be guided into His path.

In my life, Lord be glorified

S. H. K
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CHAPTER I
INTRODUCTION

1. Thesis goal

Creativity is not given only to a select group; it can be taught and developed in people throughout the general population. I believe that creative training can lead to greater productivity, and that the more we learn about creativity, the more creative we can be. The main objectives of this thesis are to study creativity and its sources, to discuss the psychological and environmental elements that contribute to personal creativity, to explore methods that enhance creativity, and to apply this information to design.

All the methods that I discuss have been developed to help designers generate numerous ideas, although different design methods will approach a single design problem in different ways. Is each method equally valuable? In order to examine this, I have used these methods to design home-based office seating.

As a result of this thesis, I hope that students will understand their potential creativity and learn new ways to generate creative ideas.

2. Thesis scope

Chapter I is the thesis introduction, and Chapter II defines creativity and its components. Creativity is an ability most people
possess, but not many know how to develop it. Several things are required in order to be creative and productive in any field of work. These requirements are mentioned in Chapter II.

Furthermore, Chapter II deals with those things that prevent designers from being creative and productive. I classify these blocks and barriers into three groups: emotional, perceptual or intellectual, and cultural. By recognizing and removing them, designers and problem solvers can increase their potential creativity.

To end Chapter II, I explain creative attitudes and motivations, which are different from creative techniques. In general, one who is open-minded and has a positive outlook produces a higher percentage of effective solutions than one without. The chapter contains a list of creative attitudes.

Chapter III contains a discussion of creative thinking and the creative thinking process. Our way of thinking can be divided into various modes: analytical thinking, judgmental thinking, creative thinking, convergent thinking, and divergent thinking. Just because someone can think in divergent and creative ways does not mean that the person is truly creative. The creative process requires problem solvers to be accustomed to using all these types of thinking at different stages in the process.
Intuition, inspiration, or sparks of imagination are crucial to the creative thinking process. Bryan Lawson says, "creative work always depends on at least one vital spark of imagination." The chapter describes where this spark of imagination springs from based on Freud's anatomy of the mind, and how it develops to become a useful solution. The creative thinking process can be divided into five different stages: First Insight, Preparation, Incubation, Illumination, and Verification. Each of these stages is explained in more detail in the chapter.

Chapter III also includes information on how the brain functions. I believe that understanding the brain increases our ability to control our creativity. Understanding the brain is crucial to understanding creativity because the brain plays the central role in our ability to be creative. Brain wave states are intimately connected with our creativity and with each stage of the creative process.

Chapter III introduces Herrmann's Four-quadrant model to explain the whole thinking process as it takes place in the brain. I enclose several occupational diagrams based on Hermann's model which show the part of the brain towards which people in different professions are more oriented. According to the occupational diagrams, we can easily

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see that people in engineering professions, for example, prefer to think in logical, analytical, fact-based terms.

As many writers and psychologists have said, creativity can be taught and developed for designers and design students. One way to lead people to be more creative and productive is to adopt various creative methods and techniques. Chapter IV introduces four different design techniques and methods: Link-up/Focused Object, the Biological Analogy, Free Association Method, and the Checklist Technique. These methods have provided designers and students with creative sources and ideas and led them to unique solutions. I chose these methods because they are the most fundamental techniques and are widely used among designers. They are simple and easy to use and the most effective for generating unique ideas. Each method is explained, including steps for how to use it.

The design process taken as a whole is a divergent task. Thus, generating many ideas is considered vital to creative problem solving. Many writers and designers agree that quantity breeds quality. All four methods discussed in Chapter IV were developed to help designers generate fresh new ideas. In Chapter V, I apply these four methods to the task of designing home-office seating. My objective is to examine the value of the methods used and to help readers to understand the process of the methods. Throughout Chapter V, I show how these methods
helped me to generate a number of new and fresh ideas. Furthermore, I introduce problem-solving funnels that graphically explain how all these divergent ideas and designs were generated by using these methods. I evaluate the ideas, leaving a few that satisfy the design goals and that are likely to solve the problem. I then introduce the final solution for the home office-seating project and explain its benefits.

Chapter VI presents the conclusions of my study.

3. Creativity—a necessary skill

What is the definition of design? Many authors have tried to define design, and their statements reveal some difference in their views. According to E. S. Taylor in the book Basic Design Concepts, “Design is a creative decision-making process and directed toward fulfillment of human needs.”2 In Design Science, Vladimir Hubka and W. Ernst Eder explain, “designing is defined as the transformation of information from the condition of needs, demands, requirements and constraints (including the demanded functions) into the description of a structure which is capable of fulfilling these demands.”3 In this book, they include many other authors' definitions of design:

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Reswick (1963): A creative activity, it involves bringing into being something new and useful that has not existed previously.  
Page (1966): The imaginative jump from present facts to future possibilities.  
Farr (1966): The conditioning factor for those parts of the product which come into contact with people.  
Gregory (1966): Relating production with situation to give satisfaction.  
Suh (1989): The creation of a synthesized solution in the form of products, process or system that satisfies perceived needs through mapping between the functional requirements (FRs) in the functional domain and the design parameters (DPs) of the physical domain, through proper selection of the DPs that satisfy FRs.

Even though design is defined in different ways, these explanations have one essential idea in common: that design is mankind’s most natural solution for trying to fulfill people’s needs, to improve their way of life, and to satisfy their lifestyles.

Certainly, because of scientific and technological developments during the last two decades, industrial designers have played an important role in shaping today’s society. Many new products, such as computers, TVs, VCRs, fax machines, and automobiles, have done much

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to improve the quality of people’s lives during the last twenty years. But customer demands have risen also. Fashions and vogues are always changing. Scott G. Isaksen says, “The necessity to respond to complexity and rapid change in modern society has resulted in a general awareness of the need to stimulate, nurture, and develop creativity.”

However, I question whether these new products have led us to live in a better world. I believe there are many improperly designed products. Nowadays, cellular phones, for example, are a popular commodity, and people find a great advantage in having them in their pockets. Cellular phones provide users with great functionality, allowing them to make and receive calls anywhere. However, users may have trouble remembering the instructions for the many functions included in a cellular phone. Many functions may never be used during the product’s life. Moreover, since the phones transmit and receive calls through radio frequency, it is possible they can cause brain cancer. In effect, people spend considerable sums of money to purchase a product that they cannot fully utilize and which can seriously damage their brains.

Victor Papanek, in his book Design For Real World, talks about the moral and social responsibility industrial designers have to develop safe and useful products:

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9 Scott G. Isaksen and others, eds., Nurturing and Developing Creativity: The Emergence of a Discipline (Norwood, NJ: Ablex, 1993), 2.
By designing criminally unsafe automobiles that kill or maim nearly one million people around the world each year, by creating whole new species of permanent garbage to clutter up the landscape, and by choosing materials and processes that pollute the air we breath, designers have become a dangerous breed.10

Victor Papanek makes an important point, saying, “design must become an innovative, highly creative, cross disciplinary tool responsive to the true needs of men. It must be more research oriented, and we must stop defiling the earth itself with poorly designed objects and structures.”11

I agree. Designers need to develop their hidden creativity while retaining moral and social responsibility for the industrial products in our society. When this happens, designers will become inventors and problem-solvers who fulfill the true needs of human beings.

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11 Ibid., x.
1. Creativity defined

I truly believe that creativity is fundamental for an industrial designer in solving problems. People sometimes believe that solutions are beyond their reach, thinking that creativity is only given to a select group of people. But anybody can be creative. As Les Jones, a psychologist and educator, says, “creativity is not a special gift enjoyed by a few but it is a common ability possessed by most people which can be developed or suppressed as a result of their individual experience.”

What is the definition of creativity? Many authors explain creativity in different ways, but their ideas show that they are pointing in the same direction. Hubka and Eder say, “The word creative means: capable of creation, inventive, imaginative, showing imagination in addition to habitual skill and knowledge.” E. P. Torrance defined creativity as:

the process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses
or formulating hypotheses about the deficiencies: testing and retesting them; and finally communicating the results.3

Furthermore, Newell, Shaw, and Simon, psychologists, suggest that any problem solving may be creative. They adopt a criterion-based approach:

To the extent that one of more or the following conditions are satisfied:
1. The product of the thinking has novelty and value;
2. The thinking is unconventional, requiring modification or rejection of previous ideas;
3. The thinking requires high motivation and persistence over a long span of time (continuously of intermittently) or at a high intensity;
4. The problem as initially posed was undefined, so that part of the task was to formulate the problem itself.4

Since creativity is a common ability possessed by most people, why doesn’t every designer come up with a creative solution? According to John F. Feldhusen, a professor of education at Purdue University, there are general components that are required for creativity: intelligence, talent, motivating conditions, and specific skills and strategy, all of which are founded on a knowledge base.

Information in the forms of facts, concepts, principles, or schemata must be retrieved selectively and utilized in determining new concepts, new modes of operation, new paradigms, or new performances. Creative experts use their knowledge base well. They grasp and are open to the new configurations that creative


cognition may generate. All new creative adaptations or creations enter and become part of the knowledge.\textsuperscript{5}

According to Joseph S. Rezulli, a professor of educational psychology at the University of Connecticut school of education, creative and productive individuals possess a relatively well-defined set of three interlocking clusters of abilities, which consist of "above-average, though not necessarily superior, general ability; task commitment; and creativity...but...it is the interaction among the three clusters that is the necessary ingredient for creative and productive accomplishments."\textsuperscript{6}

Figure 1 shows interaction among the three clusters

![Figure 1: The three-ring conception of a creative individual](image)

Adapted from Scott G. Isaksen and others, eds., \textit{Nurturing and Developing Creativity: The Emergence of a Discipline} Norwood, NJ: Ablex, 1993, 86.

\footnotesize{\textsuperscript{5} Scott G. Isaksen and others, eds., \textit{Nurturing and Developing Creativity: The Emergence of a Discipline} (Norwood, NJ: Ablex, 1993), 47.  
\textsuperscript{6} Ibid., 85.}
Creative individuals have creative characteristics and strengths. Torrance reports that creative strengths are the “expression of movement and emotions, combination of ideas, expressiveness of titles, unusual and internal visual perspective, elaboration, fantasy, humor, extension of boundaries and articulation in telling stories.”

