

On the Relationship between Technology and Artistic Creativity – Potentials and Problems

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Writing an article on the relationship between technology and artistic creativity has its problems. What is technology? What is creativity? Can technology be the use of a quill, a fountain pen, a keyboard? Can creativity be perceived? Personally, I am reasonably sure of my use of the terms, but can I be sure of my readers'?

I am certain that experience can enable and embolden one to take a clear stand on the creative. For example cuisine: can any restaurant-goer worth his or her salt claim it's impossible to tell a dull meal from an exciting one? A good wine from a bad? Yet since the 1980s musicians, music-critics and even musicologists have habitually shyed away from the seemingly herculean task of expressing a qualitative opinion. In the rest of this paper, I assume that I am addressing readers who know creative music when they hear it.

Regards technology, let's assume we're talking about the so-called state-of-the-art digital methods available at the beginning of the 21st Century. I myself have been active in the field of computer music for over thirty years now. Yet I cannot confirm that the relatively simple computer-technical means available three decades ago for the making of music were significantly less suitable for that purpose than the masses of hard- and software in the shops today. Many of the problems have remained: these days, too, if one desires something creatively unusual, something that the programmers of well-known software never could or would imagine, one can, with some luck, employ a combination of several standard products, provided that their input and output data is compatible – that's often the catch. Otherwise one is compelled to write one's own programs in available basic environments such as programming languages. This is the only way the artistic result can in some way resemble the original mental image of the work to be realised.

For the reasons mentioned my software choice thirty years ago was FORTRAN. A sufficiently general medium, it allowed the writing of programs for the composition of both piano and electronic music. 17 years ago I shifted to PASCAL, simply for the reason that Borland's Fortran compiler, the only one available for my newly purchased computer (which with 1 MB RAM, a 10 MB hard disk and built-in MIDI cost me over €15,000) was at a price of €600 four times as expensive as the Pascal compiler of the same company.

In those days I only employed the most general of programming tools. I had to. There weren't even any portable notation programs. At the start of the 1970s a Danish company introduced a notation program, which for those times was fairly reasonable but was limited in its choice of computer. And although the company's owner offered me the role of being his business partner in Germany, I preferred for reasons of flexibility to continue to develop my own software at the university of my home base Cologne. With this program I was able, from 1972 on, to print several of my scores and have them performed as well.

Several years later, in 1984, I wrote a new MIDI-linked notation program ("MIDINOTE") for my expensive new computer, a program which could adequately notate and MIDI-play layers of music in different tempi and in phase-shifted metres, a task which remains a general problem in the commercial field - only with the greatest effort can you persuade Finale or Sibelius to do something approaching this. MIDINOTE is a part of my extensive and yet extendable MIDI-file processing system, one I still use and still find more flexible than any comparable system I know.

Today my main programming tools continue to be compilers of programming languages, combined with general commercial programs for the processing of texts, images, note-scores, MIDI-data and sound waves – already an improvement. In the meantime a few formats have also arisen which are indeed interchangeable between different computer-types, such as TXT, TIF, MID and WAV, a singularly positive development. Unfortunately, notation programs have a lot to catch up with here and one is tempted to suspect that their producers have not the slightest interest in doing so.

This development, added to two others - that reasonable computers are much lighter and faster than they used to be (though a lot of useless system overhead slows them down again) - gives rise to a modicum of hope. As long as software developers are not driven by creative spirits (where these two are not the same) to making their programs more flexible and open, they will not do so. They rely on the easy satisfaction of the general user, who - instead of placing demands - adapts his or her own thought processes to the scheme of the given product.

This phenomenon is a product of historic developments in the Western World. In the wake of a catastrophically destructive world war in the middle of the last century, a significant number of influential people found themselves at a creative maximum: a plethora of excellent art works, of historically documented art directions resulted. At the same time, technology stood at the beginning of a new, promising development, a happy constellation. The signs of the time then: the new beginning. Then came the so-called "Oil Crisis": people retreated to private needs such as money, later fame, and the development of technology was removed to a more spartan existence (though a few, mainly small institutions specifically devoted to the development of creative art technology managed to keep their modest work going). In the pragmatic 1980s people in general had re-formed themselves into enthusiastic uncritical consumers, to the great delight of the industrial world. The fact that research developments occasionally made their way into the production chain is nice but not significant. Everybody joined hands, the uncritical happy buyers and the indefatigable vendors. The new signs of the time: commerce. Idealism of values paled in the light of a new virtue: private satisfaction.

