

DESIGNING QUALITY WITH A SUSTAINABLE PROCESS

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Abstract

With the necessity to build a sustainable society the process and the interaction between the actors involved must also be sustainable. The actors involved need to work together with a joint ambition.

How can the actors involved communicate and collaborate in a better way to achieve a good product?

The objective of this paper is the question of how the actors involved can achieve better results if the right orders and resources are given by the Construction Client. A discussion about how the architectural education in Sweden supports the architects to take a leading role in the development of a sustainable society will also be a part of this paper.

The method of performance of this research contains literature reviews and a summary from performed questionnaires and interviews. The result is an overview of how different factors can support a better communication and collaboration between the actors involved in a sustainable building process. The contribution of this research is a proposal of how architectural knowledge and collaborative work can be used designing a sustainable built environment.

Keywords: collaboration, communication, design process, knowledge management, sustainable process

INTRODUCTION

With a long-term perspective the ambition is to produce buildings with sustainability, energy efficiency and good quality. We are all facing a future challenge to work with consideration regarding the environment. The new challenge is to use long term thinking combined with the ecological, the economical, the technical and the social perspective in the process. The tradition has been more of short term planning and bad communication between the actors involved. The effect of this way of working has been: high costs, unsatisfied clients and customers and a bad reputation of a non-considerate sector. Re-construction has been necessary immediate after some projects and insurance companies offers insurances for problems in newly built houses. If there is a possibility to prove that sustainability can give positive effects for the construction client, the construction company and the society, good arguments for long term thinking can be given.

The users' requirements and the factors for life quality should also be translated and transferred into the building process. To solve the issue of securing life quality into the end-product, the actors involved need to work together with a joint ambition. The process is becoming more and more complicated and the keyword is communication.

Interaction between the actors involved in the building process is of great importance regarding knowledge management and organizational learning. Problems are identified

regarding the communication gap between the different actors that are responsible for the result. The gap between the actors in the building process can give problems with poor quality in the end-product. A house is more than a product and the product is a home or a working-site and must be both useful as well as sustainable. A collaborative way of working can give the consultant team the right spirit and their knowledge can better be used in a safe atmosphere. The building process can be both joyful and satisfying if you can use your skills and competence. There is however both obstacles and possibilities for the architects and the other actors involved when working in this kind of process

The architect can be an important actor who handles the complex process and transferring of the end-users needs into the building process. Architectural knowledge can maintain the holistic view during the process and add both social and human values. The tools and preparations for this role must be given during the architectural education. Does the architectural education support the role of handling a sustainable process and a sustainable product? In the design process both design models and quality tools could be used to support the architects' role and also support a better learning from experiences made in other projects. Better knowledge and understanding of building materials, technology, energy systems and economy could also be useful.

Different authorities and documents declare the possibilities with a planning process close to its residents in every municipality. Several models and methods are used with the ambition to make people more involved in the planning process. There is a challenge to get a sustainable process as well as the development of the society. The professional actors involved are used to work without "interference" and people are used to leave the work to the experts. Working conditions and regulations encourage everyone to participate actively in shaping the surrounding environment in order to increase the social durability. End-users' participation during the construction process will contribute to building better products that fulfil their needs and requirements. Meanwhile the real estate administrators will achieve a long term economic success if all renters are satisfied and prolonged their contracts. Contrary for the individuals, both the social value of health aspects are possible to influence in shaping the living environment and working-places. Previously, building one's own house was much easier when materials were accessible locally. Nowadays, the modern construction process is more controlled by standardisation and rationalisation and thus removing the end-users from the process.

Co-operation and a joint ambition are essential if the different actors involved in the building process will be part of a sustainable development. A stronger co-operation between the architect and the engineer during their education period by both students architect can lead the way to a better teamwork in the construction process

The question in this paper is how the education supports the architects' role in designing quality and sustainability. When focusing on the end-users needs and requirements there seems to be a positive effect for the actors' ability to cooperate.

METHOD OF PERFORMANCE

The method used is participation in a dialogue with different actors involved in the building process and in the educational system. Interviews and questionnaires are used to present different perspectives on the issue. Sustainability and how the inhabitants contribute and are involved in the developing process are described with different sources. An evaluation from the Swedish institute Formas point out some recommendations and connects to the question of research, education and the sustainable development and knowledge.

