ASPECTS AND ATTITUDES OF CREATIVE THINKING: COGNITIVE AND NEUROAESTHETIC PERSPECTIVES IN DESIGN PRACTICE

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Abstract:
This paper examines creativity as both a personality trait and a cognitive process, with a focus on its manifestation in art and design. It introduces the Cognition–Apperception–Limn (CAL) framework, which describes the mental–manual transformation of perception into material form.
Drawing on the theories of Guilford, Alexander, Csíkszentmihályi, and Ramachandran, the study situates creative thinking at the intersection of divergent cognition, design methodology, and neuroaesthetic mechanisms. Guilford's model of divergent thinking—fluency, flexibility, originality, and elaboration—frames creativity as a multidimensional and adaptive skill. From a neuroaesthetic perspective, the paper examines how perceptual and emotional responses influence artistic experience. Two complementary modes of creative cognition—top-down (knowledge-driven) and bottom-up (data-driven)—interact to produce both continuous engagement (Flow) and moments of sudden insight (Aha effect).
Manual sketching supports these states by allowing spontaneous ideation, while digital tools often constrain them. Integrating cognitive and experiential dimensions, the paper argues that creativity emerges from the dynamic interplay between perception, cognition, and manual expression, offering valuable insights for contemporary design education and interdisciplinary research. Understanding this process enriches both design pedagogy and interdisciplinary research in art, science, and technology, highlighting the evolving relationship between human creativity, cognitive mechanisms, and the aesthetic mind.

Keywords: *Art & Design, Creativity, Design Methodology, Neuroaesthetics, Flow State, Aha Effect*

1. INTRODUCTION

The process of creativity, as an outstanding human activity, is essentially related to symbolic and abstract cognition, and 'artistic performance' of the brain, and is at the centre of interest of different research theories. Specific areas of the brain which control and process the visual information have been localised by scientists. Brain regions responsible for diverse art-related mental functions were also identified. Still, questions arise from the cognitive and neuroaesthetic perspectives on the effect of these cognitive processes on the quality of the final work and their application in design methodology.

Concerns of this research are:

1. How is the inspiration transmitted into the artwork?

Goal: To identify the effect which flows as an invisible substance between the artwork and the host.

2. How do visual aspects determine the cognitive process?

Goal: To model the physiological pathway that ensures the connection between vision and the hand-driven drawing tool.

3. What qualitative differences arise in terms of the cognitive process types and tools used?

Goal: To identify the differences between the types of cognitive processes caused by the different states, and tools used, and their effect on the creative work.

2. THEORETICAL EXAMINATION OF THE CREATIVE PROCESS

What does creativity mean: Creativeness? Inspiration? Ingenuity? Good problem-solving ability? The embodiment of artistic inclination? Innovativeness? ***What is this?***

- Is it an attribute born with us?
- A capability?
- Inborn gene?

None, and all at once... According to Wikipedia, *Creativity is a specific feature of personality, encompassing traits of thought and specific skills that enable certain types of creative work. The person's environment influences them and manifests in their behaviour.*

2.1 Etymological examination of the concept of creativity – From Antiquity to the 18th Century

The concept of creativity has undergone a profound transformation throughout the history of Western thought. In ancient Greece, the act of artistic or intellectual innovation was attributed not to the individual but to divine inspiration. The Muses, regarded as the sources of all artistic and intellectual endeavour, were believed to bestow the gift of expression upon mortals. Significantly, the Greek language had no direct equivalent for the modern term “create”; instead, the verb poiein—meaning “to do” or “to make”—was used to describe acts of human production. (Fig. 1)

In Latin, a linguistic distinction emerged through the verbs facere (“to make”) and creare (“to bring forth” or “to produce”), reflecting a growing awareness of different forms of generative activity. During the Christian era, however, the notion of *creatio* became reserved exclusively for the divine act of creation, while facere retained its association with human craftsmanship and labour. Thus, creation in its true sense was considered the prerogative of God alone.

The Renaissance marked a pivotal shift in this perception. The Renaissance individual recognised the autonomy of human intellect, the freedom of artistic expression, and the originality inherent in human thought. This period witnessed the emergence of the idea that the artist is a creator in his own right—an originator of beauty and knowledge, rather than a mere imitator of divine or natural forms.

By the eighteenth century, creativity became increasingly linked to the faculty of imagination and the formation of novel concepts. This evolution laid the foundation for modern understandings of creative thought as an innate human capacity, integrating aesthetic sensitivity, intellectual innovation, and the pursuit of originality.

*Figure 1: Paraphrase of Baldassare Peruzzi's artwork "Apollo and the Muses" ¤ Copyright AI experiments by edit@**2025*

2.2 Creativity in Modern Science

In modern scientific discourse, creativity is recognised as a fundamental cognitive and cultural process underlying discovery, innovation, and problem-solving. No longer confined to the arts, creativity in science is understood as the capacity to generate original and valuable ideas that transform existing knowledge structures. Contemporary research across psychology, neuroscience, and cognitive science identifies creativity as a dynamic interaction between divergent and convergent thinking, enabling individuals to explore multiple possibilities and integrate them into coherent, testable solutions.

From the formulation of hypotheses to the design of experiments and the interpretation of data, creative thinking drives scientific advancement by fostering flexibility, intuition, and the reconfiguration of established paradigms. Moreover, interdisciplinary studies highlight that creativity in science is both an individual and a collective endeavour—emerging through collaboration, technological mediation, and the continuous negotiation between imagination and empirical rigor. Thus, in the context of modern science, creativity represents not merely the generation of novelty but the construction of meaning and the expansion of human understanding.