Since then, creativity of mind and flexibility of means have met in relatively rare happy coincidence. Exactly in tune with this theme, I recently had the opportunity of examining a dissertation which I would like to present here; written by one K'rheinth B'roulès, a student of my old friend, colleague and alter ego Professor Barlomew Clarifier, it deals with the psychological effect of the above-mentioned factors in combination.

Its title:

*Satisfaction in Artmaking
as a function of
Æsthetic Creativity and Technical Flexibility
as well as of
Self-distance, Remuneration and Time Pressure*

I would like to present and comment on the synopsis.

The present text seeks to explain the effect of five primary parameters in the extraction of satisfaction on the part of a subject here called N in the realising of a work of art by N. This hypothesis applies from the level of design to that of execution. It is expressed in the form of an algebraic formula, in which each of the five parameters ranges quantitatively from '0' or minimum to '1' or maximum. Here is a brief description of the parameters, followed by examples of their combined effect in the extraction of satisfaction:

Such a daring attempt at algebrising psychology! - yet I do find some grains of truth in it. Please read on...

*1. Æsthetic Creativity,
concerning a quality of the imagination, including concepts such as inspiration, fantasy and vision. In the low-creativity region, N depends primarily on certain extraneous stimuli in order to set the artmaking process in motion. The major part of the work involves locating and invoking these stimuli, frequently amongst found, available and utilisable tools, dubbed in consequence necessary for the work. In the high-creativity region, N is typically stimulated by random, unpredictable sources, resulting only then in the determination (and possibly also the fashioning) of tools.*

Indeed, the need, born of a creative urge, to develop tools practically from scratch, has been a destiny, the end of which I still cannot envisage. It thereby has been always clear to me that in the best cases æsthetics precedes technology - that the tools are made to suit diverse but definite purposes; if in some cases tools are indeed seen to be intrinsically capable of at least partially inspiring or triggering a vision, it is only because they are known in advance to assist or even guarantee the latter's realisation. The hammer and the saw were not invented for their own sake; yet a carpenter with an idea knows he can rely on them if and when he needs them, because the idea will (hopefully) not be one from the field of dentistry.

2. Technical Flexibility,

concerning the degree to which tools at N's disposal are freely utilisable, exchangeable, extendable and combinable for the purposes of the work to be made. In high-flexibility cases, one encounters terms such as 'ergonomic', 'modular', 'receptive' etc. Computer-software, for example, can here boast of psychologically intuitive and physiologically effective usage, of input and output file formats made known to the user, of openness to so-called 'plug-ins'. Low flexibility typically exhibits the opposite of these properties, in the case of software usually due to the need of producers to

- (i) hurriedly market insufficiently tested programs developed with the help of standard routines (e.g. 'toolboxes') and then to 'debug' them on the innocent first customers' money and*
- (ii) to keep internal details of the programs as secret as possible.*

I have frequently suffered the frustration of inadequate and even unsuitable tools, having most often to arduously craft my own; however, my reward in the main was to observe and enjoy the gradual evolution of the work as it was intended. This pleasure was sometimes curbed by externally imposed deadlines, as Mr B'roulès mentions here below; yet an occasional measure of boldness discernible in the compositional vision helped somewhat to ease the tension and encourage patience. The dissertation continues with..

3. Self-Distance,

concerning and inversely proportional to N's degree of self-centredness in making the work. Lower values indicate N's artistic activity as being basically aimed at the acquisition of self-esteem, fame and wealth, the avoidance of embarrassment etc., as opposed to the acceptance of the challenge and risk of boldly venturing into hitherto unknown, ignored or evaded territory and of keeping new discoveries and developments open to all without concern for personal gain. Everyone is in need of moments of low self-distance, as for example with teeth-brushing and other bathroom activities; this parameter assumes higher values only in fields such as art, science, politics, charity and such like – and this is about art.

