

Total-brain Leadership and Innovation

How to be successful in the knowledge economy

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Introduction

In order to be effective and successful organizations and nations need exemplary leaders, leaders who know how to use their fullest potential. Therefore, Warren Bennis (Ref. 1) focuses on the necessity of becoming a **healthy, fully integrated human being** before a person can show exemplary or integral leadership. According to Bennis leadership is closely connected to personal growth and at each successive stage or level of personal growth, one transcends and integrates the previous level of being, consciousness, and identity. The ability to master one's context is essential for any successful leader, and one cannot master what one cannot “see”.

Most leaders in the present chaotic world are guided by the ‘monkey mind’ to use this metaphor from teachers of yoga and the martial arts. They have not mastered their brainwaves, probably because they never saw them. Advanced bio- and neurofeedback tools can make the waves of our brain, heart and body not only visible on a computer screen, but can also teach us how to learn to master them. If a leader is not able to effectively respond to all *feedback* from the environment, including worldwide innovations, he or she cannot be a successful leader. Therefore, the more levels of development one has transcended and included, the more one sees, the more expansive and profound his/her mastery of content and context is, and the fuller the expression as exemplary and integral leader.

Robert Quinn (Ref. 2) tells us also that great leadership is about who we are and not what we do. In facing our fears and harnessing our uniqueness, we bring forth the capacity for intellectual, emotional, and spiritual integrity, for inspired leadership and for enduring change. The key to our leadership is an endogenous development, not an exogenous event and the most effective leaders are those who focus on developing themselves and formulate a strategy for personal growth, all change is self-change. A profound integration of the self/other/organization/world contexts is necessary. To explore this transformative state Quinn describes eight practices: reflective action, authentic engagement, appreciative inquiry, grounded vision, adaptive confidence, detached interdependence, responsible freedom, and tough love.

Now, in the beginning stages of the twenty-first century, an abundance of development techniques drawn from many cultures, belief systems, and rationales is available. These

techniques address the whole person, creativity, concentration, stress management, emotional and physical health and reaching peak performance. Anna Wise (Ref. 3) tells us all techniques can be traced back to one principle: **self-mastery and this involves total-brain mastery...**

A high-performance mind possesses the potential for using optimum states of consciousness. It is able intentionally alter these states of consciousness and reach a state of total-brain control. With the words of Anna Wise: "Thinking feels fluid rather than rigid. Emotions become more available and understandable. Information flows more easily between the conscious, subconscious and unconscious levels. Intuition, insight, and empathy increase and become more integrated into normal consciousness." All these competencies are characterizing an exemplary leader. (see also Ref. 4)

To make transformative and 'Total-Brain' leadership available for everyone we have developed a simple fractal model to reduce the complexity in the world and to make personal leadership available for everybody.

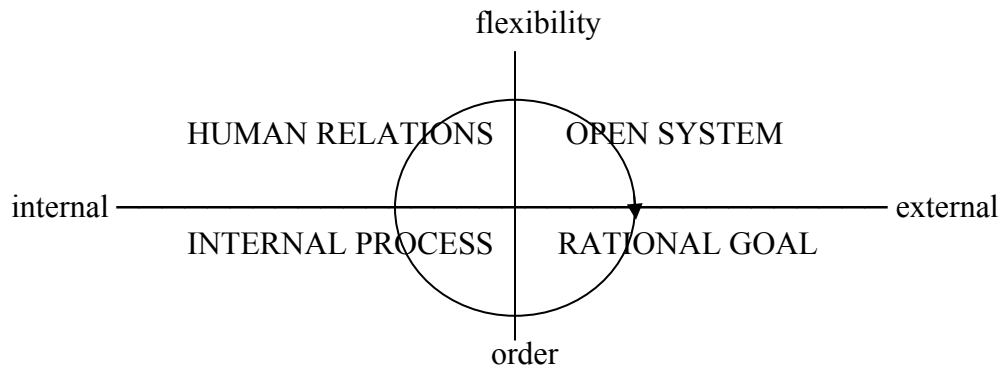
Quadrant Models and the BrainMap

Working with 4 quadrant models, in order to have a roadmap for exploring a territory, is a habit of many scientists and also in the field of organizational change, innovation and management they are used very often. There is a proliferation of many quadrant models and in any model the choice of the two axes is crucial.

