ENERGY EFFICIENCY AND PRESERVATION – SYSTEM THINKING IN A MULTIPLE CASE STUDY

Heidi Norrström[1]

ABSTRACT

The research project EEPOCH consists of a multiple case study. It has been carried out over three years, studying selected buildings restored within the Halland Model. EEPOCH was permeated by traditional system thinking for solving complicated problems during its first two years. Now in phase two a more complex approach is used as a complement, here called systemic thinking. The research design provides a methodology with a strong yet permissive structure for mixed methods, approaches and units of analysis. The overall approach is multidisciplinary, and extends across multiple fields. The units of analysis are energy efficiency, cultural and historic value, architectural values and use value, management and teamwork, laws and regulation. All units are applied on the selected buildings and on the teamwork in the conservation that was carried out. Appropriate methods have been chosen for each part and the results show that there are possible actions to recommend. Important methods are interviewing professionals and organising workshops. Professionals engaged in the heritage sector are participating, contributing with their experience and expertise and directing the research. Economic, environmental and social sustainability are uniting approaches in the necessary cooperation. There are two overall research objectives. The first is to design a theoretical model that is sustainable and application-oriented for an integrated balancing of energy and preservation demands. Could this be performed without diminishing the tangible and intangible values in our built heritage? The second is to explore and design a theoretical model for cooperation between involved professions and for a good working climate in the preservation process.

Keywords

Multiple case study, system thinking, energy efficiency, cultural and historic values, multidisciplinarity.

1. Exposition

The work that has been performed within the project EEPOCH, Energy Efficiency and Preservation in Our Cultural Heritage, mainly focused on physical and empirical data in the first phase from 2009 to 2011 [12]. The energy performance of buildings was calculated and their cultural and historic values assessed. The multiple case study has shown that energy measures taken may ruin historic values, but also that caution for these values may result in poor indoor climate and low thermal comfort. However, one of the chosen buildings shows that the two aspects can be unified and adjusted into coherence.

The process has been the focus during the second phase, which started in 2012. The aim is to illuminate interdisciplinary cooperation within the academic world and transdisciplinary cooperation between academy and practice. The key is an understanding of differences and similarities. A core action for this is to investigate the methods used within the different disciplines engaged in the preservation of the built environment, focusing on the architect, the antiquarian and the engineer. The study shows that all use different but similar methods and approaches.

The object for analysis is the Halland Model which started in the 1990s recession. The project was carried out over more than a decade, restoring buildings and built structures at risk. Geographically all objects are in Halland on the West coast in the South of Sweden. Sustainability, and even energy efficiency, was part of the concept as was management aimed at a sense of inclusion for the involved professionals. More than 1100 construction workers and apprentices were trained in traditional crafts while restoring about 100 historic buildings [14]. The documentation of the buildings and the preservation work carried out was accessible for studying. After an initial scan, three buildings were selected; Fattighuset, Teatern and Tyreshill. Engineers, antiquarians and architects who have been engaged in the conservation of these three buildings have been interviewed.

The second overall research objective is to explore and design a theoretical model for cooperation between involved professions and for a good working climate in the preservation process, and hence the exact and detailed measures, equations, historic document values

[1] Chalmers University of Technology / Department of Architecture, Sweden, heidi.norrstrom@chalmers.se

etc. are not of interest for this specific investigation but can be found in the licentiate thesis [22], published in 2011 at the end of phase one. Part two is a study about comparing methods and of understanding processes, but a short summary of the results from phase one follows.

1.1 Summary of the conservation results

The definition of A_{temp},in the following table is the area heated to +10°C or more. The new building regulation, BBR [7], equates existing buildings with new constructions in the demand for energy efficiency. If restored today none of the three buildings could meet the demands for energy efficiency and preservation. CO_2 emissions were calculated with the Swedish Environmental Protection Agency's emission factors [20].

Table 1 Comparing results for the three buildings.

