

# THE CREATIVE MIND, THE CREATIVE BRAIN

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## **INTRODUCTION**

In modern science, the brain and mind research and the purposeful applications of new discoveries and ancient knowledge about human creativity attract increasing interest. Since the 1960s, a tremendous amount of theoretically interesting and practically useful insights have been obtained. Although the veil of mystery surrounding creativity has not yet been completely removed, we now have systematic insights into the human brain-mind system, which can be turned into practical use. Some of these insights with their impact on the corporate and national power of innovation are presented in this paper.

## **CREATIVITY AS A PERSONAL AND INTERNAL PROCESS**

No doubt, human activity is the result of invisible brain and mind activity. While this statement sounds trivial, humankind has hardly started to explore and utilize its deeper meaning (Restak, 1980).

Creativity is, in the first place, an individual inner process which has an outer manifestation. This had been known from ancient times. However, modern Western societies have gradually shifted their interest in creativity from the mysteries of art and religion to the outer manifestations of innovation — technological, commercial, personal, and social. With this shift of focus towards the materialized products of creativity, most practical and scientific interest has come to be centered on the secondary, or instrumental, aspects of the creative process, such as knowledge, machinery, finance, and organization.

However, for the practical purposes of creativity research, we should understand that these instrumental aspects of creativity and innovation only describe the outer environment and do not touch the core. The core is, as stated above, the personal and invisible brain-mind process, which can lead to creative and innovative achievements of individuals, work groups, corporations, and nations. If science does not want to keep its focus on the corollary aspects of the hidden process, it has to go for more direct approach to the understanding and assessment of the creative process itself.

Since the 1960s, the brain and mind research has delivered many findings which allow us a more systematic understanding of the creative process. I will mention just four main

insights:

1. Creativity is linked to alpha-state activities, i.e., brain frequencies in the range of about 12 cps.
2. The brain, according to McLean, can be divided into three mostly independent processing units — the cerebrum, the limbic system and the ancient brain stem — with the notion that so-called higher thinking, including creativity, is a function of the cerebrum (McLean, 1973).
3. With right-handed persons, the physical center of creativity is located in the right brain (Sperry, 1983).
4. The brain, as the carrier of the mental process, can be viewed as a synergetic multiprocessor system, with specific functions and functional interactions.

These few concepts look too basic and too far-removed from any practical impact on the quest for better understanding and use of creativity. However, from these few basics a multitude of valuable, scientifically well-grounded and practical results have been obtained. The purpose of this paper is to demonstrate some of these results with special focus on the purpose of this symposium.

## **LEFT BRAIN, RIGHT BRAIN — THE OLD APPROACH**

Roger Sperry did one of the pioneering researches on brain functioning (Sperry, 1983). In particular, he found that the left brain and the right brain operate like dual processors with a data link of about 200 million connecting fibers. The left hemisphere is characterized as the rational side, while the right hemisphere as the intuitive side. Thus, it was an important insight obtained by Sperry that the physical center of creativity is located in the right brain for right handed persons.

Henry Mintzberg, a famous business professor, recognized, in 1976, the importance of the two brain halves for business. His article published in *Harvard Business Review* triggered a wave of research projects and provided the first, yet primitive brain dominance tests (Mintzberg, 1976).

## **BRAIN DOMINANCE TESTS**

These early tests tried to give an answer to the question: How rational and how intuitive-creative (left brain/right brain) is a person? The answer came in score ratios such as 70:30, indicating typical rational person, while 25:75 would have indicated a highly un-rational yet highly creative/intuitive individual. Behind these left/right tests was another finding of Sperry: most people show preferred use of one hemisphere, while neglecting the other half to some degree. This phenomenon was called “brain dominance”, and is now one of the key aspects of assessing human thinking styles, including human creativity.

The early left/right brain tests, with the acclamation of Mintzberg and many others, were soon applied to many questions such as: “Do I really fit into a technical career?”, “Am I too

right-brained to fit in with my routine job?”, “What should I study, engineering or physics?”, “Do I have enough right brain thinking to pursue a professional career as a writer?”

## **THE HERMANN BRAIN DOMINANCE INSTRUMENT**

The early tests, still without validation, at least provided a simple and popular language to describe personal gifts and job requirements. However, it was Ned Hermann who, in the late Seventies, created a scientifically validated Brain Dominance Instrument (HBDI). While working as Education Manager at General Electric, he developed HBDI as an instrument to support the assignments of training, career plans and corporate needs. One of Hermann's key interests from the very beginning was the assessment of creativity in its various expressions, as displayed by the brain dominance profiles provided by the HBDI. Because of its expressiveness and its versatile application, the HBDI soon became popular in the professional circles in the U.S. By 1990, over one million HBDI questionnaires had been scored and interpreted.