So let us look at some models. There is a model from the already mentioned Robert Quinn (Ref. 6) called the Competing Values Model (CVM), this model unites into a single meta-model four often used approaches of organizations. The four approaches are: the Open System model, the Rational Goal model, the Internal Process model and the Human Relations model. The Open System approach focuses on a flexible organizational structure in which one can exploit quickly and with foresight factors in the external environment of the organization. The Rational Goal approach is equally externally oriented but pays more attention to matters aimed at planning and setting concrete goals and above all reaching results. The Internal Process model is internal and control-oriented, where systems and procedures are decisively important, and this model is therefore also known as the bureaucracy model. The Human Relations model emphasizes flexibility and is above all internally oriented. Agreement, teamwork and morale are important points of focus. Good human interaction is the central concept.

It is interesting to see that the four models are brought together by Robert Quinn's mind with the help of two intersecting axes, with as dimensions internal/external and control/flexibility. These dimensions are opposites, hence the name "competing values".

In forming and structuring organizations, according to Quinn, the four quadrants of the CVM are followed in turn beginning with the Open System approach. This is because, first of all, a vision is required (the Why). Then this vision is translated into objectives and plans (Rational Goal quadrant, the what). After that, the manner of execution is determined (Internal Process quadrant, the How). Finally, the persons who are to be assigned the concrete tasks are appointed (Human Relations quadrant, the Who).



It can be seen from this that the four different organizational approaches succeed each other in time, as is the case during the product lifecycle which is now about 9 months. A new idea (OS) leads to entrepreneurial action by formulating business goals (RG), the new company needs rules, procedures and an internal structure (IP) and collaboration between people with different roles (HR). In this way we are creating a dynamic spiral (following a circle in time gives a spiral). In our view and experience there are more ways to go through the 4 quadrants, in fact an organisation process can start in any quadrant and follow several different pathways. The circle can be reversed and also lemniscates are possible; every process is completely different and gives completely different results. In fact order/flexibility is not a real polarity; the real polarity is order/chaos. We will use this axis from now on for evaluating other models and will see order/flexibility as a part of it.

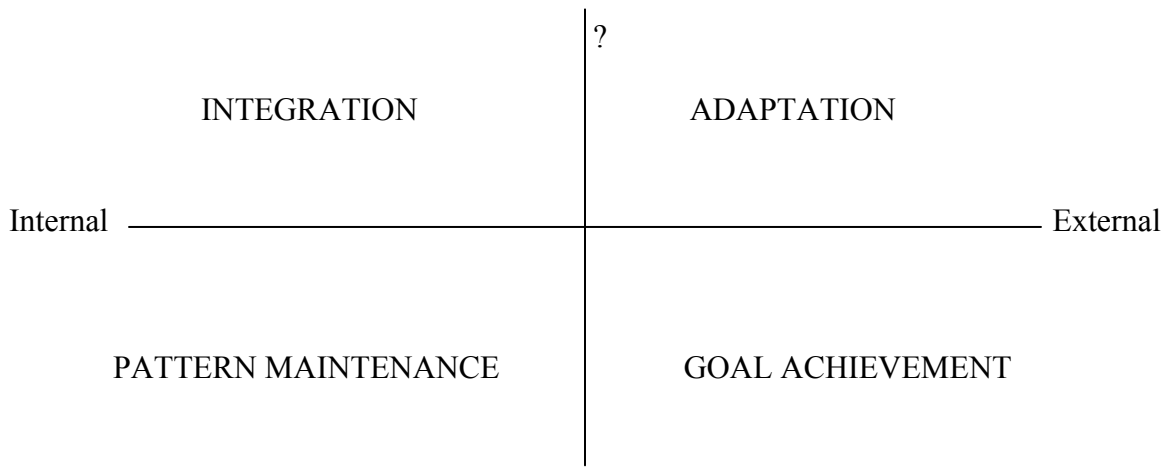
Parsons and Habermas

Time to move on to the next model which we find in the work of sociologist Talcott Parsons.

In Talcott Parsons' conceptual scheme, which Jürgen Habermas also is using in his *Theorie des Kommunikativen Handelns* (1981), human activity is classified according to four analytical aspects: adaptation, goal achievement, integration and, finally, pattern maintenance and tension regulation. The first two are externally oriented, the latter two internally oriented, and this is the same axis as we saw in the CVM.

