# The Importance of Seeing That Which is Not There

## Enrolling the concept of gestalt in engineering constructivism

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### Abstract

Engineers by and large deem philosophy of technology to be unprofitable if not futile. Only very little theory of engineering finds its way into engineering praxis. Methodologies of 'good practice' used to be confined to dry sequence models of how to proceed from a given task to its corresponding solution. However, more than one hundred years of recent thinking about technology has brought about an abundance of valuable insights in regard to what technology essentially 'is' (metaphysics); should be (ethics); and how it is put into practice (sociology and economic theory). Unfortunately, these findings are alien to engineering praxis.

My point will be that, nevertheless, it is possible to find bridge-concepts that accommodate both engineering experience and (social) theory of technology. I will propose two such concepts, namely 'solution-gestalt' and 'technological style'. Furthermore, I will interlink them within the framework of a simple model of technology generation that makes a modest claim to being a project tool for sensitising self-conception in engineering praxis.

In the genesis of solution-gestalts I find technology at source. For precisely that reason I emphasize the role of the individual in technology generation. In addition I argue that intersubjectivity of solution-gestalts is backed through abductive reasoning in justification contexts. The peculiar praxical parallelism between abductive reasoning and gestalt perception is echoed by a striking structural isomorphism of the pragmatic theory of abductive inference and gestalt theory, which I would like to point to. The bottom line is hope that praxical reflection on both—embodied gestalt perception and its interrelated reasoning patterns—will enable us to improve our present 'technological style'.

## Introduction

From science and technology studies (STS) we know that engineers don't actually do what they think they do. While engineers think they are just solving problems in the field of technology, the things designed

by them appear in the STS view as deeply impregnated by unnoticed social constructions; non-technical beliefs; socially biased routines which pass unquestioned. The things would carry scripts, for example, and therefore exert some kind of force when being used, and so on. The design process itself is considered as not to be taking place in the realm of engineering, because there is no such realm, but in a socially constructed multi-linked pluriverse. Ultimately, STS puts the very distinction between subject and object on trial.

Of course, this description of the state of affairs suffers from what Bruno Latour calls the naïve assumption of the naïveté of the others. I like to make the point that 'problem solving' in engineering is not based to a very great extent on the deplorable subject/object dichotomy and that, therefore, in turning to the lifeworld praxis of engineering, concepts can be found which serve to bridge the existing gulf between engineering experience and the culture of STS studies.

Now, for a start, how can someone see something that is not there? It is then supposed to be an *illusion*. Implicit in speaking of illusions is a reference to 'reality', for instance to something seen which is independent from the seer and can, therefore, be wrongly seen. There is much evidence from empirical psychology, cognitive science, and lifeworld experience too, of the common occurrence of illusions. My point will not be that illusive phenomenon somehow prove the independent existence of an exterior reality. The present evidence does not suffice for this purpose. I should rather like to make use of some examples of visual perception to open up a way for better understanding an intriguing trait of human perception within the remarkably complex process of technology generation—the unitary experience of *gestalt*.

From a realist point of view, gestalts are not there. But since their effectiveness is central to technology making, it is important to see them and to become aware of their cultural texture. My claim will be that in both engineering design and everyday technology use, problem solving is very much based on the perception of *gestalts*, sometimes called 'ideas'.

## On finding solutions

There is something fundamentally wrong with stock theories of problem solving in and around engineering: they typically set out with what is called a 'given problem'. Interdisciplinary engineering design research, too, pays focal attention to strategies of proceeding from given problems to possible solutions (Pahl 1999). But this approach largely ignores the *problem of identifying the problem*. In real-life engineering a well-described 'problem' will hardly ever be the starting point for solution finding. In fact, this 'starting point' from where the solution is being developed is neither a point nor a start but a fuzzy contextual complex. The 'problem' as a starting point is, if at all, only re-constructed later from the solution found.

The polarity of *problem* and *solution* is, however, a basic trait of thought in engineering education. The problem-solving scheme with its two poles of problem and solution is apparently also well suited for explaining to others what you are doing as an engineer. But this may be just because the scheme is conventional.

Great efforts have been put into developing engineering guidelines for finding 'innovative' solutions. To a great extent all of this effort has been in vain. Perhaps the basic dichotomy of problem-solution is inappropriate. Lifeworld experience, too, points to this: in engineering praxis, the current formalizations of engineering design processes are considered utterly useless.

The scope of basic concepts for better understanding technology-in-the-making needs to be widened beyond the mechanical correlation of a given solution to its problem. The problem/solution scheme is only a variation of the means/end figure which itself is inappropriate.

What does it mean *to have an idea*? In engineering, the phenomenal incident of 'having an idea' is obscured by the rhetoric of function and principle. This rhetoric is a work of purification, done to a lifeworld phenomenon possibly in order to make it better fit the more classical concept of *idea* as it is in idealism. In fact, having an 'idea' of how to solve a technical problem is more like encountering a dizzy complex of, however, some unity which immediately imposes a conviction of necessity:

'this way!' It is precisely the perceived unity of a nonetheless fuzzy complex that turns an 'idea' into a solution-candidate. That is to say, an upcoming 'idea' is less *idea* than *gestalt*.

