



# **Property management and maintenance in the multifamily housing sector in Sweden**

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Doctoral Thesis

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## Abstract

Since the 1990s and in line with reforms in other countries in Europe, Sweden has experienced a shift in the property management of the housing stock within the rental sector. Furthermore, inefficiencies in Sweden's rent-regulated housing market have contributed to making the tenant-owner cooperative (TOC) sector, in which decision making is in the hands of non-professionals, the fastest growing housing sector in Sweden. After signs that an increasing degree of property owners appeared to be neglecting housing maintenance, the Swedish government commissioned a report in 2002 to investigate maintenance needs in the housing sector with particular emphasis on multifamily housing within the stock constructed during the period 1965-1975. The results indicated that a large number of apartments built during the 1960s and 1970s require extensive refurbishment and there is concern that some tenant-owner cooperatives (TOCs) as well as some companies in the public rental housing sector may have difficulties carrying out the needed activities. The overall purpose of the thesis is to increase the understanding of the factors that influence the decisions made within the multi-faceted property management of multifamily housing in Sweden. The focus is mostly on aged properties especially those constructed during the period 1965-1975 as these are largely comparable over the sub-sectors.

The thesis consists of five papers that present several studies carried out using various methodologies, i.e., econometric analysis, semi-structured interviews and questionnaires. The first two papers in the thesis critically evaluate the conceptual distinction between investment and maintenance as well as the maintenance planning models used in other industries with the aim of finding ways in which to raise efficiency within maintenance in the housing sector. The next two papers analyse the factors that influence the decisions made in relation to property management and maintenance within the rental housing and the tenant-owner cooperative housing sectors in Sweden. The fifth and last paper provides a study of how the organisation of property management and the decision-making structure in TOCs in Sweden facilitates or hampers the adoption of large-scale renewable energy measures in that housing sector.

The results of the studies indicate that the concept of investment embraces all relevant decisions and that maintenance as a concept is irrelevant from a decision-making perspective (Paper I). They further indicate that models of maintenance planning in other industries can to some extent be applied to building maintenance. However building characteristics call for a strategy that allows for the continuous adjustment of maintenance plans based on a well maintained decision support system in the company or TOC (Paper II). How maintenance is defined as well as the timing of the maintenance measures that at times are changed due to principal-agency issues of a socio-political character are factors that could explain the divergence between posted maintenance costs within the municipal and the private rental sectors (Paper III). The studies further reveal that members of the governing committees in the TOC sector, who are non-professionals in property management, face challenges related to the lack of a long-term perspective in the decision-making due to various principal-agent related problems such as hidden incentives, a high turnover rate of committee members and information asymmetry that is exemplified by reworks due to construction faults especially in cooperatives with newly constructed buildings (Paper IV and V). Limitations in the research include endogeneity problems in general, and selection bias in particular, making it difficult in some cases to establish the degree of reliability and validity of the empirical results.

The thesis has several implications for researchers, decision-makers, policy makers and the general public. It contributes to the view of maintenance as an investment; highlights the possibility of cost saving through the linking together of several measures and the challenges involved; shows the need within the housing sector for better decision support tools as well as knowledge transfer and sharing and calls for government to promote policies that would reduce the degree of information asymmetry between the procurers of services within the TOC sector and the construction companies as well as other service providers. As part of the policies directed towards energy efficiency and a sustainable environment further research could be focused on how to formulate a requirement of formal competence and certification in managing multifamily housing especially knowledge intensive installations for example those meant to provide innovative ways of energy efficiency such as passive house technology.

**Keywords:** Property management, housing maintenance, maintenance planning, incentives; building applied photovoltaic system; tenant-owner, cooperative housing, Sweden,



## Sammanfattning

Sedan 1990-talet och i linje med reformer i andra länder i Europa, det har skett förändringar inom fastighetsförvaltningen av hyresbostadsbeståndet i Sverige. Dessutom har ofullkomligheter inom den hyresreglerade bostadsmarknaden bidragit till att göra bostadsrättssektorn där beslutsfattandet är i händerna på icke-professionella, den snabbast växande bostadssektorn i Sverige. I 2002, efter tecken på att en ökad grad av fastighetsägare med särskild tonvikt på många med flerfamiljshus byggda under perioden 1965-1975 verkade försumma bostädsunderhåll beställde den svenska regeringen en rapport om saken. Rapporten visade att ett stort antal lägenheter som byggdes under 1960- och 1970-talet kräver omfattande renovering och det finns oro för att en del bostadsrättsföreningar (BRF) samt vissa företag inom den offentliga hyresbostadssektorn kan ha svårt att utföra de nödvändiga åtgärderna. Avhandlingens övergripande syfte är att öka förståelsen av de faktorer som påverkar de beslut som fattas gällande fastighetsförvaltning av flerfamiljshus i Sverige. Fokus ligger främst på bostadsbyggnader som är konstruerades under perioden 1965-1975 eftersom dessa är i stort sett är jämförbara inom hyressektorn och BRF sektorn.

Avhandlingen består av fem artiklar som presenterar resultaten av ett antal studier som har genomförts med hjälp av olika metoder, dvs. ekonometrisk analys, intervjuer samt frågeformulär. De första två artiklarna innehåller en analys av skillnaden mellan begreppen investering och underhåll samt en studie av hur underhållsplanering utför i andra branscher. Syftet är att hitta nya sätt att effektivisera fastighetsunderhåll inom bostadssektorn. De följande två artiklar analyserar faktorer som påverkar de beslut som fattas i samband med fastighetsförvaltning och underhåll inom hyresbostadssektorn samt och BRF sektorn i Sverige. Den femte och sista artikel presentera en studie av hur organisationen av fastighetsförvaltning och beslutsstrukturen i bostadsrättsföreningar underlättar eller försvårar utförandet av storskaliga åtgärder för förnybar energi i bostadssektorn.

Studierna visar att underhåll som begrepp är irrelevant från ett beslutsfattarperspektiv (artikel I). De visar också att strategier för planering av underhåll inom tillverkningsindustrier kan i viss mån tillämpas på underhåll inom fastighetssektorn. Däremot, på grund av skillnader mellan olika byggnader slutsatsen är att inom fastighetssektorn det är bäst med en strategi som gör det möjligt att kontinuerligt justera underhållsplanerna baserat på ett bra beslutsstödsystem hos fastighetsbolaget eller BRF (artikel II). Hur en aktivitet kategoriseras (underhåll eller investering), samt tidpunkten för underhållsåtgärderna, som ibland förändras till följd av principal-agent problemet (intressekonflikter och moraliska risker) av en sociopolitisk karaktär, är faktorer som kan förklara skillnaderna mellan redovisade underhållskostnader inom den offentliga och privata bostadshyressektorer (artikel III). Studierna visar också att medlemmar i BRF styrelser, som är icke-professionella inom fastighetsförvaltning, utmanas av bristen på ett långsiktigt perspektiv i beslutsfattandet på grund av olika principal-agent problem som dolda incitament, hög omsättning på styrelsemedlemmar samt informationsasymmetri som exemplifieras av kompletterande arbete på grund av bygg fel i synnerhet i kooperativ med nybyggda hus (artikel IV och V). Begränsningar i studierna handlar om endogenitetsproblem i allmänhet, och selektionssvårigheter i synnerhet, vilka gör det svårt i vissa fall att fastställa graden av reliabilitet och validitet av de empiriska resultaten.

Avhandlingen har flera implikationer för forskare, beslutsfattare, politiker och allmänheten. Den bidrar till att lansera syn på underhåll som en investering; belysa möjligheten till kostnadsbesparingar genom att knyta ihop flera åtgärder samt utmaningar som kan framkomma; visa behovet inom bostadssektorn av verktyg som leder till bättre beslutsunderlag såväl som kunskapsöverföring och utbyte; samt uppmana regeringen att främja en politik som skulle minska graden av informationsasymmetri mellan upphandlare av tjänster inom BRF sektorn och byggföretag samt andra tjänsteleverantörer. Som en del av den politik som riktas mot energieffektivisering och en hållbar miljö framtida forskning kan fokuseras på hur ett krav på formell kompetens och certifiering inom fastighetsförvaltning av flerfamiljshus, särskilt för kunskapsintensiva anläggningar till exempel de som erbjuder innovativa metoder för energieffektivisering som passivhusteknik, kan utformas.

**Nyckelord:** fastighetsförvaltning, fastighetsunderhåll, underhållsplanering, incitament, byggnadsapplikerade solceller; bostadsrättsförening, bostadsrätter, Sverige,



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In various ways three seemingly separate incidents in my life illustrate, the decisions people make based on perceptions, incentives and hidden information. When I was a little boy, everybody expected me to become a football player of rank or a public administrator. This was based on the prevailing knowledge about my parents and projections of what their offspring ought to achieve. I made it to my primary school's junior team. Later in life, I was nominated to sit on the governing board of a tenant-owner cooperative. The secretary at the time asked the members whether they could not find someone else with a name that was simpler to spell. Competence was not an issue. When I completed my licentiate in 2009, I told a top member of staff at the time that I would present my doctoral thesis within a period of two years from then. With confidence, he commented that that would never happen. He had information on work schedules that I did not have.

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# **1 Introduction to the comprehensive summary of the thesis**

## **1.1 Background**

The post-World War II housing stock in Europe is aging and with it a need in several countries to increase the level of new construction and maintenance activities in order to remedy the deterioration (Balaras et al., 2005). In Sweden, a large share of the housing stock (63.8%) is built before 1971 in comparison to the European average of 52.2% (Dol & Haffner, 2010, p. 54) making it even more essential to take care of the existing stock. However, Sweden faces challenges in having to refurbish the approximately one million dwellings that were constructed during the period 1965-1975 under what is generally known as the Million Homes Programme (Hall & Vidén, 2005; Borgegård & Kemeny, 2004). Furthermore, Sweden has committed itself to several measures aimed at reducing energy demand within the built environment by the year 2020 (see e.g. Thollander et al., 2012; Siggelsten & Olander, 2013) and increase in efficiency within the housing sector can contribute towards achieving the goals above (see e.g. Botta, 2005; Högberg et al., 2009; Lind et al., 2014).