2. Blocks to creativity

Children often seem to be strikingly creative in inventive thinking, in art, in poetic imagery, and they then grow up to be as commonplace as the rest of us. Does this happen because talent and creativity run out? Many psychologists focus their attention on this irony and have found that children build up psychological barriers or blocks to creativity as they grow up.

David D. Edwards writes, “Your mind and culture conspire against you. That is because they like conformity. It’s safer for your ego and for society. This conspiracy involves a number of road blocks that keep you out of unexplored creative fields and in the fast lane of society’s safe and sensible freeway.” He suggests that blocks to creativity can take three different forms: emotional, perceptual or intellectual, and cultural. He

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8 David D. Edwards, How to Be More Creative (San Jose: Occasional, 1979), 19.
also indicates that there are seventeen different factors, shown below, that can cause emotional, perceptual or intellectual, and cultural blocks.9

Emotional blocks
- Fear
- The need to conform
- Frustration
- Inappropriate motivation
- Tendency to judge rather than create ideas
- An intolerance for chaos
- Ego and self-satisfaction

Perceptual blocks
- Poor problems definition
- Using the wrong approach
- Using incorrect data
- Failure to use your senses
- Inability to utilize all of your abilities

Cultural blocks
- “Now, let’s be logical.”
- Role stereotyping
- Play is for kids.
- Fantasy and daydream are bad.
- “Thou shalt try nothing new.” 10

Industrial designers need to recognize the blocks that they have built up against creativity. By removing these blocks, creativity can be guided and developed into new paths so that designers can achieve their full potential.

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9 Ibid., 19.
10 Ibid., 54.
2.1. Emotional blocks

Emotional blocks are also important. They include fear, frustration, inappropriate motivation, a tendency to judge ideas, an intolerance for chaos, and ego and self-satisfaction.

2.1.1. Fear

As people grow up, they learn to be afraid of appearing foolish, making mistakes, failing. As a result, fear is perhaps the most common emotional block to creativity. No one wants to fail and any genuine risk courts failure. If one makes no attempt, there will be no success, but neither will there will be an overt failure. According to Edwards, "The only real difference between a baby learning to walk and an adult learning to ski is that when the adult falls down his or her ego gets bruised."\textsuperscript{11} Why do people feel so ashamed when they fail! To be creative, industrial designers should admit there is no success without failure. Be aggressive and try new things!

2.1.2. Frustration

We all know what frustration means, and how we feel when we are frustrated by mistakes or failure. We cannot function mentally or emotionally and sometimes cannot even physically move. Edwards

\textsuperscript{11} Ibid., 20.
writes, “In a state of frustration the passage to your creativity is blocked, just as if there were an automatic shutoff value.”

2.1.3. Inappropriate motivation

Motivation is a very important factor for designers. Creativity does not flow without enough motivation. However, unexpectedly, too much motivation can also inhibit creativity. As one psychologist says, “motivation stimulates action, which may preclude thinking.”

2.1.4. A tendency to judge ideas

Being creative means generating many unique ideas and selecting the most appropriate solution. One bad, though human, habit is the tendency to judge other people’s ideas. Edwards says, “The average group of people searching for new ideas will spend more time defeating ideas than conceiving them.” Certainly, judging is not an encouraging behavior for designers in the beginning of the design process because it blocks them from experiencing many other good ideas. According to Alex Osborn, “The human mind uses both judgmental and creative thinking. Because of training and various background experiences, judgmental thinking often emerges as the dominant force when a problem situation

12 Ibid., 26.
14 David D. Edwards, How to Be More Creative (San Jose: Occasional, 1979), 28.
is encountered."\textsuperscript{15} Arthur B. VanGundy says, "The purpose of deferred judgment is to enable the creative part of the mind to generate ideas by overcoming judgmental thinking."\textsuperscript{16} Creativity requires positive, not negative or judgmental, thinking.

\textbf{2.1.5. An intolerance for chaos}

Although designers often feel compelled to resolve problems quickly, this may inhibit creativity, which tends to be disorganized at certain stages. Edwards explains:

Searching for creative ideas can be an untidy business. You need an open and receptive attitude to hold unresolved and sometimes conflicting information in your mind at the same time. This stage of the creative process can be uncomfortable. It's a state where everything is a jumble and nothing is coming clear. But, the longer you can maintain this state of unequilibrium, the longer you can prolong your creative mode of thinking, Your mind is now a bit like a kaleidoscope. The more you turn the bits of information over in your mind, the more creative possibilities you'll discover. If you have an overriding need for orderly thinking, you may find this stage of creative thinking difficult. Psychologists call this block an inability to defer closure.\textsuperscript{17}

To be creative, designers should allow their minds to relax, defer closure, and let a problem incubate.


\textsuperscript{17}David D. Edwards, \textit{How to Be More Creative} (San Jose: Occasional, 1979), 28-9.
2.1.6. **Ego and self-satisfaction**

Creativity involves a great number of new and fresh ideas. Van Gundy says, "the greater the number of ideas generated, the greater is the possibility that one of them will provide a solution for the problem."\(^\text{18}\) However, if designers fall in love with one of their ideas too soon, it can cause them to stop searching for any other. Van Gundy warns, "initial ideas seldom turn out to be the best ones."\(^\text{19}\) Designers need to learn to bear with a problem to get to a better solution. Perhaps the last idea will be the best.

2.2. **Perception blocks**

Perception is a very significant human function. Basically, people learn things by using their six senses: sight, sound, smell, touch, taste, and kinesthesia. Perception also is the most basic design tool for problem solvers because they initially define their problem depending on how it is perceived. Edwards says, "To be creative, you must perceive a problem clearly and correctly. Perceptual or intellectual blocks involve your perceptions of a problem and how your mind goes about solving it."\(^\text{20}\)


\(^{19}\) Ibid., 93.

2.2.1. Poor problem definition

Perceiving a problem clearly and correctly is very important as Edwards pointed out. However, people are accustomed to solving problems rather than defining and analyzing them correctly. "We are basically solution-minded rather than problem-minded. That means we're more likely to expend time and energy attempting to solve a problem before we're even sure what the problem is,"21 says Edwards. If we do not analyze a problem correctly, we cannot come to a correct solution.

2.2.2. Using the wrong approach

Trying to design computer software with clay sounds ludicrous, "Yet often our minds attempt these impossible solutions until we realize the need to use an appropriate language of strategy."22 We must use different modes in order to solve different problems. To solve problems creatively, Edwards insists that people must have the flexibility to employ a wide range of methods or languages such as drawings or diagrams, equations or numbers, words, sounds, and intuition.23 By using the right language or a combination of languages, problem solvers will be able to fully articulate their creativity.

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21 Ibid., 34.
22 Ibid., 36.
23 Ibid., 38.
2.2.3. Failure to use your senses

Each of the senses is a tool for creative problem solving, but because our perception is dominated by sight, visual imagery gets the lion’s share of our attention and our solutions depend heavily on what we see. However, we should consider using our other senses, what we hear, what we smell, what we touch, and what we taste, to solve problems. Edwards suggests that problem solvers should take advantage of all six senses to solve problems. In this way, designers might come up with unexpected solutions.

2.2.4. An inability to utilize all of your abilities

Everyone has hidden, undeveloped talents. They remain hidden in part because people prefer to use one ability over another.

Psychologists who have studied problem solving in animals have found that the sources of failure depend on the behavior repertoires of each animal: “Learning to pull a string to open a food box is easier for cats than dogs because cats are more likely to react to a dangling string. Pigs are more likely to solve a problem that requires raising a platform because of their rooting ability.” Suppose one prefers to use clay instead of a computer to make a 3-D model. A designer may lose a great

\(^{24}\) Ibid., 40.

opportunity to create unique solutions by under utilizing a second tool: the computer.

Another reason people do not use all of their abilities, according to Edwards, is because of their self-image. Quite often people say they can’t draw, yet they have never attempted to improve their drawing skills. Drawing skills can be improved to some degree. This kind of negative self-image reduces our inherent abilities.

Designers have their own repertoires, which can be very limited. In order to be creative, they need to expand their repertoires by training their hidden talents. They need to be ready to break their own self-images, so that they can fully express their potential creativity at any time on any given task in any field.

2.3. Cultural blocks

Cultural blocks are external, environmental or social forces that block individual creativity. Papanek describes cultural blocks as those “imposed upon an individual by his cultural surrounding. And in each society a number of taboos endanger independent thinking.”26

Furthermore, Edwards explains:

Cultural blocks are caused by attitudes in society and among our peers that inhibit creativity. These attitudes block us from creative possibilities by constantly telling us what is right and what is wrong, What is possible and what isn’t. Sometimes these

cultural blocks are so much a part of our upbringing that we’re blind to their role as barriers to greater creativity.\textsuperscript{27}

I truly believe that people in our society are consciously or unconsciously influenced by social rules and taboos, and that these rules and taboos seriously block designers’ creativity and prevent the development of many creative designers.

We live in a scientific world that bases its beliefs on scientific evidence and proofs. Science is great way to gather and validate knowledge and information. However, the ideology inherent in the scientific method has a serious flaw. According to Willis Harman and Howard Rheingold, educators and psychologists, in a science-driven industrial society only useful knowledge leads to a useful invention, and the usefulness of every new invention and design has to be scientifically and mathematically proven. This can be problematic because as Harman and Rheingold say:

The scientific beliefs in reductionism (the idea that the best and only way to understand something is to reduce it to its parts) and positivism (the belief that only publicly measurable phenomena can be studied) have prevented serious study of some aspects of human consciousness that might be vital to everyone.\textsuperscript{28}

\textsuperscript{27} David D. Edwards, \textit{How to Be More Creative} (San Jose: Occasional, 1979), 45.

\textsuperscript{28} Willis Harman and Howard Rheingold, \textit{Higher Creativity} (New York: Tracher/Putnam, 1984), 67.
Certainly, science has its taboos. One of them is a resistance to exploring a human’s inner knowledge – intuitions, imaginations, and inspirations.

2.3.1. Logical thinking

Contemporary society prefers logical, mathematical, rational, and linear thinking over intuition and feeling. Among designers, logic is encouraged and intuition is labeled irrational. However, imagination and intuition should be encouraged because they promote creativity.