	Fattighuset	**Teatern**	**Tyreshill**
Calculated energy balance, key figure	191 kWh per m^2 A_{temp}, year	146 kWh per m^2 A_{temp}, year	174 kWh per m^2 A_{temp}, year
Measured energy use, key figure	204 kWh per m^2 A_{temp}, year	122 kWh per m^2 A_{temp}, year	157 kWh per m^2 A_{temp}, year
Boverket's type code 826 statistic interval [8]	144-200 kWh per m^2 A_{temp}, year	123-185 kWh per m^2 A_{temp}, year	170-208 kWh per m^2 A_{temp}, year
Energy demands BBR section 9:2a and 9:3a	80 kWh per m^2 A_{temp}, year	80 kWh per m^2 A_{temp}, year	90 kWh per m^2 A_{temp}, year
CO_2 emissions	16.74 tons/year	20.53 tons/year	–
Cultural and historic preservation	Best preserved	Well preserved	Moderately preserved
Classification in the local preservation plan	1: Great cultural and historic value. The exterior cannot be altered.	1: Great cultural and historic value.	High value in its context.

Fattighuset in Halmstad, a brick construction built in stages 1859 and 1879, had a very well preserved authenticity and patina after the completion of the conservation work in 1996. In short the preservation issues were given foremost priority at the expense of indoor comfort and energy issues. Despite added insulation in the attic and new mechanical exhaust ventilation the tenants experienced a poor comfort level with too low indoor temperature. The data received by the IR camera showed that there are moisture problems at thermal bridges in spite of an installed dehumidifier in the foundation. Fattighuset is heated by district heating with moderate CO_2 emissions and the energy use is 216 MWh/year. The architectural value is high concerning its place in the context and its expressive gestalt. The building's structure and planning possesses universality, and the detailing is skilful.

Figure 1 Fattighuset at the corner, next to the fire brigade's hose tower.

Teatern in Laholm is a brick construction built in 1913. The interior was restored to its former grandeur and the building's authenticity was high after its completion in 1995. A mechanical exhaust and supply ventilation with heat recovery was installed and part of the attic was insulated. The energy efficiency measures were nicely adapted and are not seen as disturbing in the interior. This is a good and balanced example although the CO_2 emissions are high due to the gas boiler used for heating and hot water. The energy use is 108 MWh/year. No moisture problems at thermal bridges were found. Teatern's architectural value is high and together with the hotel it dominates the square. The function is announced in the façade and the grand and decorated interior signals festivity. The structure and planning possesses specificity and the design is inclusive.

Figure 2 Teatern's façade dominates the square.

Tyreshill in Rydö Bruk was built 1907 and has a timber construction and traditional wooden panelling. The completion of the restoration in 1998 offered a very comfortable house for living and working. The whole interior was refurbished, insulated, windows were replaced and a pellets boiler and tank were installed. This is the least preserved building although it has a high value in its context as being the oldest house in Rydö. From a sustainability aspect Tyreshill is the best example with no CO_2 emissions. No moisture problems at thermal bridges were found and the energy use is 37 MWh/year. Tyreshill is situated on a slope, resulting in an intricate court yard setting with a levelled garden. This is considered as a high quality but does not make the building and site accessible for disabled people. The building planning has good spatial relations and possesses adaptability.

Figure 3 Tyreshill seen from the back garden.

2. Development

2.1 Methodology

In developing the project as a whole a case study methodology was chosen. A framework of a multiple case study was a sound way to structure the project. Robert Yin's methodology [32] was chosen for an open but stable foundation providing multiple uses of different methods and approaches. A case study can be used for exploratory, explanatory and descriptive research.

The theoretical models for balancing will emerge from the case. Some will show similar predicted results, a literal replication, and some will show predicted contrasting results for anticipatable reasons, a theoretical replication. In brief it is about using pattern matching and analytical means to generalize a set of results to explore a possible hypothesis or broader theory. For development of a theory according to Yin [32] it is necessary to define and select the cases and design data collection protocols. After preparing, collecting and analysing each case, individual case reports are written. Then one has to analyse and conclude to draw cross-case conclusions. There are three principles of data collection to construct validity and reliability of the case study evidence and for convergence of evidence; use of multiple sources, creating a case study database, and maintaining a chain of evidence. These have been followed.

To frame the complicated issue of balancing the physical property and values in the buildings and the conservation work carried out, it is necessary to break down the factors into manageable units of analysis. The multiple embedded units are energy efficiency, historic values, architectural values, management and teamwork, and finally legislation but the last unit will not be analysed in this paper. All units of analysis have been discussed in six workshops with separate themes. The aim was to highlight all different aspects and the different professions perspectives on the subject matters and the investigated objects. This was essential for managing the new combined field of energy efficiency and preservation. The interest in the on-going study lies in the unit for management and teamwork, cooperation and the different professions' methods.