"Creativity is a paradox..." In terms of modern science, creativity can be examined from multiple perspectives:

- behaviour and social psychology,
- psychometrics,
- cognitive science,
- artificial intelligence,
- philosophy,
- history,
- economics,
- design,
- business and management, etc.

Figure 2: (left to right) L. Vygotsky, F. Barron, A. Maslow, T. Amabile, P. Romer and J.P. Guilford

Vygotsky emphasises the significance of social interactions in development, as well as the roles of play and language in learning and developing creative skills. [1]

Frank Barron (1922-2002), a pioneer in creativity psychology, highlights that Creative people are usually curious. They are characterised by a high degree of thirst for knowledge, autonomy and self-motivation, self-confidence, and emotional stability. They are nonconforming person with a wide range of interests, responsiveness, abstract thinking, and intellectual activity. **Abraham H. Maslow** (1908-1970), American psychologist, inventor of the Maslow Pyramid, considers creativity to be a facet of self-actualisation. The creative person feels a strong inner urge to develop their creative personality.

Joy Paul Guilford (1897-1987), American psychologist, is most famous for his psychometric research on human intelligence. In his still-popular theory, he emphasises that creativity is not a single ability but a set of cognitive skills. His model distinguished between convergent thinking (arriving at a single correct solution) and divergent thinking (generating multiple possible solutions), where divergent thinking was identified as the foundation of creativity. He characterised the nature of the intellect by describing divergent abilities, which can be summarised in these 4 categories:

1) **Fluency:** The spiritual lightness, rapidity, fertility and facility; ability to generate many ideas.
2) **Variety and Redefinition**: Cognitive flexibility and adaptability in generating, reorganising, and evaluating ideas.
3) **Novelty:** The unexpected and unusual preference, the associative capacity indicators; novelty
4) **Problem Sensitivity and Elaboration:** Ability to detect and correct flaws, with a preference for detailed analysis and refinement of ideas.

Other researchers, such as **Theresa Amabile**, have found that innovation starts with a creative idea. *"The creativity of the individuals and the group is a starting point for the innovation. The first one is necessary, but not a sufficient condition for the second"* [2]. A 2018 Nobel Prize winner, **Paul Romer,** sees creativity as a producer of capital. Creativity involves reassembling existing elements with new technologies to develop innovative products. As a result, there is economic growth. Paul Romer's theory posits that creativity, defined as the rearrangement of existing elements into new products and processes facilitated by new technologies, drives economic growth [3].

2.3 Creative Thinking

Creative thinking is the process of generating new, original, and innovative ideas by looking at problems from a fresh perspective. It involves moving beyond conventional thought patterns to find unique solutions, solve challenges in unconventional ways, and adapt to new situations. This skill is not limited to artistic fields and is applicable in areas such as problem-solving, innovation, and decision-making across various professions. **Key aspects of creative thinking are:**

- **New perspectives:** To view the situation from a different perspective, uncovering new possibilities.
- **Originality:** Novel and surprising conclusions or new ways of doing things.
- **Problem-solving:** Presenting unique solutions to problems, both common and complex.
- **Innovation:** Development of new ideas and systems that can increase productivity.
- **Open-mindedness:** Curiosity, asking questions, exploration and taking risks with new ideas.
- **Connecting ideas:** Finding new relationships between existing objects, symbols, or ideas.

2.4 Types of Creative Thinking

Five common types of Creative Thinking include (Fig. 3):

a) Divergent Thinking refers to the cognitive process of generating multiple, diverse ideas or potential solutions in response to a given problem or stimulus. It facilitates open-ended exploration and postpones judgment, allowing for the free flow of associations and unconventional possibilities. The approach is characteristic of brainstorming sessions, where the initial objective is to maximise the number of ideas before evaluation takes place [4].

b) Convergent Thinking involves systematically narrowing down numerous alternatives to identify the most effective, logical, or feasible solution. It typically follows a divergent phase, serving as a process of analysis, synthesis, and refinement. Through critical assessment and comparison, convergent thinking ensures that selected ideas are coherent, practical, and applicable within a specific context [5] [6].

c) Lateral Thinking involves addressing problems through indirect, creative, and non-linear methods that challenge conventional patterns of reasoning. It encourages individuals to reframe problems, explore unexpected connections, and consider seemingly unrelated concepts to arrive at novel insights. This form of thinking disrupts habitual cognitive pathways, fostering innovation and originality in problem-solving [7] [8].

d) Abstract Thinking refers to the ability to engage with concepts and ideas that are detached from immediate physical or sensory experiences. It enables the comprehension of complex, symbolic, or theoretical constructs, and plays a crucial role in disciplines such as mathematics, philosophy, and the sciences. Through abstraction, individuals can manipulate ideas at a conceptual level, form hypotheses, and construct theoretical models that transcend empirical observation [9] [1].

e) Aesthetic Thinking is a mode of creative cognition that focuses on the perception, appreciation, and creation of beauty, harmony, and emotional expression. It is integral to artistic and design practices, where form, composition, and sensory experience are central to the creation of meaning. This form of thinking involves sensitivity to visual, tactile, and auditory qualities, as well as to the affective and experiential dimensions that influence audience perception and engagement [10] [11] [12].