The HBDI brings together two major achievements: (1) a means to “measure” individual thinking style profiles through the means of a scientifically validated instrument, based on a questionnaire, and (2) an easy to learn brain-mind language to communicate about such evanescent topics and concepts as human thinking.

The HBDI is meaningful beyond the direct use of the instrument, which is to provide an individual's thinking style profile. It also allows, without direct use of any profiles, to discuss practical situations such as corporate culture, creative group dynamics, thinking style-related breaks of communication, directions for personal assessment and career decisions. In the next section, we show how the HBDI can be used to gain insight into the brain-mind-creativity-innovation link.

Figure 1 shows the relationship between four brain areas (sub-systems in cooperation) and the four thinking styles — A, B, C and D — as developed by Ned Hermann (Hermann, 1990). There are two cerebral upper thinking style quadrants A and D, corresponding to Sperry's left and right cerebral hemispheres and to the upper element of McLean's Triune Brain. And there are two left brain quadrants A and B (cerebral and limbic) plus two right brain quadrants C and D (limbic and cerebral). To complete the pairs, there are two limbic quadrants B and C, referring to emotional and hormone-related thinking. The resulting four types of mental realms are: A. left-cerebral, B. left-limbic, C. right-limbic, and D. right-cerebral.

The HBDI thus uses a 4-processor model of the brain (using all major parts except the brain stem). This is the way Hermann's model relates brain areas and macroscopic mental functions (i.e., thinking styles) in one synergistic system model. It is also a simple version of the more sophisticated Multimind models, as presented by Ornstein (Ornstein, 1988). However, the simplicity of the basic HBDI brain-mind model caters to its “physiological” and easy understanding and its practicality.

It is time now to expand on the four thinking styles, or HBDI quadrants. Figure 2 gives the attributes or descriptors of the four quadrants A, B, C and D.

Reading through the descriptors of these four quadrants, we find that they definitely describe very distinct personal attributes. It is instructive to visualize four extremely different characters — Mr/Mrs A, Mr/Mrs B, Mr/Mrs C and Mr/Mrs D — as individuals, each made up of only one specific thinking mode. In the mathematical terminology of the factor analysis, these HBDI quadrants represent four orthogonal factors. So, with good mathematical support, we can state that thinking modes (styles) A, B, C and D represent independent systems qualities in an interactive, synergistic model of the mind. And quadrant D obviously is the one related to creativity and innovation.

## THE CREATIVE INDIVIDUAL

With the HBDI profile, it is possible to identify individual characteristics. Figure 3 shows the profile of a typical creative individual with A=55, B=40, C=80, and D=135. A person whose profile is skewed towards the quadrant D, i.e., the right-cerebral quadrant, can be a creative scientist or engineer, an entrepreneur, a gifted software system designer and developer, a painter, a playwright, or an *ikebana* master.

In general, with obviously creative and innovative individuals, the D-quadrant scores range from 95 to 155. Profile #2 is that of a typical academic engineer, of a finance manager or an average technical manager, according to statistical mean values. We see here the dominance in A(=105) and B(=85) on the left side of the profile while the right side scores with C=45 and D=60 exhibit the typical weakness of the average engineer type person: no explicit creativity, very little interpersonal interests and skills.

From these basic insights, General Electric developed rules for the composition of the corporate leadership mix, as expressed by Mr. Rothschild, Corporate Personnel Manager. According to him, GE requires 50% of managers to be explicitly right brain type, 25% with a clear leaning to the right, another 25% to be left-right balanced, and only 25% being allowed to be clearly left-brain. After almost 15 years of this “brain-mind policy” GE has a reputation as a continuously innovative and successful corporation.

In the Human Abilities in Software Technology (HAIST) study, which we did for Siemens, we researched on software developers who had been named as the absolute top people in terms of high productivity and extraordinary design power (Peschanel, 1988). We found that they all had typical high D profiles with a group average similar to profile #1 in Figure 3. Their productivity was found to be 1,000 to 2,500 percentage points above average.