Parsons' second axis concerns direct and indirect satisfaction of needs through the mix of combinations of four other factors: affectivity, performance, neutrality and quality.

Interesting is that when we look at affectivity, performance, neutrality and quality using the Competing Values model, they can easily be placed into the 4 quadrants: Human Relations, Rational Goal, Internal Process and Open Systems. The second axis of Parsons scheme has suddenly disappeared. Let us look at Parsons scheme now.

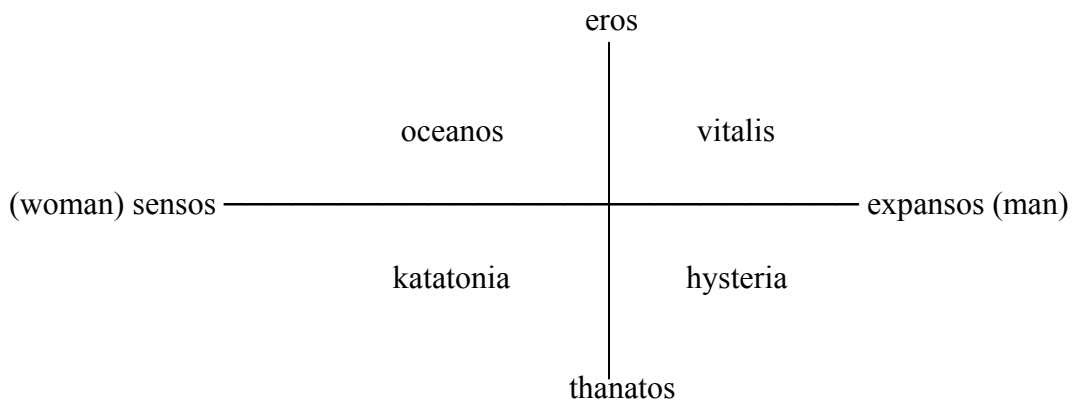


We immediately see that the CVM for organisations and Parsons' model for societies have many similarities. Because the vertical axis is blank we have room to choose for this axis also order/chaos. We now have the same models for organizations and society and we have included in our model the new science of chaos and complexity.

Freud and Jung

Models are composed by human minds, so let us move on again. What do we know about the human mind?

Sigmund Freud is a name which immediately comes to our minds. Paul Heylen summarizes the work of Freud in the following model:



The question is now, is/was a female internal and a male external? When we look at our own history especially during the life of Sigmund Freud and the present practices of many people in the world, it looks like this is the case indeed. Woman is queen of the house and man king of the road. We now have two new candidates for the vertical axis:

eros and thanatos or life and death. Is there a similarity between order and death? Between eros, life and chaos? Good questions! (Later we will see that matter, death and order are on one site of the polarity and life, eros, spirit and chaos on the other site.)

Carl Gustav Jung borrowed from Freud the distinction between consciousness and the unconscious. Within the latter he distinguished a personal and collective part (the archetypes). We will return to this subject later when we will talk about brainwaves.

The Meyer-Briggs Type Indicator is based on the work of Jung. It uses 4 polarities: extravert/introvert, sensation/intuition, feeling/thinking and judging/perceiving and by combining them we get 16 personality types.

Putting this together in a two-axis model gives the following result: extravert/introvert corresponds with external/internal and judging/perceiving with control/flexibility. Thinking has 'Wahlverwandschaft' (Max Weber) with the internal process model, feeling with the human relations approach, intuition with the open system approach and sensing with the rational goal approach.

The result is we now can construct one simple model we can use for person, organization and society; a self-similar fractal model of human reality is coming one step nearer.

