

KNOWLEDGE IN THE DECISION-MAKING PROCESS FOR SUSTAINABLE RENOVATION OF MULTIFAMILY HOUSES

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Background: Renovation of multifamily houses is a challenging process as a large number of requirements from stakeholders such as tenants, property owners, building contractors, architects and society has to be coordinated. As part of larger project aiming to develop a requirement driven model to support decisions for sustainable renovation of multifamily houses, our focus is on analysing requirements for knowledge sharing throughout the renovation process. New requirements due to a change from new production to maintenance and specialised services require new knowledge, new ways of collaboration and improved knowledge sharing.

Objectives: The purpose is to study how and who requires cooperation and knowledge sharing during the renovation process. The basis for decisions within a renovation project is addressed research questions around Criteria for choice of which property to renovate, the Documentation of renovation decisions and Knowledge sharing in the renovation process – internally, externally and between projects.

Methodology: This field study has used interviews with representatives from property companies to investigate criteria for choosing which properties to renovate and the basis for renovation decisions. The knowledge implementation in the decision-making process is also analysed. On-going renovation processes and motivation and incentives for knowledge sharing within a project between stakeholders, from project to project within a property company and between property companies are analysed.

Results: Basis for renovation decisions varies from ocular inspection to intense use of spreadsheets and yield calculations. Though an outspoken need for knowledge sharing, neither incentives nor developed and structured processes for knowledge sharing are commonly used. Sustainability is one of the requirements considered in the decision-making process.

Keywords: basis for decision, knowledge management, knowledge transfer, renovation decision, renovation alternatives, sustainable renovation.

INTRODUCTION

This study is part of the Swedish Formas program: Sustainable rebuilding, renovation and renewal of residential and commercial Buildings 1950-1975. The project looks into how technical and operational solutions are achieved from requirements and incentives through the requirements for a building project as illustrated in figure 1.

Real estate organizations incorporate both project (temporary) and property management (permanent) operations and can be regarded as a project matrix organization in accordance with Hobday's classifications (Hobday 2000). The focus on real estate organizations is of particular interest as the industry plays a major economic role in Sweden, which implies that efficient knowledge sharing/transfer and creation would most likely impact not only the companies, but the society as a whole.

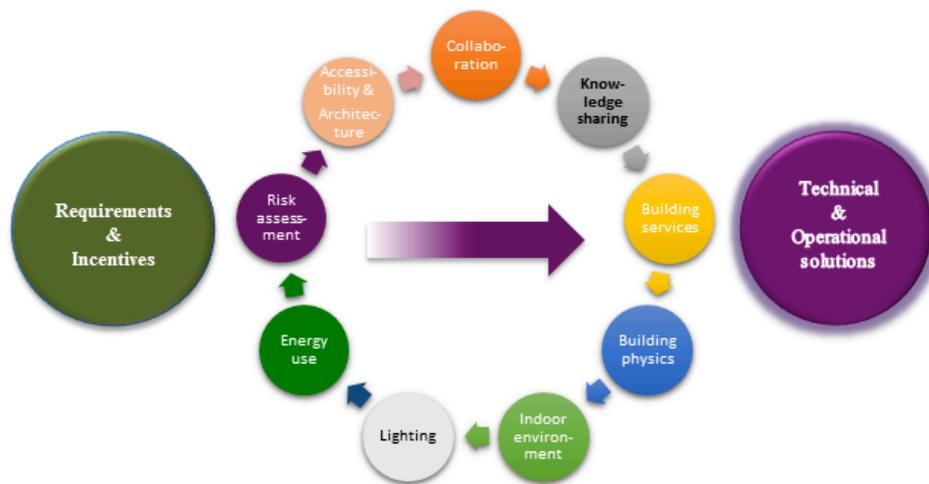


Figure 1. The requirements and incentives for a building project are adapted to the demands set from owner, users, stakeholders and authorities to accomplish technical and operational solutions.

During the last decades, focus in real estate companies has shifted from production of new houses to maintenance and services. The new demands on renovations require new ways of organizing management functions in collaboration with tenants, building contractors and architects. Housing management focuses nowadays on e.g. allocation of decision-making powers and responsibilities in projects or local organizations (Blomé, 2010). Property-related services have become more specialized and a client-provider concept is now characterizing many organizations. This puts extra demands not only on creating new skills but also on: a) finding new forms of collaboration; b) improving knowledge sharing in projects as well as in day-to-day work.

