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*The expression 'Curiosity killed the cat' seems in contradiction with Einstein's famous words "I have no special talents, I am only passionately curious". And yet, curiosity is vital in all creative processes. And these processes are essential if we want to anticipate the growing volume of traffic on a limited infrastructure. The balance in curiosity and creativity when tackling problems, is embedded in the Dutch Innovation Test Centre (ITC) of the Road and Hydraulic Engineering Institute.*
*Within the ITC everyone with a good and realizable idea within the scope of the Road and Hydraulic Engineering Institute, is invited to validate that idea. This is done with the aim to implement new infrastructural concepts, fit for the future.*
*Validation is a profound process, it may prove the power of the concept or it takes you back to the drawing board. Within the ITC all kinds of ideas and development stages are represented. The ITC's validation path helps the entrepreneur to acquire the possible market share and the government to acquire knowledge. Together, they arrive at new ways to tackle problems in current day engineering!The ITC now has a history of four years validating innovative concepts, in which it gained experience on guiding new ideas and concepts of passionate entrepreneurs onto implemented products.*

# Stop Innovating Now!

How innovation management kills creativity

**The Innovation Paradox.**

In the early days through serendipity and dedicated research smart people and geniuses made inventions without innovation management. In those days inventions were a giant leap forward, with a big impact on every day life: fire, tools, the wheel, exploration of the world, the discovery of electricity, ….
Innovation is a vital concept in our contemporary world. Nowadays, you have to be creative. Just do the job is not enough. Innovation is essential for businesses to keep their market share or respond to the demand. Life is fast and asks for immediate results and answers. So, innovation is a growing discipline, as we have to educate ourselves to be innovative. Innovation management is a well-known tool in current day business, with creative sessions as mind mapping and brainstorming.

Innovation requires freedom to experiment and investigate. On the other hand, innovation management, like all management tools, prescribes procedures and rigid tools in order to achieve creativity. The necessary freedom for spontaneous inventions versus the forced creativity of innovation management is paradoxical.
Nevertheless, innovation management is a growing field of interest and creativity gurus surround us.
In order to understand this innovation paradox, a brief study of how and why we invent will be presented.

**Curiosity killed the cat**
According to the Oxford dictionary, innovation is defined as
1. the action or process of innovating, or
2. a new method, idea, product, etc.

It is clear that to discover something new, curiosity is a necessity.
According to the Oxford Dictionary, curiosity is defined as
1. a strong desire to know or learn something.
2. a unusual or interesting object or fact.

Curiosity can be seen as the response to a stimulus, expressed as the desire for knowledge or the need to explain [6]. Curious people don't take no for an answer. They don't stop when something seems impossible; they try to figure out why it is not possible or when it will be possible.
This brings us to our key question: why is one person eager to find the answer and another not?

The need to know or learn is based on the biological drive of self-preservation and even greed. This makes curiosity is an important aspect of everyday life. The ability to understand our surroundings and respond to changes is something we have in common with animals [9]. We explore and investigate to get a good impression of our surroundings in order to detect changes in an early stage. Only if we detect changes, we can respond to these changes. In the animal world this can prevent falling prey to another animal. So there's a distinct reward for the curious.
By exploring the world we, humans, discovered new resources, new land, new (production) techniques and we even found new ways of getting more and traveling faster.

But just being curious is not enough. If you let your curiosity lead the way in your investigations, you might go too far and end up with non-realizable products. Or worse, end up dead, like Icarus or the cat in the proverb 'curiosity killed the cat'.

Curiosity has to be 'processed'; it has to be judged without premature limiting options. So, besides being curious you have to have evaluation skills. Here comes in another paradox. You want to keep your options open and, at the same time, rule out impossibilities. Being naïve and intelligent comes in handy. If naivety is defined as absolute freedom to fantasize, intelligence is ability to be reasonable.
In short, curiosity stimulates us to investigate, naivety keeps your eyes skinned and intelligence helps us select the feasible options. Nevertheless, possessing these three qualities, the ability to be creative is not a matter of course.

