Tectonic Transformation

The Architect As An Agent Of Change

Schmidt, Anne Marie Due; Kirkegaard, Poul Henning

Published in:
Proceedings from Annual symposium of the Nordic Association for Architectural Research

Publication date:
2006

Document Version
Early version, also known as pre-print

Tectonic transformation - the architect as an agent of change

Anne Marie Due Schmidt
Poul Henning Kirkegaard

Introduction

The product of architecture is not only buildings and spaces. Architecture is also the development of new knowledge, organizations and techniques – all matters of technology – or so it should be. The development of technology is important to architecture itself and to society in general because it sets the boundaries to what is possible and what is not – it acts as a structuring mechanism to our (building) culture. The technology available affects the language of architecture and the changes in the architectural language should likewise affect the technology. However, in the Danish building industry today there is a lack of development of new technology. This does not only increase building prices, it also limits the architectural language.

The concern with technology in connection to architecture can be found in the writings on architectural tectonics by writers such as Eduard Sekler (1965), Vittorio Gregotti (1983), Marco Frascari (1984), Kenneth Frampton (1995) and Anne Beim (1999). To use tectonics as the theoretical frame to talk about architecture is a way of balancing between two extremes: it rejects the thought of architecture as free art by pointing to how conditioned the architectural expression is (by aim, materials and techniques) and it rejects the thought of building as merely fulfilling a need by pointing to the cultural significance of architecture. The writings on architectural tectonics generally see the product of architecture to be architectural edifices and the makers of tectonic architecture to be a limited number of architects whose ability to create tectonics is primarily explained by talent. The framework of tectonics is, however, poignant because through tectonics the architect can change from a passive consumer of technology to a critical user and developer – thereby taking on the role of an agent of change. As such tectonics is continually an important frame for describing and assessing architecture.

Recently another writer on technology in connection to architecture, Paolo Tombesi (2005), has undertaken studies of tectonic architecture from an economic point of view. Tombesi introduces an understanding of tectonics not only in terms of the built edifice but as long term effects of the building industry and with this view, the architect's role as an agent of change becomes important not only within his own sphere of architecture but also on a broader societal level.

The aim of this paper is to discuss why there is a lack of development of new technology (understood broadly as technique, knowledge, organization and products (Müller, 2003) in the building industry and how the architect can affect this by becoming an agent of change. Jørn Utzon will be used as an example of such an architect and the composition of the building industry will be used as an explanatory frame to understand the difficulties in this development.

Tectonic architecture and the building industry

The tectonic tradition was incepted and had its peak in connection to the master-builder tradition in architecture where the design was carried out on the building site as a direct response to materials and structure. Since then, the building industry has become increasingly complex and this has confronted the tectonic tradition with a number of challenges.

Firstly the scientific tradition devaluated the master-apprentice learning of the master-builder and introduced a split between the architect and the scientifically based engineer. Two very different practices developed and the distinction made it difficult for the scientifically founded engineers to support the design process. The empirically based tradition simply has difficulties coping with the creation process of the architect that attempted to create contextual solutions that suited the actual problem at hand (Schmidt, 2005). Secondly the industrialization weakened the connection between design and execution (Beim, 1999). This happened in two instances; firstly through the industrial production of building components was introduced that had the intention of moving the production of buildings out of the building sites and into the factories to ensure cost-effective well-produced components. Secondly it happened through the introduction of a tendering system where tenders were invited to bid on the project after the design was finished. This meant that the ability to create tectonic architecture with a close relationship between the expression and the materiality was limited when the architects and engineers had to choose from off-the-shelf building components and could not work closely together with the building industry and craftsmen in the development of the design.