The physical brain models of Herrmann and Lynch

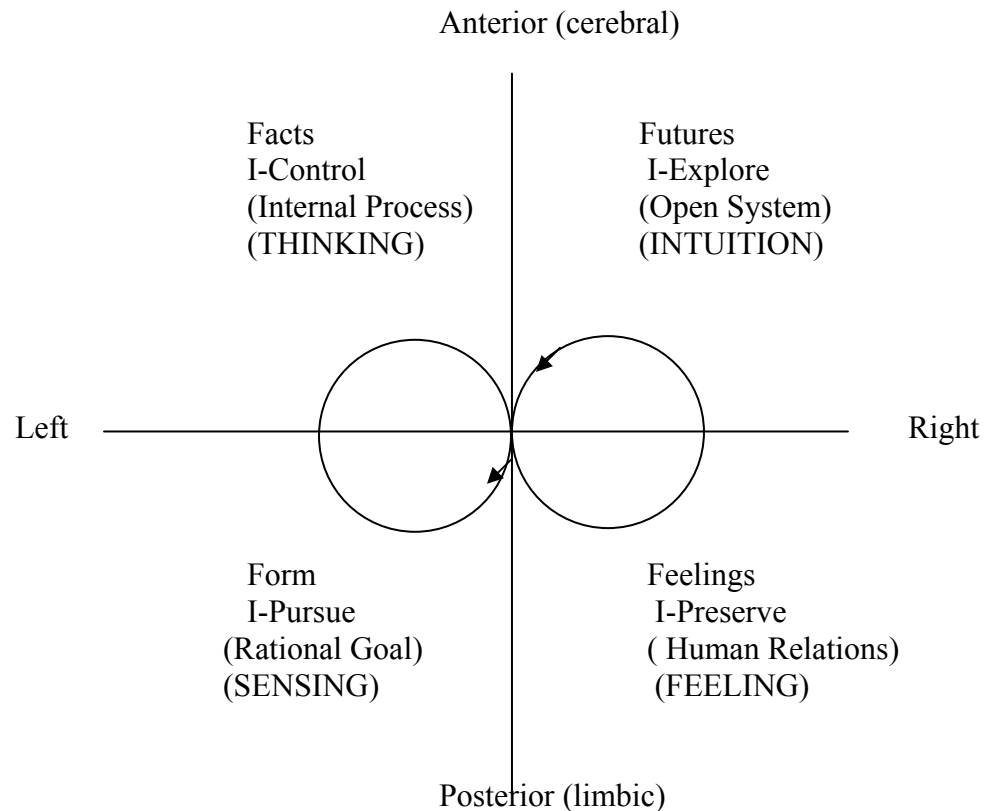
Let us now proceed from 4Q mind models to 4Q brain models. 4Q brain models are based on research of the physical human brain: left brain/right brain and limbic/cerebral brain (or the triune reptilian brain/mammal brain/neocortex). Ned Herrmann (Ref. 7) and Dudley Lynch (Ref. 8) are the names connected with the development of these physically based 4Q management models.

The BrainMap developed by Dudley Lynch and used worldwide (also by the authors) is based on brain research by Nobel-Prize-winners Roger Sperry and A.R. Luria, Ward Halstead and others (see Ref. 9). This tool has been used (among others) to:

- Identify specific kinds of thinking skills in specific individuals.
- Select members of elite problem-solving teams.
- Pave the way for introducing new ideas and needs to a group.
- Demonstrate the value to a team of multiple kinds of thinking.
- Help individuals and groups aspire to develop themselves.
- Develop action plans for changing an organization or team.
- Identify and help frame responses to conflict in organizations.
- Pinpoint strategic weaknesses in a group's behavior.
- Analyze an organization's internal and external cultures.
- Help individuals with career and retirement choices.
- Build personal self-awareness and help in defining personal goals.

The 4 quadrants of the BrainMap are amazingly similar with the 4 quadrants of a model of Ned Herrmann as the following figure shows. The words on top in every quadrant are

of Ned Herrmann and below it are the words of Dudley Lynch, between brackets are words of the CVM and Jung



The 4Q Cyclic Innovation Model of Berkhout

The above '4Q brainmodel' can be directly linked to the 'Cyclic Innovation Model' developed by Berkhout (Ref. 10):

In his treatise, Berkhout proposes to replace the static and sequential innovation models with an integrated alternative, the Cyclic Innovation Model (CIM). CIM essentially is a 4Q model describing an innovation driven society as four coupled cycles, each cycle representing a network of multichannel forward and backward innovation processes between the knowledge and business communities. These interactions based, **feedback processes** demonstrate that innovation is accelerated by creating novel, boundary-crossing combinations of (re)new(ed) complementary building blocks. Innovation may also be slowed down by intracyclic or intercycle barriers. Removal of these barriers - both at the individual level, and at the group, organizational and (supra)national level - is

the main challenge of the 21st century. This requires changes in the way knowledge, engineering, production and service providing processes are organized.