Nowadays, many observers of creative thought consider intuition, imagination, insight, and vision to be a critical part of the creative process. I believe that people should open their minds and try to listen to what their minds are saying. Edwards writes that the “unconscious mind plays a central role in human creativity.”29 People can only reveal what is hidden in their minds through intuition, imagination, illumination, and vision. The phrase “like a flash of lightning” is very common among creators, inventors, and artists. As Lawson says, “creative work always depends on at least one vital spark of imagination.”30 I believe “a flash of lightning” is the moment when a bright idea springs from the unconscious mind. Without this moment,

29 David D. Edwards, How to Be More Creative (San Jose: Occasional, 1979), 9.
Thomas Alva Edison would never have become a true inventor nor Pablo Picasso a true creator.

Designers need to remember that although logic can solve problems, creativity requires imagination, illumination, and intuition – a flash of lightning. Creative ideas may not make sense at first, and an illogical idea is not necessarily a bad one.

2.3.2. Role stereotyping

Edwards says, “Another common cultural block is the assumption that people without the advantages of advanced training, higher education, superior intelligence are incapable of coming up with a good idea.”31 I believe that a designer who is very skillful at drawing and painting and has high IQ scores is not necessarily a truly creative person. According to D.K. Simonton, “High intelligence...does not guarantee that a person has a talent for doing innovative science.”32

2.3.3. Playing is for kids

Our society tells us play is reserved for children. While children can simply play, adults spend “leisure hours” in “recreational activities.” Edwards writes, “Being creative means being willing and able to play:

31 David D. Edwards, How to Be More Creative (San Jose: Occasional, 1979), 48.
with ideas, materials, and reality. Creativity is kind of mental play".33 Playing is one way to break through to insight. Occasionally, designers find unexpected ideas while playing.

2.3.4. Fantasy and daydreams are bad

Carl Jung says, “Without this playing with fantasy, no creative work has ever yet come to birth. The debt we owe to the play of imagination is incalculable.”34 However, since fantasy and daydreams can’t be scientifically observed or mathematically tabulated, society considers them unproductive and a symptom of maladjustment.

By removing these blocks, people will be able to articulate their potential creativity.

3. Creative attitudes and motivation

Attitudes are not creative techniques but general reactions to a situation. However, they play an important part of the design process. Certainly, one who is open-minded and who has a positive mind-set shows a greater ability to produce effective solutions. Tackling a design problem without creative attitudes will produce a stillborn solution.

Edwards writes, “Once you’ve cleared the obstacles you can begin to establish a frame of mind that’s conductive to creative thinking. That

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doesn't mean you simply flip a mental switch and suddenly become more creative. You can, however, create in your mind an atmosphere favorable to creative activity."³⁵ He also has a list of creative attitudes and conditions that encourage creativity:

- a positive mind-set
- willing suspension of judgment
- sensitivity and awareness
- openness to experience
- flexibility
- a sense of psychological safety
- absence of evaluation and criticism
- quiet, relaxing times

Conditions that inhibit creativity include:

- doubts
- judgmental attitudes
- tight control
- pressure
- anxiety
- excessive motivation³⁶

Mackinnon, a psychologist, indicates that a great creator has certain attitudes:

"It is ... his openness to experience, his freedom from crippling restraint and impoverishing inhibitions, his esthetic sensitivity, his cognitive flexibility, his independence in thought and action, his unquestioning commitment to creative endeavor, and his unceasing striving for solutions to the ever more difficult problem

³⁵ David D. Edwards, How to Be More Creative (San Jose: Occasional, 1979), 57.
³⁶ Ibid., 65.
that he constantly sees for himself.”

4. Motivation

There is another factor that is as important as creative attitudes—that is, the designer’s motivation. Without motivation, creative design can’t take place. During the preparation stage, design activities start with interest, desire, and motivation as designers search for information. D. Henry Edel states, “Human motives are inner intentions that cause people to act in certain ways.... In terms related more directly to design situations, motives are referred to by expressions such as reliability, performance goals, competitive features, costs, consumer needs, profit potential, obsolescence, self-promotion, etc.”

According to T. M. Amabile, people have intrinsic and extrinsic motivations:

The unifying theme in all my own research is that people will be most creative when they are motivated primarily by passionate interest in their work. This passionate interest is called intrinsic motivation—the motivation to work on something primarily for its own sake, because it is enjoyable, satisfying, challenging, or otherwise captivating. By contrast, extrinsic motivation is the motivation to work on something primarily because it is a means to


an end; the work only represents a way to earn money, gain recognition, satisfy someone else’s orders, or meet a deadline.39

5. Summary

Having creative attitudes is the first step towards greater creativity. Creative individuals have individual characteristics and strengths, but it is very important for designers to be aware of blocks to their creativity that may be emotional, perceptual, or cultural.

CHAPTER III

STUDY OF CREATIVE THINKING AND THE CREATIVE PROCESS

1. Various types of thinking

We can divide our ways of thinking into various modes: analytical, judgmental, convergent, divergent, and creative. Different stages in the design process require most of these ways of thinking.

Analytical thinking takes place at the beginning of the design process before problem solving (Figure 2). Designers identify a problem. By observing and isolating a problem, they build upon their experience and become aware of a need. They collect data and information; they measure and quantify. These are all characteristics of analytical thinking. According to Norbert Roozenburge and J. Eekels:

In the analysis phase the designer forms an idea of the problems around such a new product idea (the problem statement) and formulates the criteria that the solution should meet, first broadly and in later iterations more accurately and completely. The problem statement should express who has the problem, what is thought to be the problem, and what causes it. It is also important to know how the problematic situation will develop if nothing is done, and what possibilities there are to intervene.¹

Designers use judgmental thinking during the evaluation stage of the design process. Every idea that designers come up with during the

idea generation stage is evaluated to determine whether or not it meets
the design criteria before it is presented as a final solution.

Creative thinking, an important behavior in the design process,
takes place in the idea generation stage. Methods developed to
encourage creative thinking for designers (brainstorming, free
association, analogies, etc.) become very useful tools that can help
designers generate the new and fresh ideas required for problem solving.

Many designers and psychologists consider divergent thinking,
which is characterized as part of the intuitive and imaginative process, to
be the heart of creativity. In contrast, convergent thinking depends on
rational, analytical, judgmental, and logical processes. According to
Mihaly Csikszentmihalyi, "divergent thinking has three dimensions:
fluency, or the knack for coming up with a great number of responses;
flexibility, or the tendency to produce ideas that are different from each
other; and originality, which refers to the relative rarity of the ideas
produced."² He says, "A person whose thinking is fluent, flexible, and
original is more likely to come up with novel ideas."³ He also says,
"Brainstorming programs are ways to stimulate people to increase the
fluency, flexibility, and originality of their ideas and responses."⁴

³ Ibid. 60.
⁴ Ibid. 368.
However, creative solutions do not arise from divergent thinking alone. Lawson states that design clearly involves both convergent and divergent ways of thinking:

It would be absurd in the extreme to pretend that there are no parts of design problems which are themselves amenable to logical processes and having more or less optimal solutions. Design clearly involves both convergent and divergent productive thinking which is probably what makes it so challenging and satisfying to practise.\(^5\)

I truly believe a designer's creativity will be evident only when divergent and convergent productive thinking are well balanced in the design process. Designers should not depend on only one kind of thinking. I deal with techniques for stimulating imaginative divergent thought in more detail in a later chapter.

2. **Problem solving funnels**

Problem solving funnels represent the basic design process. In a broad sense, these funnels are divided into three different stages: a problem analysis and redefinition stage, an idea generation stage, and an idea evaluation and selection stage.

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1. The problem analysis and redefinition stage:

According to VanGundy, "This is the stage where designers take a large amount of information about a problem, analyze it, and then narrow down a few definitions to achieve a working statement of the problem." 

![Diagram of problem solving funnels](image)

**Figure** 2: Problem solving funnels


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2. The idea generation stage:

After the elements of this problem statement converge, designers generate many different ideas in divergent ways.

3. The idea evaluation and selection stage:

This is the stage where all the divergent ideas converge and are evaluated to see if they meet the demand(s) of the design goals. At the end, a few ideas that may solve the problem remain.

3. Conscious, unconscious, and preconscious level

Intuition, inspiration or a spark of imagination are crucial in the creative thinking process. As the great inventor Edison said, "Genius is one percent inspiration and ninety-nine percent perspiration," suggesting that he believed that the one-percent inspiration is as indispensable to creating an invention as the ninety-nine percent perspiration. Let's talk about where intuition or inspiration originates by examining the anatomy of the mind.

Allen Hurlburt, in his book The Design Concept, explained Sigmund Freud's theory on the structure of the mind:

[Freud] identified three distinct levels. He placed the conscious level at the top, as the simple receptor of surface information and the mechanism for logical analysis. At the lowest level he placed the unconscious, as the deep and hidden area where accumulated experience is often isolated and blocked off by inhibition and internal censorship....Between conscious and unconscious, Freud located a third level that he called the preconscious. He considered this level to be more accessible than the unconscious--a bridge between the clear deductive mind and the mysterious unconscious. This interim level is probably the
origin of what we call intuition, which is the quick and ready insight that produces ideas without the apparent involvement of our conscious thoughts.7

Figure 3 shows Freud’s anatomy of the mind, illustrating his three major levels of consciousness: conscious, preconscious, and unconscious. At the top is the conscious level, the receptor of information, and at the bottom is the unconscious. In between lies the preconscious level that draws on both of the other levels and provides the source for insights and inspirations. The left side of the figure shows the intellectual processes, and the right side shows the emotional response. The circled numbers indicate the four generally accepted steps in the creative thinking process: (1) analysis, (2) incubation, (3) inspiration, and (4) verification.

4. Creative thinking process

Different people identify the steps in the creative thinking process in different ways. Some psychologists have formulated a three-step process, while others prefer four or five (or more) step processes with varied emphases and omissions. According to Edel, “The subconscious mental activity and subsequent flashes of insight of individual human beings are the distinguishing mental steps of the creative thinking

procedure. These two steps are usually preceded by extensive preparations and particular orientations and followed by

**Figure 3**: Anatomy of the mind

intensive verification and adjustments for applications." In this paper, I use the five steps of the creative thinking procedure on which most writers agree: first insight, preparation, incubation, illumination, and verification.

