The software beats the hardware

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The paper is based on ongoing reflections concerning the importance of information technology in architecture. Such reflections are necessary to develop research concerning the use of information technology in architectural design, so as to shift the focus from purely technological development to an actual field of research. The result of these reflections to date suggests that research into the significance of information technology in architecture must go via sociological research on the subject, since information technology has become a social factor. The central element in such research will be to identify and specify how the virtual world which is developing can be articulated in relation to the physical world. One of the ways of doing this is to use metaphors.

A few years ago the staff at the IT-lab at the School of Architecture at the Royal Academy of Arts in Copenhagen began to reflect on the position and role of information technology in relation to the discipline which comprises urban planning, architecture and industrial design. My colleagues and I intend to present the preliminary conclusions on these reflections at ECAADE '99. They originate in a number of personal frustrations which we now, because of our ongoing reflections, understand to be more deeply rooted than originally assumed. At present we find ourselves in a schizophrenic situation, suspended in mid-air between the old physical world and the new virtual world which is gaining more and more ground.

For almost twenty years we have been working to build a bridge between technology and artistic creativity. In comparison with, for example, building technology, IT is a new discipline for architects and still not fully recognised. Discussions with our colleagues have not exactly been characterised by good academic and scientific practice, but have been - and still are - dominated by personal attitudes to information technology. However, the fact that almost all architectural practices use CAD has made most people recognise the necessity of teaching information

technology at our school, though discussions are still governed by subjective attitudes concerning the position and significance of information technology in the training of architects. Scientific reflections concerning information technology in relation to the architectural profession are thus necessary.

Developments in the field of information technology have been so rapid in the last two decades that most of our time has been spent on learning and mastering the new technology. It began with CAD, first as a digitised drawing tool and now as an object-orientated design and planning tool. CAD was followed by multi-media and VR technologies. The Internet saw the light of day at almost the same time, and most recently Computer Supported Cooperative Work has been introduced. Keeping up with all these developments in the field of IT took all our time. We have become better at handling the technology, but this has been at the expense of more in-depth analysis of the significance of information technology in our society and in relation to our profession. We definitely needed a "break" in which we could step back and consider information technology in a wider perspective.

After having been granted additional funds for

Figure 1 (right). Le Corbusier, 1923. A city of towers

research in relation to a project concerning the configuration and use of a digitised 3D model of Copenhagen, we were able to "free" some time to embark on the reflection needed. So far we are not talking about independent scientific work but theoretical discussions, where we formulate questions without being able to give the answers. At this stage we wish to identify a number of theoretic problem complexes which we can use to delimit concrete areas of study, the purpose being to establish a basis for research into the use of technology in the architectural profession and to formulate objectives for such use as a supplement to development work which is, to a greater extent, orientated towards technical aspects.

The results we have achieved to date are based on studies of relevant literature. We have studied works which deal with information technology in society and with information technology in the architectural profession. In addition we have studied theoretical works on philosophy, architecture, urban planning, the humanities (art history, psychology), sociology, etc.

We have established that, despite differences in disciplines and objectives, all the works we have read agree that information technology should be regarded as a social factor and treated as such. Understanding of the significance of information technology in relation to architecture must therefore be achieved through studies of the social significance of IT. In other words, we will not be able to find the answers we seek merely by reading books on computers. Architectural research

into information technology must be supplemented by relevant social science research.

We have selected three central works which we think form a good basis for our reflections, since they more or less explicitly relate to the significance of information technology in societal production of space, and in the architectural profession. The three works are: Manuel Castells' trilogy "The Information Age: Economy, Society and Culture", "Being Digital" by Nicholas Negroponte (1995) and "City of bits" by William J. Mitchell (1995).

Despite the different starting points of these works, the authors agree that a new space is developing alongside the physical space. In addition the authors point out that the key to understanding present-day development lies in the relationship between the new space being developed by information technology and the physical space in which we move (historically).

Castells talks about "the space of flows" which is developing as opposed to "the space of place", which is the physical world we live in. Historically, our entire society (economy, institutions and culture) is built in and around "the space of place". This implies conflicts with the informational society, which is built on a global network. Castells write: *"While organizations are located in places, and their components are place-dependent, the organizational logic is placeless, being fundamentally dependent on the space of flows that characterizes information networks"* (The Informational City, 1991).

Negroponte's reflections are very similar. Having demonstrated how information technology develops in the direction of a major reduction in hardware, one reason being the increasing use of software, and how everything ultimately will be a question of bits, Negroponte establishes that: *"Our entire history is connected to space and place, geometry and geography."* He concludes: *"Cyberspace is not. One machine is as close as the next. There are no physical limits or boundaries other than the contour of the planet itself."*(Afterword, p. 236).