## WORK GROUP CREATIVITY

Creative individuals may be able to manifest their creative ideas on their own, or they may not. It often takes a work group to achieve practical innovative results from an original

idea or a complex set of such ideas. Or it takes a number of workgroups, or even a whole corporation, to manifest their creativity.

The HBDI can test group creativity by looking at the HBDI group profile, which is obtained by either overlaying individual profiles or averaging out the individual A, B, C and D scores. These group profiles indicate very quickly which of the A-, B-, C- and D-qualities is important in the group and its behavior. In other words, these profiles exhibit to a good degree the group culture, including the group's inclination to creative work.

Only in very special cases, the "all high-D champ" group is the right solution to a creative task. In certain crucial projects, we found such groups as with the former Digital Operating System Development Division.

In general, creative work requires all four quadrants to be involved. Figure 4 shows, in # 1 a profile of one-sided left brain group as is typical for traditional technical companies. In fact, this profile is very similar to that of high-ranking IBM management groups before the onset of the IBM crises. In # 2, a highly creative and communicative group profile is displayed, while #3 shows an "all-round team" with an explicit opening to creative thinking.

It is important to understand that "unbalanced profile shapes" (i.e., overly one-sided ones) are generally indicators of pending performance problems (except when special tasks demand this one-sidedness). Just through the analysis of the HBDI profiles and the quality of the communication among the members of the managing board of several companies (under contract of the Board of Trustees) Ned Hermann could foretell the potential for certain problems or the imminent outbreak of a crisis.

One remark should be made that it takes intensive corporate development activities to purposely shift group and corporate cultures to more balanced or even right brain shapes. In general, traditional corporations exhibit a strong leaning towards the A- and B-quadrants, indicating an active "immune system" against the incoming of more right brain individuals (Garnes, 1990).

## **NATIONAL CORPORATE CULTURES AND SUCCESS**

Not only work groups and companies but also nations seem to have preferred corporate cultures with different shapes of preferred corporate profiles. While systematic research has not been done on national creativity profile, it is not difficult to speculate that the American "Silicon Valley" success story is highly "D-oriented". German success in traditional industries, on the other hand, seems to be strongly linked to A- and B-style thinking.

The famous Italian art of corporate and national survival at a good level of chaos has an attribute of the D-quadrant with a definite lack of B-qualities. For example, Latin lawyers and notary public seem to be right brain, while people with the same profession in English or German speaking countries definitely exhibit strong left brain profiles.

## THE SUCCESS FACTOR MAP

The HBDI provides a means to visualize profile-related success factors, as shown in Figure 5. Of course, nationally, regionally and in different business fields, very different profile patterns can be linked to corporate success. However, it seems that there are “preferred national answers” to the quest for optimal corporate (work) cultures.

A few general statements seem to hold true:

—that acceleration, internationalization and increasing complexity mark a general demand for more D-quadrant contributions,

—that the mechanical A-/B-approach has to lose out under the search for more flexibility, quicker response and lean corporate organizations.

And, as a consequence:

—that corporations placed more on the left side of the mental corporate map as given in Figure 5 should try to move into higher D-scores (meaning a transformation of corporate culture by bringing in more C- and D-minded people, and by integrating them, against the forces of the immune reactions of the old culture).

## WHERE IS JAPAN ON THE CORPORATE SUCCESS MAP?

I have not been able to do research on the question of where Japan is on the corporate success map. But the few existing HBDI data on Japanese citizens suggest that individual profiles go pretty well along with those of the Western nations, speaking in statistical terms. However, the Japanese success story seems to be different from the Western ones in the examples of Figure 5. I can only give my subjective results. To me, it seems that, while the Silicon Valley type feasted on the D-type and Germany on A- and B-type, Japan has built on the ability to integrate the four success components — A, B, C and D — without overly excelling in any one of them.

I should add here that quality as a success factor is not only based on the B-qualities of detail orientation and statistical analysis. Instead, my research has shown that holistic concepts of quality have to include all four quadrants A, B, C and D. And this seems to be a strength of Japanese workmanship, although the famous *kaizan* work process seems to support behaviors as continuous optimization (A-type) rather than radical innovation (D-type).

## CONCLUSION

I hope I have demonstrated what benefit we can have at the personal, corporate and national levels, if we include modern knowledge and methods in the brain-mind research in our efforts at systematic promotion of creativity and innovation. What I said here about the brain-mind activity is less than what our aspirations may take us. Still, structured insight and methods are already available to us when it comes to nurturing a “creative culture”.