Since the 1990s and in line with reforms in other countries in Europe, Sweden has experienced a shift in the property management of the housing stock within the municipal and the private rental sectors (Blomé, 2012a; Turner, 1997). The distribution of tenure forms and the way housing construction and refurbishment is financed has changed from a high degree of state subsidies to a housing sector that to a large extent is market-governed (Lind & Lundström, 2007; Andersson & Turner, 2014). Inefficiencies in the rent-regulated housing market have contributed to making the tenant-owner cooperative (TOC) sector the fastest growing housing sector in Sweden (Matt, 2007; Ball, 2012). In 2002, after signs that an increasing degree of property owners appeared to be neglecting housing maintenance, the Swedish government commissioned a report to investigate maintenance needs in the housing sector with particular emphasis on multifamily housing within the stock constructed during the period 1965-1975. The study that was carried out by the National Board of Housing, Building and Planning concluded that a large number of apartments built during the 1960s and 1970s require extensive refurbishment (Boverket, 2002). The results indicated that neglected maintenance varied more between buildings within the TOC sector in which decision making is by non-professionals than in the professionally managed rental sector.

For a number of years the reported maintenance costs per unit housing area within the municipal sector have been consistently higher than in the private sector (Statistics Sweden, 2012; Boverket, 2002, p.82) and though aspects such as building characteristics and maintainability influence maintenance levels (see e.g. El-Haram & Horner, 2002a; Olanrewaju & Abdul-Aziz, 2015), given comparable buildings, these factors alone cannot explain the variance in the costs reported.

Research within the rental housing sector in Sweden has covered issues such as segregation (Andersson & Turner, 2014; Hedin et al., 2012; Bergsten & Holmqvist, 2013); corporate social responsibility (Blomé, 2012b); rent control and its influence on maintenance levels and vacancy levels (Lind, 2014; Wilhelmsson et al., 2011) as well as various management strategies (Lind & Blomé, 2012; Annadotter & Blomé, 2014). However, though TOCs in Sweden represent a substantial share of the total housing stock, 22% as compared to an average of 10 % in most European countries (Moreau & Pittini, 2012), the property management challenges for the non-professional decision-makers in TOCs is a problem that hitherto has not received much attention.

The same applies to the issue of the continuous difference in reported maintenance costs between the municipal and the private housing sectors in Sweden given the largely similar characteristics of the buildings under management. Reports (Boverket, 2002; Norris & Shiels, 2004, p.81) have expressed concern that municipal housing companies and TOCs may have difficulties carrying out required improvements in properties built during the period 1965-1975.

Solutions to a problem in one sector of an industry can at times be found through knowledge acquired through an analysis or observation of how others in a separate industry have dealt with a similar challenge (Fong & Lee, 2009; Bikhchandani et al., 1998). However this calls for the use of comparable terminology or concepts even though the decisions made will depend on the characteristics of the individual or the organisation as well as the different models and strategies applicable to solving the challenge.

## **1.2 Research topics and questions**

The overall purpose of the doctoral thesis is to increase the understanding of the factors that influence the decisions made within the multi-faceted property management of multifamily housing in Sweden and to contribute new knowledge.

The research is centred round three areas of special interest also denoted as research topics (RTs). The various studies done under these topics are based on specific research questions (RQs) that are addressed in the five papers presented in the thesis. The interconnection between the research topics and the research questions is described below.

### **1.2.1 Research topics**

The three research topics in this thesis are:

RT1. *Conceptualising maintenance*

RT2. *Maintenance planning*

RT3. *Decision making in TOCs*

#### ***RT1. Conceptual analysis – distinction between maintenance and investment***

Boverket, (2002, p. 71) identified the rent setting system as one of the reasons for the low level of housing maintenance. In Sweden, the rent paid for an apartment is not defined by the current condition of the dwelling but is set in such a way as to cover the costs for its regular maintenance. Increases above the level determined by the general rent adjustment are only allowed if the landlord has carried out investments that raise the standard of the apartment (Lind, 2014). An investment is "spending resources today in order to get some kind of "advantage" in the future" (Geltner et al., 2007) which can be considered to hold also for activities that are traditionally classified as maintenance. Due to the importance of the distinction between maintenance and investment in relation to property management within the Swedish rental housing sector (see e.g. Lind, 2014 p. 7), an investigation of the conceptual distinction between maintenance and investment was the first of the research topics in the thesis.

## *RT2. Maintenance planning in the Swedish housing sector*

The quality of the houses within the private and the municipal portfolios in Sweden is generally comparable and the apartments constitute nearly perfect substitutes (Turner, 1997; Elsinga & Lind, 2013). However, the stock within the private sector is generally older than that in the municipal sector (Boverket, 2002, p.83). Thus it could be expected that the maintenance costs would also be higher within the private sector. But, data presented in Statistics Sweden, (2012) shows that over several years the reported maintenance costs per unit housing area within the municipal sector have been consistently higher than in the private sector. The second research topic was on the investigation of the above presumed anomaly. This was done through a review of the maintenance strategies used in the municipal and the private rental housing sectors. Studies of the factors that affect maintenance costs as well as a review of maintenance strategies used in some other industries were also used in the inquiry.

## *RT3. Decision making within the Swedish TOCs*

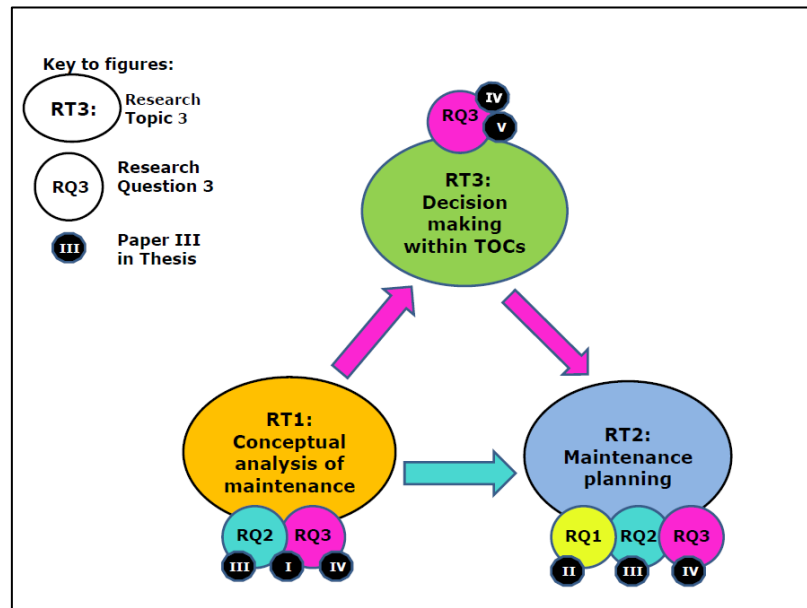
Decision making in the TOC sector is in the hands of lay-persons that might have little or no skills in property management. Various conflicts of interest and incentive problems have been shown to influence the management of common properties within multi-owned housing (see e.g. Arkcoll et al., 2013; Easthope & Randolph, 2009; Levy & Sim 2014; Lujanen, 2010; Nilsson, 2001). In this sector, the greatest risk for neglected maintenance is judged to be within TOCs that do not have professional assistance in property management, in small elderly TOCs or new ones that are located in weak markets (Boverket, 2002). The third research topic focused on issues related to decision making by the lay-persons constituting the governing committees. The aim was to investigate whether there is reason to be concerned about property management within the TOC sector in Sweden.

### *How the research topics are connected*

With time, the performance of various building components deteriorates necessitating some form of action. The question of how different activities are categorised, (RT 1), will have consequences on the financial results related to the managed properties which might influence the planning of the activities. The strategic choice to carry out maintenance on a component or not to, will influence the degree of maintenance planning required, (RT 2). Furthermore, the choice of how an activity is categorised (RT 1) might have effects of a legal, economic, technical and/or environmental character calling for some degree of competency in the decision making, (RT 3). A helicopter perspective would probably represent the interconnections of the research topics as in figure 1.

The pink arrows indicate, for example, a situation in a TOC in which an identified measure is needed. Based on a number of factors the governing committee goes ahead to select the best strategy to achieve the aim, in form of a measure planned in time or based on the monitored condition of a component. The blue arrow indicates how categorisation of an activity may affect maintenance scheduling.

Figure 1: Interconnection between the research topics, research questions and the papers in the thesis



### 1.2.2 Research questions

Based on the overall objective stated above as well as the research topics, the papers in the thesis investigated the following three questions:

- RQ1. To what extent can models of maintenance planning in other industries be applied within housing property management?
- RQ2. Why do the maintenance costs reported by the municipal sector companies consistently differ from those reported by the private sector?
- RQ3. To what extent is the concern expressed about property management in the Swedish tenant-owner cooperative housing sector justified?

The first research question was based on the observation that maintenance within the industrial sector has shifted from activities based on fixed schedules to strategies that focus on conditions and cost effectiveness (Dunn, 2003). The same cannot be said of building maintenance which appears to be planned for and carried out in a number of ways depending on whether the owner is a company in the private or the municipal housing sectors (Sharp & Jones, 2012). It is argued in works such as El-Haram & Horner, (2002b) that applying strategies such as reliability centred maintenance (RCM) will improve maintenance planning. Thus the first research question (RQ1) was intended to investigate models of maintenance in a number of industries in relation to their applicability within property management and in particular the planning of building maintenance within the Swedish housing sector. This is connected to research topic 2 (RT2) and was investigated in Paper II.

The background to the second research question was the observation that while the municipal housing companies appeared to be having the same or increasing maintenance costs these were showing a slightly downward trend within the private sector (Boverket, 2002; Statistics Sweden, 2012). Paper III presents an investigation of the factors that can possibly explain this phenomenon. This research question is linked to research topic 1 concerning the categorisation of activities as well as to research topic 2 on maintenance planning.

The background to the third research question was the fact that in comparison to other European countries, the cooperative housing sector in Sweden covers a large percentage of the multi-family housing sector (Moreau & Pittini, 2012) and that worries about property management within the tenant-owner cooperatives had been expressed in reports such as Boverket, (2002) and Norris & Shiels, (2004). An investigation of how activities are classified as well as how the maintenance is planned for within TOCs was carried out together with a study of other issues linked to the challenges in the management of multi-owned properties such as tenant-owner cooperatives. The results were presented in Paper IV. This research question was further investigated through the study of decision making and the challenges encountered concerning a particular activity – the adoption of photovoltaics. The five papers in this thesis address, one for each study, a specific research issue. Table 1 displays the five papers and the research topics as well as research questions they cover.