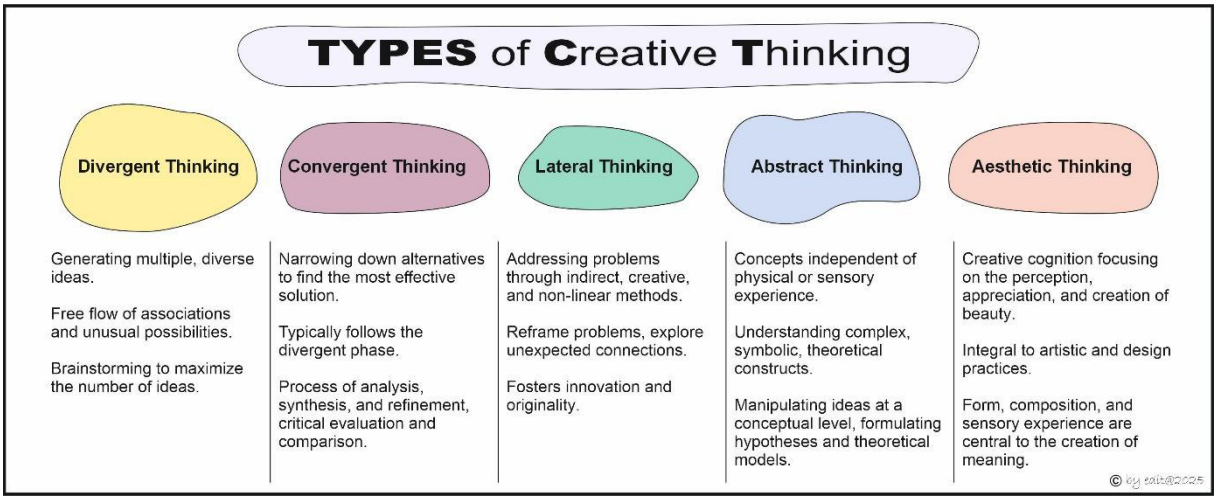

Figure 3: Types of Creative Thinking

3. THE MEANING OF CREATIVITY AND INNOVATION

Creativity is a mental activity that involves implementing new ideas and concepts, as well as creating new associations between existing ideas or concepts, or forming new ideas based on these existing ones. In the scientific approach, creative thought (often described as divergent thought) features novelty and conformity. The creative process involves combining the existing elements with a new approach and incorporating the previously hidden attributes. By the standard definition, creativity is a process that results in an original and valuable creative product. Thus, creativity can be considered an activity in which something new is created. Often confused with the term innovation, **creativity is considered a process of generating new ideas, while innovation is the act of implementing those ideas to create value and solve a problem.** (Fig. 4)

Figure 4: Thomas Heatherwick: The Friction Table (Adjustable table) – 2021 edition

3.1 Design as a Human Act

Creativity can also be considered as the implementation of "unexpected coexistence." **Christopher Wolfgang Alexander** (1936-), a highly influential architect and design theorist, says:

"Design is the generation of a form, creating new fitness between form and environment. (...) Creativity emerges when we discover the new within a structure that is already latent within the present. It is our respect for what is that leads us to the most beautiful discoveries".

To create a new product, we need to have some knowledge, but we must also forget this knowledge to realise the novel, unexpected relationships between things.

Why is it challenging to design? By Alexander, because *"If you change something, everything changes."* There are many types of connections between design and performance variables. (Fig. 5)

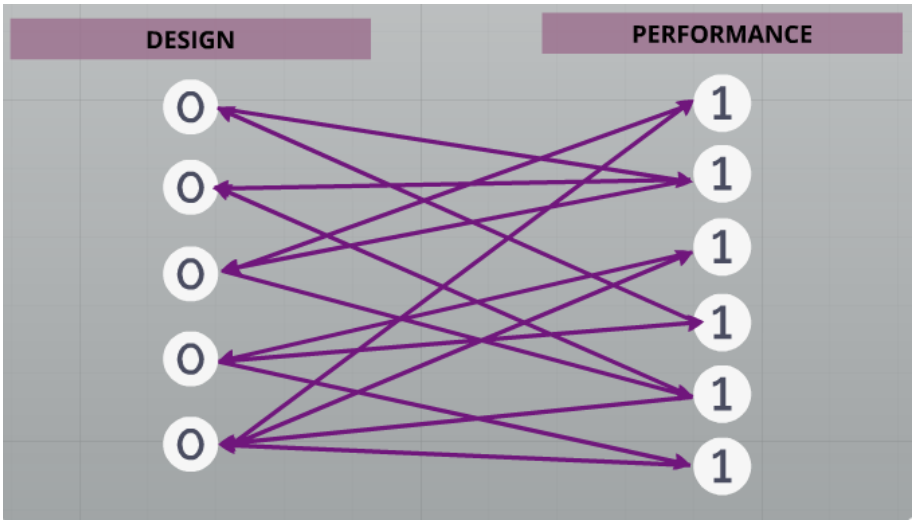

Figure 5: Design and performance variables

3.2 The Process of Creative Cognition – The Creative Idea

The process of creative cognition is somewhat unconscious and characterised by a high degree of adaptation. The creative process is a mental process based on the interaction between analysis and imagination, characterised by consciousness, passion and commitment.

Cristopher Alexander states that any reasonable person who has researched a design problem will identify similar variables. Once the process is objective, similar conclusions will be drawn.