To this I would like to say: there are artists whose field of vision factually encompasses solely themselves. They must work in order to remain in business and/or to be sufficiently documented for a postulated posterity. They are usually in a hurry and must produce and therefore resort to every possible means, i.e. - for instance in computer music - marketware in hard and soft. On the other hand, those artists to whom art itself is central have more time at their disposal. They are occasionally haunted by "ideas", by "visions" and consequentially act with introspection. For years now I have been observing some composers of computer-music seek (for lack of a vision) inspiration in machines and programs - tantamount, in my opinion, to a carpenter eyeing a fancy toolbox in the hope of hitting on a viable idea. Or to a mountain-climber eyeing a helicopter in the hope of a lift to the top. The more dedicated the tools and the more self-centred their interests, the happier such people often are for being relieved of a part (or even all!) of the creative responsibility. And, as is often to be seen, this happiness can be efficiently intensified by the application of a suitable fee. More about this follows.

4. Remuneration,

a well-known factor, expressible in cash or kind, often used as motivation and/or instigation of a work of art. The maximum value used here, '1', does not suppose or imply a numerical upper limit; it is assumed that all remunerative ranges can be rescaled to the range of '0' to '1', which can be taken to mean 'nothing' to 'all one needs or can possibly get'.

I think I have said enough about this.

5. Time Pressure,

equally well-known, ranging from '0' (= 'none') to '1' (= 'the highest imaginable or imposable'). This factor can be seen to be influenced by two of the above parameters:

(i) *Æsthetic Creativity*, the increase of which seems often to mitigate time pressure (through the enjoyment of the work process for its own sake), and

(ii) *Remuneration*, which through aiding the rescheduling of other tasks seems to have a similar effect (seeming to increase, however, with decreasing creativity and/or self-distance).

We now come to the much awaited formula itself.

The Formula for Artistic Satisfaction (S):

$$S = \left\{ \frac{\alpha(2\lambda-1) - \lambda + 1}{2} \right\} \cdot 2^{\delta\alpha^{\delta+\mu}(1-\alpha)^{\mu} - \frac{\varphi}{(E_{\mu}^{\mu+1})(E_{\alpha}^{\alpha+1})}}$$

where

α is *Æsthetic Creativity*,

λ is *Technical Flexibility*,

δ is *Self-Distance*,

μ is *Remuneration*,

φ is *Time-Pressure*,

E_{μ} is the effect of *Remuneration* on *Time-Pressure* (<0>=none, <1>= halved by maximal *Remuneration* etc.)

E_{α} is the similar effect of *Æsthetic Creativity* on *Time-Pressure*.