In phase one reductive system thinking for generalisation of factors was used to cope with the complicated task of balancing the physical issues, while systemic thinking dominates phase two in order to understand the specificity and complexity in the different processes. Under the following headings it will be revealed how. The following is a description of the main methods and approaches to give an overview.

2.2 Methods used for the energy issue

The first unit in phase one was the energy measures carried out and the energy efficiency gained. When the uncertain factors had been reduced using the archive material, visit in situ and literature [1, 2, 3, 5, 10, 11, 23, 31] and consulting professionals for choice of methods; the transmission losses through the envelope were calculated by a traditional λ-value method and degree hours. Heat loss through ventilation was calculated by approximation using a simplified rule of the thumb method. This was considered an adequate method for an architect to use. Energy use for hot water was calculated by the book and internal generated heat from people and equipment was added. The calculated energy balances corresponded quite well with the measured energy consumptions. An IR camera was used for collecting data to detect any risk of moisture damage at thermal bridges using an equation derived from the software Wüfi. This method was found in a German report by Hoppe [15]. The results were also compared with similar buildings in the category and type code 826 at Boverket's (The Swedish National Board of Housing, Building and Planning) web site for energy declarations [8] and calculations for each of the three building were made. Thus the triangulation was met, as recommended by Yin [32]. The approach was both interdisciplinary through the guidance received from engineers in academia and transdisciplinary through co-working with practitioners. They all aided improvements on the chosen methods and interpretations of the results.

2.3 Methods used for historic values

The method chosen for the assessment of cultural and historic values was the traditional Swedish one, developed through practice, described by Unnerbäck [27] and published by the National Heritage Board. Other methods like SAVE developed in Denmark or

DIVE from Norway could have been chosen. The assessment of the buildings once made and documented in the 1990s was saved for the archive according to the Swedish tradition. The intention in the EEPOCH project was to use it for triangulation of the assessment together with two new ones made by the author and independently made by an antiquarian.

The identification of basic motives is divided into two parts. The document values which consists of historic properties and experienced values which are the aesthetically and socially engaging properties. This initial part of the assessment is factual and descriptive, based on actual data gathered from archives and in situ, and if possible and applicable - through interviews. The second part is about defining the quality, authenticity, pedagogical value and legibility, rareness and representativeness (on national, regional, and local levels). In this part consulting colleagues is recommended if any uncertainties remain. The results are the main, additional, reinforcing and overall motives. From this a management plan is made. The approach was transdisciplinary with the concrete help, and guidance of antiquarians working as practitioners, and their discussions of the results.

2.4 Methods used for assessing the architecture

Unnerbäck's handbook [27] contains little about architectonic values and how to define them which was a deficiency revealed during a workshop. The project had to be complemented by a separate unit for assessment of the architecture. Triangulation was not performed within this special unit of analysis because it was not planned from the beginning. To avoid arbitrary or subjective choices of what to look for CABE's Design Review [9] was used. The Design Review is a tried and tested method of promoting good design. There is no corresponding guide or review in Sweden. The Review is designed for extensive assessment of new projects but architectural qualities are signs of value as well as physical properties, and when they are considered to be good they are desirable both in planned and existing buildings. Style and history are intimately connected and are part of the historic value. Only the most basic aspects of architectural values were addressed: construction/tectonics/building planning and daylight, the building in its context and the functions for human activities, flexibility and adaptability.

Everybody experiences architecture consciously or unconsciously but analysing architecture demands experience and knowledge on functions and use. For an analysis there are two main methods: one is starting with the interior detailing and gradually working out to the façade, looking at the site and the whole context, this is often used when designing: the other method starts with the context processing down to detail, which is common in existing and already defined environments. Architecture is an applied science and the tools used for understanding of how it works are photos, sketches, models, and the building itself. Knowledge of social sciences is also an important tool for designing or interpreting the built environment and interviews can be used. The main approach is explorative and descriptive.