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Purpose

Requirements on cooperation and knowledge sharing during the renovation process are studied. The basis for decisions within a renovation project is addressed with research questions on how decisions are developed, who is involved and what is the contribution in the different stages?

The criteria for choosing which property to renovate and the documentation of renovation decisions is studied as well as how knowledge is managed within projects, between projects and between property companies.

Method

To undertake the study interviews and study visits have been made. The interviewed (totally 9 people in 6 interviews) are employed by real estate companies and working with project management and project selection in renovation projects. The duration for each interview was between 2 and 6 hours and study visits and documentation from project decisions was provided by two of the companies. They all have insight in the decision-making process although they are not part of the company board or executive committee actually making the decision. The interviewed have knowledge of the work to prepare the decisions and evaluate project to renovate. The companies are 4 public property companies and one state owned commercial property company. Facts and key performance indicators for the studied companies are shown in table 1.

Table 1. Facts and Key Performance Indicators for the studied companies 2013.

Company	Alpha	Beta	Gamma	Delta	Epsilon*
Flats, no.	2,281	23,163	22,700	11,644	192 (properties)
Leasable area, 1000 m2 (premises)	140 (57)	1,636	1,699 (157)	875 (61)	2,562
Revenue, million €	18	152	182	90	603
Equity ratio	19 %	23 %	29 %	25 %	39 %
Dividend yield	7.0 %	7.0 %	7.5 %	3.0 %	5.1 %
Net operating income €/m2	30	28	32	35	167
Operating cost €/m2	-	39	44	35	40
Maintenance cost €/m2	19**	24	27	22	44
Vacancy	-	< 1 %	0.6 %	0.3% housing (4.4% premises)	6.6 %

* Premises only **Maintenance and operating cost

Table 1 shows that the studied companies are both big and smaller. This provides a variety in the resources the studied companies possesses. A smaller company has to rely on consultancy services to a larger extent than a bigger company who can have more developed project management competence. All companies are making a profit.

THEORETICAL FRAMEWORK

According to Lind and Muyingo (2013) it is important to adapt maintenance planning to the specific characteristics that exist in the real estate sector. It is almost impossible to predict the lifetime and degradation processes for various components of the unique and complex objects, which interact with the environment. A flexible planning system is needed where continuous adjustments of the plans are an integral part of the system. Just as important as the direct planning is a decision support system or a knowledge management system. (Lind and Muyingo, 2013)

One of the factors contributing to the low level of innovation is the adversarial relationships, and thus the lack of cooperation (Holmen et al, 2005). The construction industry (may well also be applied to renovation projects in the real estate industry) is

characterized by shifting coalitions around the unique projects, which makes it difficult to introduce renewal processes from the perspective of "trial and error", that is based on learning from a range of projects (Holmen et al, 2005). The frequent change of partners' dominates over technological renovation project, which seems to lead to a low level for the creation of relationships between the involved companies, as "...every project represents cooperation around something new" (Holmen et al, 2005).

Thuvander et al (2012) reports that there is a need to clarify the process and the values that are more difficult to define. They suggest the development of a methodology for renovation with references to different tools. "In the building sector, renovation should be considered a service-minded process rather than a merely technical one as often is the case in new construction" (Thuvander et al, 2012). The different levels in valuation of a project (Persson et al, 2012) illustrate the complexity in defining a successful project from the process level to strategic level.

Although many in the industry are talking about the importance of experience feedback it has been slow to create such systems. One reason is lack of motivation for knowledge sharing, depending on the laws of procurement, which supports short-term economic optimization and relying on well-proven solutions (Dubois and Gadde, 2000)

Pemsel and Blomé (2012) concludes in their study of how knowledge contributes to value-added activities in the real estate organizations, that knowledge-sharing activities were considered poor between different subunits in the organization and the main motivation for learning was doing a good job for their customers. It is rare that real estate organizations use incentives to increase the frequency of knowledge sharing activities (Pemsel and Blomé, 2012).

The knowledge management of the sector and available information for personnel in real estate companies is not well organised to facilitate a transfer from explicit to implicit knowledge according to the SECI model of Nonaka and Takeuchi (1995), as pictured in Figure 2.