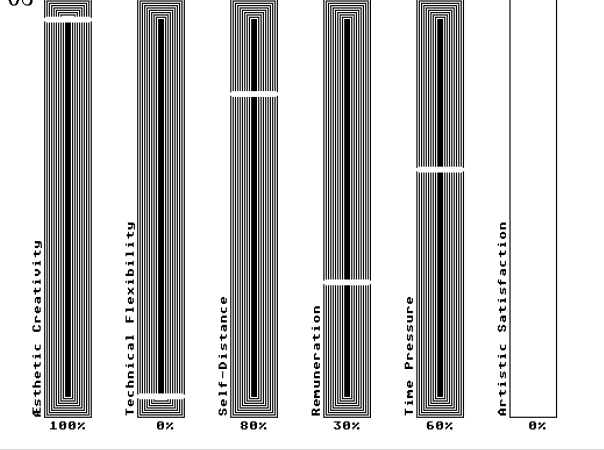
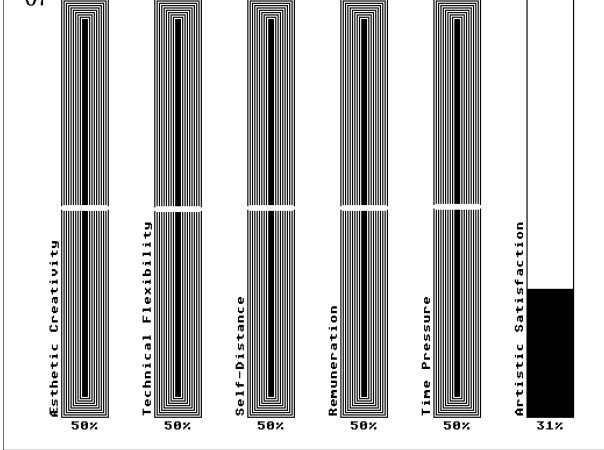
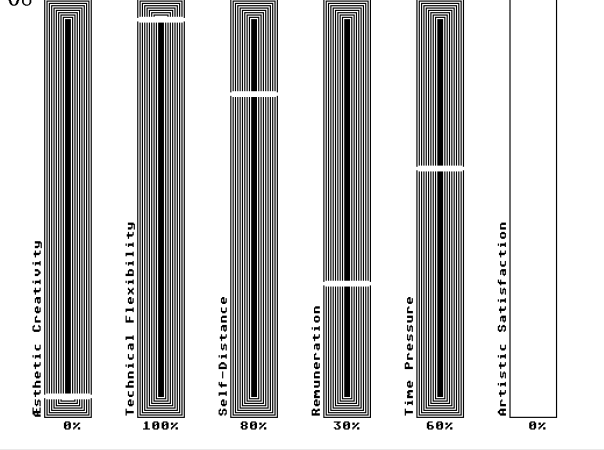
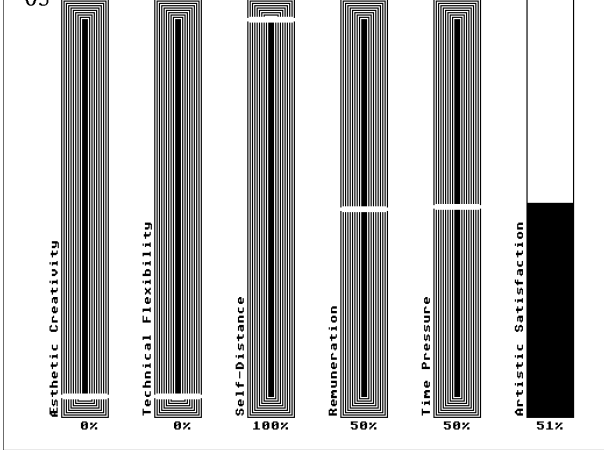
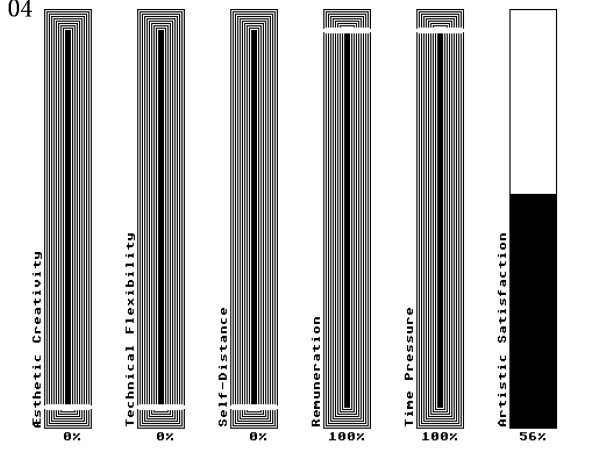
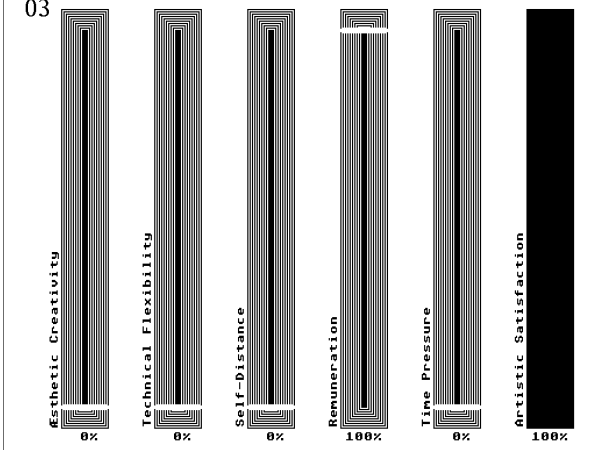