Contrary to the notion of *idea* the concept of *gestalt* is wide enough to take in a bulk of valuable findings from STS, for example the agency of non-humans and the founding role of the human body. Moreover, *gestalt* is a very readily understood concept in any poietic field of activity, as it also is in engineering, because it captures shaping beyond the rendering of form only. The intuitive understanding of *gestalt* lives on an embodied view of the relatedness of things.

From a realist viewpoint gestalts are not there. 'You cannot find gestalt in the universe', as Goethe put it. It is, however, exactly this *seeing that which is not there* in the perception of gestalts, around which I would now like to centre the practice of engineering.

Accompanied by another bridge-concept, that is *technological style*, the notion of *solution-gestalt* may enlighten engineering practice in engineering praxis. The concept of *technological style* accounts for all specifically 'social' relatedness, whereas *solution-gestalt* takes quite seriously the notion that after all, human beings (still) perceive an active agent Self. The hinge linking both concepts might be network theory.

## The concept of gestalt

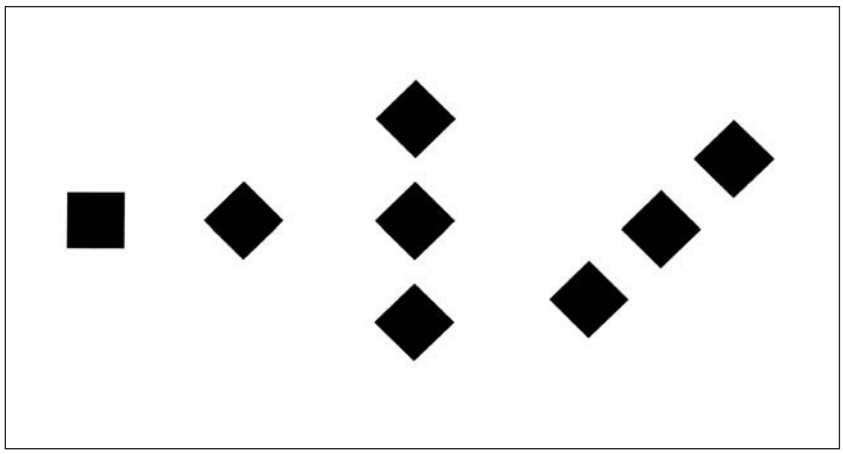
Gestalt is a German word that literally denotes 'shape' or 'form'. Historically, *gestalt* is closely related to *idea* (Latin: idea). Through much of medieval scholastic philosophy 'idea' and 'form' were known to be synonymous (idea id est forma). Today we are inclined to think of the 'shape' of something as if it were its outer limits; the 'hull' of something as given by its borderlines; by the skin in the case of a human being. This rather flat meaning of 'shape' obviously relates to Newtonian bodies in Newtonian space; it by no means captures the core of the classic notion of forma or *gestalt*. A more classic notion of *form* would be closer to 'structure'. The notion of structure, now, is less than a key, but a clue to the understanding of gestalt. In lifeworld experience a given gestalt is a *textured* whole.

However, its texture is not a system structure composed of 'elements' featuring properties that determine the system as a whole. Gestalt is precisely that which is left inexplicable through the rendering of the properties of its 'parts'.

## Diamonds and squares

As an introduction to the 'holistic' theory of gestalt perception I choose an example from visual perception as has been studied by empirical psychology. I would like to show thereby that in perceiving gestalts you do things you are not actually aware of. Perception is biased. This then I would like to understand as a basic metaphor for fundamental, unnoticed and self-referential bias in technology shaping.

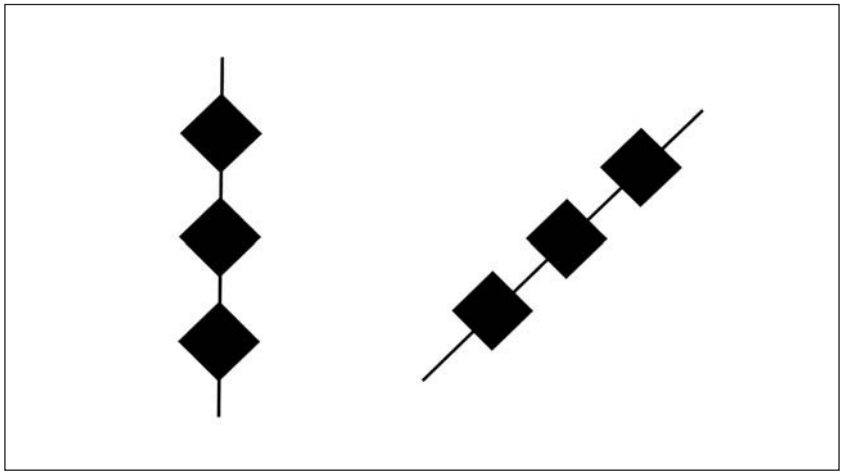
**Figure 1.**



The first element shown to the left is called a 'square'. The second element is a 'diamond'. A simple diamond may be derived from a square by rotation of 45°. Next there are three diamonds in a row, one above the other, still not very exciting. In this dramaturgy the fourth figure is supposed to bring about the 'aha'-effect. Here you probably see not diamonds but *squares*, in a

*tilted row*. You will find it hard if not impossible to see diamonds in this figure to the right, although its elements 'are' diamonds. In the given spatial order, you will perhaps conclude, diamonds 'appear' as being squares.