2.5 Methods used for exploring the management carried out

This unit of analysis is the most interesting for the development of the on-going phase two. In qualitative research constructing validity is crucial and following the guidance is important. Frost [13] mentions the importance of using reflexive awareness to reveal the influence of the author's presence and intervention on the informant. Sevaldson [26] writes about grounded theory and building theory from within a practice; to formulate hypotheses from specific data and to draw specific conclusions from hypotheses. A traditional method for interviews described by Bernard [6] was used for a tentative study. The aim was to reveal any methods and processes connected to the outcome of the restorations and for analysis of the management and leadership. Notes were taken during the very first interviews which were then transcribed. The informants read it and approved the content. In the later interviews a recorder was used and parts of the large amount of recorded material were transcribed. Three books [16, 17, 19] on leadership, management and teamwork guided the transcript analysis. The results were reported in a paper presented at the 10th Conference of the European Sociological Association in Geneva, 2011. The paper is available at the EEPOCH project website [12].

2.6 Conclusions in brief on the management

Three interviews with antiquarians were carried out at the beginning of the project. The concern was their experience of the Halland Model and their assessment or judgement of the actual results in the restoration work. All three had good experience from their work and participation. The most specific factor which all mentioned was their involvement from the very start, selecting the objects and formulating the actions. The conservation perspective was respected and the antiquarians always attended the construction meetings. The craftsmen's performance was generally considered high. None of the antiquarians had any suggestions about what could have been performed differently.

Longer interviews with antiquarians, engineers and an architect were performed and recorded to find out more on how the management was planned and performed. The horizontal regional cooperation which is the common model today was developed within the concept of the Halland Model and was also transferred to the working teams. One strategy was to choose dynamic and transformational leadership of a democratic type. A key action was involving everybody on all levels. Keeping the teams task-oriented with priority on the quality helped in managing the differences between professional cultures. Personal initiatives for improvements were invited and evaluations were conducted. This is a sign of a learning organisation. The apprentices' were introduced to the main vision, and the importance of their own work for the overall achievement was emphasised. This required a transparent organisation which in addition created a good working climate.

Altogether this resulted in efficient and responsible performance which was mirrored in the conservation work. The informants mentioned that the teams always tried to reach consensus. This is shown in the evaluation of the three buildings. Furthermore, the one where strong discussions took place during the conservation work, Teatern in Laholm, was also the one showing the most balanced results regarding energy efficiency and preservation.

3. Recapitulation

3.1 Discussion on methods

The methods used were archive search for facts and data, measures and assessments in situ, literature studies, calculations of energy balances, and interviews. Participation of and cooperation with other professionals was an important part of almost all methods used. Finally workshops were held with 95 participants in total where all three professions, as well as academics. These were essential for development of the research. A reference group and an expert group were connected to the project along with local/regional companies. All took part in the workshops, providing facts and contributing with their great experience to the discussions. They have also been consulted for choice of methods and their performance. Other professors, PhD candidates and professionals within the practice were also separately consulted and engaged in the workshops. The workshops guided the research project and its content, and through this cooperation it was possible to multiple fields. In this way the six workshops actually directed the research.

The first three workshops were conducted during phase one (2009-2011) and concerned the balancing of the physical, with discussions about methods, the energy issue, the buildings and their different properties and values but also about the different professions. In the second phase three workshops were carried through focusing on processes in the different professions' methods, assessments and the management/leadership but also about new insulation materials. The results from the workshops have shown that when working within this new combined area of conservation and energy efficiency, awareness of and respect for the different professions and roles included in the process are crucial.

3.2 Comparing the professions' methods

Measuring a building's surfaces and understanding all integrating systems within a building is complicated and takes time. Small miscalculations in this part can produce large variations in the outcome, and although reductive accurate methods are used it is necessary to approximate which can only be done with prior experience of similar work. This is crucial for interpreting the figures on consumption and calculations of transmission losses. This demands a solid base in theory. Making inventories of a building's materials and systems, its place in history and development legible in the different time-layers is equally complicated and time-consuming. Data found in archives do not always show on the site and vice versa. This demands knowledge as well as experience. Whatever the conclusions, it is never absolutely certain that the calculation or interpretation is correct and it must always be adjusted until all influencing factors have been detected. This also applies for assessing architecture, to understand all integrating aspects within a building and its context. It is necessary to interpret the built environment and experience of similar work or to consult experienced colleagues, as suggested in Unnerbäck's handbook [27].