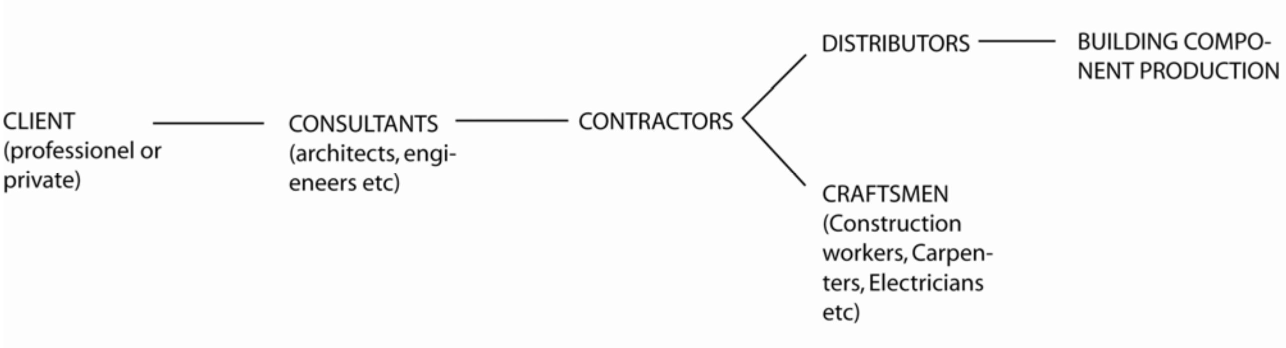

Figure 1: Building industry (general contract)

While there are many reasons for this organization of the building industry – free competition, qualified workers through division of labour etc – it is also one of the explanations of the inertia of the building industry. The split between the design team and the industry makes cheaper and easier to choose an existing product from the shelf than to challenge the technological ability of the industry – and this on the other hand makes the industry less developing because they experience that there is no market for new products.

To understand the extent of this problem, one can look at the Danish building industry that is the least developing sector in the country. This is underlined when comparing the number of companies that develops new products in the building industry is remarkable low (37%) compared to other business areas.

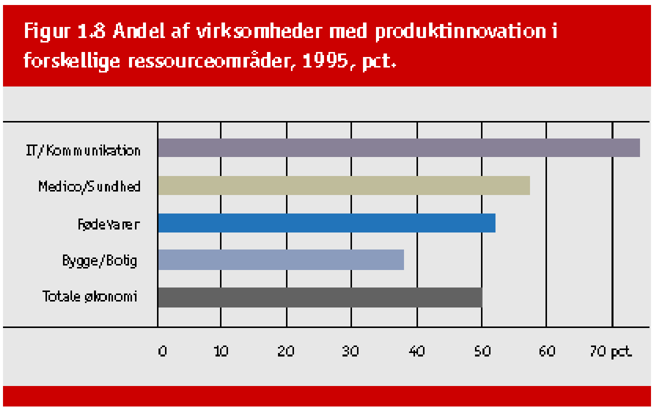

Figure 2: Share of enterprices with product innovation in various ressource areas, 1995. From the top the legends say IT/communication, Medico/Health, Foodstuff, Building/Habitation, Total economy. (Erhvervsfremme Styrelsen, 2000)

The Danish Commerce Agency characterizes the problems of the industry as “The gain is greater if one prevents innovation. So that is what most companies do.” (Erhvervsfremmestyrelsen, 2000). A new solution is more expensive and holds the risk of delaying the project due to unforeseen problems in the development and therefore it is economically sounder to stick with the standard solutions. This becomes even more explicit because all the actors in the building industry earns well on the system as it is now (Erhvervsfremmestyrelsen, 2000). The question is whether this will continue with the increasing competition from other countries.

From a societal point of view, there is a great loss connected to this system, however. On an architectural and cultural level there is the loss of tectonic architecture that speaks to both the body and mind. Kenneth Frampton (1995) has pointed towards how European policies only measure architecture in terms of economy and market forces, thereby reducing architecture to a commodity that does not recognize the cultural value of tectonic architecture.