The CIM model of Berkhout is described in Figure 3, presented in a similar set-up as the 4 Q physical brain model:

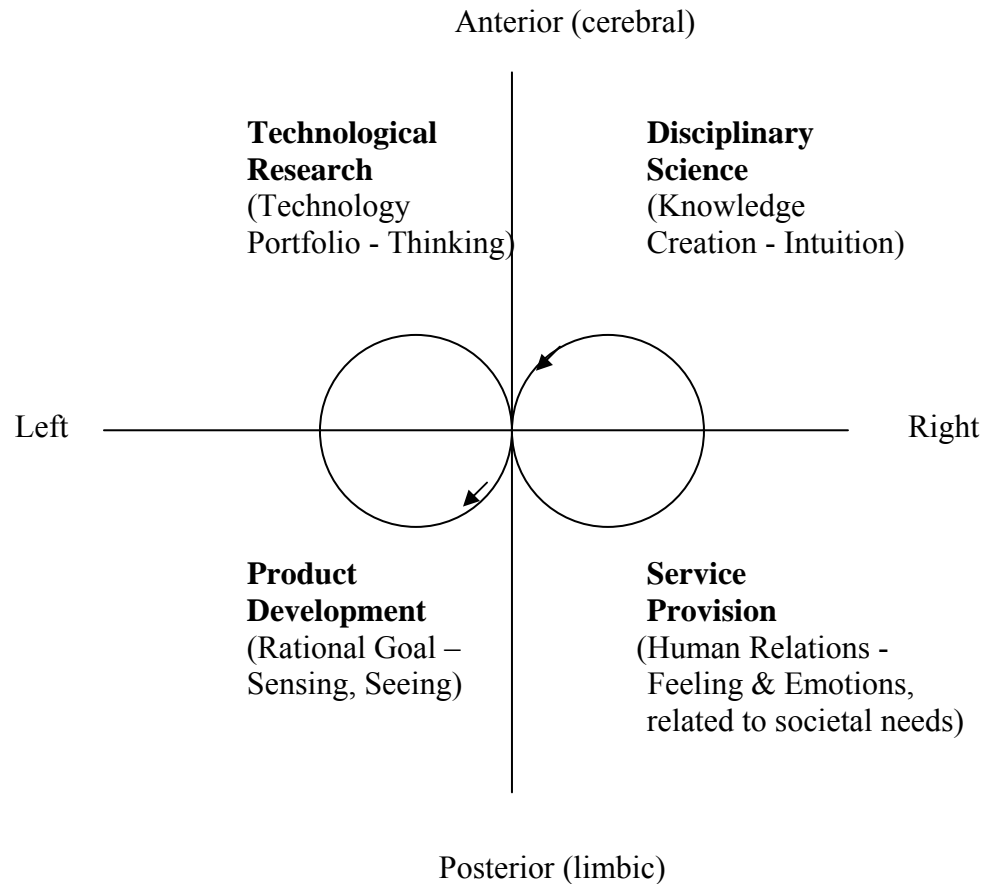


Figure 3: The Cyclic Innovation Model of Berkhout in a 4Q representation which is directly combined to the 4Q Brain Model

When we follow the direction of the arrow in the lemniscate (note this lemniscate is a circle in the CVM and the fractal model of person, organization and society), we notice that when we for instance start in the lower right Quadrant changes in society, which are related to society needs accelerate the creation of new knowledge (the upper right Quadrant), and new knowledge drives towards product development and the required technological changes. Technological research and service provision are the driving processes behind the society of the future. They are at the same time interconnected through disciplinary science and product development: **a never-ending loop of four innovation cycles coupled by multichannel feedback and feed forward interaction**

processes. These feedback and feed forward processes are vital in order to cross boundaries between the four different innovation cycles. Barriers in these processes mean stagnation during innovation!

What we can derive from figure 3 is that innovation policy should be a **boundary crossing policy, in 3 levels at the same time. The individual level (especially the leaders involved), the group or company/organization level, and the regional or (supra)national level.** The direct consequence of this insight, and here we fully agree with Berkhout (Ref. 10) is that national or federal governments (such as the European Commission) should replace their traditional science, technology and industry policy with a **boundary-crossing innovation policy which is linked to all dimensions.** (For more details we refer to the work of Berkhout)

The unique insight in innovation processes given by this simple figure cannot be overestimated!

For the first time a direct link between the individual dimension and the group, organizational and (supra)national dimensions in innovation processes is given (in the last paragraph we will see how this can be developed even further). The consequences are enormous: the very complex process of interacting cycles is described in a relatively simple model which can be used at all levels in innovation and change processes.