Cognitive and Perceptual Mechanisms

Contemporary research conceptualises cognitive functions as hierarchically organised processes within the brain. At the top of this hierarchy are the cerebral cortex and, within it, the prefrontal cortex—regions located in the frontal lobes that govern complex cognitive operations such as perception, decision-making, and memory. These areas also contain the nuclei of *mirror neurons*, which play a role in imitation, empathy, and social learning. Of particular relevance is the orbitofrontal cortex, situated just behind the eyebrows, which is critically involved in the cognitive evaluation and regulation of decision-making processes. The hypothalamus, along with other neural structures, plays a crucial role in memory

formation and regulation. Emotional processing, however, is primarily mediated by the left and right amygdalae, which integrate memory, emotional response, and decision-making. The left amygdala is associated with the brain's reward system, supporting positive emotions such as joy, euphoria, and pleasure, as well as operative cognition, associative learning, and short-term memory. In contrast, the right amygdala is linked to negative affective states and declarative (long-term) memory. The refinement of these interconnected skills is fundamental to adaptive cognition and social behaviour. (Fig. 6)

Figure 6: Freehand Drawing I - 2021_22_I (Classwork): Studying and Memorising the Features

Perceptual constancies represent another crucial aspect of cognitive processing. **Size constancy** allows the perception of an object's size to remain stable despite variations in distance. **Shape constancy**, similarly, ensures that perceived form remains consistent when viewed from different angles. **Colour constancy** reflects the brain's capacity to maintain stable colour perception across changes in illumination—an outcome of complex unconscious computations within the central nervous system. **Lightness constancy** preserves the perception of an object's brightness under varying lighting conditions. **Distance constancy** governs the perceived relationship between apparent and physical distance, while **location constancy** maintains spatial stability between observer and object. Despite retinal changes due to movement or parallax, stationary objects are perceived as fixed in space, demonstrating the brain's remarkable ability to achieve perceptual coherence amid dynamic sensory input.

3.3 Visual Perception and Cognitive Processing in Creative Practice

Vision constitutes the dominant channel of human cognition: approximately seventy percent of all knowledge is visually derived. The visual system—comprising the eye, optic nerve, lateral geniculate nucleus (LGN) within the thalamus, and the visual cortex—is the most extensive and complex neural network in the brain. This system processes vast amounts of information to construct a coherent visual experience. Yet perception is not a simple act of recording reality; it is a sophisticated interpretive

process shaped by the perceiver's expectations, prior experiences, and the contextual information contained within sensory stimuli. (Fig. 7)

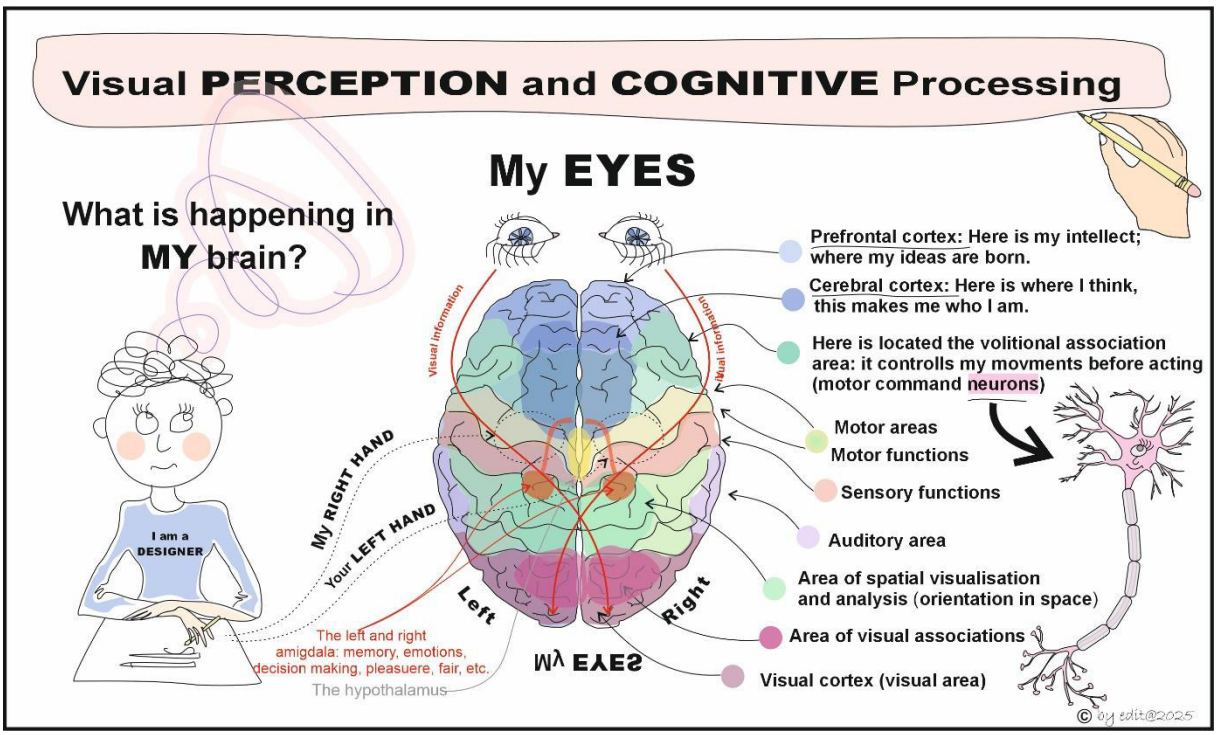

Figure 7. Visual perception and cognitive processing

Two complementary theories provide a framework for understanding how visual information is processed and interpreted.