**Figure 2.**



An organizing force is here at work that can be called 'principle of axis'. *What* the elements are for the seer, squares or diamonds, apparently depends on the elements' locus and order relatively to each other in space. Under certain circumstances, you will group close-by elements together, involuntarily; and this grouping might determine what the elements *are*.

The present example taken from experiments in visual perception may serve as a metaphor for bias of perception in a broad sense. But, is the tilted row of squares to be taken as an *illusion* or not? I do not consider this an interesting question. As noted before, I will not elaborate on what things *really* are.

## Prägnanz as an obstacle to problem solving

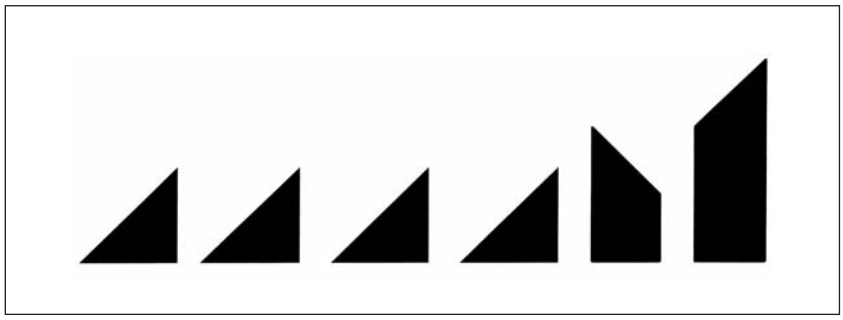
What *is* a gestalt? Maurice Merleau-Ponty noted: 'every psychology that places the *Gestalt* back into the framework of 'cognition' or 'consciousness'

misses the meaning of *Gestalt*' (Merleau-Ponty 1968). The common definition of gestalt as *a whole that does not reduce itself to the sum of the parts* he called a negative, *exterior* definition; and he was dissatisfied with it at the end of his life. He was by then suggesting that you can understand gestalt only by approaching it, by 'communicating with it' (*en communiquante avec elle*), that is: from *within* experience.

*Prägnanz* is another German word that is closely linked to what gestalts are. Merleau-Ponty cryptically paraphrased it as 'something rather than nothing and this rather than something else'. Further on, he asked insistently: '*Warum ist etwas eine gestalt?* Why is this rather than that a 'good' form or a strong form, or an orientation toward a possibility?' I for my part do not have any novel answer to this question on offer. However, gestalts do exist. They are effective elements of lifeworld experience. They are particularly effective in problem solving.

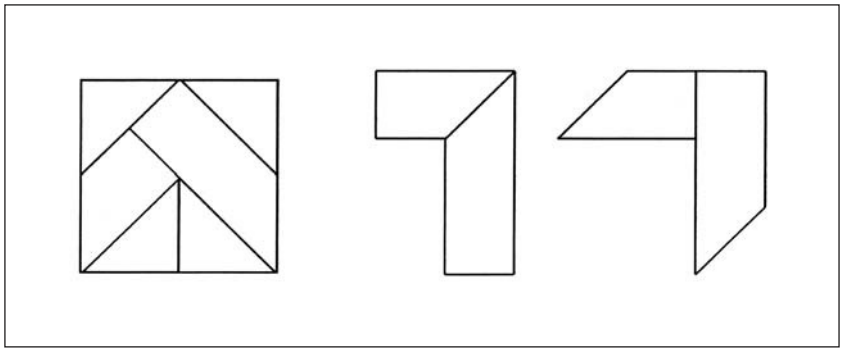
The following example I have taken from an article of Gaetano Kanizsa.[1] Again this evidence from empirical psychology should be understood metaphorically, not literally as a proof. Kanizsa asked test persons to build a *square* with six pieces of cardboard as shown below.

Figure 3.



Most test persons, he says, arrive at some early stage at the rectangular pre-structure shown in the middle. However, this structure is a dead end. The key to the solution, so to speak, is just another combination of the two trapezoidal elements as shown to the right.

**Figure 4.**



Kanizsa writes, 'even very intelligent subjects strive for many long minutes without being able to find the solution' (1975).

What is *so* difficult about the task? It is basically because you have a strong preconception of what the solution must be. You know what a square is and you start, therefore, building something square-like, something rectangular.[2] But, if you were to start with the 'key' structure shown to the right, something that is not at all square-like, you would quickly arrive at the solution. Now, I think, that throws a spotlight on dead ends in engineering.[3]

## Gestalt in engineering design

There are effective *tendencies* in problem solving. Problem-solving processes are guided by perceptual tendencies. This does not hold for visual perception only. It applies as well to the perception of possibilities in shaping technology, and to the possibilities of world building in a general sense. Speaking of 'tendencies', however, immediately raises the question of determinism or teleology. But 'solutions' in engineering are neither contingent nor determined. It is just that an *experienced* individual who is working on some problem will be driven to an *appropriate* solution.

