

STIMULATING CREATIVITY BY USING COMPUTERS

Prof. Ir. Harry Wagter

Professor CAAD

- Eindhoven University of Technology, Department of Architecture Building and Planning, Section CALIBRE (Computer Application Laboratory in Building Research and Education).
P.O. Box 513
5600 MB Eindhoven
The Netherlands
 - I3P Consulting Engineers, Maarheeze, The Netherlands
-

Discussions that cope with the relation between computers and creativity often turn out to be very sensitive.

It seems that this aspect of computer technology makes people feel uneasy.

This can easily be understood. Many examples can be found where interesting jobs with social contacts for workers changed into dull and monotone ones. This counts specially for administrative oriented organisations, but also in more technical based organisations we can see variations to this theme.

Nevertheless many advantages can be mentioned for the organisation itself, and of course for the customer himself, who is being served more accurate, faster and with a higher degree of service. The discussion on creative aspects mainly takes place in the technical oriented professions. Architects among them seem to be strongly represented. Specially in relation to CAD-techniques being obstructed in one's creative possibilities is very often mentioned as an argument for not adopting the new techniques.

An anecdote

A 34-year old woman working in the design department of a carpet factory is designing patterns on carpets.

Since one year she is using a special purpose CAD-system, to perform her job.

Her productivity since then raised about 20%. Besides this a new market was opened.

Recently she was questioned about her experiences with the system. Among other answers she said: "The system keeps me from creative production".

Shortly after this event the computer itself had a problem. A bug caused a dump on one of her monitors showing unexpected lines and some hexadecimal output. She reacted very enthusiastic. In fact this event gave her inspiration for a surprising new design.

creative

According to the Heritage Illustrated Dictionary of the English language the word 'creative' can have three different meanings:

1. having the ability or power to create things
2. creating; productive, often used with of
3. characterized by originality and expressiveness; imaginative.

These meanings are often mixed. In the context of this paper, the third meaning is relevant. This in fact is the phenomenon that struck our carpet designer that bumped into a bug. Apparently it is possible to create circumstances in which creativity gets stimulated.

The Phenomenon 'Creativity' and the ways to stimulate or block it is described in 'Practical Thinking' by Edward de Bono.

He states that the overall purpose of creativity is to change ideas or produce additional new ones.

These two processes are often mixed up but they can be separated as follows:

- escape from old ideas
- generation of new ideas.

Of course de Bono does not give direct guidelines for the design of computersystems that when followed would give optimal chances to creativity. His conclusions and directives have to do with the proces of thinking itself.

Main goals are continually removing inhibiting habits of thought and to create special settings which encourage the flow and rearrangement of ideas.

The biggest mistake people can make, not only in this context, is arrogance and dogmatism.

De Bono introduced PO-thinking, a fuzzy and at the same time clear combination of hypothesis suppose and poetry. PO-thinking is a basis for what he calls lateral thinking.

From this theories some basic remarks can be derived that can be used when projected to computersystems in general.

Time factor

When people have more time available to think, the chance that they will find a creative solution increases.

Time itself however doesn't increase creativity. It does only increase the possibility of creativity. In relation to computers time mostly is mentioned in combination to the conception 'response-time'. It is obvious that long responstimes result in frustrating situations.

Response times need to be zero. In a technical environment (CAD) this can only be achieved using decentralized computerpower.

Experience

Possessing a large amount of experience can be very restricrive. Due to experience certain parts in the proces of thinking are blocked. Parts can become fixed and rigned and do block the development of new ways of looking at a situation.

Unexpected situations

The ability to use the mind, to think energetically, must be the result of a total attitude.

The circumstances in which this attitude gets optimal chances is an environment where unexpected events happen. These events don't necessarilly have to be completely unexpected. It only has to be unexpected for the user of the computersystem. Sometimes it even can be programmed, however a complete random situation would be ideal.

Tools

Mankind always used all kinds of tools to create his environment. In principle there is no difference between two thousand years ago and some forty years ago.

In fact the evolution went very slowly. Until some decades ago a design office did not achieve aids that in principle differed much from those people were used to.

This changed under the influence of micro-electronics which can be illustrated best when the design process is studied. Without going into the details of the design process itself, it can be illustrated that decisions with a major impact on the object to be designed, are made in the heuristic phase, the early stage. This is thus the phase in which the impact of decisions is the most influential. In former days, computers were only used however in the algorithmic phase at the end of the design or production process.

The major consequence of applying CAD techniques in this respect is that the process of decision making in the first phase is more and more supported which results in better products.

So the computer will be more involved in an earlier stage of the design process. This is also the stage where a significant part of creative thinking is needed. In fact computers should stimulate us in this. At the same time it must be realized that the computer itself is a subordinate part of the system. When a tool forces someone to think in another way as he would like to do, the tool will not be satisfactory. The computer however, plays a special role as a tool.... Normal tools as pencil and paper, or a ruler, are passive by nature. They show themselves to everyone in the same way. We can use this function or deny it, of course.

In addition, we see the human intellect. Formed in many years, developed by education and experience, this appears to us as another tool. This is less clear, because every individual passed through a different unique history. Everyone thinks different, acts different, and copes different with the information that comes to him. The human intellect can be given extra valuable possibilities, which are increased by showing rapidly all kinds of unexpected and wanted alternatives, by computing very fast, or by going through different processes very quickly.