The architect's role is to interpret the end-users' needs and requirements from which they will be converted into the planning and production process. The education system provides tools to express the architects' ideas but less is focus on the technique to interpret the end-users' needs. Changes in the architect's education system are on-going which is geared to meet the active participative role in the construction process of a durable society. This paper presents in short descriptions from architectural schools in Lund, Gothenburg and Stockholm. After contacting the different schools and asking them how their education deals with the theme a short overview is presented.

The Swedish Association of Architects describes their Program for Professionalization recommended for architects with a few years of experience from working-life. In order to gain an understanding on how professional architects' view the research problems, questionnaires were used in June 2009. This group of twenty professional architects answered questions about their perspective on the architect's role in a sustainable development and how their education supports it. They give their perspective on the architect's role when developing a sustainable society and identify gaps in their education regarding sustainability.

A SUSTAINABLE PROCESS

The term sustainability can be described in different perspectives and with different interpretations. The UN's Conference on Environment and Development in Rio de Janeiro in June 1992 was characterised by the awareness that the healthy environment and societal and economical developments presuppose each other. Both social and democratic processes as well as national economy relate to the development and are restricted by the limits of the earth's ecosystem. The Rio-declaration and the action program for the twenty- first century, Agenda 21, dedicated to find solutions to the world's major environmental and developmental problems. Solutions according to this program were to work local with the task for the municipalities to take measures to attain a sustainable development. The UN Conference on Human Settlements, Habitat II held in Istanbul in 1996, proceeded from the assumption that sustainable development must be shaped locally where people live, where companies develop and from where societal activities take place. A prerequisite for this is that municipalities take on a key role in planning. Documents from this conference declare every person's right to adequate shelter and a good every day environment as a prerequisite for future generation's quality of life and a sustainable development. As an example from the Agenda 21 work in Sweden the city of Helsingborg the Chairman of the Agenda 21 Management Group stated in 1999 that: *"I believe, for my part, that a necessary prerequisite for an effective environmental effort is that residents are able to influence the changes and the targets set, and that they can democratically determine the conditions. Helsingborg is therefore endeavouring to plan, in co-operation with the residents, to make administrative processes more democratic with regard to planning."*(Mårtensson et al, 2001)

The National Board of Housing, Building and Planning (2000) presents a toolbox for conducting comprehensive planning with environmental issues at the centre. They describe the considerable potential to develop a dialogue around environmental objectives at an early stage. A key issue have been to enhance collaboration in the process among the different areas of professional competence, the decision-makers and the general public. Tools and methods that can be useful are presented in a Catalogue of ideas like; Focus diagrams, mental maps and Multi Criteria Analysis. A good dialogue between different actors is important as well as systems for documenting conditions and for visualising and analysing alternatives like GIS is mentioned as useful tools. One future threat may be a gap between computer technicians and

other actors. Technology may be so advanced that only a few specialists will be able to manage the programs.

In 1998 The Swedish Agency for Civil Emergency Planning (ÖCB) appointed an expert group that formulated its vision of a robust and persistent society with a high quality of life for all inhabitants (Ericson et al, 1999). The group worked in the field of safety in administration, building and rebuilding with a Governmental task to make society robust and sustainable. They pointed out the Planning and Building Act and other legislation as important tools as well as foresight planning and decisions made by politicians, employees and general public. Their vision:

1. *Societal development shall aim at the creation of safe, functional and long-term secure living environments. This is based on a comprehensive view of the connections between housing, working, education, care services, healthcare and facilities.*
2. *Decisions affecting a living environment shall be made by the people involved or by others as close to them as possible. Local participation, social identification and fellowship are all factors that help inhabitants stand up to external threat. A secure and sustainable living environment can only be created when inhabitants feel they are part of a local society.*
3. *The local society gives people a social base. Communication and access give citizens the possibility of taking part in the larger society's rich diversity, adding to both their own development and society's.*
4. *The society's technical support systems shall be "user friendly, planned and constructed according to ecological policy. Demanding and complicated technology shall if possible, be combined with local reserve systems.*
5. *Eco cycles and environmentally adapted technology are prerequisites for sustainable development. Local preparedness in terms of food provision and technical services in combination with a strong social network improve resistance to crisis situations. The development of local self-sufficiency up to survival level should always be given priority.*