As architects we are thus facing major challenges. While we want to introduce information technology in

the training and education of architects, the world we want to shape is changing radically – paradoxly because of information technology.

Mitchell systematically describes how functions which previously took place in buildings adapted to their purpose are now to an increasing extent taking place by means of information technology. Mitchell writes that "the software beats the hardware" and concludes: *"Architects will increasingly confront practical choices between providing for bodily presence and relying on telepresence. They will be forced to explore the proper respective roles of physically constructed hardware and symbolically encoded software, and of actual space and virtual places"* (p. 173).

However, it is still difficult to understand the new space, perhaps because it does not have any physical expression. It is also difficult to find a name for it: *flowspace, cyberspace, virtual space*? We are caught in our old physical world and have to use concepts known from the old physical world. It seems that the new world can only be understood by means of metaphors referring to the old physical world.

A central element of the works mentioned above is not only the discovery of the budding new virtual world, but also the significance attached to the meeting between the physical and the virtual world in the theories presented by the authors. As far as Castells is concerned, the conflict between the two worlds is the embryo of development. Both Mitchell and Negroponte see it as the "place" where a new architecture will arise.

This means that we must look at the processes in which the *software beats the hardware* and at the new opportunities provided by information technology as regards improvement of the living standard of human beings. Let us look at a few examples:

Shopping in supermarkets on Saturday morning has never been a pleasure. First you have to fight for parking space. Then you have to line up to hand in your empty bottles. Then you fill your trolley with articles, the same ready-packed branded goods week after week. You line up at the cash point. You put the articles on the conveyor. You move the articles from the conveyor into the trolley. Then you move the articles from the trolley into the boot of your car. Finally, once at home, you have to move the articles from the car and into the house. As end-users we have to move the articles many times as just described, and we can only guess how many times they have been moved between the place of production and the sales outlet. Probably at least as many times. In this way many tonnes of goods are being moved quite unnecessarily. With e-commerce consumers just have to point at the articles they want in the virtual shop, and the articles will be delivered to them directly from the wholesaler or producer. There seems to be ample opportunity to save energy, which is a resource we have to protect globally.

Like most industrialised countries, Denmark is experiencing problems in the health sector, particularly as far as hospitals are concerned. In Copenhagen, politicians have chosen to centralise hospital treatment, moving from numerous local hospitals to relatively few central hospitals. Many resources are being used in this restructuring process. Sick people, especially elderly people who typically need hospital services more than other groups in society, are thus forced to use hospitals which are located far away from their homes. Daily visits by relatives become a nightmare because of long travelling times.

The argument presented in support of this centralisation policy is that private citizens will benefit from the best possible expertise under one and the same roof. But does it have to be like this?

Telemedicine means that it is now possible to change planning. In the vast, sparsely populated areas of northern Norway, telemedicine is being used with great success. Via the Internet, local hospitals have gained access to top-notch experts at, for example, the university hospital in Tromsø (Politiken, 1999). In relation to the planning of our towns and cities, and the planning of our hospital sector we should discuss whether it is appropriate to allocate increasing resources to continuously growing hospitals (hardware) rather than to the development of
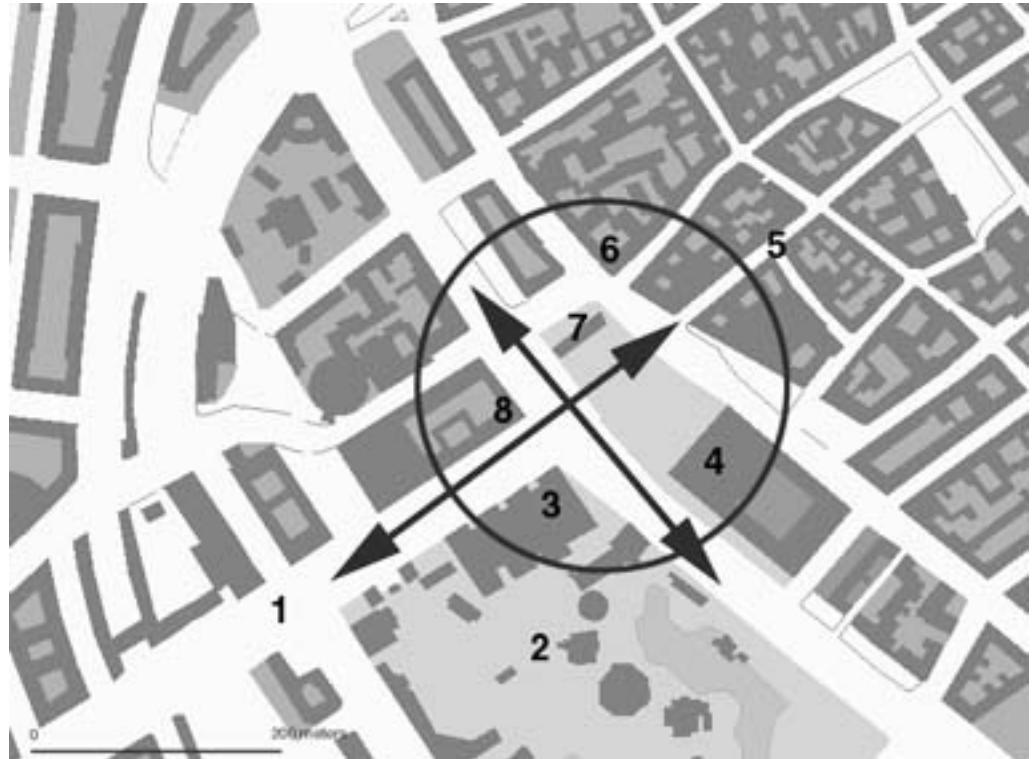
telemedicine. This is a question of life quality.