*Table 1: The five papers and their relation to the research topics and research questions*

Paper	Title	RT	RQ
I	Critical reflections on the concept of maintenance	1	2; 3
II	Building maintenance strategies: planning under uncertainty	2	1
III	Analysis of factors influencing reported housing maintenance costs in Sweden's public and private rental sectors	1; 2	2
IV	Challenges to property management within the Swedish cooperative housing sector	1;2;3	3
V	Organizational challenges in the adoption of building applied photovoltaics in the Swedish tenant-owner housing sector	3	3

The results presented in the thesis complement and provide new insights about the research field and serve as inputs to further studies. They are based on several methodological approaches that were utilised one at a time or in combination in order to achieve the research goal.

In the thesis the terms multi-dwelling building, multi-family housing and multifamily housing are used interchangeably as synonyms for buildings housing apartments. Though buildings constructed during the period 1965-1975 are of primary interest, the research is not limited to this period alone. Furthermore, the research focuses on property owning companies in the public and the private sectors as well as tenant-owner cooperatives. The research presented in this thesis does not cover issues related to the provision of affordable housing other than in relation to rent control and its influence on housing maintenance levels.

### **1.3 Brief overview of the Swedish housing sector**

The housing market in Sweden consists mainly of three tenure forms: owner-occupation, rental tenancy and cooperative tenant-ownership according to the distribution shown in table 2. Condominiums, where each housing unit in a multifamily building is a separately owned property unit, have existed in Sweden since May 2009 but they account for less than 0.1 % of multifamily housing (Statistics Sweden, 2014).

Table 2: *Estimated distribution of tenure forms and dwellings in Sweden 2012*

Total number of dwellings	4 550 779	100 %
Owner-occupied single-family	2 014 394	44 %
Multi-family housing	2 536 385	56 %
- tenant-owner cooperative (TOC)	955 000	37 %
- rental (Private)	830 000	33 %
- rental (Municipal)	751 000	30 %

(Source: Statistics Sweden, 2013)

Public rental sector refers to housing properties owned by companies connected to the local government (municipal council) or properties that are allocated according to the regulations governing “public utility” housing (Pittini & Laino, 2011, p. 22). All of the rental dwellings that are not under the public sector or tenant-owner cooperatives are considered in the thesis as part of the private rental sector. Crook & Kemp, (2014, pp. 5-6) provides a good description of how this sector is generally demarcated in a number of countries based on criteria such as financing and affordability. Rent-free dwellings as described in Haffner, (2012) or second homes owned for investment purposes, which is rare in Sweden, are not part of the studies presented here. Officially, there is no ‘social housing in Sweden (Magnusson Turner & Hedman, 2014; Pittini & Laino, 2011; Scanlon, et al., 2015) and no housing associations such as those in U.K or the Netherlands. In the research carried out they would have been categorised under public housing. In this comprehensive summary, “public” is used in reference to the whole “public utility” housing sector whereas “municipal” is used when the data is only from this type of property owner.

The extensive construction of multi-family rental dwellings for the municipal housing companies during the Million Homes Programme (50%) as compared to 30% for the cooperative sector and 20% for the private sector led to a municipal sector that predominated the ownership of multi-family properties in Sweden (Turner, 1997), even though private ownership dominates in the oldest stock. Since then portfolio transfers between the sectors have occurred and today the stock in the municipal and private sectors is about equal. Annual construction in the multi-tenant sector is dominated by dwellings for the cooperative housing sector which together with tenure conversions has led to the expansion of the cooperative housing sector (Borgegård & Kemeny, 2004).

The tenant-owner tenure in Sweden has been described by Scanlon & Whitehead, (2004) as well as Rounavaara, (2005) as confusing, paradoxical and unique due to the dual character of ownership and tenancy. A majority of the TOCs consist of “builder-sponsor” cooperatives in which the cooperative’s members are not the initiators of the project but persons brought into the development by means of advertising and a regular sales campaign carried out by a building firm. Another category of TOCs are the ones formed through a tenure conversion process that is stipulated in the legislation. In a number of cases, dwellers in the suburbs have not managed to amass the number of tenants in the building who want and/or can afford to participate in the tenure conversion as required by the legislation. TOCs also sort into two organisational groups: the “attached ones” that belong to the two nationwide cooperative organizations HSB and Riksbyggen, and the independent ones, which are primarily those founded by building companies or conversion. Management is through governing committees in which service is on a voluntary basis.

By April 2014, there were 23,271 active TOCs in Sweden and though only about 10% of them consist of more than 100 dwellings, the ones formed during the period



1965-1975 comprise of 300 to 500 apartments each (Hitta Brf, 2014). (Bengtsson, 1992) Bengtsson, (1992) and Victorin & Flodin, (2011) provide a good description of cooperative housing and the TOC tenure in Sweden.

The Swedish housing sector consists of a wide variety of property owners and a study carried out by the National Board of Housing, Building and Planning in 2010 showed that of the 50 largest multifamily housing owners in Sweden at the time, 38 were municipal housing companies, 5 were privately owned Swedish companies, 5 were foreign companies, 1 cooperative organisation and 1 in the category other (Boverket, 2010). The companies in the municipal and the private rental housing sectors could further be divided into various subcategories based on the goals and intended ownership duration of a property owner but this action suffers from the lack of reliable information.

The municipal housing companies are an example of property owners that could be placed in the subcategory of owners that are believed to have very long-term ownership durations. However financial pressure to act more in market terms as well as the need to acquire funds for major renovations have led some of them to sell off parts of their portfolios (Andrews et al., 2011). The transfers have mainly been to TOCs in centrally located areas (Andersson & Turner, 2014). Other transactions especially in less attractive areas have transferred portfolios from the municipal sector to private sector actors with very short holding periods, contrary to information given by the parties before the transaction. There have also been transfers from the private sector into the public sector. Blomé, (2012a) reports the case of a large municipal portfolio whose 11 properties were sold between various companies in the private sector not less than 48 times between 1990 and 2010. Some of these properties are once again under municipal ownership.

The research presented in the thesis was started in 2007 and since then mergers within the private sector as well as companies without a previous history of investments in rental dwellings have created players in the Swedish multi-family housing market with a special focus on owning properties built during the period 1965-1975. At the same time some of the largest foreign companies presented in Boverket, (2010) have completely left the housing sector. Therefore the focus in the thesis is on the main ownership categories and not subcategories. Age, location and size are parameters that could be used to form subcategories within the TOC sector.

## **1.4 Disposition**

The rest of this comprehensive summary is structured as follows: The central concepts in the thesis and how they have been utilised in the papers is presented under chapter 2. The rationale for the research approach as well as the data collection and analysis methods used in the thesis are presented in chapter 3 before a summary of the papers is given in chapter 4. The conclusions from the research done as well as the contributions of the thesis from various perspectives are presented in chapter 5.

## **2 Central concepts used in the thesis**

The reason for a company's existence as well as what it wants to be in the future will determine various goals for the company and the strategies on how these goals can be realised (Alfjung, et al., 2013). This perspective is applied in the thesis in exploring how various property management goals can be realised by the property owner - a company or tenant-owner cooperative. The starting point of the thesis is

the discussion presented in Boverket, (2002) about the low level of refurbishment activities together with neglected maintenance in the housing sector in Sweden and the measures needed in order to rectify the situation. But in order to analyse and find ways to deal with maintenance that is perceived as neglected, it is essential that all the parties concerned have the same comprehension of the concept. However, concepts that are used in the literature are not always clarified by the authors. For example, though Victorin & Flodin, (2011), provides a good overview of the TOC tenure in Sweden and discusses the decision making and the competence of the committee members, competence is not explicitly defined and is only described as the responsibilities of the committee. This chapter presents three concepts, *maintenance*, *competence*, and *efficiency*, which are considered to be of central importance in the research reported in the thesis.

## 2.1 Maintenance

A search in the literature shows that the definition of maintenance differs from author to author as well as between and within companies. The definition of maintenance in AFF 04, the branch standard used by most property and facility management firms and organisations in Sweden is

*“actions aimed at restoring the functions of a managed item, fixture, or appliance”* (Svenska Byggtjänst, 2004).

In the European standard on maintenance terminology (EN 13306:2001) it is defined as:

*“the combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function”* (European Committee for Standardisation, 2001).

The two definitions of maintenance shown above differ in perspective. In AFF 04 there is an assumption that the technical functions are deteriorating and that an action is taken so as to restore the original functions of the systems. The phrase “actions intended to retain in a functional state” that is included in EN 13306:2001 provides for a broader concept. However, the use of vague concepts such as “function” in both definitions creates other problems. To say that an object, which is in a good working condition “functions”, is subject to decisions based on evaluation of consequences and resources available. An illustrative example is that of a roof of a building that leaks a little during abnormally bad weather but which otherwise never leaks. When, and how to carry out a measure, is tied to the question of whether the roof is functioning or not. The distinction between “retain” and “restore” is also rather ambiguous if the demands and views on necessary functions change over time. Olanrewaju & Abdul-Aziz, (2015, p. 81) provides a list of ten definitions of maintenance found in the literature. One of these is:

*“Services required so that the building can operate efficiently and effectively while taking into account environmental condition, reliability and economic issues”* (Marsh, 2003).

In economic theory a rational decision maker is forward looking and weighs the future costs and benefits of a specific decision. Whether this decision leads to retaining, restoring or improving on the earlier or original standard of the system is irrelevant. What is important is the choice between whether an object should be kept at the current standard, allowed to deteriorate or if it should be improved. When resources are spent today in the hope of reaping a positive return, then this is called an investment. In carrying out a maintenance measure resources are spent with the

purpose of lowering operating costs and/or achieving higher benefits later on as compared to a situation in which no action is taken. Thus from the perspective of investment theory, activities that are usually classified as maintenance should also be seen as investments.

## 2.2 Competence

That decision making in about 40% of the multifamily housing sector (the TOC sector) has been delegated to lay-persons can be a cause for worry in case one were to assume that these persons have little or no skills in property management. This is partly the focus of the research done in Paper IV. On the other hand, not so much is known either about the basis for decisions taken within the professionally managed housing sector that is investigated in Paper III. This raises the issue of competence which is another of the main concepts in the thesis. Competence is defined in the literature as:

*“the ability to do something successfully or efficiently”* (Oxford Dictionaries, 2013)

*“the ability and willingness to perform a task”* (Burgoyne, 1989)

According to Lindsay & Stuart, (1997) competence must be described based on a consideration of the organisation culture as well as environment in which one is called to perform and according to the authors competence is:

*“a statement of value accorded to another person in a particular culture and within a particular business environment”* (p. 327).