4.1. First insight stage

The first insight stage is a pre-problem solving stage when designers initially determine whether a problem exists. I believe this is a very important stage to go through before entering the major problem solving stage. A designer’s time and effort can be wasted in trying to solve non-existent problems. Lawson says, “The formulation of the problem may often be critical phase in design situations. As we have seen, design problems are rarely initially entirely clear and much effort has to be expended in understanding them thoroughly.”

4.2. Preparation stage

In the preparation stage, designers gather information and analyze it in order to make design criteria and goals. Rachel Cooper and Mike Press say, “Considerable conscious thought is then required for the designers to immerse themselves in the knowledge required to enable a solution.” According to Lawson, “As with our maps of the design

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process it is recognized that there may be much coming and going between these first two phases as the problem is reformulated or even completely redefined."\textsuperscript{11} Terence Conran, an educator and psychologist, emphasizes the importance of preparation, of understanding all aspects of the finished product’s user:

You find out what people want by observing them: their lifestyles; where they go on holiday; what they read; what music they listen to; what they eat. You’re thinking about their lives. It’s often imagining what they might want before they actually get it. Sometimes you go too far and it’s a commercial flop. It’s got to be one or two steps ahead, not a cricket pitch ahead.\textsuperscript{12}

4.3. Incubation stage

The incubation stage is the period one spends waiting for an idea to come in a flash from the subconscious mind by intuitive forces without the aid of deductive thinking. It requires relaxation and calm such as when one is taking a bath or on the verge of sleep.\textsuperscript{13} Furthermore, according to Hurlburt, “It is characterized as a detach period from the factual material that has been analyzed and absorbed into the conscious level of the mind.”\textsuperscript{14} During this stage, it is important

to stop analyzing so that the subconscious mind can use its influence and intuition can grow into an idea.

**Figure 4**: The five stage model of the creative process

4.4. **Illumination stage**

Hurlburt said, "This is where insight, imagination, intuition blend with the preceding rational analysis to create a synthesis and arrive at a design concept."\(^{15}\) While designers patiently wait during the incubation stage without the aid of deductive thinking, if they are lucky, they may feel something, a picture of what the solution might be, which comes out of the subconscious mind to the conscious mind in a flash when they are not expecting it.

4.5. **Verification stage**

This is the stage where an idea from the subconscious is judged and tested to see whether it can meet design criteria and solve design problems in a valid and useful way. Hurlburt says, "The appropriateness of the solution is verified by checking it in terms of original guidelines of information given, research done, and the designer's accumulated knowledge and experience."\(^{16}\) Designers should keep in mind that there is always the risk that the ideas that spring from the subconscious mind may fail the final test unless they fully meet the design criteria.

5. **Brain physiology**

One of the most important issues in human creativity is the study of the brain since it plays the central role in our ability to be creative.

\(^{15}\) Ibid., 12.
\(^{16}\) Ibid., 13
Certainly, creativity is mental, and I believe our ability to control our creativity comes through understanding the brain. Let’s talk about how the brain is organized and how it plays a central role in creativity.

5.1. Four-quadrant model

According to Ned Herrmann, the brain is organized with four different clusters that represent the whole thinking process.17 Initially, Herrmann adopted Roger Sperry’s theory about the brain model: the brain was divided into two hemispheres that were specialized in function. He also believed a new theory of the role of the limbic system introduced by Paul Maclean. Herrmann says, “While somewhat primitive compared to the neocortex of the cerebral hemispheres, the limbic cortex is neural, synaptic, and therefore capable of thinking in the same way as its cerebral cousin.”18 Herrmann finally introduced the four-quadrant model, shown in Figure 5, based on Sperry and MacLean’s theories. He says, “This four-quadrant model serves as an organizing principle of how the brain works: four thinking styles metaphorically representing the two halves of the cerebral cortex (Sperry) and two halves of the limbic system (MacLean).”19

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18 Ibid., 14.
19 Ibid., 15.
Figure 5: Herrmann’s Whole Brain Model


According to Herrmann, even though our brain is divided into four different clusters in function, they are all interconnected to create a whole network of thinking capabilities. He explains the four-quadrant model and the interconnection of the four clusters by representing them each as a chess pieces on four small chessboards: “To play chess you need all the pieces from all the boards. Through hundreds of millions of interconnections, the working brain provides pathways for specialized activities to take place.” Designers need to use all four specialized quadrants of the brain in order to solve a design problem, just as people need all the pieces to play chess.

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20 Ibid., 15.
21 Ibid., 15-6.
5.2. Occupational norm

According to Herrmann, "Different occupations have unique mental requirements, which result in specific occupational norms."²² In this section, I talk about the different mental interests and aptitudes of people in different occupations and how designers show unique mental aptitudes.

Herrmann says that the engineering profession depends largely on the A quadrant. Chemical engineers especially tend to prefer thinking from the A-quadrant (Figure 6). Those in financial professions also prefer the A-quadrant, according to Herrmann.²³ Figure 6 indeed demonstrates that people in the engineering and finance professions prefer to think in logical, analytical, fact-based terms. Herrmann then notes that social workers, professional volunteers, and teachers, characterized as interpersonal, feeling-based, kinesthetic, and emotional, are oriented toward the C-quadrant in their thinking.²⁴ In contrast, artists, graphic and interior designers, art directors, and entrepreneurs belong to D-quadrant-oriented occupational group (Figure 7). Although Herrmann did not specify the quadrant to which industrial designers are oriented in his brain model, we can easily guess that they should belong

²² Ibid., 58.
²³ Ibid., 72.
²⁴ Ibid., 75.
to the D-quadrant-oriented occupational group because they rely more heavily on intuitive processes than on logical and analytical processes.

**Figure 6**: Continuum of profiles of those in engineering and financial professions

Figure 7: Profile of D-quadrant professionals


5.3. Brain wave states

Brain wave states are one of main elements that mark the brain as the source of creativity. Herrmann writes, "The brain is an electrochemical organ that produces electrical brain wave states that are precise, measurable, and characteristic of humans."25 Let's talk about how brain wave states play an important role in creativity and the brain state that is most conducive to creativity. The more we understand these brain wave states, the more we are able to consciously develop our creative thinking.

According to Herrmann, all brains are electrochemical, and we are equipped with four wave states: beta, alpha, theta, and delta. He says,

25 Ibid., 214.
“These brain wave states are defined by electrical frequencies measured by cycles per second, or by Hertz.”

The four wave states are distinguished with different numbers of electrical frequency range and different mental characteristics, and occur in various conditions: alert, calm, free flow, and dreamless sleep. Herrmann states that, Beta waves, with frequency ranging from 13 to 30 Hz, represent a brain that is alert and aware, and growing more alert as the frequency increases. The Alpha state is meditative, with brain waves ranging from 9 to 12 Hz. The Theta state is the most highly creative, the frequency of the brain waves ranging from 5 to 8 Hz; “it is these theta waves that introduce some of the fantasy trips and movies in the head that take place during REM (rapid eye movement) dreaming.”

The Delta state occurs during deep, dreamless sleep with a range of 0.5 to 4 Hz.

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**Figure 8**: Four key brain waves common to all human beings


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26 Ibid., 215.
27 Ibid., 216.
5.4. **Brain wave states and the stages of the creative process**

According to Herrmann, “Most descriptions of creativity refer to it as a strictly right brained process.” But Herrmann mentions the importance of utilizing the specialized characteristics of the four clusters in our brain in the creative thinking process. He says, “The specialized characteristics of each quadrant and of each mode of the Whole Brain Model are applied in various combinations as the process takes place. A missing quadrant or mode will tend to stall or even shut down the entire process.” Herrmann applies a six-step process: interest, preparation, incubation, illumination, verification, and application. Figure 9 shows how the creative process correlates with the four-quadrant model.

Since we know the brain, an electrochemical organ, is the source of creativity, we need to know which brain wave state optimizes each

![Figure 9: Creative process correlation with four-quadrant model](image)


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28 Ibid., 217.
29 Ibid., 217.
phase of the process. Herrmann writes, “Brain wave research...suggests that there is a close alignment between brain wave state and the stages of the creative process.”

He states it as follows:

- **Interest** is a general state of alert consideration of a problem situation. The brain state is beta.

- **Preparation** for applying the creative process to a specific problem situation involves beta at the higher frequencies: more intense, more purposeful, more applied.

- **Incubation** of a problem situation following preparation takes place in alpha with the lower frequency, high-amplitude brain waves producing the best results of contemplation.

- **Illumination**, which is often described as the AHA! stage of the process, takes place in theta. This is the stage where the potential solution presents itself in the form of an idea.

- **Verification** returns the mental process back to beta, and sometimes occurs at 2:00 a.m., or in the shower, or while commuting to work. This is the stage when an alert evaluation of the potential solution is considered in relationship to the original problem. This is generally high-frequency beta.

- **Application** is the final stage of the process, and continues as an aroused beta level activity.

Herrmann finally states, “The creative process takes advantage of the four quadrants of the Whole Brain Model and the three brain wave states that are involved in a conscious processing of the discrete stages...
of creativity.”32

6. Summary

The brain is central to creativity. Different stages in the design process require different ways of thinking. A designer’s creativity will be evident only when divergent and convergent productive thinking are well balanced in the design process. This process has five steps: first insight, preparation, incubation, illumination, and verification. Brain physiology and brain wave states play a key role in this process.

32 Ibid., 222.
CHAPTER IV

TECHNIQUES AND METHODS FOR CREATIVITY

1. Introduction

As many writers and psychologists have said, creativity can be taught and developed in designers and design students; it is not given only to selected people. One way to help people become more creative and productive is to have them incorporate multiple creativity methods into their design processes. These methods are used to develop solutions that can be applied to a wide variety of design problems.

In this chapter, I present four different design methods (Link-up/Focused Object, Free Association, Biological Analogy, and the Checklist) and characterize them by distinguishing the different ways they help a designer approach design problems. I believe these four methods are the most fundamental and common techniques used by designers. These methods are simple, easy to use, and highly effective in generating unique ideas.

Although they are four independent methods, they can be used in a group, according to VanGundy.\(^1\) Classical Brainstorming, invented by Alex Osborn and known as a group method, relies upon linking thought

processes; ideas are generated through the Free Association method. Another commonly used group method of designing is Synetics which uses types of analogies to generate ideas, namely Biological, Personal, Direct, Symbolic, and Fantasy analogies.