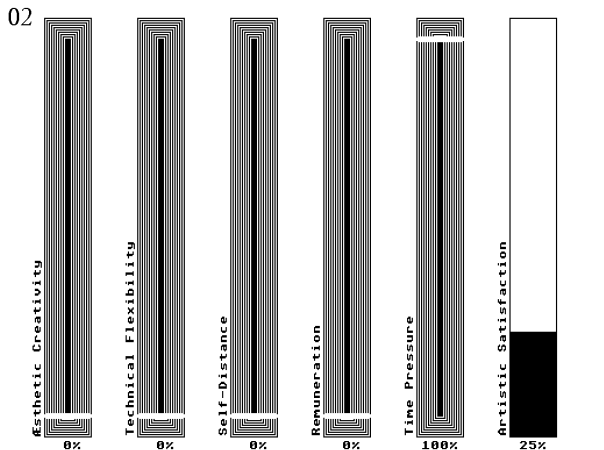
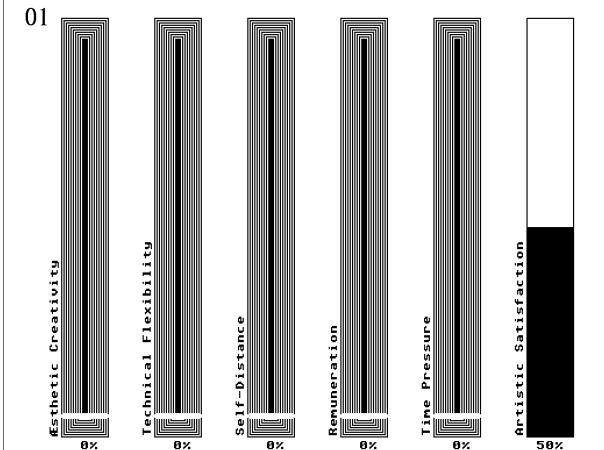
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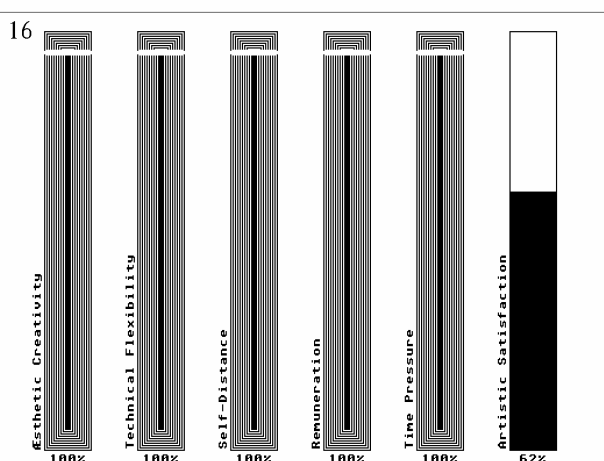
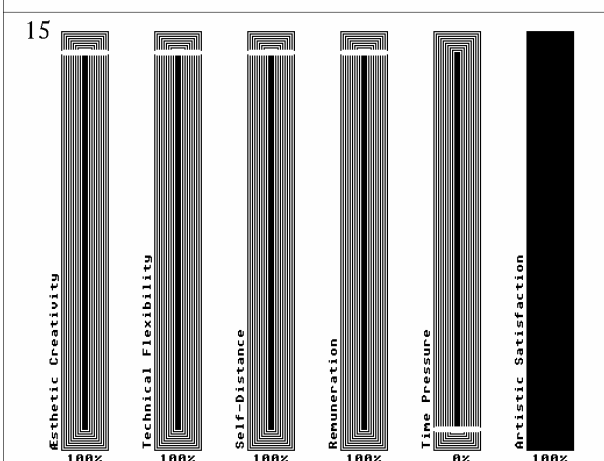
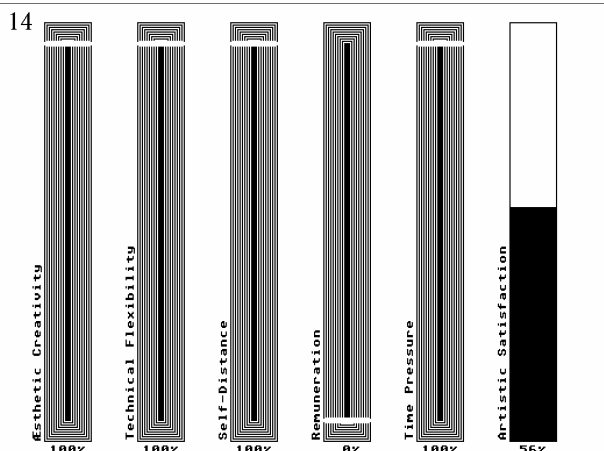