The assessment in itself is standardised and linear but the assessment about the properties and values found regarding high or low quality, are sometimes non-linear and irregular, and can be either tangible or intangible. The system thinking which engineers, antiquarians, architects and many other professions make use of is based on the traditional mechanistic conception provided by natural science. Collecting data, making linear assumptions and generalising by using pattern matching are common techniques. System thinking is predictive and used for framing the project and reducing it to manageable parts. Understanding of a building's history or all functions and systems that must interact in a building is complicated but can be investigated, and problems solved. Complexity emerges though, as soon as the users or inhabitants and their habits and behaviour are added into the picture. In these matters the linear system thinking needs to be complemented by non-linear systemic thinking [21]. All three professions have to find out, ask or imagine how people use their homes or offices, what hours and functions, and for the antiquarian the use must be mapped through history, the societal and techno-historic impact and so on. Systemic thinking, contrary to system thinking, is dynamics and puts people, their wellbeing and their behaviour in focus.

The different worlds of physics and natural science, and of the humanities and of architecture are standardised but not static. In parts they are all predictive but the views are constantly changing due to society's complexity based on human activities. Due to this it is also necessary to be projective and adaptive, and take advantage of the possibilities.

3.3 Discussion on management

Could the kind of best practice shown in the Halland Model be transformed into today´s different situation as regards economics, politics and the labour market? Management today is generally lean in order to optimise production processes. It is about system thinking and reducing disincentives for improvements or simply preserving value with less work. Value in this management philosophy is defined by any action or process that a customer would be willing to pay for [28]. Lean leadership builds on respect, to build mutual trust and taking responsibility in continuously developing the teamwork but it cannot be characterised as systemic thinking because it is still based on linear assumptions and aimed at solving complicated problems.

Complexity is what characterises human societies and activities. The complex system is a rather new approach to science and is about how relationships between parts give rise to collective behaviours of a system. It is used as a broad term in diverse disciplines from mathematics and physics to anthropology and sociology. However a consensus regarding a universal definition does not yet exist. The complexity theory is rooted in the chaos theory but should not be comprehended as absence of order, rather as a mass of complex information [29, 30]. To navigate in the complexity of human actions, human design is needed. To explore the possibilities a systemic thinking is needed. Complex processes with paradoxes occur when people are involved. These consist of time and identity which are based on human perception, interpretation and action [21]. In non-linear interactions bifurcations exists within the situation and always implies choices, leading to the possibility of multiple futures and surprising responses. There is no ambition to find optimised configurations, rather transformative changes creating new contexts [4]. Complex networks of creative individuals are reacting and adopting dynamically, creating their own social environment. When treating teams as complex phenomena, human behaviour and the paradoxes created in their interaction need to be taken into account. By using this systemic approach in e.g. systemic meetings a communication is facilitated through the actors' understanding of each other's work. The approach has been used in car industries and in construction businesses as well as in the field of healthcare and in hospitals [25]. This approach will be part of the theoretical model in combination with other methods.

4. Coda

4.1 The energy efficiency and preservation demands

Cross-case conclusions drawn from the analysis of the units applied on the chosen objects show that there are crucial measures and steps to take. Regarding the indoor climate it is obvious that it has to be the focus and adapted to human wellbeing, but also to the activities in the building. Risk for moisture problems should always be calculated before any actions can be carried out, and there are software programmes available for this task. Ventilation systems and heating should be continuously measured and adjusted to a predetermined level. The residents or users should be involved in determining the appropriate levels. Putting people first, demands good comfort indoors. The planning process for energy measures and preservation should include user participation.

The interviews with professionals engaged in the restorations revealed a decisive connection. Involvement of all professions from the very start up to the completion of the preservation work is a key factor, with great impact on the end results in the buildings. At a workshop a gap was noted; the lack of guidance on how to assess architectural qualities. The research project will try to fill at least a part of this gap.

The chosen objects show three different performances. In one case the energy issue was dominant, having less successful results in terms of preservation. In another the preservation concerns were given priority over the energy issue. The third and last case showed care was taken in both energy efficiency and preservation. The three cases can be placed on a scale where the third case is found in the middle and the other two somewhere at the ends. All other objects restored within the Halland Model can be placed somewhere on this scale. An overview regarding their energy performance and preserved values will be carried out. Possible actions will be discussed when making the review, and pros and cons will be valued. The base for this will be a list of measures created at the first workshop. It will be expanded with more options and every measure will be looked at from at least four aspects. The aim is to determine which conservation measures and energy measures might conflict with one another and which might be accepted. The result will aid professionals engaged within the heritage sector in Halland but it can be transferable to other built heritage and other regions. The review will be made in cooperation with practitioners at Heritage Halland, and will be part of the application-oriented theoretical model for integrated balancing of energy and preservation demands.