A few remarks considering the interdisciplinary aspects and consequences:

Technology is to be considered as ‘frozen thinking’ (a well-known saying of sociologist Max Weber). The 4Q Brain and CIM Models formulate an integrated framework of vertical and horizontal building blocks in terms of goal-driven processes, human tasks and matching competencies, especially of leaders. This framework shows how to ‘liquefy’ frozen thinking into new and sustainable products, services as well as employment. No less than: **The Future of Work!**

Another remark concerns the important link which is made by the 4Q models to developments in learning and in the psychology of learning. How to learn in the most effective way, and how to develop your personal core competencies? The most important issue however remains, and here we come back to the main questions of the Introduction: How to be an exemplary leader? How to reach total-brain leadership?

A **key** is in the crossing of the boundaries between the Quadrants. An uninterrupted flow in innovation and change requires uninterrupted interactions across the boundaries. The nature of these interactions is referred to in the words **‘feedback and feed forward processes’**. Feedback (and feed forward) of information is crucial. We will not go into the nature of feedback at the organization or regional/national level. Here again we refer to Berkhout (Ref. 10).

In this publication we will restrict ourselves to the feedback processes at the personal level, needed to reach total-brain control, and to become an exemplary leader.

In the last two decades the combination of information technology and neurotechnology has enabled methods for learning and training ‘Quadrant crossing at the personal and interpersonal level’. These methods are summarized with the names **Bio- and Neurofeedback.**

Bio- and Neurofeedback

Scientific progress in the 90's related to brain and body functioning including the relation between mind and body has been significant. Technological advances, especially in software and sensor technology has allowed the development of various techniques in the approach of the mind and body at a level never before imagined. Among those techniques Biofeedback stands out as a successful and promising approach to mental and physiological functioning, and therefore is considered as one of the training and therapy methods most likely to prevail in the 21st century.

Biofeedback is a technique to voluntarily control physiological functions of which people are usually not aware, with the purpose of recovering, to maintain or to improve the health and/or performance. Biofeedback is a method to make involuntary bodily functions (e.g. heart rate, skin resistance, temperature, muscle tension, etc.) perceptible (visible and /or audible). This is done through the use of sensors that measure accurately and instantly the physiological function under study, informing the subject, about the value of physiological parameters that are being monitored.

With this information, (and sometimes guided by a trainer or therapist) the subject has the possibility of altering such values, according to their will and in order to change them to a more desirable level. For example subjects can learn to constrict their blood vessels without the help of chemical substances, in order to treat migraine. Biofeedback therapy presents many positive points when compared with other kinds of treatments. Unlike what happens in the treatment by drugs, biofeedback therapy doesn't present side effects. Since it is non-invasive, the therapy is practically free of hazards, and completely painless. People can also learn to suppress pain with biofeedback, when they are shown the activity of a pain-control region of their brain, according a recent article by Helen Phillips in New Scientist of May 3 2004. Another important point is that the person has the control of the evolution of the training or therapy. Conscious and voluntary participation plays a decisive part in the success of biofeedback.

In the last 40 years an impressive amount of research has been published on voluntary self regulation (biofeedback). Biofeedback uses special instruments attached to the body in order to give a person information about what is happening in the body. The instruments serve to amplify the signals that the person may not otherwise be able to detect so they can then use this visual or auditory feedback to learn to regulate certain bodily functions.

Biofeedback training is a technique whose application is not of exclusive use of a particular professional class. It can be performed by professionals in different areas, in peak performance training of professionals, in the health area and in the educational area.

Neurofeedback is a special case of Biofeedback. The neurofeedback or electro-encephalographic Biofeedback measures the electric waves of the brain, just as it happens in the classical EEG. So it is possible to train a person to produce or to decrease their

production (amplitude and/or frequency) of any one of the bands of cerebral waves, in any of the cerebral hemispheres, or in both, according to the physical and subjective state that it aims to reach.

Neurofeedback training assists the person in recognizing the inner experience of optimal state and learning to replicate that state. Managing arousal and balance in performance means synchronizing mental and emotional imagery with logical thinking. Neurofeedback is transformative in improving attention, control, and steadfastness and helps in dissolving memories and barriers to performance.

