Chapter 4

The profits of CAAD can be increased by an integrated participatory design approach

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4.1 Introduction

Computer-aided Architectural Design is understood in Poland as comprising all computer applications in an architectural design office. In Polish architectural practice (with a few exceptions) it is still under theoretical consideration and in an experimental phase. Therefore if we are talking about the future of CAAD in Poland we are thinking about a much more long-term future than for Western countries. However, if new economic and organizational changes initiated in Poland in the early 1980s continue, future problems and solutions in CAAD will, for us, become similar to those in Western countries.

The most important changes initiated a few years ago in Polish architectural practice are:

(1) The introduction and rapid development of small design offices (cooperatives, private offices, etc.), which did not exist in the past because of the monopoly of large state and cooperative organizations; and
(2) The implementation of a new financing system, based on bank control, which existed only in theory in the past.

These two factors are the cause of the growing interest and more direct emphasis by Polish architects on the use of CAAD. At the same time it means that profits resulting from the use of this new tool will be measured mainly in direct financial terms. This pragmatic approach should be taken under consideration in prognoses of CAAD.

4.2 CAAD in practice

The field of CAAD can be divided into two areas:

(1) Aid for routine, traditional architectural workshop and office activities; and
(2) The introduction of completely new activities.

It is easy to see that the first area of application can bring direct financial profits because it is suited to contemporary organization and billing systems in design. The direct profits of CAAD are a result of the increase in the power of the design office, bringing higher speed, complexity and preciseness to architectural projects - in other words, higher productivity.

The profits in this area of applications will probably be slow in arriving but will continually increase in the future. However, such profits have nothing to do with the growth of quality in design which architects and society in general are seeking. In a traditional architectural workshop increasing productivity by using computers often leads to all kinds of mistakes.

For this reason architects appear to be more interested in the second area of application which are related to design activities previously not found in the traditional architectural workshop, e.g. sophisticated energy consumption analysis, optimization of the site and building layout, etc. which are sometimes difficult to measure in financial terms. These profits we call social benefits. It is difficult to say now how large they are -probably they are not so large as we would hope and the lack of precise, up-to-date and complex data is the main reason for the low efficiency of these applications.

In resolving this problem the computer will probably play an important role as a communications medium. Computerized data banks, data management software and computer communication networks allow us to hope that the computer will be a powerful tool for information and communication in architectural design. One of the promising areas for the use of this tool is design participation. The basic question is: what conditions should be fulfilled to meet this challenge?

4.3 Design participation and CAAD

The importance of user participation in design has been accepted for many years, but in its implementation in professional practice there are still many problems. For example, one of these is organizational: how to introduce the participation of many users in complex design problems. Another is the choice of a common design language which would be effective and easy to use by non-professionals, architects and specialists in other disciplines. However, the problem of easy access to sources of information still exists. In consequence user participation makes design more time consuming.

This is particularly easy to see in the integrated participatory design concept. This is based on a systems approach to design and its main principles are:

(1) In the design process there should participate not only professional designers and specialists but also non-professional users and others affected by this process (in a systems approach to design this means all participants in architecture: architects, engineers, consultants, builders, maintenance engineers and users);
(2) The common design language for all participants is a necessary condition for effective participation (communication between all participants);
(3) The common, multidisciplinary database is essential to make correct design decisions.

Computer aid appears to be very promising in the realization of the above ideal concepts, but before these promises can be fulfilled there is much

preparatory work to be done in the field of organization, both in design and in investment systems. The organization of design and communication will be the critical factor in future effective CAAD.

The list of the organizational changes required is a long one, and the most important tasks appear to be:

(1) In computer communication:
   (a) Preparing and introducing design-oriented databases on different coordinated levels (local, regional, national and international) with easy access for all design office;
   (b) Implementing computer communication networks, thus allowing savings in time and the cost of database access for individual users;
   (c) Refining a standard computer language, thus allowing precise and clear visual communication for those engaged in design;

(2) In organization of professional activity:
   (a) Improving the contracting system, which should take into consideration the dependence on fees of the quality of design (in this case computer aid in design can bring greater profits);
   (b) Introducing new regulations allowing participation in design for non-professionals with the use of a computer as a communications medium.