The sustainable process hopefully produces a sustainable building but it will ultimately change the way we live. The green architecture may contain changes in how to handle the every day life in order to be more considerate about the environment. Architects who are seeking to change the relationship between the buildings and the environment with the ambition of green architecture are described by Wines (2000). They are dealing with conversions of elements like environmental technology, energy conservation, sustainability into architecture as art. There can be a conflict between the commitment to ecological design principles, versus an "*overly righteous moral posturing and a failure to convert noble objectives into an equivalent artistic expression*". Wines also declare a more philosophical viewpoint to the art of building in the Age of Ecology and refer to a mental state of transference and the re-awakening of an expansive sense of "oneness" with nature. He wants to identify the motivational ideas behind each architects' approach to the challenge. When referring to the historical perspective this period have the potential of being the most challenging periods of architectural innovation in history. For the first time there is an opportunity to "*invent the future in terms that are sociologically and ecologically responsible*". Cultural and economic change with strong industrial and technological influences belongs to the past. The new challenge is an evolutionary stage with environmental architecture as a tool for development.

Green architecture and a sustainable development require new way of working together. The architectural education can support the role to be the actor that facilitates the creative and dynamic process. New combinations of different technological solutions must be developed in order to achieve a more earth-friendly architecture. The end-users requirements and needs can be the driving force to the process.

THE ARCHITECT'S ROLE

The Swedish Association of Architects declares in their political program in February 2008 that the architect should be more responsible in issues concerning sustainable development and become more useful in society. Both social and human values must be added and kept during the building process. Questions about regulations, economy and technology dominate the dialogue between the actors involved. The holistic view and the values that are of importance for the end-users can be handled by the architects if the task is given. Building a sustainable society needs a sustainable process and good cooperation between the actors involved. The solutions and ideas to design sustainability need the knowledge and experiences that are known, combined with new ideas and new knowledge. It is of great importance that the management of knowledge is given the right resources to flourish. A good leadership and teamwork can provide a creative and dynamic environment that supports the individuals to use their skills.

It is important to be aware of how to manage the human resources and the human assets of the organizations (Handy, 1993). The individuals find new capacities within themselves and learn how to interact more productively. The challenge is to understand how to channel this process of learning and discovery. Handy mention three major methods of individual learning: Formal education and training, group learning and assignment or planned experience. Knowledge about communication is another useful tool for the actors involved in the process. Kreps (1990) describes the different levels of communication in organizations and refers to Weick who talks about communication as the crucial process performed by organization members and human interaction as the central phenomenon. Kreps presents a model for therapeutic communication to enable individuals to communicate more effectively to achieve their goals and work with problem solving. Key aspects for the communicators to identify are: empathy, trust, honesty, validation and caring. The actors involved have to understand both their individual as well as their mutual activity (Weick 1995). Sensemaking is described as a social ongoing process and Weick states that organizing and sensemaking have much in common.

New way of thinking and the development of new products require individuals with the right attitude towards the task and towards other actors involved. The consultants that are involved in the building process share responsibilities both towards the construction client, the end-users and towards society. The architect can be the key person who transforms end-users' demands, needs and requirements during the construction process where the construction documentation are formulated. Changes that must be made in the everyday life when dealing with developing a more sustainable society need actors that can show the way of how to do it. The change agent is another word for the person responsible for effecting changes to design and can also be used in construction (Emmitt & Yeomans 2001). Architectural education can support and prepare the students for the pedagogical role as well as a communicator in the building process. The skills can be used when involving the users and when communicating to all other actors.

Architectural research

The Swedish institute Formas initiated an evaluation of the research at the Swedish schools from the years 1993-2005 (Forsse, 2006). A group of internationally renowned experts evaluated the research in order to assess the scientific quality in an international perspective. They stated that: "Architectural research in Sweden has traditionally excelled in areas with a high social relevance and strong human content, such as sustainability, housing and workplace design, and has been distinguished by its close attention to physical and social realities." A first recommendation from the expert panel is to open a dialogue between the various schools. This can give a more efficient research strategy that can strengthen the Swedish Architectural research when using the resources more efficient. The retirement of a large proportion of researchers is the most serious immediate problems; almost half of the researchers are over sixty years old. A rapid and effective action to recruit younger researchers can be difficult because of the career structure and the lack of post-doctoral opportunities.