Virtanen, (2000) distinguishes competence, that is *“a kind of human capital or resource that can be transformed into productivity”* from qualification which is *“requirements of a certain class of work tasks”*.

From the definitions proffered above competence is principally a situation specific attribute. It is often used synonymously with competency, which is defined either as *“observable performance, the standard or quality of the outcome of a person’s performance”* or as *“the underlying attributes of a person such as knowledge, skills or abilities”* (Hoffmann, 1999). In various ways there is reference in many of the definitions of competence to “skills and abilities”. The descriptions further encompass the concept of knowledge which can be defined as “understanding based on experience or a familiarity with how to do something that enables a person to perform a specialized task” (Fong & Lee, 2009).

Competence, according to Seemann, et al., (2014) is *“the extent to which one is able to manifest one’s intent”*. It means being able to demonstrate or in some other way make clear one’s objectives. This can be done through the creation of a transparent decision making process with a decision support system that leads to activity plans whose results are easy to analyse. Such a decision support system also has to take into account challenges related to the observable as well as hidden incentives of the person undertaking a duty or assignment (the agent) together with the goals of the beneficiary to the work being done (the principal). Within the TOC sector, in general, only members in the cooperative can be elected to sit on the governing committee (Victorin & Flodin, 2011,p.92). Thus the reasons behind a household’s tenure choice will influence the composition of the members in a particular TOC from whom the governing committee members are chosen. However due to the occurrence of free-riders it can be assumed that the number of persons within the elective body that are knowledgeable, skilled in property management and are willing to serve is not so large. Burgoyne, (1989) takes willingness to be a

criterion for competence, and based on this definition it could be hypothesised that competence in managing TOCs can only be found in some of its members.

### **2.3 Efficiency**

The third of the central concepts used in the thesis is efficiency, which at a broad level, is a statement about the utilisation of resources. Within microeconomic theory allocative efficiency is the direction of resources towards outcomes that maximise a welfare function (Førsund & Hjalmarsson, 1974). In an environment with a set of feasible social outcomes and consumers with preferences over the feasible social outcomes, an outcome  $x$  is said to be Pareto superior to  $x'$  if every individual is at least as well off in  $x$  as in  $x'$  and the preference for  $x$  is strictly higher for at least one individual. An outcome is considered to be Pareto efficient if no other outcome is Pareto-superior (Kreps, 1990, p. 154). Given a number of alternative ways in which to carry out a measure, such as a maintenance activity, a subset of choices will be Pareto efficient if no other subset can outperform any of the measures in the set selected. Pareto efficiency does not necessarily result in a distribution of resources that is socially desirable as it does not focus on equality or the overall utility of the society. Two social outcomes  $z$  and  $z'$  are Pareto incomparable if one individual is better off in  $z$  and another is better off in  $z'$ .

Within business administration, efficiency has also been defined as “doing the right thing” while “doing it right” refers to effectivity or effectiveness (Drucker, 1977). The goals of a not-for-profit organisation such as a public housing company or a TOC might differ from those of a private sector housing company. Consequently, efficiency will be evaluated according to the type of business and sector in which the organisation/company is operating. Management is the process of efficiently getting activities completed with and through other people (Mertens, 2013). Olanrewaju & Abdul-Aziz, (2015) find a process to be efficient if it can achieve maximum profitability or return on investments. According to the Oxford dictionary a person is efficient if that person is working in a well-organized and competent way (Oxford Dictionaries, 2013). Thus, efficient property management can be described as the managing of the operation of a building/property in a manner that produces desired results without wasting materials, time, or energy and by persons that operate in a well-organised manner and way that requires the possession of necessary skills or ability to meet a benchmark.

### **2.4 Use of the concepts in the papers**

The three concepts above have been used in the papers in various ways. The concept of maintenance has been used in all of the papers either in form of a proposal of a conceptual framework (Paper I), in the review of maintenance strategies (Paper II), in the analysis of factors influencing maintenance (Paper III) or in the analysis of decisions made by governing committees (Paper IV and Paper V). In order to investigate research question two only costs pertaining to planned maintenance taken over a number of years were used in the quantitative study presented in Paper III in an attempt to have data that is comparable. On the other hand, in the qualitative inquiries presented in Paper III, Paper IV and Paper V, a wider all-inclusive perspective that combines elements of the definition in European Committee for Standardisation, (2001) and in Marsh (2003) was applied whereby corrective actions such as repairs and renovations were taken to be maintenance activities. Only the addition of new space or totally new functions was considered as an investment.

The definitions of competence given above are not specific enough so as to provide a scale that can be used to quantitatively measure competence in property management within the three housing sectors investigated in the thesis. Based on Lindsay & Stuart, (1997) it could be hypothesised that competence in property management especially within the TOC sector will be viewed from the perspective of the culture and work environment within the particular organisation. Effort is taken in Paper IV to find out how the members of governing committees in TOCs view their competence in managing the properties of the TOC according to the distinction between qualification and competence given in Virtanen, (2000). The discussion in Paper II about the ability to operate within uncertainties and in Paper III, Paper IV and Paper V about the ability to decide on as well as oversee various measures is largely based on how competence is defined in Oxford Dictionaries, (2013).

The last of the concepts, efficiency, underlies the discussions in all of the papers as the aim of the suggestions given is towards increasing the understanding of the factors that influence the decisions made and consequently raising the degree of efficient property management as exemplified through the challenges identified in the studies in Paper IV and Paper V. Reducing the challenges would raise efficiency.

### **3 Research design**

Research that aims at finding the best predictor of an outcome is primarily conducted using a quantitative approach whereas a qualitative approach is most suitable for the identification of factors that influence an outcome especially if the most important variables to examine are not known to the researcher. In a situation when the approaches above, each by itself, are not adequate to understand the research problem, then a combination of the two is advisable (Creswell, 2013). This is what was done in the thesis. This chapter describes the collection of quantitative data which was used in the study covered in Paper III as well as it presents the collection of the qualitative data based on interviews reported in Paper IV and Paper V together with the data gathered through the questionnaires that are presented in Paper III and Paper IV. The chapter ends with a description of how the collected data was analysed together with a reflection on the limitations of the research results.

#### **3.1 A multimethod approach**

Amaratunga et al., (2002) asserts that within the built environment research community, the quantitative and the qualitative approaches are best thought of as complimentary and should be mixed in research of many kinds. There is an abundance of literature that discusses quantitative and qualitative designs and also reasons for and against combining the two approaches (see e.g. Bryman, 2006; Amaratunga et al., 2002; Creswell, 2013; Venkatesh et al., 2013). Based on a pragmatic perspective the empirical papers contained in the thesis use different data sets and different methods in the separate studies that provide components of the whole research project.

A multimethod design involves qualitative and quantitative projects that are more or less complete on their own (Byrne & Humble, 2007). These are then used together to form crucial components of one research program. Each study is planned and executed to answer a specific sub-question, whereby the results of the research are used to form a comprehensive whole. This is the case in the thesis in which multiple sets of data and multiple methods were used one at a time or in combination, depending on the nature of the research question in each specific paper. According

to Venkatesh et al., (2013) there is a conceptual difference between the terms mixed methods and multi-method. However the terms multi-methods, multi-strategy and mixed methods are often used interchangeably (Bryman, 2006). The term multimethod is used in the general discussion below and it is taken to represent the two terms multi-methods as presented in Venkatesh et al., (2013) and mixed methods as given in Creswell, (2013).

### 3.2 Data collection – describing six sets of data

#### 3.2.1 Overview

The research in the thesis seeks to understand what is happening and why as well as how certain phenomena are dealt with in two types of tenure within multifamily housing: renting and tenant-ownership. The use of qualitative methods such as interviews serves the purpose well in most of the cases as it is possible to investigate the why and how of decision-making and not just the where, when and what. However, the question of why can also be answered through a causal explanation investigated using econometric analysis.

Table 4 shows the data collection and analysis method used in each of the five papers in the thesis. The review of documents relevant to the study at hand is another type of data collection that in varying degrees is used in all of the papers in the thesis. The individual papers contain more details of the methods used for each specific study.

*Table 3: The data collection and analysis methods used in the papers*

Paper	Data collection		Analysis		
	self-administered questionnaires	Interviews	Econometric analysis	Descriptive analysis	Conceptual analysis
I					x
II				x	
III	x		x	x	
IV	x	x		x	
V		x		x	

#### 3.2.2 Quantitative data from financial reports

Data provided in Statistics Sweden (2013) showed that public housing companies consistently reported maintenance costs that were higher than those in the private sector. In order to investigate whether “fundamental” features such as differences in the age structure of the buildings or the economic situation of the companies could provide an explanation for this, data on maintenance costs reported in the financial reports of housing companies in the municipal and the private sectors was collected. The housing companies in this study were selected based on two criteria: that access to financial reports covering several years was readily available through the internet, which turned out to be a major limitation, and that the maintenance costs were clearly demarcated from repairs and central administration. Initially 46 housing companies were found but the number decreased to 28 (10 private and 18 municipal) as few of the companies fulfilled the second criteria. The remaining companies were paired according to the type of municipality in which a majority of the properties were located (in large city or not) as well as the ownership category (public or private). The analysis was confined to the period from 2004 to 2007 as only a few companies displayed reports older than 2004. Data before the

global financial crisis in 2008 has the advantage that it belongs to a more stable period.

Eight pairs that fulfilled all the criteria above were found. Effort was taken to match the companies in terms of portfolio size as well as the volume of properties in the portfolio that were constructed during the period 1965-1975. This varied from 75% to about 20% in the 16 companies studied. The descriptive statistics are presented in Paper III. Data on 11 variables such as the rent level, maintenance cost level, total space under management, total housing space under management, the age distribution of the individual housing properties under management together with their reported taxation as well as book values were collected.

### 3.2.3 Data from interviews

#### *Interviews in Paper IV*

The inner city of Stockholm has registered the highest rate of tenure conversion and price increase leading to discussion about different types of segregation in this sector (Andersson & Turner, 2014). It is hypothesised that the priorities and the management decisions within TOCs in the suburbs differ from those of TOCs within the inner city. To find out whether proximity to the city centre as well as the age of the buildings under management had an influence on factors such as the degree of outsourcing and allocation of duties within the governing committee and consequently the decisions made, the semi-structured interviews reported in Paper IV were carried out. The tenant-owner cooperatives studied were selected based on their size and location in relation to the city centre as well as the accessibility of their financial reports through the internet. A minimum size of 25 apartments was chosen in order to eliminate the very small cooperatives. An upper limit was set at not more than 150 apartments in order to leave out the very large cooperatives. The size of the TOCs that could be sampled was chosen so as to cover for the most common type of TOC based on statistics provided in Hitta Brf, (2014). TOCs located within 2km from Stockholm city centre and an inner suburb area Farsta, which lies about 10km from the city centre, were selected for this study. Farsta has a good tenure mix and buildings of various ages and is representative of the areas of the inner suburbs according to the description of inner suburb given in Andersson & Turner, (2014).