In any situation that calls for a change, the 'collective of humans and non-humans' will drift to a 'solution' which is more or less appropriate. This is true for both, engineering design and everyday technology use. But when being a participant in a given situation, how would you know what is appropriate and what is not? The certainty of appropriateness, I claim, is derived directly from experience by virtue of gestalt perception.

Moreover, and far from recorded empirical findings, I maintain that *gestalts of solution* are effective in engineering design. They are picked up everyday with certainty. Due to embodied ways of thinking, some solution will qualify rather than another. From a culturalistic point of view this means that every thought collective produces its own *technological style*.

There are different coexisting technological styles; and styles of technology are succeeding one another in time. Unfortunately, with regard to its historical dimension the concept of style is too readily linked to certain schematic accounts of styles of art and architecture. Handbooks and tourist guides offer help for identification of particular 'styles' by listing their proper 'elements'. Hence a variety of standard views of standard ways of, for instance, painting or building, is constructed. The taxonomic use of 'style' is a favoured pastime of the educated class. However, original painting or building is in fact not an application of a formula. Lived style, style in action as it were, derives its coherence from the socially embodied worldview or *Weltanschauung* that is shared among individuals in a style collective.

*Technological style* should be understood in this genetic, not in the scholarly and semi-expert taxonomic sense. Style in action, though, is hard to identify as a particular one. To name the typical is difficult from outside and almost impossible from inside an active style collective. However, technological styles exist, essentially through collectively shared patterns of thinking and interrelating patterns of praxis.

This brief outline concerning style and gestalt in engineering may seem to be close to the well-known discussion of difference and similitude across coexisting *cultures*. However, I want to focus attention on a remarkable trait of the generation of technological style in particular. Gestalt and style are strongly interdependent. Style is re-produced through gestalt perception; the perception of gestalts is style permeated. I regard this interrelation as

the fundamentally conservative trait of gestalt perception and action according to it. On the other hand, style permeated gestalt perception is the reason for the occurrence of anything new in technology.

The Russian engineer and philosopher Pyotr Klimentich von Engelmeyer argued that at first the inventive proposal is nothing but a hypothetical solution comprising a plenitude of 'ideas, concepts, pictures, tones, emotions, and desire' (Engelmeyer 1928). Amazingly Engelmeyer lists 'psychological' elements as well as approved traditional ingredients of inventions. I think he was right to do so. Furthermore, according to Engelmeyer *unity* and *spontaneity* characterize the invention. Hence, without making reference to style or gestalt, Engelmeyer gives a description of the invention as being a spontaneously occurring complex whole of heterogeneous parts. But this characterization holds for the upcoming of a solution-gestalt as well. And precisely because of the complex heterogeneity of solution-gestalts no two individuals will ever come up with the very same solution (-gestalt). Only later, in the process of elaboration and purification, solution-gestalts may be arranged or prepared to fit a more conventional scheme, for instance they are made to converge on the same 'principle of function'. But on the individual level there is variance in the perception of gestalts.

The common and unavoidable variance in the perception of style impregnated gestalts is the reason for novelty in engineering design. Exactly here, in the individual perception and generation of solution-gestalts I find technology at source. From here, patterns of technologically mediated action set out to come into existence. Hidden 'scripts' in technology usage, for instance, routinely designed with technologies, enforcing particular action, are deeply rooted as envisaged usage patterns within the firm and fuzzy complex of preliminary solution-gestalts.

This way patterns of thinking are linked to patterns of action. Basic traits of thought that are active in a particular thought collective contribute substantially to the generation of usage patterns by design. Thus thought collectives constitute technological style, when in turn a particular style is compulsory for any individual being a member of a thought collective.

However, the conservative fundamental of engineering on the basis of gestalt is permanently re-constructed through the equally basic variance in the individual perception and generation of gestalts. The means for balancing the

dynamics of conservation and re-construction is intersubjectivity. Solution-gestalts need to be explained. According to Engelmeyer the first still fuzzy phase of an invention comes to its close exactly at the moment that the inventor succeeds in explaining the 'idea' to somebody else. Justification is crucial, if late, in the process of invention.

Within the social context of justification especially the *appropriateness* of a given inventive proposal is evaluated against the established norms of a collective background. To become an innovation, an inventive concept needs campaigning. To enhance the chance of success for a promoted proposal, an inventor will apply conventional schemes of reasoning in justification.

## Abduction and gestalt perception

According to Charles Sanders Peirce there are three elementary kinds of reasoning. These three kinds are *induction*, *deduction*, and *presumption* (for which Peirce proposed the name abduction). Peirce defines abduction as 'the process of forming an explanatory hypothesis'; with might and main he claimed that 'it is the only logical operation, which introduces any new idea'.