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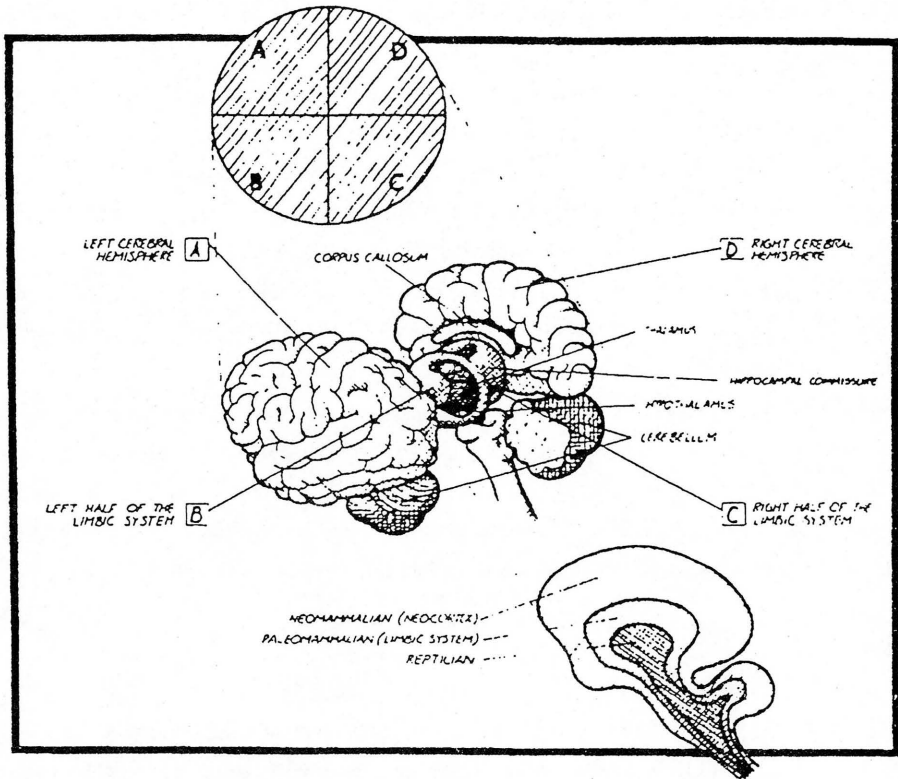


Fig. 1: The Brain and the 4 quadrant concept. Source: Ned Herrmann (5).

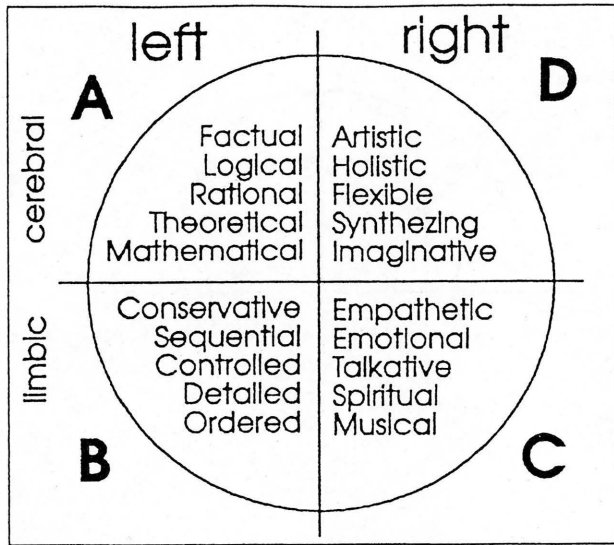


Fig. 2: The 4 mental realms of human thinking in Ned Herrmann's 4-quadrant model.