**Creativity**
In the Oxford Dictionary, creativity is defined as 'involving the use of imagination or original ideas in order to create something', in short, the ability to create. Even the definition of the term creativity has developed through the years. The development is also driven by the agricultural, industrial and knowledge revolution. Before 1900 inventions and developments were in the field of skills and techniques, after 1900 human development was mainly emotional. Upcoming psychoanalyses, made the theory on creativity to be studied in two ways:

1. Psychologists consider creativity as in between normal and neurotic or pathologic behavior. Creativity as a human exhaust for unconscious passion, or characteristic feature and
2. Humanists look upon creativity as the highest achievable ideal, cleared of disturbing influences of defense mechanisms. Creativity as the combination of intelligence and problem solving capabilities. They believe everyone is creative.

No matter which definition we choose, it still does not account for our key question why one person is creative and another is not.

Da Vinci is regarded as a highly creative person. He was a painter, writer, musician, philosopher, engineer, he wrote mirror wise with both hands. Einstein said "I have no special talents, I'm only passionately curious". For them, the drive to investigate was the investigation itself. So, curiosity comes with a drive.

Amabile[1] came up with the three-component model of creativity: expertise, creative skills and intrinsic motivation increase creativity.
According the investment theory of Lubart & Stenberg (1996) [10] creativity requires six components to go together: intellectual skills, knowledge, way of thinking, personality, motivation and environment.

So far, two conclusions can be drawn:

1. creativity incorporates curiosity
2. creativity manifests when several components are present, among which 'drive' or 'passion'

This motivation, drive or passion versus the reward or profit divides the creative people into three groups: pioneers, passengers and pirates. This is presented in the so-called 5P-model [4].

**5P-model**

The first P stands for pioneer. Pioneers are inventors and artists. They are distinguished by a continuous flow of curiosity. To investigate is their drive; the search is their adventure, passion their engine.

An example of a pioneer is Gaudi. His most famous building is the Sagrada Familia in Barcelona, an absolute masterpiece (figure 1). The construction started in 1882 and is yet to be finished. In search for the ideal curve in the construction, he hung little chains upside down and therefore designed the church upside down.

Figure 1 Sagrada Familia, Gaudi

Another example is Leonardo da Vinci. Inspired by the classical story of Icarus, he searched for a suitable way to fly. His passionate curiosity brought him to the invention of the parachute (figure 2), 300 years before the first successful parachute jump (1797)! Needless to say, although he invented the parachute, he never realized nor introduced this novelty. So, according to the definition of the term innovation, Da Vinci was a pioneer, but no innovator, as he never realized it.

Figuur 2 Leonardo da Vinci

The second P stands for passenger. Pioneers or concepts inspire passengers. They elaborate or improve the ideas into products. So this is not pinching!
Vitruvius, a Roman architect at Julius Ceasar in the first Century before Christ, wrote on the human proportions which had to be reflected in temples. As proof of the harmony and perfection of the human body, he described how a well-built man with spread out arms and legs, perfectly fits within the perfect mathematical figures: a circle and a square. Leonardo supplied the figures for the book written by a friend on human proportional theory with a description of Vitruvius' theory (figure 3).

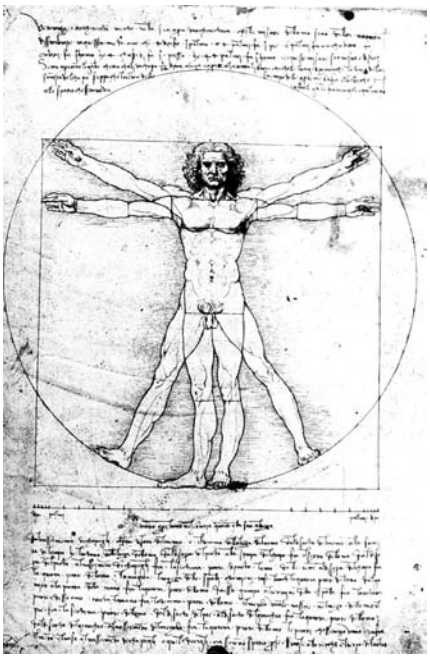


Figure 3 Leonardo Da Vinci

Le Corbusier (figure 4) did a similar thing in 1948. He described the human proportions as if divided into sections according to the golden section (1:0,61803).