According to Peirce, epistemic objects are not passive but suggestive in forming an explanatory hypothesis. Abduction is the 'step of adopting an hypothesis as being suggested by the facts', whereas the mode of suggestion by which the facts suggest the hypothesis 'is by *resemblance*,—the resemblance of the facts to the consequences of the hypothesis' (Peirce 1901).

Peirce noted that in abduction the conclusion could not be inferred unless its entire content was already present in the premiss. Thus, some scholars consider abduction a logically invalid mode of reasoning. A great deal of discussion in Pragmatism revolves around the question of whether abductive inference is logically valid or not. However, I would like to focus on the actual phenomenon. Abduction is ubiquitous.

Abduction forms principles or 'seed crystals' of order, which rearrange complex and confusing manifolds as coherent wholes. But precisely this is gestalt perception! Gestalts are heterogeneous wholes, which spontaneously emerge in the interaction of the perceiver and the perceived. Abductive reasoning, however, is found to be more explicit, more language bound than

gestalt perception. My presumption is that abductive reasoning essentially forms the cognitive top level of gestalt perception in justification contexts.

Interestingly enough, the mode of abductive inference is by *guessing*.[4] Abductively inferred conclusions are possible, at the most, likely, but not necessary (Roozenburg 1993). Ad hoc adopted explanatory hypotheses, in ontological sense verbalized surfaces of underlying gestalts, evoke order and thus the plausibility of that which did not previously cohere. Abductive reasoning on the basis of gestalt perception, I claim, is a common pattern of reasoning in both science and engineering praxis. It is quite possibly altogether the most fundamental pattern of reasoning.

## On forming explanatory hypotheses

The mode of abduction applies to a wide range of reasoning in science, in engineering, in everyday life. However, the particular wording of the form of abductive inference as elaborated by Peirce in his 'Harvard Lectures on Pragmatism' (Peirce 1903) applies best to what is commonly thought about science: in science there is 'observation'; there are 'facts', the facts may be 'true'.

– The *surprising fact*, C, is observed;
  But if A were *true*, C would be a matter of course;
  Hence there is reason to suspect that A is *true*.

For engineering the given form may be rephrased.[5] I would like to attempt to find other wording that preserves, however, the particular form. 'Surprising fact' I substitute with 'contradictory function'; 'observation' I substitute with 'intention'. Further on 'truth' in the case of science I substitute in the case of engineering with 'usability' or 'workability'.

– The *contradictory function*, C, is envisaged/intended;
  But if A were *workable*, C would be a matter of course;
  Hence there is reason to suspect that A is *workable*.

But what does 'contradictory function' actually mean? As an engineer, for instance, you are after something that does *not fit in yet*. 'It' does not fit in the given context or set-up. That which is newly intended, what is demanded surprisingly, is *contradictory* to that which is already realized

or known. It is contradictory to the physical layout, to some properties of material, occasionally even to some laws of nature.

The common ground of both of the above given formulations is this: both, the surprising fact and the contradictory function, *do not fit in*. Thus, the general form of abductive reasoning may be given as follows.

– *Within an active context*, something, C, is *surprising*;
  But if A were *appropriate*, C would be a matter of course;
  Hence there is reason to suspect that A is *appropriate*.

I would like to emphasize two points in the given phrasing. Firstly, the hint on 'surprise' preserved from Peirce's wording that indicates emotional involvement. Secondly, the stress on *appropriateness*, enforcing the notion of mediated dynamic truth, habitually embedded in lifeworld routines.

However, with respect to lifeworld routines the given form of abductive inference is but a lifeless scheme. Nevertheless this form captures a central pattern of reasoning in both the professional praxis of (scientific) engineering and everyday life. The point of proposing an argument according to the abductive mode of reasoning is essentially given by its capacity of explaining something that is unexpectedly inexplicable and hence a surprise. Its function is, in a manner of speaking, to put order into some unanticipated and embarrassing chaos.

## Organizing the chaos

There is a structural isomorphism between the pragmatic theory of abduction and gestalt theory of perception. Pragmatic theory of abduction and gestalt theory are explanatory theories of the very same lifeworld phenomena, the first coming its way from disputing classic assumptions on logical reasoning; the latter coming from reflection on embodied perception. The converging point of both theoretical layouts will show up notably in the modelling of a recurrent social moment in everyday praxis of both science and engineering; the moment of explaining a perceived gestalt to another, who cannot see it yet.

Because I am at a loss for such a model, I would like instead to tentatively reveal the proclaimed structural isomorphism by drawing the line on the moment of 'surprise'. Peirce wrote:

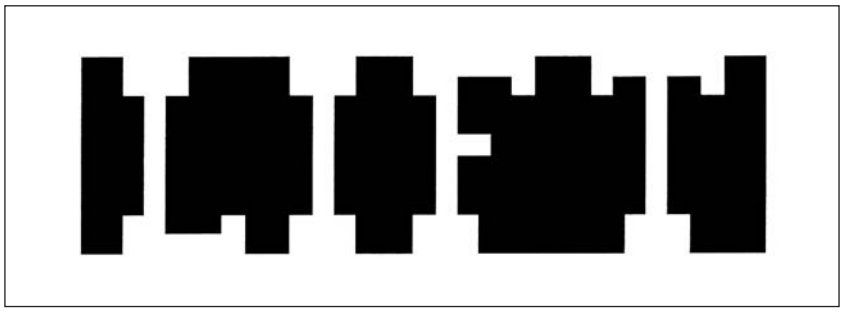
> The abductive suggestion comes to us like a flash. It is an act of insight, although of extremely fallible insight. It is true that the different elements of the hypothesis were in our minds before; but it is the idea of putting together what we had never before dreamed of putting together which flashes the new suggestion before our contemplation (Peirce 1903).