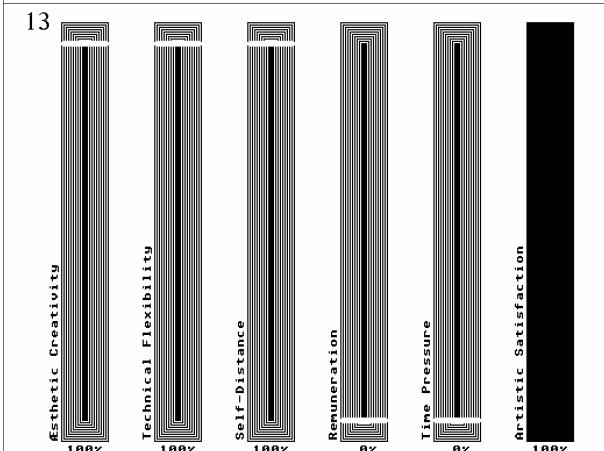
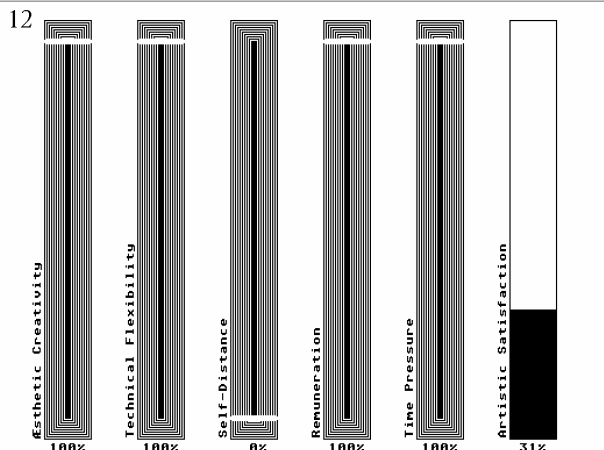
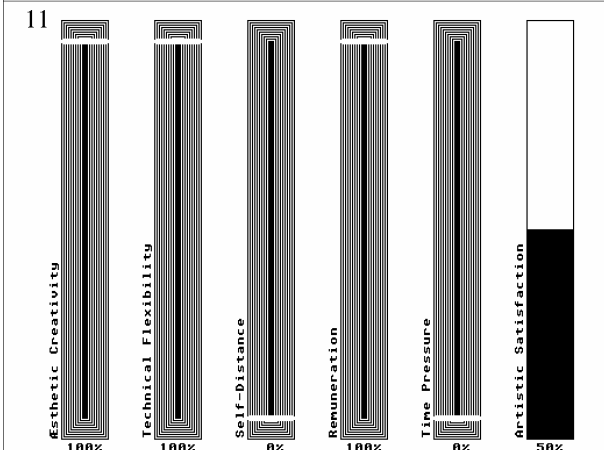
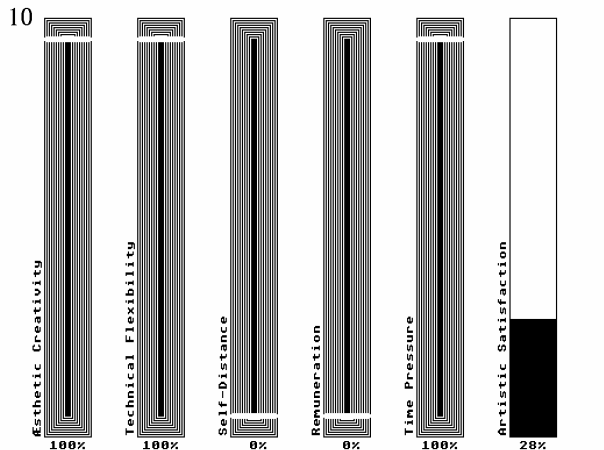
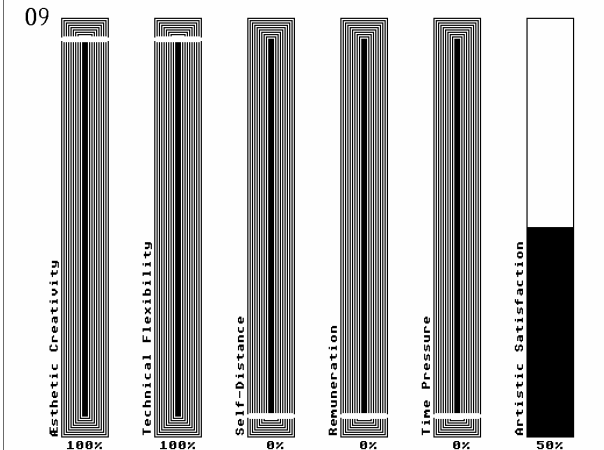
Combined effects