Top-Down Processing: According to Richard Gregory's (1970) theory of *top-down processing*, perception functions as a hypothesis-driven act—an interpretive "best guess" derived from the brain's existing knowledge and conceptual frameworks. Rather than passively registering external stimuli, the brain actively constructs perceptual meaning by drawing on memory, experience, and learned associations. This process, however, is prone to perceptual biases and illusions, which Gregory viewed not as flaws but as evidence of the brain's creative engagement with the world. From a design-theoretical perspective, the top-down approach parallels *stepwise design*: a method based on decomposition and abstraction. Complex systems are divided into smaller subsystems or elemental components, allowing designers to work from conceptual understanding toward tangible form. In this sense, "errors" of perception—misreadings, distortions, or unexpected interpretations—can become generative sources of creativity, stimulating imaginative reconfiguration and innovation.

Bottom-Up Processing: In contrast, J. J. Gibson's (1966) theory of *bottom-up processing* emphasises data-driven perception. Here, information flows from sensory input ("the bottom") to higher cognitive interpretation ("the top"). The perceptual system, in this model, relies directly on the available sensory data to construct visual meaning—an approach often summarised as *"What you see is what you get."* Within design theory, the bottom-up model corresponds to an *information-centred* or *compositional* process: perception begins with discrete details and progressively integrates them into coherent structures. Designers applying this approach often rely on observation, analysis, and iterative synthesis, building meaning and form through the accumulation and organisation of empirical data. Thus, understanding visual perception not only enriches cognitive science but also deepens insight into the

epistemology of design. Creativity, seen through this lens, emerges as a neurocognitive dialogue between expectation and experience, between what is imagined and what is seen.

The process of creative cognition

Where does the creativity come from? What happens in the brain? Fantasy, like ideology, is based upon subjective, egoistic ideals of unity, self-sufficiency, and control. Creativity exists in the imagination: it is a subconscious, uncontrollable and unmanageable process. A kind of 'daydreaming': activity of a very active brain, which is manifested in communication between the frontal and back of the brain. The communication is intensive, and fully 'private'. The "errors" of perception (inability to focus), cognition (mixture of the taught), and apperception, the process of understanding by which newly observed qualities of an object are related to experience, result in the diverse ideas, upon which the artistic products (artworks) are born. (Fig. 8)

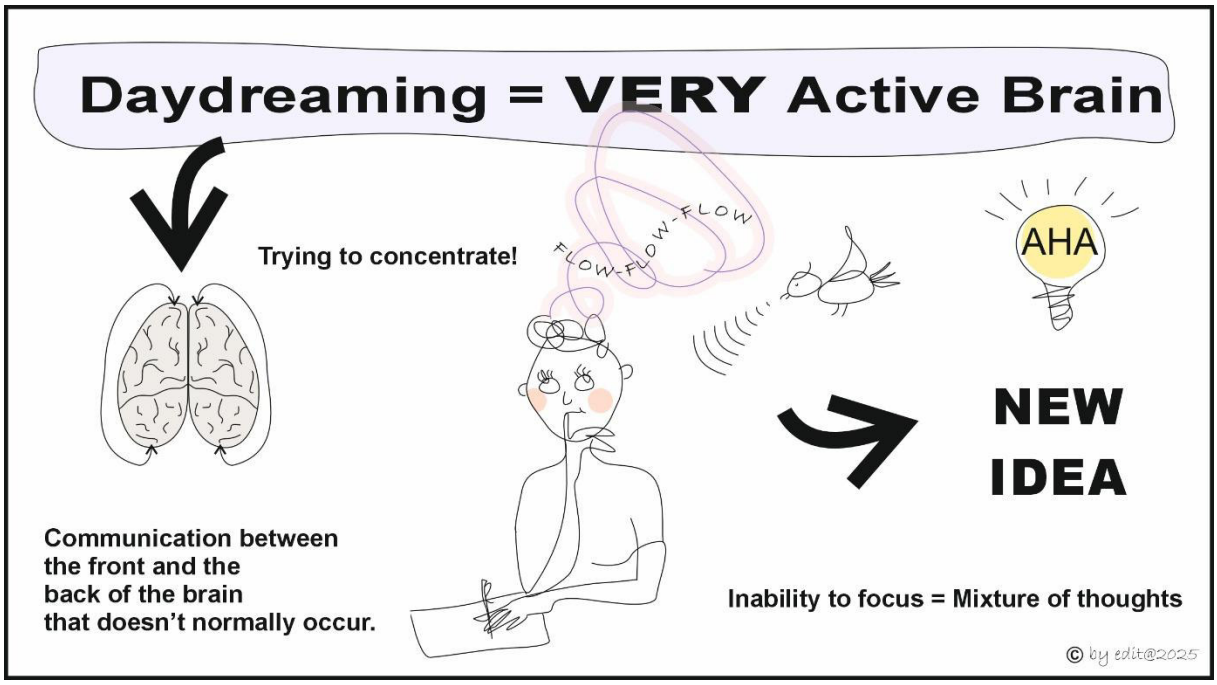

Figure 8: The process of the Creative Imagination

As a unique human activity, fantasy is based upon subjective ideals of unity, self-sufficiency, and control. Focusing on the stage of apperception raises several questions: *How is the cognitive process influenced by visual aspects? What is the physiological pathway that ensures the connection between the vision (eye) and the hand-driven drawing tool? What appears on the paper form of graphite, ink, coal, or colour, as a manifestation of the pure idea?*

The content of an artwork and the method of its representation are a display and a reflection of the aesthetics of the age and the society in which it is created. Art, as a form of interpretation of existence, does not exclusively mean artistic creative activities, but any others that result in a material or spiritual product. These terms seem to be inseparably linked, since thought became visible just in a physically perceptible-visible, audible or tactile form.