Secondly, there is the loss of development of appropriate technology. Paolo Tombesi, deals with this problem from an economic point of view. In his view architecture contributes to society through long term economic benefits for the companies developing products, knowledge, technique and organization in the building process. The society benefits through taxes and jobs. However, Tombesi argues, this potential is often not exploited due to a focus solely on reducing costs of building projects through short project deadlines and economic goals that forces the use of standard solutions. He compares the changes to the building industry as a result of two projects – the Sydney Opera House and the building of the Olympic Village in Sydney. The Sydney Opera House meant a huge leap forward for the Australian building industry but it was heavily criticized for not being on time and budget. The Olympic Villa in Sydney, on the contrary, was on time and budget but no innovation happened. The latter should be seen as the greatest failure because it failed its potential as a site of development (Tombesi, 2005).

Architecture is as such more than the buildings actually built; it is also a process that can lead to the development of new technology. One of the examples of this is Jørn Utzon, who is a good example of the architect as an agent of change.

A human experience

Having won the architectural competition of the Sydney Opera House in 1957, Jørn Utzon immediately began work by gathering a team of advisers. The first acoustician the Danish Vilhelm Lassen Jordan could have taken one look at the competition entry and shaken his head and concluded that his new partner was an illiterate with regards to room acoustics – Utzon's auditoria resembled Greek theatres with a circular ground plan. In terms of acoustics there is a significant difference between modern and Greek auditoria; the Greek theatres were outdoor spaces that relied on the direct sound from the speaker to the audience while modern auditoria are covered spaces where the walls and ceilings of the space support and enhance the sound coming from speaker or musician.

The advice from the acoustician that was invited to participate in the project was highly needed but the collaboration between Jordan and Utzon was troublesome because Jordan's understanding of creating acoustically sound spaces was to get as close to the classic European concert halls that were known to work – he worked from an empirically based number of inspirations. That was not what Utzon wanted for the Sydney Opera House; the European concert halls were box-shaped and would be difficult to fit under the sails. Utzon had difficulties accepting that there was only one solution to geometry of the halls and when he read about the Berlin Philharmonie where the architect Hans Sharoun and the acousticians had introduced a completely new geometry, he contacted Lothar Cremer and Werner Gabler who were the acousticians on the project. This collaboration was to become very influential to Utzon. When Cremer and Gabler got involved in the project in 1962 their main concern was not primarily to push the architectural project further, rather they first focused on teaching Utzon and his team a number of fundamental principles of acoustics. One of the means to do this was to introduce the architects to two rooms – one with only absorptive surfaces and one with only reflective surfaces which led Utzon to understand the effect of reflections which is the most significant difference between the Greek theatre and the contemporary auditoria. He came to understand that the room itself becomes a music instrument and colours the music of the orchestra that plays in it. Also a number of empirically based 'rules of thumb', such as the maximum difference between direct and reflected sound, enabled Utzon to work creatively with the field of room acoustics.

At the end of Utzon's involvement in the Opera House project, he drew up a report that also included remarks on the acoustical development: "... it is creative work because such a thing as "This is right" or "This is wrong" does not exist. The solution can only be found by experiment and my experiment became actually realistic only after I had learned how sound behaves. It takes a long time, and good co-operation with acoustical engineers, to understand the properties of sound." (Utzon, 1965, p. 2). That Utzon learned about the field of acoustics is not only evident from his own writings, an examination of his subsequent architecture, testifies that he actually learned and came to understand the field of room acoustics very well. Bagsværd Church – drawn by Utzon in 1973 – clearly shows that this piece of architecture is created by an architect who has an inherent understanding of acoustics. A church is one of the most complicated types of buildings from a room acoustic room point of view but Bagsværd Church is a talented solution to the problem of combining acoustic quality for both song and speech – an inherent problem to churches (Mortensen, 2005). The convex curves of the ceiling are used to radiate the sound quickly towards the audience while the higher part of the ceiling maintains a large volume. The sculpting of the convex curves of the ceiling shows Utzon's understanding of the fundamental principles of room acoustics and this church room must be said to be one of the most unique spaces in Danish architecture. This is even more impressive since there was no acoustician involved in the project.