In analyses of our physical world we should try to look at cities and places from another angle. As mentioned before, we normally use metaphors from the physical world to describe phenomena in the virtual world. On the other hand, we may seek to analyse places by means of metaphors taken from the virtual world. In order to establish how the worlds meet we could, for example, analyse the City Hall Square in Copenhagen by means of a metaphor taken from the Internet.

As a matter of fact, the City Hall Square has more references to "Yahoo" than to any classical architectural ideal. Though the City Hall Square is one of the most centrally located squares in Copenhagen it is not a place where people stay very long.

Nevertheless it is an extremely important place in Copenhagen because it functions as a transit zone (Ovesen, 1998). Yahoo is also a place where people do not stay very long, but it is a place of transit between your home computer and the things you are looking for on the web.

We are not going to analyse the City Hall Square in detail here, but would just like to mention that on and around the square we find all the same elements as we find on Yahoo: an information kiosk with electronically controlled displays concerning bus traffic, advertisements on buildings very similar to the banners found on Yahoo, short news items in the form of rolling text on a huge display on the building belonging to the newspaper "Politiken" (one of the largest national newspapers in Denmark which, by

the way, is making a huge effort to create traffic on its web site), information about the weather, etc.

The City Hall Square actually encapsulates a historic moment, marking as it does the transition from the medieval city centre to the east and the modern industrialised city to the west. The square could also be said to be an instant picture of the transition from a modern city to cybercity.

We can also use other art forms in our analyses. For example, the way in which cities are described in films such as "Blade Runner" gives us an interesting impression of the meeting between the virtual and the physical world, despite the gloomy, utopian urban universe it depicts.

Our preliminary conclusion is that we must

continue our reflections, and that we must to an increasing extent include sociological studies about information technology in them. Our reflections must be translated into concrete analyses and experiments as to how the virtual world and the physical world should be articulated.

This is not the first time architecture has been confronted with new technology with far-reaching societal implications. Art and architecture from the 1920s are particularly interesting, and we are convinced that we can learn something from this particular part of architectural theory and history. It would therefore be appropriate to conclude this sketch reflection concerning the significance of information technology in architecture by quoting Le Corbusier, one of the architects who introduced a great deal of innovation into architecture on the basis of reflections concerning technology, society and architecture.

> "We are living in a period of reconstruction and of adaptation to new social and economic conditions. In rounding this Cape Horn the new horizons before us will only recover the grand line of tradition by a complete revision of the methods in vogue and by the fixing of a new basis of construction established in logic. "In architecture the old bases of construction are dead. We shall rediscover the truths of architecture until new bases have established a logical ground for every architectural manifestation. A period of 20 years is beginning which will be occupied in creating these bases. A period of great problems, a period of analysis, of experiment, a period also of great aesthetic confusion. A period in which a new aesthetic will be elaborated."
> (Toward a New Architecture, 1927).

Figure 3 (top left). City Hall Square. Top: The square seen from the east with weather report and advertisements. Bottom: The square seen from the south with information kiosk at the front and Politiken House at the back.

Figure 4 (bottom left). Still picture from the film Blade Runner (WB, directed by Ridley Scott, 1993)

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