For the purpose of studying maintenance strategies in relation to the age of the buildings under management, TOCs with buildings that became operational after 2005 were categorised as new/young. The ones with buildings constructed before 1991, were classified as aged. The criterion requiring easy access to financial reports greatly narrowed down the sample within the geographic area of interest to less than 100. The number was further reduced as many of the persons with knowledge relevant to the study could not find the time to participate in interviews. Finally a total of twelve interviews, out of 42 possible ones, with three TOCs in each of the four sample categories (inner city vs inner suburb and young/new vs aged) could be carried out over a period of three months in 2012. The questions were based on an interview guide covering descriptive information about the TOC which was used to gauge the ability to produce or achieve a desired result, efficacy, and the sense of collectivism in the TOC. Other questions were used to collect data about the governing committee and the presence of competent persons on the board, the degree of participation by members of the TOC in decision making as well as the level of outsourcing and monitoring of service providers. The chairperson and the treasurer of the TOC were interviewed together at a location of their choice. These

interviews were carried out with another researcher whose focus was on issues of financial management within the TOCs. Those results have been presented in Hullgren, (2013).

#### *Interviews in Paper V*

A number of TOCs attached to Riksbyggen had previously expressed a wish to install building applied photovoltaics (BAPV) on the roofs of their buildings (af Klintberg & Björk, 2013). The research reported in Paper V was based on data collected through seven semi-structured group interviews in four out of eleven of these TOCs together with three others that had already carried out the installation. Inquiries through Riksbyggen had produced one of these while a study of the website of the Solar Energy Association of Sweden (Svensk Solenergi) had produced two more that were willing to participate in the study. Exploratory interviews that involved the chairperson, the treasurer and the property manager were carried out in the first four TOCs with the purpose of gaining an overview of the field under study. These were then followed up with the interviews in the three TOCs that had installed BAPV. The entrepreneur responsible for the installation of BAPV in one of the TOCs also took part in that particular meeting.

The seven interviews, which were conducted together with two other persons on the research team, were carried out over a period of five months in 2013. They lasted about 2 hours each followed by an analysis of relevant documents in an attempt to verify the information received. In preparation for the interviews the research team was given access to documents such as the financial as well as maintenance reports of the TOCs. The TOCs that possessed BAPV are located in different regions and under the jurisdiction of three separate county governments which added another dimension to the data collected. Two of the TOCs are attached to Riksbyggen and the third is attached to HSB.

#### 3.2.4 Data from questionnaires

##### *Questionnaire in Paper III*

To enhance as well as to compliment the initial study in Paper III, a questionnaire based on a number of hypotheses related to the literature was administered. The rationale for choosing this approach is that, as noted in Tagesson & Eriksson, (2011), municipal companies at times are poor at complying with accounting standards and legislation and a study based on their reported data is problematic. From the literature on property management in the housing sector eight hypotheses that essentially elaborate on the five factors that affect maintenance costs as given in El-Haram & Horner, (2002a) were formulated and used to compose a questionnaire consisting of 51 structured questions. These were in form of statements to which the respondents could fully agree, fully disagree, or partly agree. The survey consisted of questions that sought answers of a factual nature as well as others concerning the opinion of the respondents which could be compared to those in previous studies such as Borg, (2006). This method of data collection was chosen for this study because unlike interviews it provided a cost-effective way of collecting data in a short period of time from respondents over the whole country.

From lists of housing property owning companies in the private and the public sectors acquired through contact with the Swedish Property Federation (Fastighetsägarna) and the Swedish Association of Public Housing Companies (SABO) data about the companies such as the size and age distribution of their



portfolios was collected through the internet. The aim was to select companies that owned rental housing buildings constructed in Sweden during the period 1961-1975 as this period contains apartments that are taken as relatively comparable within the public and the private sectors (Turner, 1997). One hundred and ninety companies that fulfilled the criteria were identified and an electronic questionnaire sent to the managers. The survey had a response rate of 46% with forty percent of the respondents from the private sector and 60% were from the public sector. There was no information that could be used to compare the group of respondents and the group of non-respondents' which might have an effect on the reliability of the results. The response rate in self-administered questionnaires is often low and Rowley, (2014) finds a rate of 20 percent to be acceptable. Reminders were sent out in order to raise the response rates.

#### *Questionnaire 1 in Paper IV*

The initial study presented in Paper IV was of an exploratory nature based on 12 semi-structured interviews in the municipality of Stockholm. The first questionnaire in Paper IV aimed at investigating, over a wider area, the major issues discovered through the interviews. It comprised of 20 statements, that the respondents were asked to rank based on a 5 point-scale ranging from total disagreement (1) to full agreement (5), on among others the form of acquisition of the buildings, the maintenance strategies used and degree of adherence to maintenance plans, the degree of outsourcing of facility management and the usage of economic analysis tools in prioritising between activities.

Through subscription to a database containing detailed information about TOCs in Sweden (Värderingsdata), an initial search was made for TOCs that were geographically closer than 4km from the city centre (the radius of the inner city) or further than 10km (slightly further than the approximate radius of the Stockholm municipality). It returned 3409 TOCs. By limiting the sample to TOCs that owned at least 25 apartments but not more than 350 apartments the result was reduced to 2447 TOCs. These were then sorted into four categories as in the case of the interviews. However, the category young was redefined to buildings that became operational starting in 2000 while the group, aged, was redefined to contain buildings constructed before 1981. A random selection of maximum 250 TOCs from each category was then made which produced a shortlist of 725 TOCs. The questionnaire was then sent by post to the addresses of the chairpersons. The respondents were also offered the opportunity to participate electronically.

All of the TOCs in the category inner city (101 with response rate 36%) as well as all of the ones with newly constructed buildings in the inner suburbs (126, response 40%) received the questionnaire together with 248 in the category aged within the inner city (response 40%) and 250 in the category aged in the inner suburb (response 32%). Two hundred and sixty six completed and usable questionnaires produced a response rate of 37%. A reminder sent out after two weeks raised the initial response rate by 8%. As the questionnaire was addressed to an individual it is assumed that the right person participated in the survey. However the reliability of the results is influenced by the lack of detailed information about the reasons as to why some people responded but not others.

The price paid for the right to dwell in an apartment in a TOC comprises in part of the purchase sum (that can be financed through a personal mortgage) and a share of the mutual debt held by the TOC. This master debt is used to fund various capital needs of the TOC such as part of the procurement sum of the buildings and the land.

The TOC member also pays a monthly fee that is used to cover the cooperative's running costs and responsibilities such as interest payments on the master debt which influences the level of the fee (Hullgren, 2013). The last section in questionnaire 1 comprised of 9 questions that aimed at finding out various factors related to decisions on mortgage choice within the TOCs. Based in part on the discussion about segregation presented in Andersson & Turner, (2014) as well as a higher degree of newly constructed TOCs in the inner city the hypothesis was that the composition of the governing committees in the suburbs differs from that in the inner city. This was taken to have an influence on the decisions concerning mortgage structures for the master debt.

680 out of the 725 TOCs that received the questionnaire had been identified as having some kind of mortgage and were sent this section too. 97% of the 266 responses to questionnaire 1 also contained answers relevant to this part of the questionnaire. Through studying the financial reports found on the websites of various property owning companies as well as lists of tenure converted properties previously owned by the Municipality of Stockholm the TOCs could further be categorised according to whether they had been acquired through tenure conversion or not. The descriptive statistics related to this particular section of questionnaire 1 have been published in Hullgren, (2013).

#### *Questionnaire 2 in Paper IV*

Dwellings constructed during the period 1965-1975 have been noted to have major renovation needs that, if rectified, could lead to lower energy consumption (Högberg, Lind, & Grange, 2009). Governing committee members in TOCs with these buildings face the challenge of carrying out these measures in the most cost effective way for the cooperative. Whereas questionnaire 1 focused on the age and location characteristics of the TOC, questionnaire 2 focused on possible differences in decision-making between the builder-sponsored TOCs and the ones formed through tenure conversion. The hypothesis behind the inquiry was that the basis for energy efficiency measures in the tenure converted TOCs was different from that in the builder-sponsored TOCs many of whom are connected to HSB and Riksbyggen. TOCs that own properties built during the period 1965-1975 and located outside of the highly transacted inner city market segment, in the thesis taken to be further than 10km to the north and south of the Municipality of Stockholm, have many comparable characteristics and provided the sample area for this study.

The data collection was in form of 9 statements on a 5 point Likert scale ranging from total disagreement (1) to full agreement (5) that sought information about various aspects concerning energy efficiency measures carried out by the TOC before 2009, during the period 2009 to 2012, as well as those planned to be carried out during the interval 2014-2016. Though the term of service on the governing committee is 2 years there is often no restriction on the number of periods a person can serve and it was hoped that through choosing periods close to 2013 when the survey was carried out the chairpersons to whom the questionnaire was sent would have the relevant information being sought. Data on various factors that influence the governing committee's decision-making as well as the financing of the measures was collected together with information about the competence of the members of the governing committee in aspects of a legal, technical, as well as economic character.

The questionnaire was sent by post to the chairpersons in all of the 91 TOCs that had been identified through a property database (Värderingsdata) as relevant to the study. 26 responses were received of which 19 were fully completed and usable. A

reminder that was sent produced only one extra response. The low response rate in this questionnaire, about 20%, could be due to the character of the survey that sought historic information.

### **3.3 Data analysis**

#### **3.3.1 Overview**

The data collected as described in section 3.2 was probed in such a way as to provide substance to the discussions in the research carried out. The analysis done is presented below according to the collection method used and not in terms of the paper in which it was applied as this was shown in table 3.

