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BACK ON THE DRIVERS SEAT

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When weighing the dangers which threaten the architectural profession today, I believe one of the most alarming trends is the that architects retain ever-decreasing influence over the final product. In other words, the finished building is not always the one you dreamed up.

A few hundred years ago, the architect, as a genuine Renaissance personality, acted as "master builder" and controlled all aspects of the entire construction project, down to the processing of the very last piece of stone. In contrast, in today's technological environment, on the one hand, skills are highly specialized and, on the other, time is accelerated and has become the dominating constraint on the construction project. The client will pay most attention to those who have the greatest impact on deadlines and budgets. The architect often becomes just one of the players among many other contributors to the design, such as structural engineers, HVAC and electrical engineers, interior designers, civil engineers and others. In principle the architect is still responsible for co-ordinating the work of all these participants, but the reality is different. The information flow among the participants takes place on paper, with all the inherent limitations of paper, and under the pressure of deadline and budget constraints in most cases it is the general contractor who ends up making the important decisions. Who loses? The loser is the finished building, our built environment, and consequently the entire society.

How can we return to our roots? How can we regain the control architects enjoyed during the Renaissance? How can we climb back into the driver's seat of the construction industry?

We Hungarians have a proverb: "Take a hair of the dog that bit you!" Technological developments deprived the architectural profession of its leading role; but current technological developments have the potential to return architecture to its former stature.Technology made building information so complex that without the proper tools, the architect could no longer remain in charge of all this information. But another technological development, namely information technology, can fix the mess and put things back into their natural place.

Information technology (IT) has long been perceived as a means to automate tedious manual work. The first generation of Computer Aided Design (CAD) workstations were used as automated drawing boards, to improve the efficiency of the drawingprocess. This was the case some 20-30 years ago among nearly all computer applications, but in the last 10 years "computing technology" has been re-named "information technology" and has gained a completely new interpretation. Computers are not just a means of automation, but first and foremost a means of information control. The IT revolution is not a continuation of the industrial revolution, not just a further development of machine automation. Rather, it is the beginning of another revolution, with much more profound impact on the destiny of the human race.

The IT revolution of our age was preceded in human history by two other revolutions related to "information technology". The first was the invention of the spoken language, some 40,000 years ago, enabling us to communicate detailed information. The second was the invention of writing, enabling us to store and accumulate information throughout generations. The invention of writing may be dubbed the "Paper Age". But Gutenberg's marvelous invention inherently

forecast an end to the very age it created: The amount of knowledge collected in millions of books in thousands of libraries is now so huge that it has become practically inaccessible.

The third IT revolution, which characterizes the current era, addresses this challenge and is as profound as the invention of speech and writing. While the spoken language enabled us to formulate information, and the invention of writing enabled us to store information, computers now enable us to organize, process and control information -- in other words, to find among this ocean of information the exact piece we need. It marks the beginning of a new era of the human race, called the "Information Age".

I believe that the pulleys and levers of ancient times were merely secondary factors in the building of pyramids. The spoken language, which made it possible to co-ordinate the work of thousands of people, and the gradually increasing know-how of generations preserved in written form, were the real keys to the spectacular achievements of the ancient world.

Similarly, the improvement of drawing efficiency, offered by today's CAD workstations, is just secondary to the ability to control complex building information.

The rules for communicating building design on paper were first developed some 400 years ago when architectural drawing became the lingua franca of the profession. But paper, as a medium for communicating building information, has three major limitations:

1. *Limits on the amount of information that can be stored on paper.* As building technologies and buildings themselves become ever more complex, the size and number of drawings grows exponentially, and the management of hundreds of huge DIN A0 size drawings becomes a real challenge.

2. *Limits on parallel access to the same information.* We all know how many revisions are performed on the building plans during the design phase and even later, during the construction phase. These revisions often lead to conflicts among the different disciplines, such as structural engineers or building services, or to budget conflicts. It is the architect who should be in charge of resolving these conflicts. But as there is no parallel and concurrent access to the paper-based drawings, participants do not see the effect of changes made by others on the same building. This limitation slows down the information exchange and consumes the most critical element of any construction project, TIME.

3. *Lack of ability to represent relations among the different aspects of the same information.* Paper has only two dimensions, while the real building has at least three, but in fact much more. There are several functional and logical relations among the different aspects of the building, representing the fourth, fifth and further dimensions. For example, how HVAC requirements will be affected if a glass surface is enlarged, not to mention the effect on construction expenses, or operational cost. Paper drawings do not reflect these dynamic relations, although they represent the most critical building information.

The first and second limitations (the amount of the information and the concurrent access to it) have been partly resolved by the first generation of architectural CAD systems, the "automated drawing boards". There are no physical limits to the electronic version of the drawings, they are much more flexible for revisions, are much easier to manage and organize, and the synchronized access to them by several players has recently been solved using intelligently networked computer systems.

However, as long as computers just imitate paper, ruler and pencil, they will never offer any solution to the third and most important challenge, namely the limits on the depth of the building information on paper. For this we have to leave the "Paper Age" and really enter the "Information Age". It is not the paper that should be simulated on computer, but the building itself. The digital

prototype of the real building (we call it “Virtual Building”) contains much more than just floor plans, elevations and sections, even more than a visually attractive 3D model of the building. It comprises all information about the real physical building and all the inherent logical relationships within this complex information, on a level that could never be perceived and communicated on paper. The architectural design software should go far beyond being a mere productivity enhancement tool. It is an authoring and reporting tool about the Virtual Building and it is the key to control the information about it.

The original author of the Virtual Building is the architect, who owns most information about the actual building. But most importantly the architect becomes the one person in charge of coordinating all the information coming from different contributors, such as structural and building services engineers, interior designers, or from the demand side, i.e. the general contractor, the facility manager and the owner.

The ability to simulate a building's behavior, both before it is built and throughout its life cycle, will naturally affect the architects’ design process, but it will also change his relationship to the client, the contractor, the community and to the entire construction industry. For example, as the owners and caretakers of the Virtual Building, architects will enjoy competitive advantages in procuring all future work associated with the same building, including maintenance and management, where much more financial spending is concentrated than in the design phase. The architectural firm will offer comprehensive services by integrating all design disciplines -- engineering, civil, facilities -- and become a lucrative consulting business as well.

In other words, IT will put the profession of architecture back in the driver’s seat of the construction industry and allow architects to maintain full control over the building project, just as master builders did hundreds of years ago.