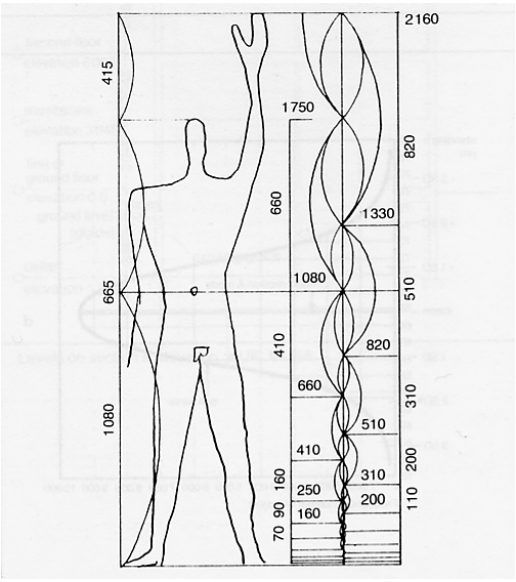
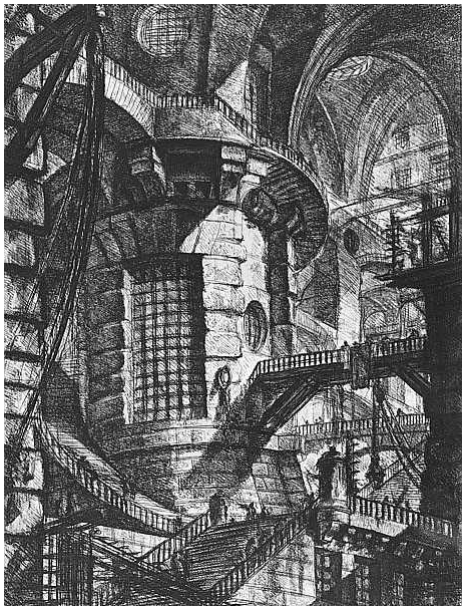
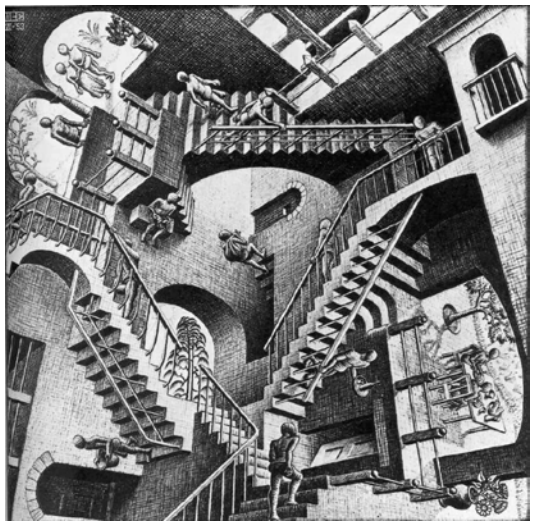



Figure 4 Le Corbusier (1948)

Piranesi (figure 5) inspired M.C. Escher (figure 6), famous for his fancy drawings playing with the perspective.



Figuur 3 Giovanni Batista Piranesi, etching from the Carceri series (1745)



Figuur 4 M.C. Escher, Relativity 1953

The third P is the pirate. In contrast to pioneers and passengers, pirates steal ideas and concepts, just to exploit them. Their drive is making profit.
According to Gareth Pearce, the Dutch 'Kunsthal' in Rotterdam (figure 7) corresponds at over 40 aspects to his design for the new city hall for the London Docklands, including ramp, exterior and dimensions. Rem Koolhaas, the architect of the 'Kunsthal', is supposed to have copied the idea when it was in his possession during the time Pearce worked for him in London.


Figuur 5 Kunsthal Rotterdam, Rem Koolhaas

Another example is the notch in Dutch Rusk. This notch was introduced to cope with the problem of taking the fragile round Dutch Rusk out of the package. Theo Tempels invented this notch. He offered it to Bolletje in 1997, but they were not interested. In 1999 he patented the notch (figure 8). Then Bolletje introduced a notch in their Dutch Rusk. Theo Temples pointed out the patent to them. As the offer for the patent was not sufficient, the patent was not transferred. But Bolletje now urges Theo to transfer the patent, at a fine of 10.000 □ each time Theo mentions this affair.