2. Link-up/Focused Object

C. S. Whiting developed the Focused-Object technique. Van Gundy says, “The Focused-Object technique... generates ideas by examining the relationships produced by forcing together fixed and randomly selected elements.”² This technique is based on de Bono’s Link-Up theory. “Link-Up” represents a subtle relationship between any problem and any word or object unrelated to the problem. De Bono says that it is possible that a creative connection can be developed between the problem and any other object or word picked at random from the dictionary, no matter how unrelated they are.³ By exploring a characteristic of the random word or object, designers will find useful ideas that can be applied to the problem and combined to produce a new object or idea. This connection provides designers with a new perspective of the problem that would not have developed from the nature of the problem alone, allowing them to come up with a unique

² Ibid., 84.
solution. Whiting suggests the use of the following steps:

1. Select a fixed element (usually related to a part or all of the problem).
2. Select a random element (usually an object from the immediate physical environment that seems to be unrelated to the problem).
3. Using these two elements, free associate on different ways they could be combined to produce a new object or idea (first-level ideas).
4. Using the first-level ideas (Step 3), try to think of new ideas (second level ideas).
5. Continue free association until all possible ideas have been generated.
6. After all ideas have been exhausted using the fixed and random elements, select a new random element and repeat the process using the original fixed element.
7. Terminate the process once a useful pool of ideas had been generated.4

3. Biological Analogy

For all analogies, regardless of kind, designers generate ideas by finding the similarities between their project and other objects, persons, or situations in the world. The use of biological analogies is one representative direct analogy method. Van Gundy explains the Biological Analogy by giving the example of a designer who thinks about the gills of a fish as a tool to find new ways to improve the design for an underwater breathing apparatus.5 Other possible analogies included can be


Personal, Direct, Symbolic, and Fantasy analogies.

VanGundy provides these steps for using analogies:

1. State the problem.
2. Think of an object, person, or situation and relate it to the problem in the form of an analogy.
3. Progressively develop the analogy, translating it back to the original problem at each stage of development.
4. Continue developing the analogy until a satisfactory definition of the problem is achieved.6

4. **Free Association Method**

VanGundy says that the “Free association technique is the most basic of all the idea generation techniques.”7 It relies upon the individual linking his or her thought processes together. Because people have different educational backgrounds and have grown up in different environments, they have different ways of linking their thoughts. For instance, say “snow” and almost everyone thinks “white,” but depending on the individual, it is also possible to link thoughts that are not usually connected with one another by metaphors and analogies. According to VanGundy, “Ideas have to come from somewhere, and Free Association is the method generally used to draw ideas from the mind’s stream of consciousness.”8 In this method, one thought link is used to latch onto another thought, which is then used to generate a third thought link,

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6 Ibid., 46.
7 Ibid., 85.
8 Ibid., 85.
and so forth until a useful thought is found. Roozenbury and Eekels say that a "Designer's capacity to produce unexpected thoughts which are far from the problem and to link them to a problem in a meaningful manner is considered individual creativity."\(^9\) Problem solving, which requires meaningful links, consists of the following steps:

1. Write down a symbol (word, number, object, condition, et cetera) which is somehow linked to the problem
2. Note down every thought which occurs in connection with item 1, without looking at its link with the problem (first level thoughts).
3. Note down more thoughts which are suggested by first level thoughts without looking at its link with the problem (second level thoughts).
4. Note down more thoughts which are suggested by second level thoughts without looking at its link with the problem (third level thoughts).
5. Study the list and choose some thoughts which seem to have important implications for the problem.
6. Use the associations from step 5 to think of concrete solutions to the problem.

5. **Checklist Technique**

Many people use a checklist when shopping to help them buy all the goods they want quickly and accurately. Can you imagine how many times one might have to go up and down aisles in a large department store when shopping for specific goods without a list to help remind the shopper of what is needed and to simplify the trip? Checklists are a good way of solving problems.

VanGundy says, "The checklist technique generates ideas by preparing a list of items related to a problem and checking the items against certain aspects of the problem." According to J. W. Taylor there are two major uses: (1) as a problem-delineation list, and (2) as a possible-solution list. He states that "... a problem delineation list is used to provide a direction for an idea search, to make sure that no ideas have been overlooked, and to evaluate the applicability of ideas borrowed from a previous problem."

A sample problem-delineation list would be as follows:

1. Physical Characteristics
   - Size?
   - Shape?
   - Color?
   - Weight?
2. Marketing Characteristics
   - Likely consumers?
   - Competitors?
   - Distribution plan?
3. Packaging Characteristics
   - Type of material?
   - Availability of material?
   - Structural adequacy?
4. Production Characteristics
   - Adequacy of existing equipment?
   - Suitable labor force?
   - Quality control?

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10 Ibid., 82.
The purpose of the possible solution list is to develop a new idea. VanGundy says, "A new product might be developed by altering an old one." A possible-solution checklist constructed by Osborn consists of these items:

A sample possible-solution list would be as follows:

1. What other product is like this one (adapt)?
2. How could I change this product (modify)?
3. How could I add to this product (magnify)?
4. What could I take away from this product (minimize)?
5. What could I use instead of this product or a portion of it (substitute)?
6. How could I alter this product's composition (rearrange)?
7. How could I turn this problem around (reverse)?
8. What could I put together to make a new product (combine)?

By combining these two lists, Davis, et al., developed another possible solution checklist for product improvement. This list uses seven items to stimulate ideas:

1. Add and/or subtract something
2. Change color
3. Vary materials
4. Rearrange parts
5. Vary shape

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13 Ibid., 83.
6. Summary

The Link-up/Focused Object, Free Association, Biological Analogy, and Checklist methods are the most fundamental and common techniques used by designers to generate creative ideas. Incorporating these methods into the design process can help designers and design students become more creative.

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CHAPTER V

CREATIVITY METHODS IN THE DESIGN OF HOME OFFICE SEATING

1. Introduction

Certainly, designers and design students take advantage of creative design methods, but often they remain unclear in their minds about what these methods entail. In order to examine the value of the four methods we have mentioned, Link-up/Focused Object, Biological Analogy, Free Association, and the Checklist Technique, I chose a project that involved designing seating for people who work at a home-based office. I hope that designers, as a result of reading this chapter, will understand the process of how ideas are generated through these different methods so that they may be able to design innovative and creative products.

2. Introduction of home office concept

The development of numerous products, including computers, printers, and fax machines, has led people to change their living habits, cultures and traditions. There are also major differences in today’s lifestyles compared with the ways people lived ten years ago. One of the main factors responsible for these lifestyle changes is the computer, which is being used in offices, schools, homes, and other settings. The use of computers at home, as a necessity of life, is an emerging trend.
Working at home can significantly contribute to one's efficiency while providing wonderful opportunities to improve the quality of one's home and family life. For this reason, the number of people who want to work at home has increased in the past few years. According to Link Resources, a New York-based research house, “The number of telecommuters will increase from 5.5 million in 1991 to more than 10 million by 1998. The Department of Transportation predicts that a full 15% of the U.S. work force will be telecommuting by 2002”\(^1\)

Many people have discovered important advantages with working at home; however, most task chair designs on the market today are not designed for home use. Also, as people move their work places from office to home, their work habits are becoming more informal. In addition, the formality required in the office is not necessary in the home. It is perfectly normal, for example, for some people to work in their pajamas. As a result of these factors, a chair used in a home office setting should be designed to allow people to sit in a more relaxed way.

Since family members may share the home office, family related issues become an important aspect in the home office furniture market. Because office life and family life take place at the same time in a home-office setting, designers should consider how to allow workers to be able

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\(^1\) Alice LaPlante, “Telecommuting: ROUND TWO VOLUNTARY NO MORE,” FORBES ASAP, 9 October 1995, 133.
to interact easily with their families in order to satisfy the needs of this group of people.

The appearance of a chair is one of its important design elements. However, since the home-office concept was introduced in the market, the home-office chair has retained the same look as the office chair, and since the appearance of most furniture is designed for the traditional office, it is inappropriate for use in the home. Furniture for a home office requires a different aesthetic.

Since many home workers spend a lot of time sitting in front of a computer working with it and its related products, physical complaints of the neck, wrist, and shoulder ailments have become serious problems and remain a significant problem that designers need to solve.

Figure 10: Design plan for home office seating
<table>
<thead>
<tr>
<th><strong>Design Goals</strong></th>
<th><strong>Design Criteria</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovative: designing something new that has not been introduced on the market.</td>
<td>Appeal: Unique appearance and function</td>
</tr>
<tr>
<td></td>
<td>Uses a nontraditional principle</td>
</tr>
<tr>
<td>Acknowledgement of different sitting habits</td>
<td>Provides various sitting positions</td>
</tr>
<tr>
<td>Functionality: have the right equipment and supplies to get your work done in a safe and in a secure way</td>
<td>Multi-functional</td>
</tr>
<tr>
<td>Convenience: work simply and easily, with a computer and its' related products</td>
<td>Helps makes work with a computer and related products simpler and easier</td>
</tr>
<tr>
<td></td>
<td>Multi-purpose</td>
</tr>
<tr>
<td>Comfort: feel physically and emotionally satisfying</td>
<td>Satisfies sitting posture emotionally and physically</td>
</tr>
<tr>
<td></td>
<td>Fun to sit in</td>
</tr>
<tr>
<td></td>
<td>Uses soft materials</td>
</tr>
<tr>
<td>Ergonomic &amp; human factor considerations: designing something that reduce pains and aches in the muscles, joints, and tendons of the wrist, and incorporate universal design principals</td>
<td>Reduces repetitive motion problems</td>
</tr>
<tr>
<td></td>
<td>Decreases pains and aches in the muscles and joints</td>
</tr>
<tr>
<td></td>
<td>Adjustable</td>
</tr>
<tr>
<td>Space-efficient design for small home office: efficient use of space</td>
<td>Maximizes limited space</td>
</tr>
<tr>
<td>Promotion of good health</td>
<td></td>
</tr>
<tr>
<td>Appropriate appearance</td>
<td></td>
</tr>
<tr>
<td>Manufacturing satisfaction with existing technology</td>
<td></td>
</tr>
<tr>
<td>Cost: reasonable price that the home workers can pay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reasonable and comparable price with other products on the market</td>
</tr>
<tr>
<td></td>
<td>Encourage buyer with price and non-traditional design</td>
</tr>
</tbody>
</table>

**Figure 11:** Design goals and criteria
In the following subsections, I will explain various methods and the steps that I used with each method in order to generate ideas. I will then discuss problem-solving funnels and my use of an evaluation matrix to determine the value of the ideas generated.