(as seen in sixteen diagrammes implementing the above formula; numerical values are in %, the effects of *Æsthetic Creativity* and *Remuneration* on *Time-Pressure* are set to 0.2):

Æsthetic Creativity and *Technical Flexibility* are seen to best work at mutually similar values for engendering higher satisfaction: low creativity causes bewilderment in the face of high flexibility and high creativity frustration with low flexibility. The opposition of maximum and minimum yields zero satisfaction here, irrespective of the other factors, as shown in Figs. 06 and 08.

With minimum *Æsthetic Creativity*, *Technical Flexibility* and *Self-Distance*, see Figs. 01-04 for the mutually cancelling performance of *Remuneration* and *Time Pressure* (min-max: 25%, max-max as well as min-min: 56%, max-min: 100%) - the jump of 25% to 56% by introducing and maximising remuneration is higher than with maximum *Æsthetic Creativity*, *Technical Flexibility* and *Self-Distance* (see Figs. 13-16 - min-max: 56%, max-max: 62%, max-min as well as min-min: 100%; here zero time pressure causes remuneration to have no effect).





Figs 09-12 show the same as the last-mentioned, but for zero Self-Distance. Here the values are min-max: 28%, increasing marginally with increased Remuneration to max-max at 31%, reaching 58% for min-min as well as max-min, showing that Time-Pressure has a larger effect than with high Self-Distance (compare Figs. 09 and 13, 10 and 14 etc.).

These evaluations could work prescriptively as well as descriptively - in order to raise N's Satisfaction (if it is too low), it is recommended that N's present situation be analysed according to the formula and resulting diagrammes and that an alternative, more satisfying course be followed.

Irrespective of what one might think of Mr B'roulès' dissertation, I would like to add the following both that connection and on behalf of myself:

In times of generally low Æsthetic Creativity, it helps to support public well-being by keeping the level of Technical Flexibility as it was in the final decades of the 20th Century - equally low.

Yet, just before the start of the 21st Century an opposite tendency seems to have set in: there are indeed a few software developers at present who are working on open, flexible and modular systems even free of charge (and I do not mean Windows). Furthermore, my teaching work in The Hague and Cologne leads me to the conclusion that in the present student generation, at least in that of North-Western Europe, individual tendencies are becoming apparent, in which concepts such as quality and content are replacing those of quantity and investment, questions of 'how' and 'why' those of 'where' which have dominated the scene for years. I see relevant potential in the support of these new properties.