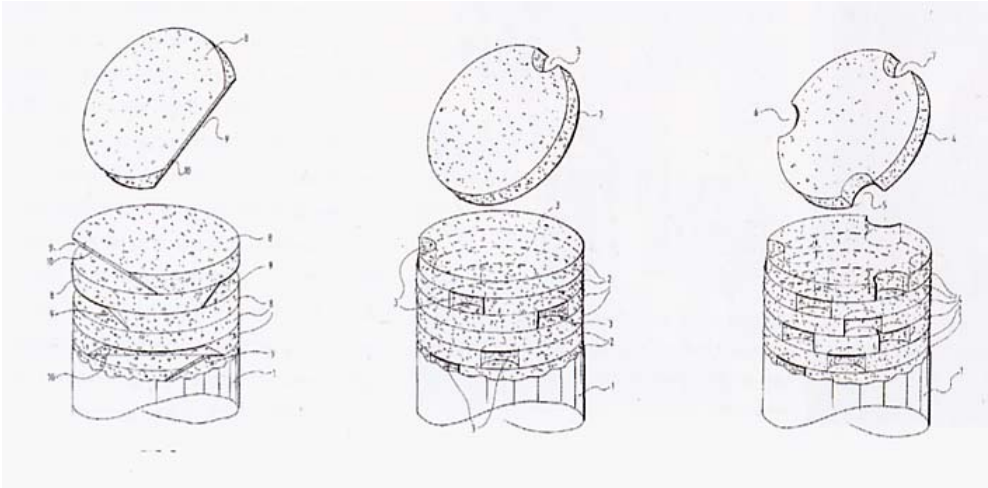
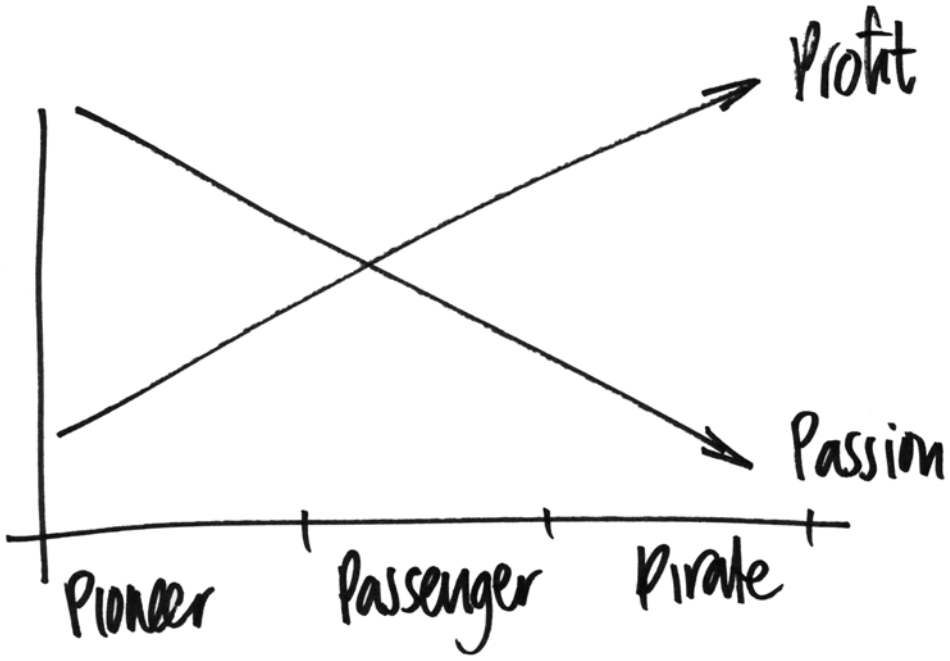


Figure 6 Notch in Dutch Rusk, Theo Tempels (1997)

The 5P-model is completed with the 2 P's, which stand for profit and passion. These are the two factors, which distinguish between the 3 groups. For the artists and inventors the search and curiosity are the drive. The final result is not important. Pioneers possess real passion but they lack commercial sense. This is the other way round with the pirates, whereas with the passengers it is like a 'break-even' point. This is presented in the graph in figure 9.