The expert group also looked at the relevance of research to a sustainable society. They found out that the way the terms sustainable development and sustainability have been interpreted by the researches has not always been precisely specified. Different schools adopt the term sustainability as a strategic research subject in different ways. The term has been investigated in architectural research and introduced into teaching programmes at Chalmers University of technology, Blekinge Institute of Technology and the Swedish University of Agricultural Science. No explicit statement about the strategic importance of sustainability is made in KTH documentations according to the evaluation. The interrelations between different dimensions should be dealt with in the research. In order to identify the interrelationship between environmental, economic and social dimensions a systemic approach can be applied. In a Post Occupancy evaluation can be a sectored contribution rather than an interdisciplinary one, if it deals with the different dimensions. When the expert group describes the research subjects that explicitly address sustainability the state that: "Research on these subjects illustrates the integration and application of knowledge generated by several disciplines and professions without which the interrelations between the key dimensions of sustainability could not be studied effectively". The expert group recommend :

- A better co-ordination and networking between researchers from different institutions.
- Further investments can be made by pooling resources and improved co-ordination.
- Chalmers that appears to have the highest concentration of resources should co-ordinate research on sustainable development.
- The amount of funds for research on sustainable development is likely to increase in the near future and researchers can therefore be proactive and envisage applying for financing.

Architectural education in Sweden

The architects' education can support the professional role as facilitator in the process of involving the end-users. The end-users knowledge can also be of great importance to make sure that the process is going into the right direction.

Answers from a questionnaire identify knowledge gaps and both the student as well as the professional architects argue that there is a weakness in the current foundation that is unable to support the end-users' involvement in the construction process while simultaneously be active in the whole process (Svetoft, 2008). The professional architects require a model and method to communicate better with the end-users. An option which is possible is to employ briefing and analyse method from the design stage where the end-users needs analyse and

then the information can be tested as a prototype. They also express their wish for more co-operations with engineer students during their education. If they could work together in projects during their education they could earn more knowledge and awareness of the differences and be more prepared for their working-life conditions. The respect for each others skills come from the knowledge and can surely make it easier to communicate and create new ideas together.

New educational programmes at both Chalmers University of Technology in Gothenburg and Luleå University of Technology combine engineering and architectural education and create new actors in the building industry. At Campus Helsingborg and at Mid Sweden University in Östersund you can find programs with building engineering combined with architectural and environmental knowledge. At the University of Umeå a new architectural education will start at fall 2009. In the official presentation of the program some new ideas are described. Co-operations with for example building engineering- and design programs are planned. Terms that is important for the new architectural education is communication and co-operation as well as sustainability. These new students will become actors in the building industry and can hopefully bridge the gap between the different disciplines. The architectural schools in Stockholm, Gothenburg and Lund are working with some interesting changes and will combine this with research and strategies that will develop new ideas. The education is in many ways connected to the ongoing research work by the personal resources and their knowledge used when teaching and developing the programs.

Lund Institute of Technology

In the new curriculum (2009/2010) for the third year at the architectural education in Lund skills for developing a sustainable society will be achieved. The idea is to introduce the terms in the first and second year in order to focus to this area in the third year. The students can choose different courses with sustainability as a theme. The design of urban places and environments are in focus at the department of urban design. The education deals with courses in environmental planning and sustainable urban design.

A two-year studio-based course of study gives the student a Masters degree in sustainable urban design. *“The Masters degree in sustainable urban design produces highly skilled and creative professionals capable of making the worlds’ growing cities into healthy, attractive and sustainable places”*. (www.stadsbyggnaad.lth.se 081211)

Chalmers University of Technology, Gothenburg

In the general description and curriculum of the architectural education in Gothenburg mention that courses in sustainable development can be chosen as a complement. Students will learn the principles of building technology for example how to create a good indoor climate without any waste of energy. *“you will also learn how to contribute to a long-term sustainable development of the society”*. (www.chalmers.se 081211)

Chalmers Architecture has a master program called Design for sustainable development. The purpose of the course *“Sustainable development and the design professions”* is to provide all students *“with a foundation and an ability to creatively and critically consider and reflect on questions related to planning, design and management of the built environment within a context of sustainable development”*.

Royal Institute of Technology, Stockholm

In the Master of Architecture programme *“Architects work with the development of future society in its widest meaning.”* (www.kth.se, 081211). In the fourth and fifth year at the Architecture program students can choose different studios

The Sustainable design studio: *"In order to develop new strategies for designing a sustainable society, this studio emphasizes economy, ecology, energy and new technology in relation to architecture and urban design"*.

