A NEW GENERATION NEEDS NEW TOOLS
(A proposal for a joint effort)

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Abstract:
After an introduction describing the present situation on computer-programs used in learning environments, some remarks are made on what future programs should look like. Although the design and the building process are both extremely complex, a proposal is made to carry out a project in a joint effort among ECAADE members to achieve a new generation of learning tools. These tools should also be of good service in a consulting environment.

1. The present situation

Designing with the aid of a computer is not a new issue any longer. Although it is regrettable that the practical use of the computer is still an unknown aspect in the profession of most of the architects and even of some of the building engineers, we have already passed a few computergenerations.
In consequence of the evolution of computertools, many faces of programs changed.
At the same time, however, the view on solving architectural or building oriented problems also changed drastically during the past ten years. However, by changing faces of programs we don't change programs substantially. Most programs on CAAD and CABD used for educational purposes are conceptually dated ten years ago. Of course many new developments can be recognized.
Most of them are research projects. They will not result in new learning tools, maybe within a few years, and they will not fit into developments in other universities.
At this moment the time is ripe for building a new generation of computertools in architecture and building engineering.
These tools for the new generation of architects and engineers are needed urgently.
Developing them we will also achieve better tools for the building society in general. It must be noticed that there is no need to pass criticism on the now called old fashioned programs.
They are just a result of their period and we have to be loud in praise of them. Specially the Abacus suite of programs is still contributing to our experience and knowledge in many situations, all over the world.

2. Characteristics of new generation programs

During the past five years many papers were presented at many congresses, telling us about the specifications of the new

generation of programs.
Mostly only covering a part of the total field but all together parts of an enormous jigsaw puzzle.
Thanks to all these contributions we are able to formulate how the ideal CAAD or CABD system possibly might look like.
Most principal difference in the way of thinking on this is the transition form procedural systems to knowledge engineering.
The knowledge is manipulated indescriptive in contrapositions to the prescriptive computerprograms we are used to.
Of course one should realize that though "expert systems" are the hottest item ever been in the computer society the last five years, we are still only entering the first stage of the developments on this.
At the same time the prescriptive computer environment still can be of good service in many circumstances.
Nevertheless knowledge engineering opens the gate to manipulate with soft parameters. As soft parameters can be recognized factors as: feeling; pleasant; colour and so on.
Computer programs don't need to act fully algorithmically anymore.
For the program itself can take all kind of decisions based on fuzzy-set theory, which is based on experience itself, to reduce the number of solutions that mostly occurs.
All together this will result in systems by which an exact problem definition is not necessary any more. These systems approach the way architects and building engineers work in practice.
To achieve this is one of our main goals.

3. Integration and the building industry

To obtain a flexible an open organisation (from a technical point of view), with no limitations in the function of computer tools, it has to be considered what information is flowing through it, how this information flows and of what type and character it is.
We will soon find that almost every process or sub-process in a design or production is extremely complex. Besides that, the amount of information is gigantic.
It might seem a self evident statement, that all aspects in the building process relate to almost everything.
This means that an integrated datamodel of our technical environment is impossible by definition.
However, it is possible to identify sections in the flow of information where computers can be of good service.
These sections cover an almost complete aspect in the total information flow. The advantage is that a section can be overlooked.
It is the art to recognize those sections and it is possible to create conditions by which the different flows in and around those sections have an optimal correspondence. It is not difficult to indicate the main bottle necks.
Main problem is that the variety in information and the amount of information is too big to handle.

Besides this the type of information is too complex and the generating of data during the design and building process is almost infinite. It never comes to an end.
A way has to be found to tackle these problems.
The degree of detail we want to consider is one of the parameters. It is obvious that an architect is for instance not interested at first in a high degree of accuracy. However, at the same stage he has to, and other participants in the process are obliged also. Every discipline is a world on its own. We will have to specify more levels of information density for instance by using logical zooming technique.