So, the technique of Neurofeedback is very well placed to assist in learning to cross the boundaries described in the 4Q model. It is the main technique where a person learns to master his or her context and transform into an exemplary leader. The ultimate result is **self-mastery through total-brain control**, the prerequisite of successful transformation and innovation. Learning across boundaries also means new learning experiences and making (self-organizing) new connections between neurons and between glia cells in the brain (see also Scientific American of April 2004). Making new connections between people is also very important during innovation processes as one of the authors recently made clear in the article (Dutch) “Innovatie van de Innovatie” (Ref. 11).

Brainwaves and leadership competences

Brainwaves are based on electrical activities in the brain and are measured in frequency (cycles pro second, or Hertz the velocity of the electrical pulse) and amplitude (intensity of the brainwave). A frequency of 1 means a cycle of one pulse pro second.

There are 5 kinds of brainwaves varying from the low amplitude/high frequency Beta till the high amplitude/low frequency Delta:

Beta: 14-38 Hz: normal wakefulness, focus on the external world, active thinking, normal problem solution, logical thinking, making decisions, also feelings of separation, stress, fear and ‘fight or flight’.

Alfa: 8-14 Hz: physical and mental relaxation, the bridge between consciousness and deep consciousness, relaxed focus, faster learning, open for other people, feelings, visualising, fantasizing, and daydreaming.

Theta: 4-8 Hz: deep consciousness, memories, (memory training!) and emotions, creativity and inspiration (innovation!), REM-sleep, imagination, trance, meditation.

Delta: 0-4 Hz: dreamless sleep, deep trance, deep meditation, loss of body-consciousness, radar, orientation in space and time, ‘rapport’ with other people, intuition, entrance to the collective deep consciousness (Jung’s archetypes), synchronicity, merging with the mind of other people, blindly understand each-other in management and sport teams.

Gamma: Higher than 38 Hz: co-ordination of separate parts of the brain, modulating of perception, cognition and memory.

Present western science is based on experiences and experiments in the beta state which is only the tip of the iceberg of human consciousness, from which we can conclude that present science is only a state of ignorance. Many scientists all over the world presently are exploring the farther reaches of brainwaves and consciousness and this not only leads to a new kind of leadership – according to the personal growth model of our introduction - but also a new kind of science, in other words a new paradigm. In a future publication we will explore this innovative side of human enterprise.

With neurofeedback personal growth is speeding up and entrance to the information belonging to the different brainwaves is emerging, reason we use this tool for peak performance training.

Conclusion 1

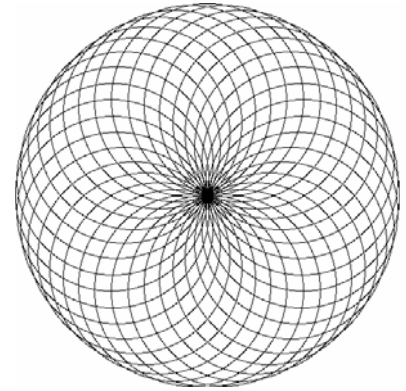
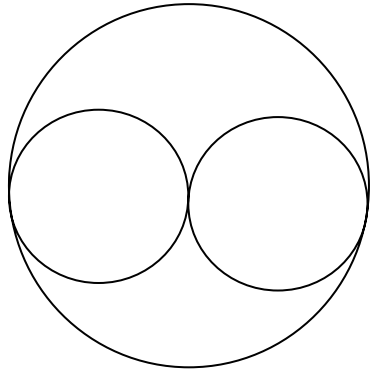
4Q models (interesting is human DNA is also based on the number 4, there are 4 bases) are extensively used to describe communication processes, competing values, and different types of personality. Also they are well in place in innovation theory, where the newest concepts based on Cyclic Interaction Modelling are beginning to break through. Central in these concepts is the notion that each quadrant represents a cyclic change process, and that effective system changes, be it on an individual, group or society level, are only possible when uninterrupted interactions across the boundaries of the quadrants take place through continuous feedback and feed forward processes.

Focusing on the individual level of the exemplary leader: using the technique of neurofeedback an individual is able to intentionally alter states of consciousness and reach total-brain control, a guarantee for uninterrupted crossing of boundaries. This enables a person to optimally respond to feedback from the environment, and guarantees optimum performance in a knowledge economy where continuous innovation based on continuous feedback is essential for success.