4. ART AND THE BRAIN

Art is considered to be a subjective field of human activities that reflects one's experience, knowledge, preference, and emotions. Balthasar Gracian (1601-1658), Spanish-born Jesuit priest, says: *"Art is the completion of nature, as it were a second Creator..."* As an interpretation of existence, art does not exclusively mean artistic creative activities, but any others that result in a material or spiritual product. These terms seem to be inseparably linked, since thought became visible just in a physically perceptible-visible, audible or tactile form. However, *whose competence is to identify what effect flows as an invisible substance between the artwork and the host made up?* [13]

4.1 Ramachandran's Neuroaesthetic Theory

The relationship between art and the brain has long intrigued both scientists and philosophers. In recent decades, the emerging field of **neuroaesthetics** has sought to explain aesthetic experience through the lens of neuroscience, investigating how the brain perceives, interprets, and responds to artistic stimuli. Neuroaesthetics is an interdisciplinary field combining neuroscience, psychology, and aesthetics to explore the biological foundations of artistic perception and creativity. It investigates why certain visual or auditory patterns are universally appealing, and how the brain encodes notions of beauty, harmony, and emotional expression. For instance, understanding how the brain responds to form, colour, and rhythm can inform therapeutic environments, enhance emotional well-being, and guide aesthetic decision-making in product and fashion design. Linking neural processing to aesthetic experience demonstrates that creativity and perception are deeply intertwined at the biological level. Art, in this sense, operates not merely as cultural expression but as a form of cognitive communication—one that speaks directly to the architecture of the human brain.

Among the leading figures in this discipline is **Vilayanur S. Ramachandran**, whose work has been instrumental in linking visual perception, neural activity, and aesthetic pleasure. Ramachandran's broader research explores the brain's remarkable ability to construct and sustain perceptual realities—a capacity that is also fundamental to the art experience. Ramachandran's approach to art and perception is grounded in the idea that artistic practices exploit the brain's innate mechanisms of visual and emotional processing. According to Ramachandran, art functions through **exaggeration**—a process that intensifies perceptual signals and elicits stronger neural responses. Certain exaggerated features can *hyperactivate* specific neurons, producing an amplified perceptual and emotional effect. In art, similar exaggerations—whether in form, colour, or expression—provoke heightened aesthetic engagement. Ramachandran suggests that artistic experience capitalises on fundamental principles of **visual processing**, such as grouping, contrast, symmetry, and isolation of key features. These mechanisms are part of the brain's natural strategy for simplifying complex sensory input and identifying meaningful patterns. Artworks that effectively manipulate these principles successfully activate neural pathways associated with pleasure, recognition, and emotional resonance.

4.1.1 The Eight Laws of Aesthetic Experience

Together with William Hirstein, Ramachandran (1999) articulated the **"Eight Laws of Aesthetic Experience," a framework that describes** how visual art stimulates and satisfies the perceptual system. These laws include principles such as *peak shift*, *grouping*, *contrast*, *isolation*, and *perceptual problem-solving*, all of which govern how the brain extracts and interprets visual meaning. By engaging these neural mechanisms, art evokes aesthetic pleasure through the dynamic interaction between expectation and perception.

4.1.2 Mirror Neurons and Empathy in Art

A further component of Ramachandran's theory concerns **mirror neurons**—cells that activate both when an individual performs an action and when they observe another performing the same action. These neurons are believed to play a crucial role in empathy and emotional contagion. Through this mechanism, art becomes a shared emotional experience, bridging the gap between artist and audience at the neural level. (Fig. 9)