Figuur 7 Profit & Passions versus Pioneer, Passenger & Pirate

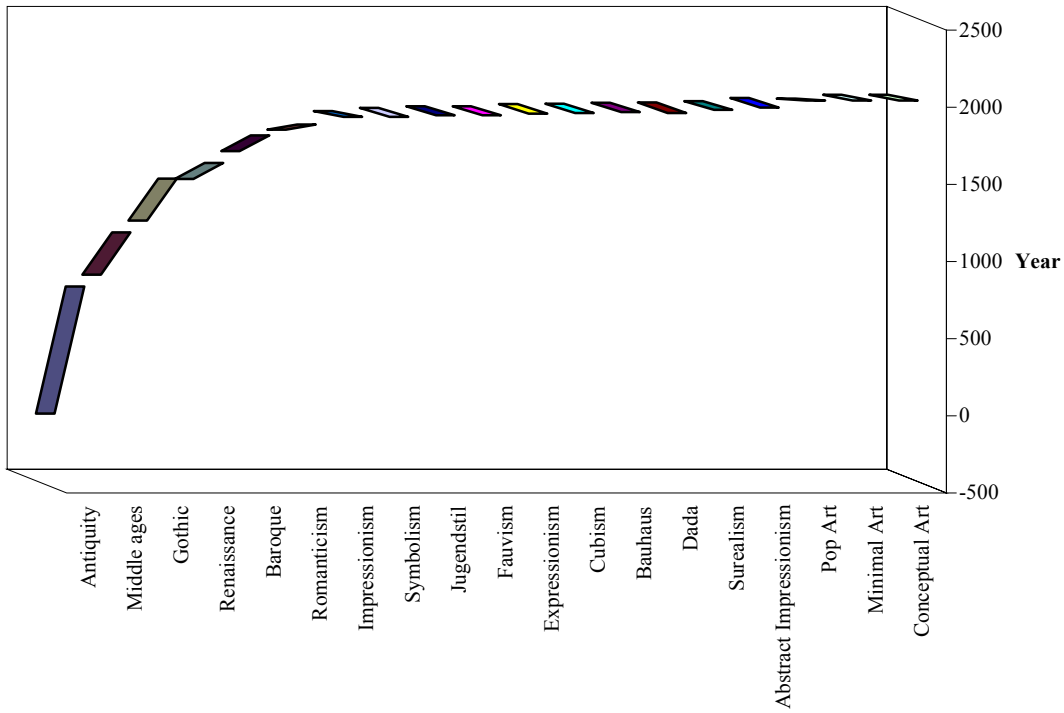
**There's an end to art**

We wanted to show how and why we invent in order to understand the innovation paradox. In a brief study the relationship between curiosity, creativity and innovation was described, in which we concluded creativity incorporates curiosity and is best displayed with passion.

In the 5P model the pioneers possess curiosity the least influenced by making profit. Therefore, artists are often considered the ultimate pioneers. If passion and curiosity is best incorporated within the artist, let's focus on them.
In the history of art we see the same development as in the development of the human species, where art developed parallel to the development of industry.
The first wave, also known as the agricultural or demographic revolution was the invention of agriculture. This forced human to depend on climate and surroundings and settlements appear.
The second wave or the industrial revolution comprises the rise of mass production and consumption.

The third wave is the knowledge revolution: The introduction of computers which made complex calculations in design possible, which enabled fine-tuning of existing theories. The rethinking and reformulation of the mental legacy of the second wave enabled the human emotional development.

Art history shows a similar development, first technical with the discovery of perspective and color, later psychological with the question of whom and why we are. As all different art periods are defined, a graphic representation can be drawn (figure 10).
A mathematical approach of this graph shows the development of art is limited. A new period is introduced when renewal is a fact. As shown the effect of renewal becomes smaller with time and the periods, which represent renewal, become shorter. According to the mathematical theory we can interpret this graph as proving there's an end to art….