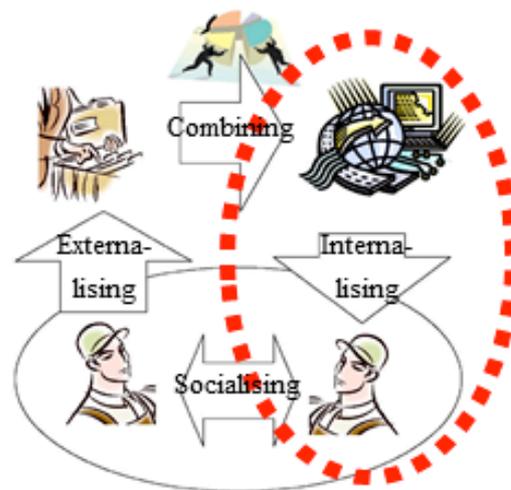


Figure 2. The SECI model of knowledge transfer with the process of internalising highlighted (adapted from Nonaka & Takeuchi 1995).

The bottom of figure 2 shows the process of socialising (tacit → tacit); on the left is externalising (tacit → explicit); at the top is combining of knowledge (explicit →

explicit), and on the right side is the important process of internalising (explicit → tacit). Enabling internalising is a main objective of knowledge sharing (Persson 2006).

The construction industry is of a project-based nature and projects are described as the ideal form of learning and knowledge sharing, as problem solving often requires the creation of new knowledge (Hobday, 2000). Projects in the construction industry can be seen as knowledge-intensive units with actors with specialized skills, which must be used for the success of the project (Damgaard and Hansen, 2012).

It is often perceived that the level of innovation in construction real estate industry is low. There may be several reasons. Each project is in its own way unique and there are few customers who demand series of similar projects, therefore construction projects are intermittent and dependent on unpredictable and heterogeneous demand of different customers (Holmen et al, 2005; Easton and Araujo, 1997). Projects have temporary character, which means problems for accumulating knowledge and that a new learning curve must be initiated by the provider each time (Cox and Thompson, 1997). Individuals from different companies working together on a project rarely meet in other projects and individuals are additionally frequently replaced in on-going projects (Holmen et al, 2005; Welling and Kamann, 2001). Technological innovation projects are overtaken by the recurrent change of project partners and firms tend to act as if they will not benefit from relationships in coming projects, but as Holmen et al (2005) state, it is possible to reuse knowledge about the counterparts and how they work in other project, thus favouring actor bonds and not resource ties and activity links (Holmen et al, 2005). Within a project the design and construction processes is often segregated, which means that feedback from the construction process is not taken into account in the design process and the design is fixed within a specific project (Holmen et al, 2005). The lack of knowledge and knowledge sharing resulting in increased project costs of 10-25 per cent of the total project cost (Pemsel and Blomé, 2012).

However, it is worth studying initiatives that require collaboration and relationships even if the underlying theories and models are based on other industries (Holmen et al, 2005).

FINDINGS

Criteria for choosing which property to renovate

There are many criteria influencing the choice of property for renovation, however common aspects are profitability and the technical status of the building, based on some sort of inventory. The inventory is made every year or every three years according to predetermined criteria and result in points on a scale or a property profile, which are used together with a market-driven analysis. Ocular inspections resulting in a list of properties in need for renovation, are used in company Gamma, and simply result in choice of the property in worst condition. Due to legal obligations to adhere to market principles, the profitability aspect for public housing companies is also key criteria.

For Epsilon change of operations and user requirements are further criteria for choice of property. Since the consequences of a renovation lead to a raise of standards from the 1960's and will result in increased rents, discussions with tenant are held before any decision is made.

Finally, directives from owners to contribute to the development of the city for one of the companies, Delta, result in taking the need for housing, mix of tenants and level of rents and costs for a specific area into account. Gamma on the other hand states that area specific or even social reasons are seldom factors for choice of renovation object.

Legal obligations

Total renovation of a building also brings along requirements to comply with present legislation for new buildings. The most discussed legal obligations, influencing choice and level of renovations, are accessibility, fire protection and energy conservation. Profitability is difficult to reach, as the legal obligations are mandatory for obtaining construction permits. In many cases the cost for renovation cannot be fully reimbursed by an increase in rents for the public housing companies. However, both Beta and Delta are of the opinion that the obligations have to be accepted, even if the cost for renovation increases. As one manager in Beta (2014) stated “we have to accept it, we complete the drawings and do our calculations based on it”. Gamma does not implement any renovations, for example pipe replacements leading to refurbishment of bathrooms and wider door openings, which demand construction permits and subsequently cannot be motivated from a profitability aspect. In Epsilon customer requirements often lead to higher levels than the legal obligations stated and the customer is willing to pay for these levels. Sometimes it is difficult to reach targets, for example for indoor climate, since certain buildings may not be changed architectonically on the outside. It is of great importance to have a good dialogue with town planning authorities and a way of negotiating the fulfilment of legal obligations in the construction permit process.