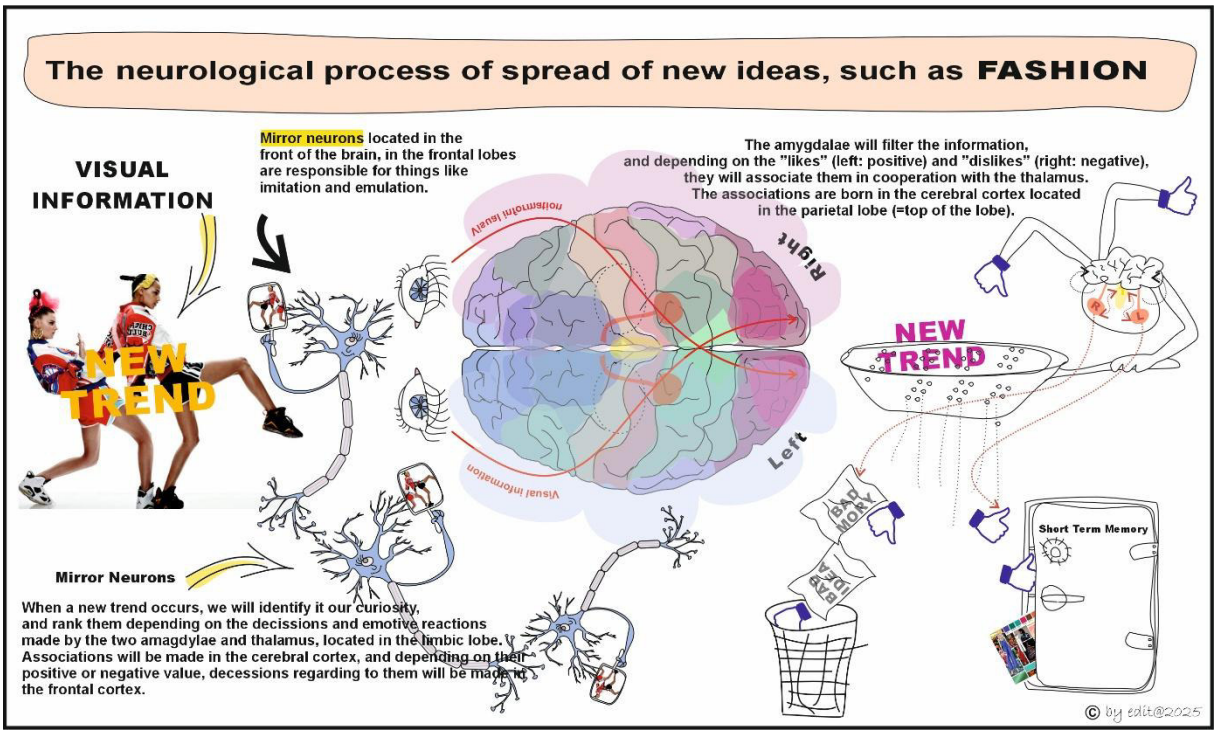

Figure 9: The neurological process of the spread of new ideas, such as fashion

5. DISCUSSION: THE FLOW AND THE AHA EFFECTS

An artist must be completely *in tune* with the art object to enrich its creation. [14] As the piece of art progresses during the creative process, so does the artist. In positive psychology, this mental state is known as FLOW. It is a mental state in which *"a person performing an activity is fully immersed in a feeling of energised focus, full involvement, and enjoyment in the process of the activity. In essence, flow is characterised by complete absorption in what one does."* The concept is highlighted by the name of Mihály Csíkszentmihályi [12], and it has been widely referenced across various fields. It can be considered the main mover engine of artistic (designer) activities in the design process: this mood is the 'tool' that flows through the pathways managing the different brain regions during the CAL [13] process.

The effect, which is known as the sudden insight, or the AHA! effect, is characterised by the sudden appearance of a solution to a problem. This occurs in 4 of the insights:

1) **Suddenness:** the experience is surprising and immediate.
2) **Ease:** matched to the difficulties experienced before, the solution proceeds smoothly and easily.
3) **Positive affect:** insights produce a confident experience.
4) **The feeling of being right:** problem solvers judge the solution as being true and have confidence in this judgment.

The AHA! effect can be compared to the **bottom-up processing approach**, as problem-solving is stimulated by an insight. This insight, as a data-driven process, is motivated by a positive cognitive experience of problem-solving, which is often present in the Computer-Aided Design. (Fig. 10)

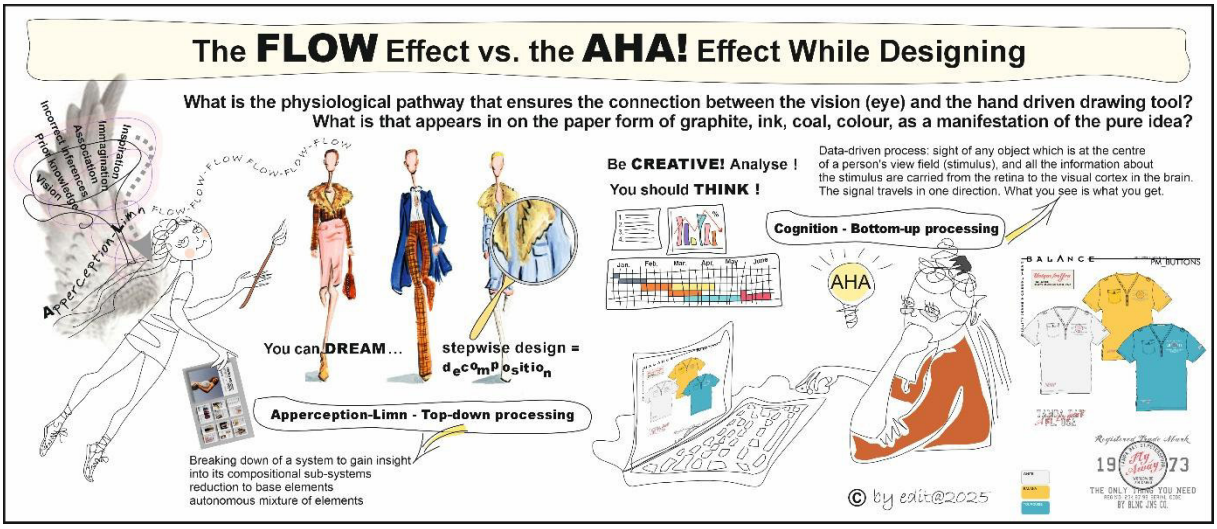

Figure 10: The FLOW vs the AHA! effects while designing

Artists and designers use specific tools while designing. Digital, and especially recently widely spread AI applications, may be usefully used in 'operative' type work, but the process of designing (creative thinking and creation) is too sensitive and irrational to be taught. Thus, FLOW can hardly be accompanied by digital tools, because their management (drawing of different objects, managing their preferences, shaping them, colouring, applying different patterns to them, combining objects to create an entire silhouette, etc.) is more cognitive in its nature. Only manual work can convey the free stream of ideas. The FLOW effect can be considered a top-down processing process, where prior knowledge related to a stimulus often reveals unexpected associations, incorrect inferences, and a decrease in attention, often led by 'errors' of perception. (Fig. 10) In manual drawing, mistakes can be considered a source of fresh ideas and renewed concepts for cuts or details.