4.2 The professions

The different professions engaged within the heritage sector play important roles in the development of the two theoretical models, although they all have their own disciplinary matrixes. In architecture a multitude of methods have been developed for different uses depending on what is to be designed or investigated. This situation is comparable with the engineering and the antiquarian fields as well. Assessments in existing buildings can be made, but the great variety suggests there may be contradictions between the different professions' interests. This is a classic dilemma of the engineer's nomothetic focus on laws (*nomos* in Greek) in natural science, and the antiquarian's traditional idiographic focus on the individual (*idios* in Greek) and the unique. It could be exemplified with the engineers, emphasising the interest of e.g. energy efficiency, and the antiquarians, emphasising specific historic values. However, the boundary between the nomothetic and the idiographic does not coincide with the boundary between natural sciences and the humanities according to

Liedman [18]. He mentions several examples which comprise both the individual and the general in the economic field and within biology, sociology, history and so on. Architecture is both nomothetic, adjusting to laws of nature, and idiographic - seeking for the unique - and using methods common in social sciences. This applies to all three professions. All are working in a wide scale from rooms to cities, and this broad perspective is a driving force, which synthesises knowledge and also requires a generalist competence. By looking closer at the methods used in this study the similarities outweigh the differences. This is a significant conclusion which opens up to cooperation in teamwork within companies and networking between companies.

4.3 The cooperation

Conservation is carried out by people with different background and ways of interpretation. When people are part of a situation it usually turns from a complicated state into complexity, to non-linearity and new unpredicted situations. The cooperation should preferably be based on transparency and trust, learning from the Halland Model, and understanding of the involved professions' specific skills. Furthermore, having a main vision and keeping focus on the overall achievement are important parts. Involving people is another part as is a learning organisation or system. For this purpose systemic thinking could be used [25]. This is a dynamic and including approach, and about using individual resources in the team's cooperation. It is projective and used for managing the processes by trying to see the whole picture and make use of possibilities. A systemic meeting was performed and tested at a workshop in May 2013. Systemic meetings are used for knowing and understanding, for insight, overview and action. There are eight steps organised in five phases in a systemic meeting;

- Observation, where an individual 'story' is told and explorative questions are answered (step 1 and 2).
- Reflection, where patterns and choices are detected and possible alternative actions emerges (step 3 and 4).
- Action, where the alternative actions are suggested and then considered by the individual who gets feedback and is acknowledged (step 5 and 6).
- Management's perspective, response from those who are facilitating the work (step 7).
- Mutual and collective reflection leading to individual choices in a new strategy or in an action plan (step 8).

Individual interpretations can be processed in the meetings in an empowering way. The activity is collective but aims at individual action. The method facilitates understanding and communication between professions and is used in many organisations. For knowledge to become learning, active reflection and dialogue are needed. The structure of an organisation is usually a closed and reductive system while a learning system is open and expanding. A system which is open, complex and independent from the (organisational) structure, and based on knowledge, methods and practice is a prerequisite. It takes advantage of human resources, giving *power to,* and complementing the structure's taking *power over* in an organisation [25]. Management will be performed in different situations from the planning of a conservation project to meetings at the construction site. Systemic meetings will be part of the theoretical model and more methods will be investigated for creating a methodological systemic approach. The key is the combined system and systemic thinking.

There is a reconciling foundation for professional cooperation which is important today when the boundaries for what is worth preserving in buildings are expanding. Considering that most of the building stock that will be in use in 50 years is already constructed, our built environment must also be seen as basic societal resources and accordingly treated as economic and sustainable. The top priorities for economic development are creating jobs and increasing local household income. Comparing new constructions with restoration or rehabilitation the latter creates more jobs and less use of materials and less waste, according to Rypkema [24]. Built heritage also plays a significant economic role in the tourism sector and in development of traditional trades and skills.

Economic, environmental and social sustainability will be part of the conceptual framework as the main vision and as uniting factors in the necessary professional cooperation. Rehabilitation or restoration requires different experts and these should interact with the ultimate expert; the user who will live or work in the building. The Swedish architects' traditional method of user participation will be one important part of the social sustainability in the final model. The hypothesis and the possibility that all perspectives can converge and meet in applied cases has been strengthened and confirmed. It will be followed by a gradual clarification as the theoretical model for cooperation and good working climate in the preservation process take a more precise and coherent form for testing in practice.

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