#### **3.3.2 Analysis of quantitative data from financial reports**

STATA was used to handle the panel data harvested from the financial reports. Due to the small data set stepwise regression was carried out with the aim of improving the model's forecasting performance through reducing the error caused by estimating redundant terms. Maintenance costs have been analysed in empirical studies but mostly as parameters in hedonic price models (see e.g. Wilhelmsson, 2008). Moorhouse, (1972) used regression and simultaneous modelling to examine the optimal maintenance undertaken by a property owner in a rent controlled environment. The maintenance expenditure was cast as a function of net revenue, the size of the building and its age. The analysis in Paper III was modelled using similar variables (maintenance cost, rent level, total space under management, degree of aged housing in the portfolio) but with the ownership category of the company as one of the factors. The selection of these variables was also motivated by literature on factors that influence maintenance costs such as given in El-Haram & Horner, (2002a). It was not possible to rule out uncertainty due to omitted variables such as the number of staff per dwelling and therefore it is difficult to claim that a true model was achieved. The log-log form that was used not only helps to deal with possible heteroscedasticity problems but it also simplifies the interpretation of the regression coefficients as shown in Paper III. The Durbin-Watson test was used to check for autocorrelation.

#### **3.3.3 Analysis of qualitative data from interviews**

The simultaneous collection and analysis of data whereby both jointly shape each other is a characteristic of qualitative research (Maxwell, 2008). During the various interviews the handwritten notes that provided the means of documentation were constantly consulted to check for any questions or issues that needed to be clarified immediately by the interviewees in order to understand the research question being investigated at the time. Thus, while in Paper V follow-up questions were asked about the strategy chosen by the particular TOC in its adoption of BAPV and the experiences of the participants involved in the implementation process, in Paper IV the analysis focused on understanding the basis of various decisions so as to determine the questions that could be pursued in a questionnaire. The questions were followed up with others based on the comprehension of how the respondents had answered a particular question. The results in Paper V are based on a case study approach which is appropriate when the aim of the study is to answer "how" and "why" questions (Baxter & Jack, 2008) but they are presented in the form of case reports as this was not the study of a case in its entirety. The virtue of the case report

and the analysis underlying it is that it has publication value in demonstrating an example and for dissemination of knowledge (Hyett et al., 2014).

### 3.3.4 Analysis of data from the questionnaires

The questionnaires administered in the studies presented in Paper III and Paper IV were all handled using Survey Monkey and Excel. Before the responses could be analysed they were anonymised through substituting the respondent's name and contact information with an identification number that was based on the housing types/categories being investigated. Thereafter descriptive statistics for the various questions was created and analysed in order to inform the discussion of the results. This analysis revealed that of the TOCs that took part in questionnaire 1 in Paper IV 61% were connected to HSB, while 7% were attached to Riksbyggen. Sandelowski, (2000) notes that, in a qualitative descriptive study the analysis is aimed at the description of patterns or regularities in the data rather than the presentation of frequencies. An analysis of the requests sent out in comparison to the responses received indicated that a proportionately higher degree of TOCs attached to HSB did not take part in the survey. This finding contributes to the research in question which in part dealt with competence as well as outsourcing and efficiency in the TOC sector. 21% of the TOCs that responded to the second questionnaire in Paper IV had been acquired through tenure conversion while 74% were from builder-sponsored TOCs and in 5% of the cases the respondent did not know.

### 3.3.5 Conceptual analysis

Data in a conceptual paper can be in form of arguments and/or concepts as well as literature used to put forward the claims of the author. Consequently the analysis will focus on finding the grounds or support for the claims advanced (Hirschheim, 2008). Based on investment theory an analysis of the concept of maintenance in relation to the concept of investment was done in Paper I whereby arguments as to why the proposed conceptual change is valid were presented. Though Paper II is not a conceptual paper, it too was based on the analysis of data that is in form of what others have written. This is done in order to gain knowledge that supports the conclusions arrived at regarding the utilisation of industrial models of maintenance planning within property management. The maintenance models which are described in research studies on maintenance within several industries such as the aero, maritime, marine, frozen food as well the electricity distribution industries were analysed in relation to their possible utilisation in building maintenance.

## 3.4 Reflections on limitations of the research results

This chapter ends with a general discussion of the various limitations that have an influence on the reliability and validity as well as generalisability of the results and conclusions in the thesis.

### 3.4.1 Reliability and validity.

Reliability refers to the consistency of a measurement procedure in producing similar results under the same circumstances on all occasions even when employed by different people. Validity indicates whether a measure actually evaluates what it intends to appraise. Internal validity is used to reflect if the conclusions drawn are based on the material collected whereas external validity refers to whether the results can be generalised (Amaratunga et al., 2002). The application of the multimethod approach in the research mitigates some of the shortcomings and raises the validity

of the results. Documentary evidence provides supplementary research data which, in combination with data acquired through other methods can be used to establish the credibility of the findings (Bowen, 2009). This was done in all of the empirical papers.

The research carried out in the studies presented in all of the five papers is based on non-probabilistic sampling which implies that the results can be context-specific. There is also a possibility that the conclusions arrived at are based on answers from persons that are overly enthusiastic about the topic being reviewed or that only the projects that were successful are represented in the samples used in Paper II and in the cases reported in Paper V. The interviews in Paper V were conducted as group interviews and according to Andersen et al., (2012) a major disadvantage of this form of data collection is that one or two individuals in the group can anchor the thoughts of the rest, and due to lack of confidentiality individuals might be reserved in their responses. Thus in Paper IV and Paper V effort was taken to follow up the information provided by the interviewee through cross checking notes with the other researchers present during the interviews and the analysis of documents provided or collected through other sources.

Results based on the opinions of respondents such as in Paper III can lower the reliability of a study. However if handled properly they are a valuable source of information that the researcher might otherwise miss. In order to increase the degree of reliability of the questionnaires the order in which the questions were asked was carefully considered (Sheatsley, 2013). A major limitation of this data assembly technique is that the researcher has little control over the response process and, as a stand-alone method it is not possible to know whether the respondents have provided accurate data or if they understood the questions in the specific study. Thus the questionnaire was sent to the highest ranking person responsible for the property management strategies in the company and through asking a number of similar questions in questionnaires sent to respondents in different sectors and categories, some degree of triangulation of the general results was achieved. Reminders were sent out in Papers III and Paper IV which helped to raise the response rate and degree of consistency in the results (reliability) especially in Paper III.

Stepwise regression that was used in Paper III is can be problematic in that at any given step, the model is fit using unconstrained least squares thus affecting the validity of the results. The limited size of the sample used in the econometric analysis meant that some tests to ensure validity were not carried out, a fact that necessitated the multimethod approach in an effort to raise internal validity. The sequential questionnaire that arose out of a number of qualitative hypotheses based on the literature review served to mitigate this shortcoming.

Incentives affect the degree of participation in surveys and online questionnaires often yield a low response rate (Rowley, 2014). This is particularly true in the questionnaire on energy measures that is reported in Paper IV. Participatory research is a method through which the researcher can take part in the everyday decision-making process as well as information sharing. Given ample resources and time this is a method through which it is possible to raise the internal validity of the type of research reported in paper IV. However, in the research reported in Paper IV choosing this method would have been at the cost of both reliability and external validity.

In general it can be noted that due to limitations in the individual data collection methods used the validity of the empirical results in Paper III, Paper IV and Paper V

is not as high as it could be and other ways of carrying out the research could probably have produced more valid results. The same can be said about the reliability of the results in Paper III and Paper IV. However the case study type of data collection and supportive document studies carried out in the research reported in Paper V help to raise the reliability as well as validity of those results. Furthermore, the internal validity of the conclusions presented in all of the papers in the thesis is high as they are based on the material collected. Through the utilisation of several data collection and analysis methods, the five papers jointly provide an overview of various factors that influence property management in the Swedish housing sector. The results of the different questionnaires and interviews point to a number of similar conclusions such as a short term perspective in some of the maintenance planning done. Through purposive sampling as well as the use of the multimethod approach the reliability of the thesis as a whole is increased and taken collectively the papers raise the external validity of the thesis.

### 3.4.2 Generalisation of the results to other countries

Some of the conclusions presented in the thesis such as in Paper I and Paper II can be applied to other markets and countries especially those with accounting standards that differentiate between maintenance activities and investment activities. However, the nature of the samples used in Paper III; Paper IV and Paper V make the international generalisation of the conclusions difficult but possible at a national level. Nevertheless caution should be exercised when making generalisations especially when it comes to more specific results derived from aspects within the various subsectors.

The data in Paper III is based on a small sample of property companies within the Swedish public and private rental sectors. Their property management strategies are greatly influenced by the rent regulations in place and the variation in tactics between companies in the different sectors can be as wide as within the sectors themselves. However the convenient sampling method of selecting the respondents to the questionnaire, together with results that to a large extent are consistent with those in reports such as Boverket, (2010) on the possible reasons as to why the private sector companies report large profits point to conclusions that are generally applicable to the ownership categories investigated. Due to the characteristics of the TOC-tenure form the data collected for the studies presented in Paper IV and Paper V can be seen as very specific to the Swedish market. Nevertheless, some of the challenges identified especially in relation to incentive problems are in many ways similar to those in countries with multi-owned housing units and could be relevant to other countries.

## 4 Summary of papers

The results and conclusions of the various research studies in the thesis are presented in the five papers that are described here. The papers are ordered according to the order in which they were written.

### 4.1 Paper I: Lind, H & Muyingo, H. (2012) 'Critical reflections on the concept of maintenance', *International Journal of Strategic Property Management*, Vol16:2, pp.105-114

This conceptual paper highlights the lack of consistency in defining maintenance within the built environment and notes that there is a risk for erratic decisions and loss of efficiency when similar activities are classified haphazardly. The aim of the paper was to provide a clear and logical terminology that simplifies the planning as well as evaluation of property management activities based on the same definition. The paper critically evaluates the conceptual distinction between investment and maintenance. From the perspective of standard investment theory a review of a number of definitions of maintenance given in the literature leads to the conclusion that the concept of investment encompasses all of the information necessary for decision-making with a view to the future performance of an object.

The main contribution of this paper is that investment planning and maintenance planning that hitherto have been analysed separately must be seen as one integrated activity. In a dynamic age the relationship to earlier characteristics and functions, as given in the general definition of maintenance, becomes less and less interesting. The conclusion is that the concept of investment embraces all relevant decisions and also puts the emphasis on the future consequences of a decision and not whether it restores an earlier standard or not. Maintenance can be retained as an administrative tool for e.g. taxation purposes but is irrelevant from a decision-making perspective.