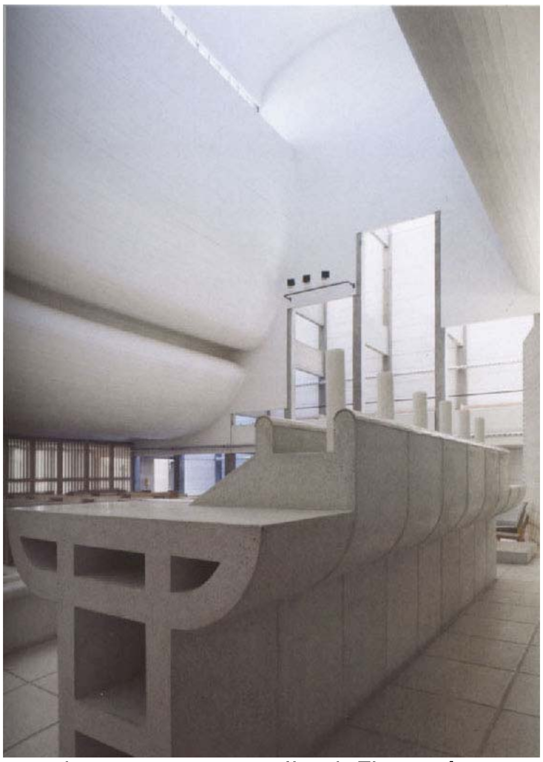

Figure 3: the interior of the Major Hall in Sydney Opera House that was never realized. Figure 4: Bagsværd Church interior.

In the design for the auditoria in the Sydney Opera House, it was not only the human experience of the space and the acoustics that played a part. Also the construction of the spaces was significant. Utzon was fascinated by the very advanced Australian ply-wood industry that was able to produce the longest ply-wood sheets in the world at that time. Furthermore a particular factory close to Sydney had developed a method for creating a stiff composite building material by adding a layer of lead between the wooden layers. This material was normally used for train carriages but the material had the perfect acoustic properties for the auditoria and Utzon and the factory developed a building system that would enable the auditoria ceiling to be assembled like a giant jigsaw puzzle where the pieces from the manufacturer would be ready for assembly at the building site without further refinement or adjustments. Utzon's famous quarrel with the Australian Government about the Sydney Opera House was rooted in this attempt to develop solutions to his design directly with building component producers. This had been his working method in the previous parts of the design as well, for the cladding of the sails of the Opera House for instance, he chose to develop a solution in collaboration with a Swedish tile producer. When tenders were invited to bid on the project, the design was already based so heavily on one manufacturer technology that it was difficult for other bidders to compete. Utzon argued that this gave the cheapest price because the design was developed with the technological abilities of one producer in mind with the result of a cheap and quick production. The Australian building industry, however, were highly unsatisfied and this was one of the reasons behind the dismissal of Utzon from the project in 1965 (Weston, 2001).

Utzon's approach to building projects can be said to attempting to re-create the master-builder position in an industrial age. Firstly Utzon attempted a close collaboration with the other consultants in order to be able to design in a way that solved the requirements of all the areas in one instance. Secondly he attempted to collaborate closely with the building industry.

The message here is not that there is a need to re-instate the architect as a master-builder but rather that there is a need for the architect to realize his potential as an agent of change both within the existing building industry as well as through a change of the building industry.

The architect as an agent of change – individually, professionally and socially

Utzon can easily be characterized as an agent of change. His acquired understanding of technical fields and the industrial production methods enabled him to create architecture that was far from being neither a solution to a technical problem nor solely a free artistic expression – he was able to create tectonic architecture. And through this tectonic architecture he was able to change the building industry as well.

There are a number of lessons to be learned from Utzon. Firstly that the individual actor needs to recognize their role as agents of change – instead of waiting for the technology to be developed, the architect can spark the development.