On another occasion he captured the enlightening moment of surprise even more elaborately:

> A mass of facts is before us. We go through them. We examine them. We find them a confused snarl, an impenetrable jungle. We are unable to hold them in our minds. We endeavor to set them down upon paper; but they seem so multiplex intricate that we can neither satisfy ourselves that what we have set down represents the facts, nor can we get any clear idea of what it is that we have set down. But suddenly, while we are poring over our digest of the facts and are endeavoring to set them into order, it occurs to us that if we were to assume something to be true that we do not know to be true, these facts would arrange themselves luminously. That is *abduction* (Peirce 1903).

Now, I like to confront this description again with an example from visual gestalt perception. Test persons when looking at the figure below for the first time usually see nothing but an array of meaningless black splotches.

Figure 5.



Suddenly, you may discover what it actually 'is'.[6] From the moment you see 'something', you probably cannot look at the figure any more without seeing what it 'is'. Suddenly there is order where there was chaos. You may be able to switch from perceiving the gestalt of the 'hidden' word

to the black splotches and back again. Gestalt switches are popular in gestalt theory. However, in this case emphasis does not lie on the peculiar possibility of switching between different gestalts that are based on the very same material substrate. Nor do I want to stress the question of whether the word 'LIFT' is 'really' written there. I just want to focus on the very phenomenon of the creation of order in chaos by spontaneously introducing an assumption. What you sometimes need in order to see something more than just a confused snarl is a good *guess*; with or without deliberation, if you do not know yet what 'it' is, you guess. This is a common trait of gestalt perception, and Peirce noted the same about the abductive mode of adopting a hypothesis: 'abduction, after all, is nothing but guessing' (Peirce 1901).

The element of *guessing* is prominent, too, in Engelmeyer's theory of invention. In the early stage of elaborating an inventive idea, inventing he says is very much guessing (Engelmeyer 1928). This guessing is, of course, contextual. Inventions do not come out of thin air. The element of *guessing* and the element of *surprise* are interrelated elements in the perception of inventive gestalts, which then may be considered solutions to corresponding problems of some kind. Inventive gestalts being solutions to problems, however, occur at first in disguise. Wrapped in a wide semi-transparent cloak, as it were, the structure of 'solution' may not be clear quite possibly for some considerable time. A solution-gestalt, however, is complex from the start. Pure 'principle ideas' that are to be detailed in further work inhabit textbooks and not workshops.

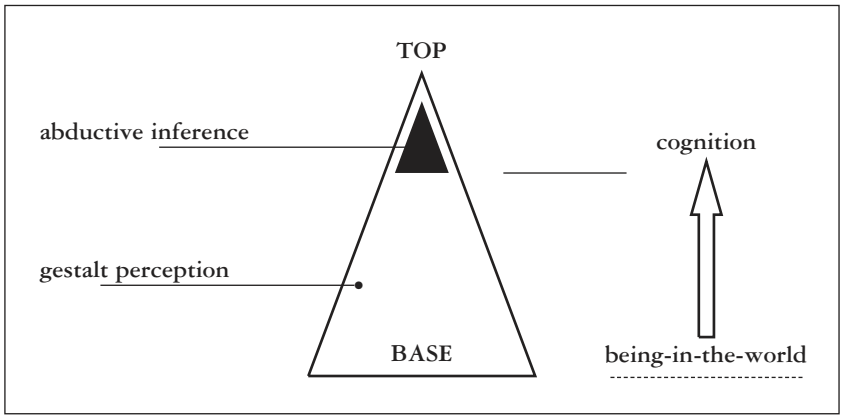
The 'function principle' of some invention may be rationally extracted from a particular gestalt of solution. Extracting the function principle from inventive ideas (solution-gestalts) plays a major role in communicating 'ideas' to another. Within the complex problematic context, the function principle often forms part of an abductive inference. If the function principle, A, were workable, C would be a matter of course. However, justification is late in the process of inventing.

In a comparison between gestalt perception and abduction, gestalt perception can be said to be rather implicit whereas abduction is more explicit. Abduction relates to knowledge building, whereas gestalt perception relates to world building in a more general sense. Abduction is

self referential, where gestalt perception is self-organizing and thus certainly self-referential, too. It can be said that inventions *emerge*.