In creative practice—particularly in fashion design—both top-down and bottom-up processes interact dynamically. The imaginative reconstruction of experience (top-down) and the analytic organisation of sensory input (bottom-up) together underpin the balance between intuition and structure that defines innovative visual design. The *top-down* mechanism supports imagination, conceptualisation, and abstract reasoning, while the *bottom-up* mechanism grounds design decisions in sensory experience and empirical observation. Effective creativity arises from the continuous interplay between these modes—between intuition and analysis, vision and perception, idea and material. Manual sketching supports cognitive states associated with spontaneous ideation, such as *insight* and *flow*, by enabling direct, unmediated interaction between perception and motor expression. In contrast, digital tools—while efficient and systematic—tend to constrain these processes through their predefined interfaces and algorithmic structures. Such an understanding contributes to the broader discourse on design cognition, offering implications for contemporary design pedagogy, the integration of creative technology, and interdisciplinary research that links art, neuroscience, and artificial intelligence. Ultimately, it redefines creativity as a hybrid cognitive phenomenon—one that evolves through the reciprocal relationship between human imagination, neural mechanisms, and technological mediation.

6. CONCLUSION

Contemporary design practice has become increasingly shaped by digital acceleration and algorithmic assistance. Designers now rely heavily on CAD systems, online mood-board platforms, and AI-based applications that generate patterns, colour harmonies, or even entire collections. These tools enable unprecedented efficiency and rapid prototyping but also encourage a surface-level, "instant creativity," where ideation often precedes reflection. The deep, iterative processes that once defined design thinking risk being replaced by automated visual synthesis and data-driven prediction.

Professional expectations mirror this transformation. Industry job profiles emphasise digital proficiency—trend forecasting, material research, and mastery of programs such as Adobe Illustrator, Photoshop, CLO3D, and emerging AI tools like Midjourney or Adobe Firefly—while manual drawing skills are rarely valued. This shift reflects both technological progress and the gradual loss of direct, tactile engagement with form and gesture. The human hand, once central to visual reasoning, has become secondary to algorithmic optimisation.

As AI-assisted creativity expands, the visual language of design risks becoming homogenised: products increasingly reflect the logic of their tools—efficient, coherent, but often predictable. The compression of development cycles under fast-fashion and AI-driven market analytics has further limited time for conceptual incubation and artistic differentiation. Yet manual artwork continues to embody the essence of creative cognition. It captures the immediacy of the idea, translating thought into form through sensory and emotional experience. Neuroscientific evidence suggests that manual and digital design processes activate distinct neural pathways and creative states—most notably the Aha! moment of insight and the Flow state of deep immersion. While AI can simulate aesthetic outcomes, it cannot replicate the embodied intuition or affective resonance inherent in human creation.

Recognising these neurocognitive distinctions underscores that creativity cannot be reduced to computational speed or technological fluency. True design innovation emerges from the interplay between intuition and analysis, sensory perception and conceptual thought, human emotion and digital intelligence. In this evolving landscape, the challenge for contemporary designers lies not in rejecting AI, but in integrating it meaningfully, balancing algorithmic assistance with the irreplaceable depth of human imagination and artistic agency.

REFERENCES

[1] L. Vygotsky, Thought and Language, A. Kozulin, Ed., Cambridge, Massachusetts, MIT Press.

[2] T. M. Amabile, R. Conti, H. Coon, J. Lazenby and M. Herron, "Assessing the Work Environment for Creativity," *The Academy of Management Journal,* vol. 39, no. No. 5 (Oct., 1996), pp. 1154-1184.

[3] C. I. Jones, "Paul Romer: Ideas, Nonrivalry, and Endogenous Growth," *Scandinavian Journal of Economics,* vol. 121, no. (3)., pp 859-883., 2019.

[4] J. P. Guilford, The nature of human intelligence. McGraw-Hill Book Company, New York, 1967.

[5] A. Cropley, "In praise of convergent thinking," *Creativity Research Journal,* vol. 18(3), pp. 391–404, 2006.

[6] R. J. Sternberg and C. J. Kaufman, The nature of creativity, Cambridge University Press, 2018.

[7] E. De Bono, Lateral Thinking: Creativity Step by Step, Harper Colophon, 1973.

[8] A. Koestler, The Act of Creation, London: Hutchinson & Co Ltd., 1964.

[9] J. Piaget and B. Inhelder, The Psychology Of The Child, New York: Basic Books, 1972.

[10] J. Dewey, Art as Experience, Tarcher, 2005.

[11] S. K. Langer, Feeling and Form: A Theory of Art, New York: Charles Scribner's Sons, 1953.

[12] M. Csikszentmihalyi, Creativity: Flow and the psychology of discovery and invention, New York: Harper Collins, 1996.

[13] E. Csanák, "The CAL: cognitive, apperceptive and representative aspects of fashion design – Side note to neuroaesthetic theory," in *In: IOP (Ed) 17th World Textile Conference AUTEX 2017: Shaping the Future of Textiles*, Bristol, United Kingdom, IOP Publishing Ltd, 2017, p. Paper 172008.

[14] P. Sullivan and J. McCarthy, "An experiential account of the psychology of art," *Psychology of Aesthetics, Creativity, and the Arts,* pp. 181–187, 2009.

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