### 4.2 Paper II: Lind, H. and Muyingo, H. (2012). 'Building maintenance strategies: planning under uncertainty', *Property Management*, Vol.30, No.1, pp.14-28

The second paper in the thesis studied maintenance strategies in a number of industries with the aim of determining the extent to which they could be applied to building maintenance. The proposition was that due to its characteristics and uncertainties, building maintenance should be handled differently from that in other industries in which the decision is hung on information based on a multitude of homogeneous components in relatively similar application environments. The study was based on Swedish research reports that contained descriptions of maintenance procedures and strategies from several industries. A number of stylized facts were identified and explained with the purpose of drawing conclusions.

The main contribution of this paper is that it presents an analysis of uncertainties affecting building maintenance and a discussion of the importance of taking into account the different types of uncertainties in the planning of building maintenance. The conclusions are that the view that building maintenance is underdeveloped and can be made more efficient through models from other industries is mistaken and that it is not rational to make detailed long-term maintenance plans but rather to focus on a flexible planning system based on a reliable decision support system.

#### **4.3 Paper III: Muyingo, H. 'Analysis of factors influencing reported housing maintenance costs in Sweden's public and private rental sectors'**

(Manuscript resubmitted after minor adjustments to International Journal of Strategic Property Management)

This paper had its origin in an observation that housing companies in the public sector consistently reported maintenance costs that were higher than those reported by actors in the private sector. The aim of the paper was to contribute to an understanding of the reasons behind this as part of the general drive towards a higher volume of building maintenance and renovation in the sector, especially in apartments constructed during the period 1965-1975. A panel data econometric analysis of maintenance costs reported in the financial accounts of 8 matched pairs of companies from the municipal and the private sectors and a sequential questionnaire sent to 196 managers, response rate 46 %, provided the base for the conclusions drawn.

This study contributes to the ongoing discussion of how the public sector companies can operate in a more business-like manner. The econometric analysis indicated a significant *ceteribus paribus* change in maintenance costs due to a switch in the ownership category. The results from the complimentary questionnaire revealed that activities are not classified in the same way in the two sectors. Furthermore, the period under analysis was a period with very low interest rates which has an impact on the economic surplus of the companies. The dividend policy or not-for profit status of the company affects the amount of funds retained which according to a clear majority of the respondents influences the company's maintenance efforts and subsequent costs reported. Regulations that govern tendering and procurement within the public sector have an effect on the speed at which projects are accomplished. However, procurement efficiency and other factors such as construction quality, tenant composition, and maintenance standards were found not to be part of the explanation for the observed difference in the reported maintenance costs. On the other hand, the answers to the questionnaire revealed that the planning horizon as well as the influence of external factors, such as politicians and the media, were factors that provided part of the answer as to why the reported costs were different between the two sectors investigated. An increase in the economic surplus that cannot be paid out as dividends as well as incentive problems within the public sector lead to the carrying out of maintenance activities in a schedule that is different from that in the profit maximising/cost-efficient private sector.

A contribution of this paper is that it presents empirical data that the ownership category in itself is an explanatory factor for the difference in the reported costs and indications that the inconsistent classification of activities as investments or maintenance, a result that relates to the study presented in Paper I, can provide part of the explanation for this. The general conclusion of the multimethod research carried out in this paper is that from a profit maximising perspective the public housing companies appear to carry out activities earlier than necessary and should look closer at the maintenance strategies of the private sector companies. This involves a review of how the activities are classified as well as the choice between condition based and time based maintenance scheduling.



**4.4 Paper IV: Muyingo, H. (2016). 'Challenges in property management within the Swedish cooperative housing sector'. Working Paper 2016:1, Working Paper Series Department of Real Estate and Construction Management & Centre for Banking and Finance (Cefin), Royal Institute of Technology.**

This paper presents the governance and property management challenges within the Swedish tenant-owner cooperative sector that, partly due to tenure conversions, is the most active housing sector in terms of market transactions (Ball, 2012). The aim of the paper was to analyse property management within the sector with the purpose of understanding the factors behind the decisions taken by the non-professional governing committees. Previously studies in the sector had focused on for example gentrification and housing affordability (see e.g. Andersson & Turner, 2014; Norris & Winston, 2012).

The conclusions drawn are based on three empirical studies that in various ways analysed the decisions made by the governing committees in relation to the location of the TOC in proximity to the city center, the age of the buildings under management as well as the way the TOC had been acquired. The initial study in form of semi-structured interviews of governing committee members in 12 TOCs was of an exploratory character that furnished the base for the sequential questionnaires. The first questionnaire which was electronically administered focused on the operation and management strategies as well as decisions behind the mortgage choice of 266 out of the 725 TOCs contacted (response rate 37%). The second questionnaire, which complimented the first two studies, was sent to 91 TOCs (response rate 46%) and investigated issues related to energy efficiency.

The results from the studies presented in this paper confirmed the existence of challenges to property management within the sector, such as free-riding and short-term investment horizons, that are similar to those in other multi-owned properties as given in the literature. The respondents in the interviews agreed to the fact that there was a lack of professional property management competence among the committee members but saw themselves as capable guardians of the collectively owned property. Principal agent problems such as adverse selection and moral hazard influence the decisions made and provide challenges to the non-professional decision maker. Within the built environment some of the consequences of actions taken are not evident until after a couple of years.

A contribution of this paper is that several issues that have been analysed separately in previous studies e.g. energy efficiency (Palm, 2012) or mortgage choice (Hullgren, 2013) are handled together here. The main conclusion of the research carried out is that the lack of decision-support systems that can reinforce knowledge sharing between members of the governing committees who often serve for short durations is a major challenge in the ever changing environment in which property management is conducted with new regulations, technical innovations and high capital values of the apartments.

#### **4.5 Paper V: Muyingo, H. (2015), 'Organizational challenges in the adoption of building applied photovoltaics in the Swedish tenant-owner housing sector', *Sustainability*, Vol.7, pp.3637-3664**

This study had its origin in the observation that Sweden has committed itself to follow European Parliament directives aimed at energy efficiency within the built environment. Despite its location, the solar influx in the southern half of Sweden is comparable to that in Northern Germany and the deployment of photovoltaic (PV) systems within the TOC sector which accounts for about 22% of the multi-family housing stock can play an important role towards meeting the stated sustainability goals. However, due to the dual ownership and tenancy nature of the TOC tenure, the cooperative's members as well as decision makers in this sector might have motives and incentives for undertaking sustainable renovation measures that differ from those of housing companies in the public and the private housing sectors. The aim of the paper was to study how the organisation of property management and the decision-making structure in TOCs influenced the adoption of large-scale building applied PV (BAPV).

The data gathering started with exploratory document analysis and on-site semi-structured group interviews in four TOCs located in mid- and southern Sweden that wished to install PV on their roofs. The same procedure was then used in studying three TOCs that had already installed BAPV. The results indicated among others that arguments based on economic analysis did not provide sufficient grounds on which to adequately explain the behaviour of the adopters (Dieperink, et al., 2004). It could not be ruled out that hidden incentives were the driving force behind the decisions taken. The results in this paper contribute towards the confirmation of the fact that the unique character of the TOC tenure form makes it possible to take decisions that fall between the profit-maximizing choices made by a corporate housing company and the small-scale energy-efficiency measures of a single homeowner. A fact that can be utilised by policy makers in promoting the expansion of renewable energy sources in the housing sector.

The main conclusion of this paper is that the decision to adopt BAPV in TOCs does not follow the common frameworks of adoption of innovations and that to a large extent it is in the hands of individual "champions of the cause". Challenges due to moral hazard problems, information asymmetry, investment risk and the voluntary nature of the work on the governing committee provide hindrances to the adoption of large-scale residential BAPV by the TOCs.

#### **4.6 My contributions to the included studies in this thesis**

To a very large extent the work presented in the thesis is my own. However other persons have provided assistance to the degree described here. My main contribution to Paper I was during the literature review stage and the writing while the co-author did most of the theorising. My main contribution to Paper II was in carrying out the literature review whereas the writing and the analysis were contributed equally with the co-author. Papers III and IV are to the full extent my own work, with due support from my supervisor. The fifth paper is part of a larger research study in which the data was collected as a team. However the research design, literature review, data analysis and writing of Paper V is my own work.

## 5 Conclusions and contributions

Three research questions were addressed in the thesis that has the objective of increasing the understanding of the factors that influence the decisions made within the multi-faceted property management of multifamily housing in Sweden. This, in part, was a response to concerns that actors in the sector may have difficulties carrying out necessary measures (Boverket, 2002). The issue of how maintenance is defined and planned for is used in a number of ways in the five papers to illustrate various property management strategies. The research covered in Paper I forwards the view that more and more of the activities that are classified as maintenance should be reported as investments since the distinction between investment and maintenance from a planning and decision making perspective should be independent of concepts used for administrative purposes. Since the publication of Paper I, the accounting regulations in Sweden have changed and as a way of raising the quality of the financial reporting and comparison between different reports from the 1<sup>st</sup> of January 2014 all registered companies as well as associations such as TOCs must apply component depreciation (Nordlund, Pramhäll, & Drefeldt, 2013). This is in line with the strategy proposed in Paper I.

The following section presents a brief discussion of the three main research questions followed by conclusions that can be drawn through this research project.

### 5.1 To what extent can models of maintenance planning in other industries be applied within housing property management?

In a number of industries maintenance has been modified to suit the character of the business. Depending on the consequences of failure different strategies that employ models based on centralised data collection systems that can be used to predict failure patterns are utilised to plan as well as to carry out maintenance. Building maintenance, especially within the municipal sector, appears to be based on time-based plans which according to Sharp & Jones, (2012) is inefficient and should be replaced with an execution of maintenance that is more closely related to the performance of the building. This is in line with the fact that a number of uncertainties such as demographic changes have an effect on the actual need/use of the buildings whereby buildings should not be maintained to a level/status higher than necessary. The investigation in Paper II indicates that models of maintenance planning in other industries can to some extent be applied to building maintenance but this would not be a rational choice especially in view of the, at times, changes in the utilisation of the building. What is needed is a strategy that allows for the continuous adjustment of maintenance plans based on a well maintained decision support system in the company or TOC. This research question paved the way for the studies presented in Paper III and Paper IV which looked at the various maintenance strategies applied within the three housing sectors investigated. The analysis could not find indications of any utilisation of patented maintenance models such as Reliability Centred Maintenance (RCM); Total Productive Maintenance (TPM) or Condition Based Maintenance (CBM) (see e.g Bertling, 2002; Ahuja & Khamba, 2008; Bengtsson, 2007) within the housing sector.