Without taking the dynamics of emergence in account for now, the interrelation of abduction and gestalt perception may be given through a simple inclusion model. In the diagram below *gestalt perception* is a triangle or pyramid. For the sake of plausibility I make use of a widespread vertical model of human ability or power. On top where the upright human being is thought to be thinking, there is cognition; and part of cognition is abductive inference. Below thinking—where the heart beats and perhaps beneath—the more bodily capabilities and capacities are located. This is where gestalt perception is to be found.

Figure 6.




Gestalt perception is pervasive. Firmly founded in (implicit) lifeworld praxis, gestalt perception reaches up to the top level of cognition. Abductive inferences are explications of underlying gestalts. The BASE of reasoning is being-in-the-world: *In-der-Welt-Sein*. The TOP of gestalt perception is cognition, and within cognition, justification.

The plausibility of abductive inference is first implicit, then explicit. Plausible inferences are based on the plausibility (*prägnanz*) of gestalts. Abduction confirms gestalt and prepares the grounds for justification:

In campaigning for your favourite particular idea or solution, you ask others to adopt a hypothesis. If A were true, C would be a matter of course.

Discovery/invention in science/engineering thus spontaneously emerges from individual variance in the perception of gestalts; invention is deeply rooted in our most fundamental world-building capacities.

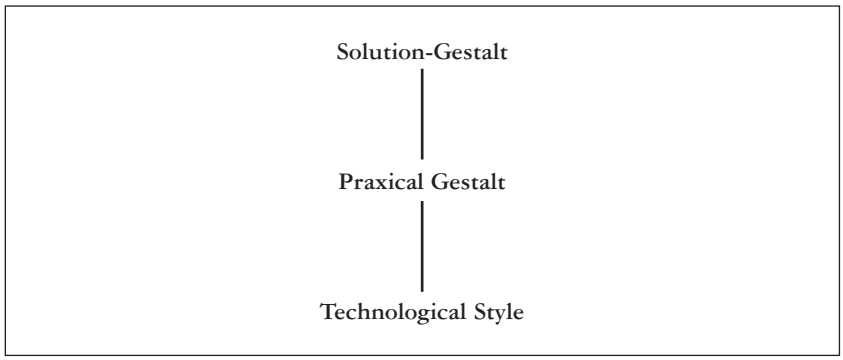
## A simplistic model of technology generation

Within the scope of contemporary philosophy of technology, I would like to arrive at a pragmatic theory of engineering design; a theory *of* technology shaping *for* the praxis of technology shaping; a theory *of* engineering *for* engineering; a theory that accounts for the human as a whole. Thus, I try to identify concepts that are suitable for culturalistically sensitising self-conception *in* engineering.

I became aware that the modelling of technology shaping should go beyond the common means/end scheme of technology use patterns; it should also go beyond the metaphorical speaking of 'seeing' solutions with the 'mind's eye', because this concept of 'seeing' enforces the illusive assumption of being in control.

Three basic concepts are forming the core of the following model of technology generation: *solution-gestalt*, *praxical gestalt*, and *technological styl*e.

**Figure 7.**



According to Don Ihde *praxical gestalts* are patterned praxes that change from historical period to historical period, and also from culture to culture (Ihde 1990). Technologies transform the praxical gestalts of human experience.

*Technological Style* refers to *thought style* as conceived by the Polish physician and philosopher Ludwik Fleck. The particular thought style of a given thought collective consists of a particular disposition for selective perception and the actions according to it (Fleck 1935). Pragmatically, if somewhat unclear in psychological terms, Fleck related thought style to *mood*. I think you could say that about technological style, too: it is brought about by a particular mood.

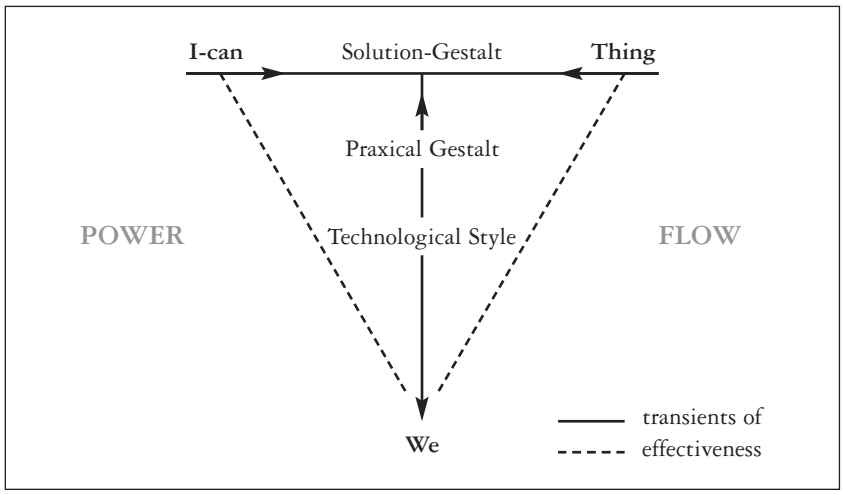
The third concept in this model is *solution-gestalt*. It denotes a life-world phenomenon that is often called 'idea'. Historically the concepts of 'idea' and 'gestalt' are close neighbours as previously mentioned. But, 'idea' is much less incorporated; it is less fleshy. Hence its attractiveness and its inappropriateness. *Solution-gestalt* is the self-contained unity of the solution as experienced by an individual in living perception. It is a complex of logically *and* associatively networked heterogeneous elements. Gestalts are not fixed entities. They are dynamic and heterogeneous wholes. What an element 'is' depends on the other elements; thus the changing of one element will change what all other elements are.