Legal obligations for fire, accessibility and fire conservation

Accessibility and fire protection are perceived as more difficult to fulfil and necessitate careful planning since they lead to higher level of cost. Delta suggests different levels for accessibility as means for improving, for example accessibility with wheelchair for new properties and with walker for existing properties. For Alpha fire protection is more difficult as every flat has to be a fire compartment and elevators do not fulfil the legal obligations. Gamma does not make any refurbishments and decides about action after action, but does put in new elevators.

Regarding energy conservation Alpha means that energy requirements lead to something in return, i.e. lower energy consumption and accordingly lower energy cost. In Delta both national and city goals for energy consumption are to be met and what can be done to raise the building from an energy perspective and reach a cost, acceptable for all parties. In Beta a strategy for using heat exchange in ventilation is formulated, but this is not a decision of the company board, and no heat pumps are accepted because of dependence of electricity.

Basis for decisions

The basis for decision-making used for prioritising between objects for renovation differs from ocular inspections and fault reports, spreadsheet, calculations of investment, value and to demands for dividend yield. In Gamma the technical inventory, previously centred on one person, who has performed ocular inspections, together with fault reports form the basis for decision-making. In Alpha it is based on the inventory of properties and thereafter on a 21-point programme in the form of a spreadsheet, to analyse the need of actions and calculation of cost, i.e. a Life Cycle Cost analysis for a time period of 30 years. The income consists of rent and savings on energy conservation and renovation. To further explore and compare level for

renovation Alpha benchmarks with the key performance indicators of SABO (Swedish Association of Public Housing Companies).

In Epsilon decisions are based on cash flow analysis, technical descriptions, financial calculations and planning for the area in question. Everything must meet profitability demands and the owner requires a dividend yield of 5.8%. The calculations are not unique and based on experience and an overall view and an effort of finding balance between need and money in the end result. If not so profitable measures are put together with more profitable measures, a synergy effect is achieved.

With Delta investment and value calculations form the basis for decision-making documents presented to the company board and the goal is not to have any suggestions rejected. A dividend yield of 7% is required and the company works with investment calculations, operation costs and also yearly evaluations and market comparisons, i.e. a value calculation based on dividend yield. If a property is to be sold after a renovation the investment should pay off.

Connectivity with user/tenants

The renovation decisions are anchored in a tenant dialogue with the users or tenants in all the companies, but the process takes a long time and action is needed well in advance. In Alpha the decision protocol is anchored with the Swedish Association of Public Housing Companies Tenants, and the tenants sign a letter containing information regarding the renovation. As in company Beta, meetings are held with the tenants, where they can influence the renovation process. Both companies have employees, who have contacts with tenants and coordinate temporary housing back and forth. In Delta tenants and accessibility advisors are involved in the renovation process, the later also review the construction permits. Project managers meet with tenants at times suitable for the tenants to discuss how they feel about their area and how to improve it. At the time for acceptance, representatives visit the tenants at their homes. In Epsilon the tenants have the possibility to influence and after every new stage communication and thereafter a referral round take place. "The more the customer is involved, the better" (project manager, Epsilon, 2014).

During the renovation all the tenants of the building in the Alpha company move out, whereas Delta wants the tenants to stay on during the renovation and is of the opinion that the contractors have found a way of spending as short time as possible in every flat and for whom a focus on the tenants is rational. For Epsilon remaining tenants is a working environment problem, since the tenants often cannot predict the impact of the on-going renovation on its own operations. However, remaining tenants has experienced an increased awareness of security regulations, which will benefit the tenant after the completion of the renovation.

Customer satisfaction after a renovation project is important according to Delta, even if not always done and is measured through a customer survey. Response rates are improved through lottery of two months' rent. Epsilon uses customer surveys and follow-up meetings in order to receive feedback; they do not want to have dissatisfied customers.