Circles, Lemniscates and Doughnuts

Only by meditating and in this way connecting with all brainwaves, without using neurofeedback amazing insights are possible. When we follow the circle according the arrow in the CVM – see the beginning of this article - we go from Open System to Rational Goal to Internal Process to Human Relations. When we follow the same order in the BrainMap based on the physical brain, we get a figure 8. Amazing! A circle in the models created by creative human minds is a lemniscate in models based on the physical human brain and vice versa! In this way we discover a polarity between mind and brain or spirit and matter. It is easy to integrate a circle and a lemniscate and transcend the seeming polarity.

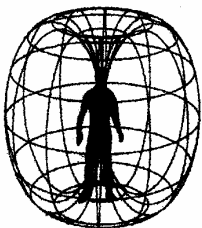
The result is a simple geometrical figure, a doughnut shaped torus and the vice versa is a torus in reverse. Both are moving and turning in opposite directions.



We now have constructed a self-similar model for person, organization and society and this model is shaped like a **torus fractal** – a torus inside a torus inside a torus. A Russian doll is a magnificent model of this vortex-model which is synthesizing mind (spirit) and matter. At the same time we have arrived on the territory of fractal geometry and as we know a fractal is a permanent feedback process on the border of chaos and order far from equilibrium, or better meta-equilibrium.

Interesting is this same torus-model (Eve’s apple) we present here is also found – connected with the human heart - in the book ‘The Biology of Transcendence’ of Joseph Chilton Pearce (Ref. 12). The healthy and coherent heartbeat of the strongest electromagnetic field producing organ of the body, exhibit characteristics of non-linear complexity comprised by the coherent organisation of waves following a pattern of fractal self-similarity, in the form of a cascade of toroid shapes.

Self-similarity, the simple name for fractal algorithms like the famous Mandelbrot and Julia Set fractals, describes self-embedded recursion, or coherent self-reflecting feedback loops. The coherent heart rhythm, is acting as a self-organizing “attractor field” of chaos churning out coherent order.



We already know from quantum physics how human consciousness influences the outcome of scientific experiments, now we see from our torus/vortex shaped mind/body, spirit/matter model we cannot separate mind and matter at all!

Quantum Physics turned classical physics upside down. It was a gestalt shift in the part-whole relationship. The part is more fundamental than the whole in classical physics. In quantum physics, the whole is more fundamental than the part. Parts are quantum entangled or non-locality connected wave-particle duality. There is no possibility of conscious free willed choice in quantum physics. Classical science is about determinism (order) and quantum physics about indeterminism (chaos) and never the two shall meet

The nature of consciousness and its place in the universe has always been mysterious. Classical models view consciousness as computation among the brain's neurons but fail to address its enigmatic features. At the same time quantum processes also remain mysterious, yet are being harnessed in revolutionary information technologies (quantum computation, quantum cryptography and quantum teleportation). A relation between consciousness and quantum effects has been pondered for nearly a century, and in the past decades quantum processes in the brain have been invoked as explanations for consciousness and its enigmatic features. Critics deride this comparison as a mere "minimization of mysteries" and quickly point out that the brain is too warm for quantum computation which in the technological realm requires extreme cold to avoid "decoherence", loss of seemingly delicate quantum states by interaction with the environment. However quantum computation would surely be advantageous from an evolutionary perspective, and biology has had 4 billion years to solve the decoherence.

Indeed **coherence or entrainment** is the very term which is used in bio/neurofeedback when waves are coming into **resonance** with each other. We have also seen that on the border of order and chaos (and according complexity science far from equilibrium, but we like to talk about meta-equilibrium) the fractal of consciousness is unfolding and this is the very explanation for being in the "zone" and 'flow', when everything in a person's life is evolving smoothly and by itself.

Coherence and entrainment of brainwaves and the people connected with them is also happening when groups of people meditate together. One of the best meditations to accomplish this is using the Merkaba-meditation which is based on sacred geometry and ending in torus-shaped energy field in which the participating people feel totally connected in a heartfelt field of oneness. (By reading this article your personal doughnut shaped Merkaba/Vortexija-field is activated and becomes conscious.)

Final Conclusion

Our final conclusion is simple and straightforward.

A new leadership, a new science, new practices of education, a new kind of creativity and a new world are in a turbulent state of birth. Humanity is waking up and arriving in the age of consciousness and consciousness technologies. The yoga of leadership is back on Earth.

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