3. The first idea-generation process: Using the Link-up/Focused Object

I want to show how I generated ideas for home office seating by using the Link-up/Focused Object method (p. 49, 50), which is a method that I frequently use in my design process. I believe it promotes creativity, and I strongly suggest that other students use it. The method, forcing a connection between the problem and an unrelated word or object, can truly develop and lead to a creative solution. Because the word or object is unrelated to the problem, the resulting connections can provide us with a new perspective on the problem that would not have developed from the nature of the problem alone, allowing us to come up with a unique solution.

Throughout the following example, I hope that readers understand that many creative connections, which can lead to a creative solution, can be made between the word or object and the problem. The steps I used with this method are as follows:
**Step 1:** I selected a fixed element: **body support**.

**Step 2:** I selected a random element, **ring**, which was unrelated to the problem (Figure 13).

**Step 3:** In order to make connections to produce a new object or idea (first-level ideas), I first tried to explore characteristics of a ring and wrote down words and objects that were easily suggested by the ring: tube, life tube (preserver), tumbler, rolling, UFO, and rubber band. As I tried to link these with the fixed element, I came up with several new ideas and objects: **tube body support**, **life tube (preserver) body support**, **tumbler body support**, **rolling body support**, UFO, and a rubber band.

**Step 4:** I picked the word “rolling” as a new element from the first-level ideas. I wrote down the objects “tire” and “home vehicle” which were suggested by rolling. Next, I tried to make another connection between the objects and the fixed element, “body support.” As a result, I came up with the idea for **home vehicle body support**.

Finally, I chose five different ideas from the Link-up/Focused Object and developed them further (Figures 13 and 14). The first idea was a tube body support, which supports the chest. The person leans forward against the tube and the tube prevents the person from falling.
The second idea was another tube body support. It is suspended in the center of a C-shaped table, and four elastic bands connect the tube to the inner edge of the table.

The third idea was a tumbling body support, which uses a tumbling motion. No matter which way a person leans, this body support easily comes back to an upright position.

A fourth idea was a rolling body support. The rolling characteristic of the ring allows people to sit in many different positions. The body support is attached to the ring on a track so that the seat moves along the track inside the ring.

The fifth idea was a moving body support with a computer in it. This allows people to work in a wide range of space. I think this idea has value for handicapped people who work at home.

4. The second idea-generation process: Using a Biological Analogy

I believe that designers should learn biology and nature in order to design unique products. Biology and nature are good sources for direct analogies and have a history of providing designers and inventors with a number of ideas. For example, Roozenburg and Eekels discuss the design of Velcro, which was inspired by the seeds of the burdock root.2

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and the landing gear of McDonnell Douglas’ FA-18 which was modeled after the legs of the grasshopper. 3

I don’t believe most chair designers would think of designing a chair for a monkey. It sounds strange. However, I want you to be open-minded enough to accept this design approach. It is possible that we can come up with a creative solution for human seating as we study monkeys and design something for them. I truly think that this use of a Biological Analogy can provide us with new ways of looking at a problem.

In my work, I selected a monkey for use in the analogy because of its similarity in bone structure to human beings (Figures 15 and 16). Specifically, I generated ideas using a Biological Analogy in the following way:

**Step 1:** I stated the problem as “designing body support for people who work in a home office”.

**Step 2:** I selected the object, a monkey, which can be related to the problem in the form of an analogy.

**Step 3:** I progressively developed the analogy by exploring their sitting habits, behavior and motions, and lifestyles. As a result of this, I derived two ideas from how the monkeys sit down and stand

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3 Ibid., 187.
up and hang in a branch of a tree: **stand-up body support and hanging body support 1 and 2.**

**Step 4:** The word “hanging” from Step 3 suggested a new object to me – a **fishing rod** – which can also be related to the problem in the form of an analogy.

**Step 5:** Using the word “fishing rod,” I generated one more idea in the form of an analogy: **hanging 3**

In attempting to relate the monkey to the problem in the form of an analogy, I derived several ideas from the monkey and the fishing rod, resulting in five different body support ideas. The first design is stand-up body support. When I observed monkeys running and jumping around on TV, I asked myself what if I make a monkey chair so that it can walk, sit down, and stand up by itself? Then, the person who actually sits in the monkey chair does not need to try to sit, or stand up, or walk around because the chair will eventually sit, stand up, and walk around for him. Finally, I designed the stand-up body support. It helps people stand up and sit down. The body support pushes a person up until the person is standing, and the body support also works as a supporting form in which the person sits. I believe this body support will decrease undue stress in the spine and knees.
We quite often see monkeys hanging from the branch of a tree and swinging from side to side while hanging. I was inspired by the way monkeys hang from trees and designed “hanging body support 1.” Instead of using legs on the ground to support a person, this body support hangs from the ceiling like monkeys hang from a tree. The body support swings from side to side, backwards and forwards, and up and down. Thus, home workers can easily move in any direction while working at a worktable.

The “hanging body support 2” has the same hanging principle as the first idea but uses another way to hang the seat. The body support hangs from the end of a hook-shaped frame. Because the pivot points are in the center of the base, the seat rotates around the center point. The worktable is designed in a C-shape and the product will be effectively used as it moves along with the table.

The “hanging body support 2” suggested a fishing rod to my mind. I directly got the idea of how a fish hook dangles on a fishing rod and applied it to “body support 3”. The jacket dangles like a fishhook on a fishing rod. This body support holds the person in a hanging position, allowing the user to move freely while working.

The image of a hanging monkey inspired another idea, an exercise bar, which allows a user to do chinning exercises. People who work at home tend to be sedentary, spending most of their time sitting in front of
a monitor. I believe the promotion of good health has become a significant issue since the home office trend emerged. I believe this exercise bar has the potential to play a role in promoting good health for home office workers.

Next, I got an idea for a "hanging monitor," which was derived from the first and third hanging body support. Instead of the jacket dangling from the fishing rod (Figure 16), the computer monitor hangs from the ring frame (Figure 22). This computer monitor can be moved up and down and tilted from 0 degrees to 90 degrees (Figure 26).

People have fixed ideas about a chair: that it should have legs, seat, back support, and arm rests. Because of this, chair designs available on the market are not much different from what they have always been. Sometimes we need to break the barrier of a fixed idea in order to design a creative product. I believe the Biological Analogy provides us with numerous resources so that we can design something that has never been introduced on the market before.

5. The third idea-generation process: Using Free Association Method

As I mentioned in the previous chapter, Free Association is the most basic of all idea generation methods. Linking individual thought processes takes place in every method (you can see it in the last two idea
generation methods). In this idea generation process using Free Association (p.51, 2). I would like to show how one thought links to another thought, which is then used to generate a third thought (Figures 17 and 18). The steps that I used are as follows:

Step 1: I wrote down words: magnetic force.

Step 2: I wrote down two thoughts, door and earth, which were suggested by magnetic force without looking at its link with the problem.

Step 3: I wrote down exclusion and new, which were suggested by door.

Step 4: I wrote down sphere, life, and freedom, which were suggested by earth.

Step 5: I wrote down ball, which was suggested by sphere.

Step 6: I wrote down bird, which was suggested by freedom.

Step 7: I chose five thoughts that seemed to have important implications for the problem and developed them further (Figure 17).

Using these five thoughts, I generated four different ideas (Figure 18). The first was magnetic body support. The magnetic jacket floats in the air in a reaction with a magnetic base so that people in the jacket can comfortably move and sit in a stress-free posture. The second idea was the roller seat. Having roller bearings in between a base and a seat
allows a person to lean in any direction. The third idea is called the bird seat. This is an attempt to replace the suspension system of an ordinary chair with the suspension system of a bird’s legs. The last idea is called a sleep seat. As you see (Figure 18), the seat is inclined at a 45 degree angle, so that people can look at a large screen as they leisurely lie down in the seat.

I believe that Free Association, which is based on individual linking thought process, provides us with a number of fresh ideas and results in creative solutions. I encourage you to apply this method in your design process. When you generate ideas through the Free Association method, there will be a lot of crazy ideas that you will need to discard during the evaluation stage, but don’t be disappointed. In attempting to link thoughts continuously, this process will sometimes lead to an unexpected thought that will lead to a creative solution.

6. The fourth idea-generation process: Using the Checklist Technique

The Checklist Technique (p. 52-4) is a simple method that is widely used among designers. I believe that checklists are good way of solving design problems. Certainly, many designers find a great advantage in using checklists. By preparing a list of items relating to their project and
cross-checking them against their stated problem, designers can generate many ideas.

The last idea generation process that I used to design home-office seating involved the possible-solution checklist constructed by Osborn (p. 54):

**Step 1:** I selected an ordinary office-like chair (Figure 19), from which I developed a new chair for home workers by using a series of checklists.

**Step 2: What other product is like this one? (adopt)**

The idea of storage units in a chair was adopted from the piano chair, which has a storage place under the seat (Figure 20). Since home workers deal with electrical devices, they should try to organize their space. The drawer can be used to store tools such as pencils, printer paper, etc.

**Step 3: How could I change this product? (modify)**

This chair was modified to fit the style of home environments.

**Step 4: How could I add to this product? (magnify)**

Another reason that people are choosing to work at home is to spend more time with their families. I designed a chair that has an extra sliding seat under the main seat that allows another person to sit. Hopefully, this design will benefit family life.
Step 5: What could I use instead of this product or portion of it? (substitute)

Since people choose to work at home, they want to be comfortable and relaxed in their working environments. Instead of using the original seat, back support, and armrests, I used a sofa-like seat and the original legs so that people can be comfortable and relaxed while they work.

Step 6: How could I turn this problem around? (reverse)

How could we reverse the problem – take the problem and going the opposite way? We can change our vision of our prospective consumers from employees to employers. Thus, I designed an executive chair for home workers. Home workers may be employees yet choose to use an executive chair. This doesn’t matter because the home workers are at home and other workers do not care what they sit in.

Step 7: What could I put together to make a new product? (combine)

Because the home worker spends a lot of time using a keyboard while sitting, I combined a keyboard and armrest and designed a keyboard armrest chair. This keyboard armrest will help increase productivity.
As a result of using this method, I discovered that it is much easier to generate ideas by using the Checklist Technique than by using the other methods. Furthermore, the ideas generated by using the Checklist Technique show more applicability than those generated by the other techniques.