Basis for renovation decisions within a renovation project

Decisions within a renovation project are mostly about profitability and sustainability, but also technical status and market analysis. In Beta one project involves Corporate Social Responsibility, CSR, with close cooperation between the jobcentre and the contractor with the purpose of engaging unemployed people in the renovation project

and at the same time raise the areas profile. Some unemployed people will find temporary unskilled work for the duration of the project and thus experience, some are eligible for training and will have acquired skills beneficial for future employment and others with a formal education from other countries, like engineers and architects, will learn the conditions for working in Sweden and be more employable. For Alpha the decisions are about safeguarding construction during the lifetime of the building. Beta is of the opinion that the maintenance plan is a “living” document and therefore the order of priorities can change. The company board has decided to differentiate levels of renovation to mini, midi and maxi, which the project managers mean will make it difficult to differentiate the rent. The same system is in place in Delta and partly in Gamma, where it is suggested not to be appropriate from a market view, since the company is responsible for the operational lifetime of the property, not only until the tenant move.

Technical solutions are chosen based on consultants with excellence and experience from other projects. Epsilon is the only studied company that is implementing environmental certification such as BREEAM or LEED. The reason for this is probably that Epsilon has business customers and no private tenants.

”The problems are not unique in these buildings. It is about ensuring the construction of the buildings.” (Project manager, Alpha, 2013)

Knowledge management in the decision-making process

Knowledge management was noted as important and needed, but difficult. The studied public housing companies displayed a lack of structured processes for knowledge sharing and expressed that they were considering setting up systems to be better in this respect.

Knowledge sharing in a project

All studied companies described a normal project situation with new project team and new stakeholders in new projects. Stakeholders and project team also changes during the progress of a project. New team members are introduced to the project and other leaves the project. Knowledge sharing regarding project information is maintained in meetings and through project documents. New knowledge to the project is brought in mainly through the members of the project team and the knowledge processes that are present in their organizational environment.

Many obstacles that slow knowledge sharing were expressed in the study. As there is a business and competitive setting for the work in a project there is a lack of trust between consultants, entrepreneurs and property companies. In partnering projects there is generally a greater expression of trust between client and contractor but this does not often encompass all subcontractors and suppliers that are involved in the project. There is a risk that to much focus on tendering process (no incitements).

Knowledge sharing from project to project within a property company

The investigated companies displayed limited systems for sharing knowledge between projects. Main methods are having guidelines, policy document, presentation of reference projects and checklists. One example was found for a systematic way of documenting a project before project start decision.

Workshop (debriefing) after projects was a method recently introduced in a couple of the companies. There was limited experience from using this as input for new projects. The problem being how to structure lessons learned; what is new and what is confirmed knowledge? and how to present this?

Knowledge sharing between property companies

The public property companies are not competitors as they have municipal owners and only appear on their local market. They are also members of SABO (Swedish Association of Public Housing Companies) that is an organization that initiates research, development, publications, guidelines and seminars for housing companies. The studied companies mention SABO as an important source for information/knowledge and benchmarking for the Swedish public housing companies. It is therefore not surprising that there is an expressed preparedness to share experience and knowledge through study visits etc.

CONCLUSIONS

The criteria in the public property sector for choosing which property to renovate, are gradually moving from solely inventories of need for renovation and technical aspects, to more complex decision-making tools including life cycle cost analysis, profitability, market value, customer requests and directives from owners. Newer aspects for decision-making involves Corporate Social Responsibility as means of raising the status of an area and for public property companies and contractors to take an active responsibility for the social development of the community.

Sustainability was not used as a separate parameter in the decision-making process. As part of CSR sustainability was considered on strategic and project level by the investigated organizations. All of them work with long-term engagements and renovate with the intention to operate and maintain the buildings for a long periods of time.

There is an awareness of the benefits of knowledge sharing among the studied companies and a realisation that it is perhaps possible to reuse knowledge even though renovation projects are of a temporary character. One of the companies actually have some kind of system for registering knowledge, but due to its smallness feels a lack of partners to share it with. The other public property companies all seem to be in the process of searching for a system to help them share and reuse knowledge created in renovation projects among themselves and the actors involved. This process and different ways of handling knowledge in the sector is a field for further studies. The company acting commercially and only with premises seem to have accomplished more regarding knowledge sharing, which could be worth learning from for the public property companies.

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