The Urban studio: *" This studio discusses sustainable urban development in terms of globalization, climate changes, mega cities and urban strategies- transformed into new typologies and innovative urban design"*.

The Swedish Association of Architects

After the architectural education The Swedish Association of Architects offers new steps to be more professional and learn more of the process and discuss the role based on experiences after a few years of work.

"The program for professionalization of the Swedish Association of Architects addresses the generic competences for management in building and planning. These are the same regardless of the objectives of the built environment. However we do discuss issues concerning the professional ethics regarding long term ecological consequences, social awareness in the daily work and the economics of life –cycles in buildings. In step 1 we specifically present environmental quality systems as applied in architecture and the new standards for environmental performance developed by ByggaBoDialogen. We discuss with real estate managers how they manage cost, time and quality in projects. We also discuss methods to enhance the collaboration between engineers and architects in order to develop the new technological solutions that can meet the environmental demands on the building. In step 2 we specifically discuss the mechanisms of collaboration in teams, communication methods, the client relationship, how to formulate a business concept based on the architects knowledge and real estate calculation methods in relation to qualitative aspects." (Pehr-Mikael Sällström, Education and Research, Swedish Association of Architects, 081215)

Professional architects attending the Professionalization program held by The Swedish Association of Architects in 2009 answered a few questions about their role and presented their view on the role in the development of a sustainable society. Several answers state the fact that both the competence and the will are there, and they want to be responsible for the whole process. There are possibilities to take a new role in society and to show the way to a more sustainable development. Several answers declare the need of communicating these goals in the early stages of the process and to have a good dialogue with the Construction Client.

The obstacles for working with sustainability are referring to economy and to the difficulties to argue towards a long-term solution in the building process. The conservative culture is also mentioned as an obstacle regarding the slow process to achieve changes in the building sector and the short-term view in decision-making. Another obstacle mentioned is the lack of knowledge and the stressed time-schedule in the building sector.

When the architects answer the question if they could have use for new knowledge or tools when working, several persons argue that the knowledge-level is low regarding sustainability and environmental issues. Structures and tools for communication must be developed and more methods for better collaboration must be used. To visit the building-site more often can give the possibility to have a better dialogue with other actors involved. This can also give the positive effect to learn more and use experiences from the construction company as well. The architects also discuss the idea of using full-scale projects as role-models in order to achieve better products.

CONCLUSIONS

The challenge to work successfully with a sustainable development of our society requires a better cooperation between the actors involved. All inhabitants have the right to be part of the planning process in order to create a safe, healthy and social sustainable environment. All the knowledge that is available must be used in order to solve these complicated problems concerning energy efficiency and environmental concern. The actors can share the responsibility and the Construction Client can give the necessary resources to the project. Quality in the end-product comes from using the available knowledge and skills from all the actors involved. The architectural education gives only a few tools for the architect to take a key role in future development of a sustainable society. Swedish schools and university develops their programme and courses in sustainability. The students and professional architects in the questionnaire express their wish to be a key part when developing a sustainable society. It is of great importance to actively take that role because it can be a good opportunity to be more responsible for the whole process. With the right education and if using resources effectively this can be a great challenge for the future.

There seems to be some obstacles in the lack of methods and models to communicate in the process. Results from the research also identify a lack of architectural knowledge in order to be part of the whole process. Possibilities can be found in different projects where a process with a joint ambition gives the right product. The possibilities can be the joy of working together with an important task- to create a sustainable environment with universal design concerning all people.

RECOMMENDATIONS FOR FURTHER RESEARCH

Research in the area is recommended to transfer results to students and use the resources better by coordination and networking between the institutes. Local work in municipalities is preferred when working with everyday issues with a long term perspective. A sustainable society is also about the social perspective and the positive experience of being a part of designing the environment. Therefore is the question of how to handle the end-users involvement in the building process of great importance. The obstacles can be in the culture, the attitude, lack of tools and lack of knowledge. Complex technical solutions and advanced systems require an understanding for the terms used in the discussion. To find new solutions different knowledge and skills must be used and co-ordinated. End-users, architects, engineers and craftsmen needs to communicate and co-operate in a better way to develop new ideas and solution. By transferring experiences from other sector methods for a sustainable process can be developed.

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