Solution-gestalts are found with individuals in the first place. Technological style is a feature of large collectives. In between there are praxical gestalts that may be collective patterns or singular individual patterns.

I set the coupled concepts of solution-gestalt, praxical gestalt and technological style in a *triangle of tension* as shown below, comprising the Self as I in the mode of 'I-can'; opposite to the 'Thing'; and 'We' in the second dimension.

This I like to think is a simple but working model of the basic dynamics of technology generation. It is a 2-axis model with the two axes forming a 'T', the initial letter of 'transition'. The bonding lines I call *transients of effectiveness*. The triangle itself is placed in a *field of force*, which is a *field of flow* at the same time and on the other hand. The arrows do not denote causation, they may rather be read as 'one affects' or 'acts on' another.

Figure 8.




Unfortunately, sketches and diagrams readily suffer from the fallacy of false concreteness. However, this model is a two-dimensional symmetric theory. In particular it is a theory of action. I have been asking myself for some time where does technology 'come from'? I now think, the locus of the generation of solution-gestalts is precisely where technology comes from, if there is any such font at all.

Certainly, in this model I mix academic disciplines; sociology, history of technology, cultural anthropology, phenomenology, psychology, physics. Sensu stricto this model even may logically be inconsistent, particularly because its frames of reference are floating. But I would like to assume that this model is useful.

The transition model—*T-model* [7] for short—is advantageous for the following reasons:

– Firstly, it is applicable in engineering praxis, because it allows the first person perspective. Many if not most theories in social science imply a hermetic god's eye view. As an engineer I cannot use these theories in praxis.

– Secondly, the model comprises bodily aspects of engineering: my body is co-present in every gestalt, as Merleau-Ponty said.
– Thirdly, the model opens up two interlinked perspectives: one from the point of view of the autonomous subject as it is in the mode of I-can, and a complementary perspective on cultural texture.

## Conclusion

Gestalts are complex wholes, which are not there in a realist sense. They are pervasive; and they are effective in technology generation. Gestalts are commonly shared experience among the members of a particular thought collective. Hence a particular technological style is brought about. Technological style is realized and re-produced through gestalt perception and the actions according to it. I consider that a genuinely conservative trait of gestalt in style. On the other hand, gestalt perception accounts for the occurrence of the new. Novelty in design is achieved through individual variance in gestalt perception.

Any hands-on and hence praxically worthy reflection of what we actually do in (science and) engineering should take the role of the individual seriously. That role comprises involvement in dispute. Reasoning in general, particularly justification, frequently meets the standard of abductive inference. Abduction, again, is deeply rooted in gestalt perception. In campaigning for an 'idea', certain aspects from underlying complex textures (solution-gestalts) are routinely extracted and presented within justification contexts in the abductive mode.

To have an 'idea' of how to solve a problem means to create a solution-gestalt that appropriately fits an intricate problematic context. Being intermediate between solution-gestalts and technological style, praxical gestalts form style permeated patterns of action, which may be either individual or collective. With those three concepts at core—solution-gestalt, praxical gestalt, and technological style—a simplistic but easy-to-handle model of technology generation can be assembled, which might be useful for enlightening engineering practice in engineering praxis.

## Notes

1 Kanizsa is usually seen in line with the once well-known Graz Gestalt school which was later outdated by the Berlin Gestalt school.

2 I asked engineers, scientists, even philosophers of technology, to complete the task. No one succeeded in a short time. It is amazing to see how difficult this simple task actually is. I would like to encourage you to have a try with your colleagues and friends.

3 There is just one hidden pitfall in the present example of bias in solution finding. The square-building task has only one solution, which is given from the beginning and may or may not be 'found'. This is contrary to the standard case of problem solving in engineering praxis, as noted before. However, as a charming little exercise it points to fundamental prejudice in the tackling of problems.

4 'Deduction proves that something *must* be; Induction shows that something *actually* is operative; Abduction merely suggests that something *may be*' (Peirce 1903).

5 Of course, science and technology are interdependent and thus inseparable, especially in any account of 'what' they are. STS scholars today are proud to have overcome the legacy of the former metaphysical distinction between science and technology. However, if asking somebody what s/he *is*, scientist or engineer, you will get a clear answer in almost every case.

6 It 'is' the word 'LIFT' (written in white capital letters).

7 *T-Model* certainly is reminiscent of the more famous *Model T.* Ford Motor Company's Model T was known for its less-than-comfortable ride at top speeds, its rattling noise and it frequently had to be driven up a steep hill backward. But, the Model T was affordable, less heavy than other cars, relatively powerful and fairly easy to drive; and so is the T-model: robustness and simplicity is something they have in common.

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