Figuur 8 Year versus art periods

We already stated that in the early days of art, the renewal came from discoveries in perspective and color theory, whereas the latest renewal in art comes from technological improvement such as computers. For example, computers allow complex calculation of curves, which introduced the so-called ‘blob’-architecture, and digital processing of pictures, words and video allow a different translation of ideas to art works. Nowadays, renewal is mostly the translation of old concepts into the contemporary state-of-the-art. And, although renewal can be seen, it does not call for a new movement.

If creativity is a function of passion, curiosity and freedom, we can make yet another division between art, business and science (see figure 11). Where in art going beyond limits is the main activity, in science proving a theory is the goal. Moreover, within business and science, creativity is associated with a hobby and predestined to extraordinary people.
So, no bounds within art, all bounds within science.


Figuur 9 Creativity versus Art, Business & Science

Summarizing we can state:

1. Art is at it’s end and new technological break-troughs are not to be expected,
2. Business and science kill creativity by the nature of their game and
3. Passion is an essential component of creativity.

**Stop Innovating Now!**
Mihaly Csikszentmihalyi [3] studied what makes people really happy. He noticed that if we think consciously, we tend to reason linearly. He introduced the term ‘flow’; the state of optimal experience in which everything goes smoothly and inspiration brings the best in us, like a flowing creative stream. This implies ‘to inspire’ is not an action, but a condition!

If creativity and therefore innovation is to be stimulated, motivation is the key feature to tackle. Motivation, as in drive or passion, is displayed as flow. Drive or passion cannot be controlled, whereas a condition as flow can be provided!

Management systems act contrary to the necessary freedom, they kill the drive to investigate and experiment. Earlier we stated passion and environment are essential components of creativity. Motivation is a condition, a climate in which we are allowed to investigate and experiment. Just hyping the term 'innovation' is useless without motivation. If employees feel free and are allowed to experiment, creativity is a fact. Everyone is creative; it depends on the incorporated passion and motivation. So stop innovation management, but stimulate motivation.
Like Amabile [1] said, "if you want to spark innovation, rethink how to motivate, reward and assign work to people".

**The Ministry of Transport, Public Works and Water Management**
But how can a government spark innovation? Governments are no manufacturer, but they control and set up requirements. Governments have a need filled in by the industry. So innovation must come from the industry. But, innovation implies investment and investments by the industry are only then worthwhile if it is likely costs can be recovered.

The Ministry of Transport, Public Works and Water Management is responsible for mobility policy in the Netherlands and for protection against floods or falling water tables. The knowledge in these areas is actively propagated via forms of collaboration with other countries.

Nowadays, RWS is forced to anticipate the growing volume of traffic on a limited infrastructure. Environmental measures, safety, durability en limited hindrance during traffic works ask for renewed options, which need an new approach to stimulate innovation within the industry.

**The Spark project: Innovation Test Centre.**
Within the Road and Hydraulic Engineering Service (DWW) of Rijkswaterstaat (RWS), the Innovation Test Centre realises a stimulating innovation climate by dedicated validation of ideas within the earth, hydraulic and road engineering. The aim is to contribute to an increase in the innovative potential within the industry.

Considering innovations cannot be pushed and 'to inspire' is not an action, but a condition, the ITC found a way to stimulate motivation. By assessing the surplus value in cooperation with the entrepreneur, we enable him to gain a clear insight in the possible market share. The benefit to RWS is the risk of implementation will be investigated.

The ITC now has a history of four years validating innovative concepts, in which it gained experience on guiding new ideas and concepts of passionate entrepreneurs onto implemented products.
In these four years we assessed over 40 proposals on criteria as originality, performance improvement and problem solving capabilities. Pioneers and passengers presented these proposals in different stages of development, from concept to prototype.

The proposed projects range from an autonomous cleaning reflector pole, ground consolidator modules to underground bank reinforcement and new methods for asphalt improvement.

The ITC proved to be a successful concept; increasing the innovation potential can be realised without a complex management tool. Just by being an expert interlocutor and sharing the passion for creativity, an entrepreneur is stimulated to develop his idea to a successful product.

Lesson learned? Staying curious and just do best stimulates innovation!

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