I believe all of the ideas generated have value, and that each idea could possibly be developed as a final solution and become an actual product. I do not think there would be structural difficulties or extreme expenses associated with manufacturing them.

However, from a different point of view, the ideas generated that were by using the three other methods were more creative than the ideas generated by the Checklist Technique, thus using checklists has advantages and disadvantages. The advantage is that they easily guide us in which way to think, generating many ideas as we respond to a list of questions. However, our thinking is limited by those specific questions, so that ideas cannot be formulated beyond set boundaries.

I think it is undesirable for a designer to rely only on ideas produced through checklists. I strongly suggest using the Checklist Technique with other more open-ended methods, such as Free Association and Biological Analogies.
7. Problem-solving funnels

The problem-solving funnels in Figure 21 show the whole process of designing home-office seating from the beginning of market research to the final solution. The funnels are divided into three different stages: Problem Analysis and Redefinition, Idea Generation, and Idea Evaluation including an evaluation filter.

During the Problem Analysis and Redefinition stage, I gathered a large amount of information about home offices and human seating, analyzed it, and then focused my information in order to generate a small number of definitions and arrive at a problem statement. I also set up design goals and criteria during this stage.

During the Idea Generation stage, I generated ideas by using the Link-up/Focused Object, Biological Analogy, Free Association Method, and the Checklist Technique. These ideas are graphically shown at the end of this chapter. Arrows show how the ideas were generated in divergent ways.

During the Evaluation Stage, ideas were examined for whether they met the design goals. The arrows in the figures indicate how all the divergent ideas converge and are filtered through an evaluation in order to meet the demand of these design goals and leave only a few ideas that will be likely solutions to the problem. The gray-colored arrows are the
ideas selected as a final solution, and the numbers indicate which design goals they satisfy.

The objectives of the problem-solving funnels are (a) to show the process of designing home-office seating, (b) to show the divergent ideas that were generated by these four design methods, and (c) to represent visually how the ideas were tested with the evaluation filter and selected.

8. Evaluation process

Throughout the four idea generation processes, I generated many ideas and came up with multiple new designs. However, I don’t believe all of them are appropriate as final solutions for home-office seating, nor that they should lead to products on the market. As I mentioned above, evaluation is a significant process wherein all of the ideas generated by using the various design methods in divergent ways during the idea-generation stage are combined and tested to see if they can meet design goals and solve design problems in a valid and useful way. Many of the ideas generated by the different methods are discarded unless they meet key design goals.

To run this evaluation process, the evaluation filter as an evaluation tool plays an important role in checking the appropriateness of ideas against the final solution.
The evaluation filter consists of the design criteria that are derived from the design goals. Every idea must be checked against the design criteria, and only ideas that seem to satisfy the design criteria can come through the evaluation filter and be selected as final solutions; the rest of them should be discarded.

8.1. Evaluation matrix

An evaluation matrix is one simple way to show idea evaluation and determination processes. When an evaluation matrix is used, every idea generated by the Link-up/Focused Object, Biological Analogy, Free Association, and the Checklist Techniques is tested against each design criterion starting from left to right as is shown in the matrix in Figure 12. The most important outcome of using an evaluation matrix is the number of criteria that ideas satisfy.

In this project, the ideas that satisfy the most design criteria will be selected as final solutions. After all the ideas are checked against the design criteria, they are rank ordered according to the number of design criteria and goals that are satisfied.

As a result of this evaluation process, I selected five different ideas (rolling body support, exercise bar, hanging monitor, chair that has a sliding seat, and key board armrest chair) as final solutions depending on numbers of the design criteria they satisfied and the creativity of the design. Some of the design ideas didn’t perfectly meet of all the design
<table>
<thead>
<tr>
<th>Ideas</th>
<th>Appealing, Useful, Appetizing and Function</th>
<th>Provides various seating positions</th>
<th>Multi-functional</th>
<th>Flexibility</th>
<th>Fun to sit in</th>
<th>Enhances regular motion problems</th>
<th>Sturdy, adjustable</th>
<th>Easy to use, handle, store, and assemble</th>
<th>Encourages exercise</th>
<th>Looks friendly in appearance</th>
<th>Uses good materials</th>
<th>Reasonable and comparable price with other products on the market</th>
<th>Encourage buyers with price and performance</th>
<th>Determination</th>
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</table>

**Figure 12:** Evaluation matrix
Criteria. However, they were judged to be of high enough quality to be selected as final solutions when the ideas were rated as meeting most of the design criteria. Since design criteria include many different factors (such as sitting comfort, innovative design, promoting good health, space-efficient design, and others), it was hard for any a single idea to cover all of the criteria.

However, I believe that the few design criteria that the five selected ideas failed to meet will be recovered when the ideas are combined. As you can see in Figure 12, the rolling body support failed to meet three design criteria, and the exercise bar and hanging monitor failed to meet two design criteria.

When I selected two of the ideas generated by the Checklist Technique, it was difficult to select a best idea because there was not a significant difference in the number of criteria that each failed to satisfy. For this reason, I selected two ideas that seemed more creative in appearance and function: the sliding-seat chair and the keyboard-armrest chair.

8.2. **Five ideas selected during the evaluation process**

The first idea selected during the evaluation process was the rolling body support. I believe it has unique appeal in appearance and function, especially because of the rolling characteristic of the ring as a
nontraditional principle that allows people to sit in many different positions.

This body support can be used for other purposes, such as a system for 3-D computer simulation game. Today, 3-D simulation games are becoming more popular, and you can easily find such games in game stores and movies theaters. And the idea that you play a 3-D game as you move your seat on the ring track at home sounds like fun.

Another advantage of this body support is that it might maximize limited space in a small room. Suppose we have a king size bed mattress, and we need to determine the best way that we can place it in order to save limited space in a small room. What do you think is the best way we can try to save the space with it? Probably we can place it vertically against the wall. The rolling body support uses the same concept that we used to put the king size bed mattress vertically against wall. People sleep horizontally when they lie down on a bed, we work horizontally on a table, and we put things on a table in a horizontal way. That is why most furniture is designed for people who organize their work in a horizontal fashion. Think about how much space an L-shaped computer desk plus the working range of a chair can take up. I believe the rolling body support can maximize the space because we work vertically and the seat moves vertically.
Designing a body support that looks compatible with home environments was one of my design goals and criteria. I believe the rolling body support can look compatible with home environments. Nowadays, many people have exercise machines such as a Nordic Track or a running machine, and these machines have become part of many home environments. I believe the ring structure of the rolling body support resembles one of these exercise machines, and that this resemblance will help it look like it belongs in a home.

In the final solution, I used a twin-ring structure instead of one with a single-ring frame. The ring frame is 3” in diameter and uses tubular steel for stability and ease of seat travel.

The second idea selected in the evaluation process is the exercise bar inspired by the image of a hanging monkey, which can allow a user to do chinning exercises. As I mentioned earlier, people who work at home tend to be sedentary, spending most of their time sitting in front of a monitor. I believe this exercise bar can possibly play a role in promoting a home office worker’s good health. In the final solution, an exercise bar was added to the twin ring frame, so that a weakness of the rolling body support (failure to meet the encourage-health design criteria) was improved.

The third idea selected during the evaluation process was the hanging monitor. In the final solution, instead of using the hanging
monitor, I designed a hanging unit that has the monitor at the front, the fax machine at the top, the printer at the bottom, and the CD player and the phone at the side. I believe a user who sits in the rolling body support can easily operate them by changing the position of the seat along the track inside the ring. Furthermore, I designed this hanging unit to be tilted at many different angles, so that users can vary the position of the monitor depending on the position in which they are sitting.

The fourth idea selected in the evaluation stage was that of a chair with a sliding seat. Even though this particular idea didn't satisfy seven design criteria, it was good enough to be selected as a final solution because it could be improved as it became a form and was combined with the rolling body support, the exercise bar, and the hanging monitor. This chair has a unique idea, a secondary-sliding seat, which is not part of the other four ideas. One reason people are choosing to work at home is to spend more time with their family. The number of women who are home workers has rapidly increased for the last five years. One reason is because they work and also take care of their family and house while at home. Instead of having sliding chair in the final solution, I added a secondary chair to the final solution (Figure 22). The addition of another seat on the left side will allow another person to sit and enjoy watching
the user working. I believe that this type of interaction can benefit family life.

The last idea that I selected in the evaluation process was the keyboard armrest chair. The most innovative feature of this chair is its keyboard armrest. There was one important part still missing in order to satisfy all my design goals – even after I combined all four ideas. The missing part was an armrest. Combining this idea with four other ideas made the final solution more defined. Additionally, in final solution, the keyboard armrest was designed to open in order to allow the user to use the keyboard in a relaxed way and to permit easy excess to the seat (Figure 25). I expect this keyboard armrest will decrease pains and aches in the wrist muscles and help increase productivity.

As you saw in the evaluation matrix, these five ideas were top five ideas that mostly satisfied the design criteria and that became final solutions. By combining all of these five ideas, the final solution became more defined and satisfied 19 different criteria.
This figure shows what ideas and thoughts were suggested when I explored the characteristics of the random object, "ring." I forced these characteristics to be linked with the problem, producing five ideas: tube body support, life tube (preserver) body support, tumbler body support, rolling body support, and home vehicle body support.

Figure 13: Idea generation map 1
This figure shows how each idea generated by Link-up/Focused Object solved the problem.

**Figure 14: Link-up/Focused Object**

**a TUBE**
This is the tube which supports the chest. The person leans forward against the tube and the tube prevents the person from falling.

**b LIFE-TUBE**
The tube body support is suspended in the center of a C-shaped table, and four elastic bands connect the tube to the inner side edge of the table.

**c TUMBLER**
No matter which way the person leans, this body support easily come back to an upright position.

**d ROLLING**
The rolling action of a ring allows people to sit in many different positions. The body support is attached to the ring on a track, so that the seat moves along the track inside the ring.

**e HOME VEHICLE**
This is a moving body support that has a computer in it. This allows people to work in a wide range of space at home.
This figure describes what ideas were derived by studying monkeys' habits, behaviors, motions, and their life styles. As a result of this, I came up with four different designs: stand up body support, hanging body support 1, 2, and 3.