4.4 The 'Urbigraph' system

The 'Urbigraph' system is designed to cope with diverse problems of town planning and design. This enables the professional as well as the amateur designer to 'build up' a fragment of a town plan (using a set of ready-made elements like dominos) with a simultaneous calculation of all possible measurable consequences of the spatial decisions which have been taken.

The idea of computer-aided design resulted from Polish use of a CAD system in the construction of prefabricated industrial buildings. In its first version the idea was based on the TAD (Interactive Automated Design) system, whereas the second was based on the IGD (Iterative Graphical Design) system. Both systems use the computer-digitizer-plotter-display arrangement.

The 'Urbigraph' system has been used in two town-planning games as a tool of design participation:

Game 1 serves as an aid in building up a physical model of part of a city centre (the game board depicts the area of around a dozen street blocks and the set of game elements consists of street-block quarters of different configuration).

Game 2 serves as an aid in building up a physical model of a street block (the game board depicts a street block and the set of game elements depicts independent building sections).

More details description of the system has been presented in the author's papers (Wrona, 1976, 1981; Wrona and Olsynski, 1985).

'Urbigraph' is a computer-aided simulation game and is intended to enable non-professionals to participate in the initial stages of the design process. Both the computer and its programs used in the system can be

fully utilized in the further stages of professional design, and the system itself should make use of a common, professional background of design and planning data.

By using the system the urban or architectural plans are reduced to a simplified, comprehensible diagram (the so-called game board) and the set of elements used is limited (limited number of game elements), but this may well constitute an excellent point of departure for a more detailed and specialized professional approach.

Also the modular mode of the plan created by the 'Urbigraph' may be effectively adopted as a method of professional design. Moreover, the method of depicting investment intentions facilitated by this system enables developments to be under control both in terms of time and of the environment. The system was endorsed by the redevelopment plan of Warsaw's Western Centre.

During the first experiments with the system it was noted that both major groups of participants, architects and non-professional future users of the design, had insufficient knowledge of computer technology, and therefore work with the system had to be based on graphic communications using the computer and conversation.

In graphic communications with a computer the architect has an obvious advantage since he is professionally trained to draw and to read architectural drawings with different perspectives (e.g. urban plans, differing views and cross-sections, etc.).

The non-architect is, in principle, eager to read drawings which are three-dimensional and which reflect reality (e.g. drawings in perspective, frontal views, physical models, etc.) as often he cannot draw.

One aspect which became very apparent here is the significant role played by the 'Urbigraph' programs. By using the digitizer, they allow for the automatic insertion of ready-made fragments of drawings from the 'menu' cards, their transformation and description by means of the main 'menu' and the automatic generation of two- and three-dimensional drawings on the graphic monitor and plotter. To some extent this decreases the above-mentioned differences in professional training in graphic communications media.

4.5 Conclusions

The experiment with the 'Urbigraph' system allows interesting and promising possibilities of computer use in design, the most important of which are:

(1) *A design database:* the local database system is playing a very important role in design as a source of interdisciplinary information needed in the decision-making process.
(2) *A computerized model:* building a computerized model of the area, site and building allows for clarity of design decisions in different scales by specialists and non-specialists; together with the design database the model may also help local design expert system,
(3) *A 'menu' technique:* a 'menu' with a geometrical and technical descrip-

tion has been proved as a tool which shortens the time of decision making and helps non-professionals to participate in resolving design problems; in this sense a menu technique offers ready-made phases of design language, utilizing all the graphical resources of the computer,

(4) An overlaying technique: overlaying helps different specialists to work simultaneously on the same layouts and allows free selection of the information required.

An important role is the speed of computer processing. Using all of the above-mentioned possibilities and applying high-quality computer graphics dramatically increases the amount of information processing. If the computer response time is to suit regular design activity the fastest processor must be used.

References

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