Secondly, there is a number of inherent problems against tectonic architecture and the development of technology in the lay-out of the building industry that Utzon also experienced in his work in Australia. The Danish Government has already become involved in suggesting changes to the tendering system, supporting new organizational structures of the building industry in public building projects and suggesting a focus on innovation through increased research and development activity. However, the changes to the Danish tendering system during the last years have not yet had the expected effect (Feldthaus, 2004). In this area there is therefore a need for a deliberate effort of the profession of the architects and not only from the individual architect.

Thirdly there is the lesson to be learned that architecturally experimenting large-scale building projects holds the potential to become sites of development of technology. This does not mean that architectural projects should not have limits in terms of time and economics but rather that society in general would benefit from acknowledging this characteristic of building projects. As Tombesi argues, one could imagine innovation to become a parameter on which competitions for large-scale public building projects would be measured.

The polemic point of this paper is thus that to ensure the ability of architects to create tectonic architecture, the whole building industry needs to be affected. Therefore the architect needs to act as an agent of change both individually, professionally and socially.

References

Beim, Anne (1999) *Tectonic Visions in Architecture*, 1st edition, Royal Danish Academy of Fine Arts, School of Architecture, Copenhagen.

Erhvervsfremme Styrelsen (2000) *Byggeriets fremtid - fra tradition til innovation, erhvervs og byggestyrelsen* [Internet], Available from: www.ebst.dk/publikationer/rapporter/byg_frem/index.html [Accessed March 24th, 2006]

Feldthaus, Per (2004) Ud af elfenbenstårnet [Out of the ivory tower], *Arkitekten*, volume 106, no. 3, march 2003, p. 34.

Frampton, Kenneth, (1995) *Studies in Tectonic Culture - The Poetics of Construction in Nineteenth and Twentieth Century Architecture*, MIT Press, Cambridge Massachusetts.

Frascari, Marco (1984) The Tell-the-Tale Detail, *VIA* no. 7, Graduate School of Fine Arts, University of Pennsylvania, p. 22-37.

Gregotti, Vittorio (1983) The Exercise of Detailing, In: Nesbitt, Kate (editor) (1996), *Theorizing a new agenda for architecture – an anthology of architectural theory 1965-1995*, New York, Princeton Architectural Press, p.494-497

Mortensen, Bo (2005) Akustikken i Bagsværd kirke. In: Utzon, Jørn; Weston, Richard; Bløndal, Torsten (ed.) (2005) *Jørn Utzon Logbog Vol. II, Bagsværd Kirke*, Edition Bløndal, Hellerup, p. 152-155.

Müller, Jens (2003) Conceptual Framework for Technology Analysis, In: John Kuada (ed.) (2003), *Culture and Technological Transformation in the South: Transfer of Local Innovation?* Copenhagen, Forlaget Samfundslitteratur.

Schmidt, Anne Marie Due and Kirkegaard, Poul Henning (2005) Navigating towards digital tectonic tools. In: Conference of the Association for Computer Aided Design In Architecture, October 13-16, 2005, Savannah (Georgia), *Smart Architecture: Integration of Digital and Building Technologies*, p. 114-127.

Sekler, Eduard (1965) Structure, Construction, Tectonics, In: Kepes, Gyorgy (ed.) (1965) *Structure in Art and in Science*, Studio Vista, London, p.89-95.

Tombesi, Paolo (2005) Iconic Public Buildings as Sites of Technological Innovation. *Harvard Design Magazine* 21 [Internet] Fall 2004/Winter 2005, Available from: <www.gsd.harvard.edu/research/publications/hdm/current/21_tombesi.html.>

Utzon, Jørn (1965), *Report on Acoustics*, Unpublished, Mitchell Library Collection, ML MSS 2362/21, Sydney.

Weston, Richard (2001) *Utzon,* 1st edition, Germany, Edition Bløndal.