This is the area we are discussing now. The quality of a CAD system should be defined to the extent of how many additional possibilities are given to a user.

The way the cooperation between man and equipment is realized, will determine the ultimate quality.

To achieve a high quality, three conditions have to be fulfilled:

- the CAD system must support a user in applying and developing his products,
- a user needs to be an expert in his own profession.
- a good communication channel between user and system must be provided for. Visual means will help enormously, because people are oriented visually. (One picture tells more than 1024 words).

This means that a workstation should be provided with special supplies and should be designed according to a predetermined

concept. Moreover a program used must not obstruct a user. If all these conditions are met, the user must be skilled in using his equipment. For all these reasons, a designer doesn't have to be afraid that his creative talents will get jammed. He only has to be aware if a management mistake by choosing a bad or wrong CAD-system, is made. However it is realistic to state that many examples we daily can see are not stimulating. And of course this is not the only problem we expect to meet. The preceeding conclusion sounds optimistic, but the other aspects will require extra attention.

This concerns

- Communication:
 - * between people.
 - * between computers,
 - * between man and computer.
- High costs of applying CAD-techniques.
- Shortage of good programs.

One should realize that these techniques are only just being developed.

Workstations

Combining the different aspects mentioned in this paper it is possible to conclude with conditions to be met by computersystems to give optimal chance to creative thinking by the use of them.

- time has to be decided on by the computeruser (designer) himself. Response-times have to be zero. This only can be achieved using the so called workstation concept; decentralized processing-power. Processing power should be there where it is needed.
- experience can be a restrictive factor. Nevertheless good things invented before could be used again. Experience in the designers head can work very conservative, experience inside the computersystem can be an aid to his work. Future expertsystems will be helpful in this respect.
- Systems will act as an intelligent design assistant offering alternatives the designer might not think on. Unexpected situations can be created or simulated.
- Visual means are essential. Within a few years all systems will be bitmapped and icon driven. Results will be presented graphically. Color will be self-evident. The future is very close on this item.
- Hands and feet of computers have been very limiting until now.

Monitors infact are a kind of pillar-box we have to look through to see into the world of our computermodel.

In- and output devices are clumsy without exeption.

The possibility to use more than one screen, character recognition or touch screens, without financial barriers to cope with, will be our future. Although these subjects are major research items for many years already, progress is made very slowly.

Until know Apple's mouse is possibly one of the best solutions.

Conclusions

Creativity takes place inside the human mind. Decisions have to be made by man himself. It is possible to offer him tools that give optimal chances for creative thinking.

Computertechnology is in its beginning of its development. Even with todays state of the art it is possible to create the wanted circumstances.

The future is promising.

References

1. The Heritage Illustrated dictionary of the English Language,
American Heritage publishing Co. Inc., Mc. Grae-Hill int. book
com.
2. Edward de Bono, The Mechanism of mind, Pelican 1969.
3. Edward de Bono, Practical Thinking, Pelican 1971.
4. H. Wagter, CAD/CAM Technology: changing the engineer's world.
CA '85 conference, Jakarta 1985, page 51-61.

Introduction: Computer-Aided Architectural Design Education

Let's call this the "second generation" of computers in design education: we have moved out of the research labs and into the studios and support courses. Do students now discuss the possibility that architecture includes information management? Do they think in terms of integrated building systems in a way they never did before? Do they study more alternatives, build and test more models, critically evaluate more alternative media?

No, not yet. The last two years have seen computers at work in the studio (since we couldn't get design into the computer courses), and in some cases 3-dimensional modeling software has even helped students see buildings as something more than plans with elevations tacked onto the sides. This is the first step toward seeing the building as a three-dimensional performing ensemble of structure, environmental control, materials, occupiable voids and animated series of visual experiences, all of which we need the computer to help us understand.

In every studio which has successfully used computers, the entire studio faculty have been enthusiastic and willing to take risks and look at new methods. We discovered at Mississippi State that younger (second-year) students are still natural risk-takers, and everyone has stories of students who outstripped the faculty in their computer proficiency.

Faculty, however, have a lot of time invested in traditional techniques; we have no right to expect automatic support; integration into the curriculum is a justifiably delicate problem. In order to keep the support of faculty, we must address two issues head-on:

- Computers as they now exist deny tactile, hands-on experience of building representation (pencil, pen, cardboard, light and shadow, the rendering of texture). How do we convince fellow team teachers that time away from Prismacolors is time well spent on energy analyses, animation, the "numbers" side of building design? How do we "buy time" until the technology improves and computer modeling is as evocative and interactive as clay?
- If we are working with other faculty to integrate CAD into architectural curricula, how do we handle institutional settings that mostly reward individuals' research efforts? Even schools with a superb record of team studio teaching have little experience with "horizontal" teams whose members bring differing skills to the group. Computer faculty provide service to other faculty members and not to just their own students; service time takes time away from the traditional teaching and research responsibilities of both server and served.

My own experience is that I have finally, happily, gotten studio students to look at their buildings in three dimensions, and I have become immediately dissatisfied with merely looking at them in the usual 256 glowing, unshadowed, unmoving colors on a computer screen. So I have replaced the cumbersome minicomputer-based modeler with a microcomputer-based system which will allow students to readily add or write new applications for their 3-D models, applications like those being presented in the session "Computers and Architectural Design Education." But I think it will take many, many more workshops, both inside and outside ACADIA and the ECADEE, before we find answers to the problems of tactility and service to our peers.