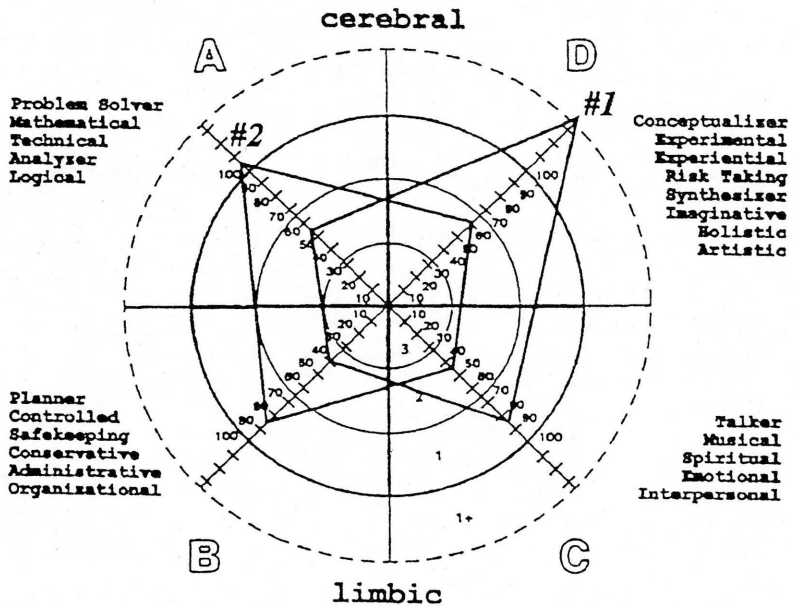


Fig. 3: Two HBDI-profiles; one of the typical creative individual, the other of the typical engineer.



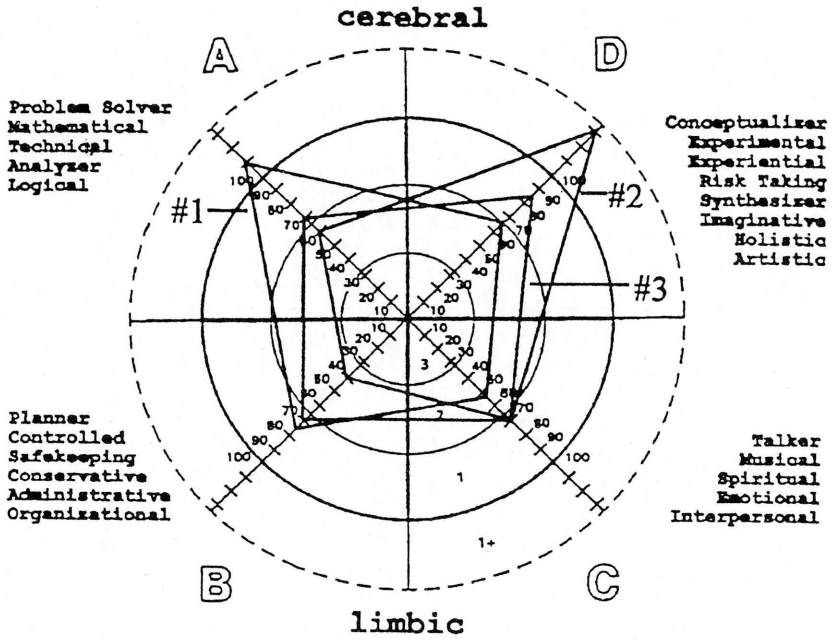


Fig. 4: Three group profiles from left to right dominant (group averages).

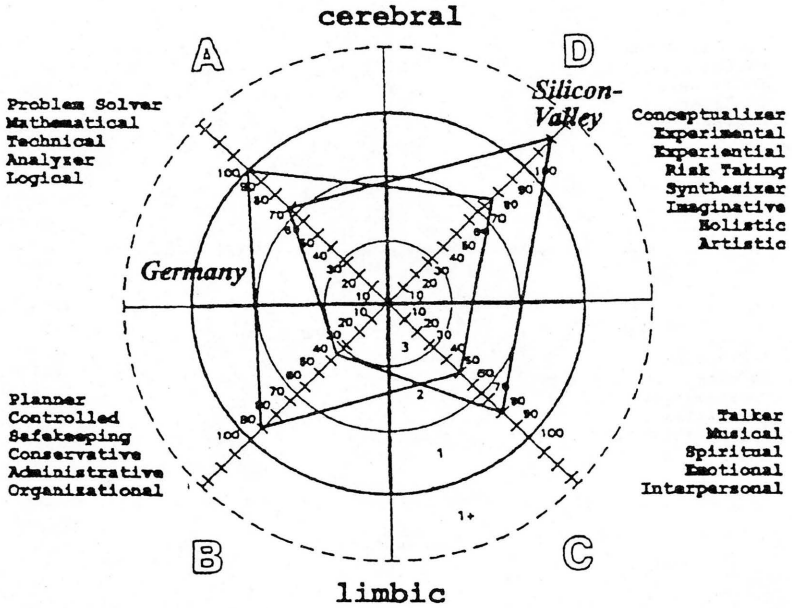


Fig. 5: Profile related national success factors (pro forma profiles).