**Figure 15:** Idea generation map 2
This figure shows how each idea generated by the Biological Analogy Method solves the problem.

These two stand-up body supports help people to stand up and to sit down. The body support not only pushes up a person until he stands, but also helps him sit. The body support works as a supporting form in which a person sits. This decreases undue stress on the spine and knees.

Instead of supporting a person from chair legs on the floor, this body support hangs from the ceiling. The hanging body support swings from side to side, forwards to backwards, and up and down. Thus, home workers can easily move in any direction while working at a worksite.

Figure 16: Biological Analogy
The idea generation map 3 shows how the liking thought process took place to design home office seating. It shows how thoughts are linked together to generate new thoughts.

**Figure 17:** Idea generation map 3
This figure shows how I used each idea generated by the Free Association Method to solve the problem.

The magnetic jacket floats in the air in a magnetic reaction with a magnetic base so that people in the jacket can comfortably move and sit in a stress-free posture.

Having roller bearings between the base and the seat allows a person to lean in any direction.

This is an attempt to replace the suspension system of an ordinary chair.

People can look at a large screen as they leisurely lie back in the seat.

Figure 18: Free Association Method
IDEA GENERATION MAP 4

1. What other product is like this one (adapt)?
2. How could I change this product (modify)?
3. How could I add to this product (magnify)?
4. What could I take away from this product (minify)?
5. What could I use instead of this product or a portion of it (substitute)?
6. How could I alter this product's composition (rearrange)?
7. How could I turn this problem around (reverse)?
8. What could I put together to make a new product (combine)?

CHECKLIST

Figure 19: Idea generation map 4
each idea generated by the Checklist Technique solves the problem.

The idea of having storage units in a chair comes from the piano bench which has a place under the seat for storage. Since home workers deal with electrical devices, they should try to organize their space. The drawer and storage can be used to store tools such as pencils, printer papers, etc.

**Figure 20: Checklist Technique**

a. How could I change this product (modify)?

b. How could I add to this product (magnify)?

This chair has been modified to fit a certain style in different home environments.

Another reason why people are choosing to work at home is to spend more time with family. This allows another person to sit.

Since people choose to work at home, they want to be comfortable and relaxed in their working environment.
1. Problem Analysis and Redefinition stage:
   Designers take a large amount of information about a problem, analyze it, and come up with a working statement of the problem.

2. Idea Generation stage:
   After the elements of this problem statement converge, designers generate many ideas in divergent ways.

3. Idea Evaluation and Selection stage:
   All the divergent ideas converge and are evaluated to see if they satisfy the design goals, leaving a few ideas which will be likely to solve the problem.

**Figure 21: Problem-solving funnels**
Figure 22: Front view

Figure 23: Back view
This shows the position of the body support at the top of the track when the user works with the fax machine on the top surface.

**Figure 24:** Sitting variation 1
This shows the arm rest opened which allows the user to have easy access to the seat.

**Figure 25:** Sitting variation 2
This shows a position of the body support inclined at 45 degrees with the monitor tilted, which allows the home workers to sit in a relaxed way.

**Figure 26:** Sitting variation 3
This shows position of the body support at the bottom of the track when the user works with the printer on the bottom.

**Figure 27:** Sitting variation 4
9. Summary

I generated a number of ideas for the design of home-office seating by using four different design methods. I tested the ideas with the evaluation filter to see if they satisfied design goals, finally choosing only a few as a final solution (Figure 22). This final solution met the majority of my design goals:

- Design innovative body support
- Promote good health
- Incorporate human factors and ergonomic considerations
- Acknowledge different sitting habits
- Work simply and easily with a computer and its related products
- Have the right equipment and supplies to get work done in a safe and secure way
- Benefit family life
- Satisfy space-efficient design

The final design, which uses the rolling characteristics of a ring, allows people to sit in many different positions, and with the body support attached to a ring on a track, the seat moves along the track inside the ring.

Instead of having a computer monitor, printer, fax machine, and a CD player and speakers in different places, I designed a unit that has the monitor at the front, the fax machine at the top, the printer at the bottom, and the CD player and the phone at the side. This will allow a user to operate the items easily, simply by changing the position of the seat along the track inside the ring. Figure 24 shows the position of the body support at the top of the track when the user works with the fax
machine on the top surface. Figure 27 shows another position of the body support at the bottom on the track when the user works with the printer on the bottom.

I designed the main unit so that it can be tilted at many different angles. This will allow the user to change position depending upon the angle of the monitor. Figure 26 shows the position of the body support when it is inclined at 45 degrees with the monitor tilted, which allows the user to sit in a relaxed way.

To reduce pains and aches in the muscles, joints, and tendons of the wrist, I designed a keyboard armrest. In contrast to ordinary keyboards, this keyboard is divided and built into both armrests. Moreover, I designed this keyboard to be opened in order to allow the user to use the keyboard in a relaxed way as well as to have easy excess to the seat (Figure 25).

People working at home spend a lot of time sitting in front of a monitor. For this reason, I added an exercise bar to the body support (Figure 23) to promote exercise and improve their health.

Because the appearance of a chair is an important element in the design, I designed the seat to be compatible with home environments. Instead of choosing dark, grayish colors, I chose a pale yellow color for the seat to give it a feeling of warmth. Nowadays, many people have an exercise machine, such as Nordic track or a running machine, which has
become a part of the home environment. The final design resembles one of these exercise machines and will not look out of place in the home.

One reason people are choosing to work at home is to spend more time with their family. The addition of another seat on the left side (Figure 22) will allow another person to sit and enjoy watching the user working. I believe that this type of interaction can improve family life.

The final solution measures 5'-6" long x 3' wide x 6' high. The base for the ring structure is made of injection molded ABS plastic. The ring frame is 3" in diameter and is made of tubular steel for stability and ease of the seat travel. Nowadays, this type of tubular steel structure is used successfully in designs for tubing stair and exercise machines. Tubular steel frames can be made by extrusion and welded together.

The seat and back support are assembled using three materials: ABS plastic with softly rounded cushions of made of polyurethane foam that is wrapped with the pale yellow leather. The armrest constructed of steel with anti-static plastisol coating. The main unit is made of injection molded LEXAN polycarbonate. Currently, LEXAN polycarbonate is used in the automotive, packaging, electrical and electronic industries.

As a result of my explanation of this home office seating solution, I hope that readers have come to understand how the four design methods led to the generation of unique solutions.
1. Conclusion

Many people believe that only a chosen few are creative. This type of negative thinking discourages the majority of people from having any creative aspirations. I agree that Edison was a genius. However, the truth is that we don’t have to be a genius to be creative. We can be creative simply by having creative attitudes or removing inhibitors to creativity.

We already saw that the general components of creativity can be acquired, for the most part, by our own efforts. Furthermore, we know that creative ideas arise from the subconscious or unconscious mind when we are relaxed and when our brain waves are in a Theta state. When we are in this frame of mind, we can get past our hidebound thinking, allowing our brains to mull over the problem and present it to us in a new light.

Another way to develop our creativity is to adopt creative design techniques. Since 1950, design scholars have been fascinated by the study of creativity methods, and they have developed a number of creativity methods and techniques. Today, designers and design
students take advantage of these creative design methods in their fields of work.

As a result of my thesis, I hope that readers understand three things: their potential creativity, the creative design methods that were presented, and how ideas are generated through these different methods. It is through this understanding that designers can realize a wide range of possibilities for designing distinct and creative projects.

2. **Summary of my thesis study.**

- Creativity is not given only to select people. It is a common ability that most people possess and can develop.

- The general components needed for creativity are intelligence, talent, positive attitudes, motivating conditions, specific skills, strategies, and a knowledge base.

- Creative and productive individuals possess a relatively well-defined set of three interlocking clusters of abilities: above-average ability, task commitment, and creativity.

- Blocks to creativity take three forms: emotional, perceptual or intellectual, and cultural.

- Having creative attitudes is the first step toward greater creativity.

- Divergent thinking is considered the heart of creative thinking. However, divergent thinking should be balanced with convergent thinking in the design process in order to produce a unique design solution.

- Creative work always depends on at least one vital spark of imagination. It often comes from the subconscious mind when a designer patiently reflects on a problem.

- Human brains are organized with four different clusters (logical, intuitive, emotional, and organized), which represent the whole
thinking process. Designers belong to the D-quadrant-oriented occupational group, which is characterized as intuitive and creative.

- We are equipped with four brain-wave states: Beta, Alpha, Theta, and Delta. Of these brain wave states, the Theta state is the natural brain state that is conducive to creativity.

- Creative design techniques and methods can be used for thinking up solutions to a wide variety of design problems.

- The Link-up/Focused Object, Biological Analogy, Free Association Method, and the Checklist Techniques are the most basic and widely used idea generation methods of designers. They are simple, easy to use and highly effective for generating unique ideas.

- I believe all four idea generation methods allow us to find new ways of looking at problems. Looking at a problem in a new way might suggest a new problem definition, which could then lead to an innovative solution.

- Taken as a whole, the design process is a divergent task. Idea generation methods have been designed to help problem solvers generate a lot of divergent ideas. I believe these four methods will help designers generate divergent ideas.

- The ideas generated by the Link-up/Focused Object, Biological Analogy, and Free Association Methods are generally more creative and innovative than those generated by the Checklist Technique. The Checklist Technique generates ideas using lists of items and questions that limit our thinking. I suggest using the Checklist Technique with other more open-ended methods such as Free Association and Biological Analogy.

- I have generated a number of ideas by adopting four different approaches: Link-up/Focused-Object, Biological Analogy, Free Association Method, and the Checklist Technique. The ideas were tested with an evaluation filter to see if they satisfied my design goals. Only a few of them were chosen as a final solution. This final solution met many of my multiple design goals:
  - Design innovative body support
  - Promote good health
  - Incorporate human factors and ergonomic considerations
  - Acknowledge different sitting habits
Work simply and easily with a computer and its related products
Have the right equipment and supplies to get work done in a safe and secure way
Benefit family life
Satisfy space-efficient design

Clearly, more can be said about creativity, and I hope that this thesis gives designers and design students a place to start when they are working to realize their creative potential.


Himowitz, Michael J. “Setting up Your Own Home Office.” Fortune, 10 July 1995, 124-128.