The complexity of the building industry

In general the following stages in a building life cycle can be recognized

1. initiative
2. basic requirements
3. final requirements
4. design (several participants)
5. specifications
6. invitations to tender
7. contracts
8. carrying out the project
9. furnishing, devices, etc.
10. using the building
11. facilities management
12. maintenance
13. demolition, re-use

Parties involved are designers, licencing authorities, constructors and other specialists, information houses, and of course, last but not least, the customers. For our purpose it can be assumed that only the stages 2 to and including 5 and 8 to and including 11 are of interest. A new to be designed system must be able to cope with these aspects, with regard to the remarks made before in chapter 2 and 3. The final conditions have to drawn up by a small working group.

5. Proposal for action

To carry out project that has a main goal the achievement of a general learning and consulting tool based on the latest techniques to be used in the building society, a good preparation is essential.
This preparation must result in conditions that make it possible to run the sub-projects on a small scale in small units.
In principle each unit can be a member of ECAADE. Each unit can carry out a well defined part of the puzzle.
An organizational and technical infrastructure has to be

agreed. Only with an agreement on this it will be possible to develop a system of which the different parts will have an optimal chance for interchange and communication. Main thresholds are the achievement of a good initial plan and the financial arrangements.

6. Technical infrastructure

6.1. hardware

Of course the easiest circumstances arise when everyone selects the same hardware. This is not a realistic starting point. It is realistic, however, to select a common operating system of which it might be expected that it will be in use for many years.
A significant improvement is caused by the Unix computing environment. Although different Unix versions exist, it provides the optimal chance for communication and the interchange program parts. It leaves freedom to the institutes to select their own hardware facilities. Besides the Unix environment, the workstation concept based on professional micro's with Winchester facilities must be the basis of the developments. A decision has to be made on adoption of certain standards as IGES or GKS.

6.2. software

The systems-software environment has already been mentioned in chapter 6.1.
For the application itself the adoption of a commercial available package that gives a good basis for further developments, is proposed. This means that source codes must be available. Possible candidates could be Eaglew (Acropolis), Medusa, Arcos or Dogs, although the latter doesn't offer suitable 3D-facilities.
An investigation among ECAADE members might result in another good candidate!
Main topics will be:

1. a program that enables a designer to build a model of a building in three dimensions;
2. to compare physical behaviour form different angles of .incidence;
3. the system must act as an intelligent cooperator;
4. the system must have the ability to make complicated 2D-drawings using advanced layering techniques;
5. it must be possible to test the original requirements in an intelligent way;
6. tools have to be designed that can be used as a planning system during realization, to perform comprehensive facility management in all its aspects, including space planning, telephone- and key-plans, furnitureplanning, and so on.

7. Organizational infrastructure

Besides the mentioned technical infrastructure, also an organizational infrastructure is needed.
The start should be the installation of a working group which consists of three persons.
The working group is not allowed to exist longer than six months.
Its task should be
- to select a commercial available package;
- to formulate the main specifications of the system in global terms;
- to make a working plan for the project;
- to arrange funds from the EC-Comett program.

The effort needed for the working group should be financed by ECAADE members, or by a EC-pre-fund.
After six to nine months a central discussion has to take place, followed by some major decisions: the point of no return will be passed here!
If the outcome of this discussion is positive, work has to be divided among the members and a central project-team has to be installed. This project-team should consist of 2-3 persons. They will be recognized as the overall projectleaders. Each three month there will be an evaluation meeting where a steering-committee will deliver a report on the progress made in the passed period.
The maximal total projecttime should not exceed 32 months (2,5 year)

8. A closing remark

Although this paper presents a simplified representation of the facts, the proposal is comprehensive.
This fact is not underestimated. Sometimes one must take the liberty to do so. The proposed project can be the start of an European effort in software technology for the building industry, carried out in several universities with the help of professional software industries as Comett demands. It can be the start of a intensive cooperation between academical and professional institutes. In the beginning the main advantage will be getting experience on a local scale. Later on the international effect will be explicit, and each local institute will gain the results of work carried out by colleagues.