## **5.2 Why do the maintenance costs reported by the public sector companies consistently differ from those reported by the private sector?**

The results of the quantitative study reported in Paper III showed that public sector companies indeed reported higher costs. Results of the sequential qualitative study indicated that an important explanation to the observed difference was due to how the activities are denoted a fact that is related to the discussion presented in Paper I. Similar measures were accounted for differently depending on whether the property owner was in the private or the public sector. The results of the questionnaires pointed to a maintenance strategy within the public sector that appeared to consist of a basic not so detailed long term maintenance plan that in many cases was not followed due to various principal-agency issues of a socio-political character. On the other hand, the strategy within the private sector appeared to reflect a reliance on more short-term plans that were more closely related to the status of the building than the financial standing of the company.

According to the data the answer to the research question appears to lie principally in the timing of measures, which has a direct influence on the reported costs and efficiency. That private sector companies appear to be more efficient in their property management is also given in Boverket, (2010, p. 46) as an explanation of why profitability is higher within the private sector companies.

## **5.3 To what extent is the concern expressed about property management in the Swedish tenant-owner cooperative housing sector justified?**

A major source of the concern about property management in the TOC sector as expressed in Boverket, (2002) was that newly created TOCs located in weak markets as well as small elderly cooperatives and those that lacked professional assistance risked to have a high degree of neglected maintenance. The strategy used in attempting to answer this research question was to focus most of the studies presented in Paper IV and Paper V on maintenance plans and the decisions around them. The results from the studies highlighted a number of challenges faced by the non-professional decision makers sitting on the governing committees of the TOCs.

A major challenge reported in Paper IV is related to difficulties faced by the committee members in their role as procurers which underlined the need for knowledgeable decision makers. There is a lack of well documented policies on a number of issues such as maintenance strategies or on how to prioritise between different measures as shown through the low utilisation of investment analysis even for capital intensive measures as evidenced in Paper V. In answer to a question about property management competence within the governing committees in the TOC sector an interviewee described them as good housekeepers that just see to it that the granary is not empty. The studies in Paper IV indicated that the view on the competence of the decision makers is that just enough is required so as not to make mistakes and that this strategy has worked well for years. This is also an argument that is used to suggest that there is no cause to worry about property management in this sector. On the other hand, making mistakes can strategically be avoided through procrastination whereby others are left to take and carry out the probably complicated and time consuming decisions. This in itself could lead to a higher degree of neglected maintenance which is the source of the concern in Boverket, (2002).

The studies carried out indicate that the competence of the decision makers in the sector can be defined initially based on the second noun in the definition given in Burgoyne (1989) – ability and *willingness* to perform a task. Thereafter the ability to

do something comes in. Through outsourcing, ability might be achieved. However, several principal-agent relationships exist in a TOC. These consist not only of the kind between the TOC and the service providers but also of the agency association between the members of the governing committee (agents) and the other members of the TOC (the principal). A worrying factor is the dependency on “champions of the cause” in carrying through various activities such as energy efficiency measures. An advantage is that activities get done. However, responses in Paper IV point to the fact that some of these “champions” might have hidden motives related to the expected appreciation in the value of their “apartment” after the measures are completed. That one of the BAPV installation projects described in Paper V was kept going can be attributed to the psychology of sunk cost. But Arkes & Blumer, (1985) note that this effect is not lessened by courses in economics. Thus, it is not considered as a reason behind the concern about property management in this sector.

The interviews reported in Paper IV indicate that the members of the governing committees are rather satisfied with their achievements. This is possible due to benchmarking against accomplishments within a sub-goal setting. Small cosmetic measures that are visible to the members are prioritised over those that require more information and investigations before a decision is taken. Thus activities such as painting the stairways and securing the main entrances to the buildings will preside over more complicated ones such as the installation of geothermal heating. The description of the cognitive processes called mental accounting that is presented in Thaler, (1999) provides another good explanation for the observed decision making and the sense of satisfaction experienced by the committee members. Through focusing on maintenance the results in this sector could be compared to those collected from the rental sector which could be utilised as a proxy benchmark of the actions of the decision makers in the TOCs. As decisions in the TOC sector are in the hands of lay-persons this research question also brings to the front the consequences of the high turnover rate of members on the governing committees and the need for knowledge management/sharing within the sector. There is a need to have clear policies on how to deal with the various problems this entails but this is missing in many of the investigated TOCs.

The concern expressed in Boverket (2002) about property management in the Swedish tenant-owner cooperative housing sector was justified and still holds as it is related to issues connected to competence and in several ways to principal-agency problems within the sector. However the degree of concern will depend on the characteristics of the particular TOC.

## **5.4 Contributions of my research**

The goal of the thesis was to increase the understanding of the factors that influence the decisions made within the property management of multifamily housing in Sweden and to contribute new knowledge. The conclusions presented in the five papers in the thesis have a number of implications for researchers, practitioners, policy makers and the general public perceived from a number of standpoints presented below.

### **5.4.1 For the research community**

The thesis contributes to the work on housing maintenance as presented in e.g. El-Haram & Horner, (2002b) and Sharp & Jones, (2012) through the systematic way in which to undertake the formation of a maintenance strategy costumed to a

particular building and its expected use as proposed in Paper II. Paper I submits the notion of viewing the concept of maintenance within the Swedish housing sector, in which the rent setting system has been seen as an influencing factor behind the low maintenance levels, from an investment perspective in order to place the focus on what is done other than how it is accounted for. Amaratunga et al., (2002) notes the use of mixed methods within research studies carried out in the built environment and the utilisation of econometric analysis and qualitative analysis in Paper III contributes to broadening the approach.

There is a lack of empirical studies on the adoption of photovoltaics on a large scale within the TOC sector which has been done through this research. In relation to the discussion of various ways to reduce the costs of maintenance and renovation of properties built during the period 1965-1975 the research highlights not only the possibility of cost saving through the linking together of several measures but also the challenges involved.

#### 5.4.2 For a housing company or TOC

Perceived from a company or tenant-owner cooperative perspective the thesis proposes a strategy based on the view that it is not rational with rigid maintenance plans. Companies and TOCs should invest in good information systems; divide their buildings into core and non-core buildings as well as list the various components according to how crucial they are to the long run value of the building so as to have flexibility in the maintenance plans. Good decision support systems as discussed in Paper II are essential in the property management. Furthermore there is a need for the actors to speak the same language (concepts) and one step towards this would be to classify as much as possible as investment. The discussion in Paper I helps to explain the background and need for component depreciation that is now being carried out in Sweden. The housing sector in Sweden comprises of many different actors with varying goals and strategies even within the same ownership category. Nevertheless, the results of the studies presented in the thesis indicate that within the whole sector there is need of better decision support tools as well as knowledge transfer and sharing especially within the TOC sector.

#### 5.4.3 From a policy-matter perspective

Paper III provides an indication that maybe the maintenance backlog might not be as large as assumed in case the private sector is taken to be doing things efficiently in that they do not spend more on maintenance just because they can afford it. They do not appear to have pressure to renovate if it is not profitable. With component accounting in place maybe it is time to go even further and consider all measures as investments as proposed in Paper I. The research has also shown that principal-agency problems within the TOC sector can hinder the application of innovative sustainable environment measures. Currently this is an area with many policy changes especially concerning taxation. The unique ownership structure in the TOC sector provides some advantages that can be utilised in the effort towards achieving various goals in a number of EU Directives but consideration should be taken not to forget that decision-making is by non-professionals serving voluntarily.

The housing sector has experienced some scaring examples of multi-family property owners that view the dwellings as trade objects (Blomé, 2012a). The TOC sector too has had its examples of principal-agency related problems especially in the TOCs with newly constructed buldings in which methods considered to be innovative by the developer have later turned out to be major causes of disputes

between the TOC and the developer. Though the government cannot make decisions for the companies or TOCs it can promote policies that would reduce the degree of information asymmetry between the procurers of services and the construction companies as well as other service providers in a manner similar to that proposed in (Borg, 2015). Another policy implication of the research in the thesis is related to the issue of competence in relation to buildings with knowledge intensive installations for example those meant to provide innovative ways of energy efficiency such as passive house technology. A requirement of formal competence and certification in managing such properties should be part of the policies directed towards a sustainable environment.

## **5.5 Ideas for further research**

Despite the research reported here, much remains to be done. Several factors influencing efficiency in the management of the properties in the different sectors have been presented but important issues concerning the decisions between various alternatives could be investigated through factor analysis or participatory research. An interesting extension of this research would be a more detailed study of the formal as well as informal competence in relation to the relevant competence of the decision makers as well as that of the service providers and whether there have been any changes over the years. Survey tools such as the management development questionnaire (MDQ) have been used to test managerial competencies for example within the Swedish construction industry (Arditi, Gluch, & Holmdahl, 2013). Similar tools could be employed for the comparison of decision makers and managers within the various housing sectors.

Though newly constructed buildings within the TOC sector were not the main focus in the thesis responses during the interviews in Paper IV indicated the existence of exploitation of the TOC sector by construction companies through the use of several subsidiaries with long term service contracts or subcontractors similar to the situation in Australia mentioned in Hendrik & Daniëlle, (2014). There appears to be very little research covering this in Sweden. An idea for further research is to investigate the nature of contracts and their clauses in newly constructed buildings in the TOC sector together with a mapping of reworks in this sector. This would provide a continuation of the research carried out within the built environment as presented in Josephson & Hammarlund, (1999) and in Borg, (2015). The purpose would be to strengthen the ability to procure services and to broaden the knowledge about principal agent problems in a sector governed by non-professionals.

It can be expected that tenant-owners have an incentive to do the right things related to property management within the TOCs as they otherwise stand to see decreases in their property values. The same could be said of managers in the rental housing sector who might stand to lose their employment in case the company performs poorly. There is need for further research on the motives and incentives behind the decisions made within the various sectors. Due to moral hazard and other such problems the decisions taken in buildings in which property value appreciations can be capitalised will probably differ from those in which the property value is not of major interest.

## 5.6 Closing remark

A major assumption that underlies the study presented in Boverket (2002) is that the private sector is considered to be more efficient than the public sector. However, there is an enormous variation between the goals and motives of the property owners even within the same subsector and a lot of research leading to more knowledge about the reasons behind the decisions made in the different sectors is still needed in order to raise the efficiency of property management within the Swedish housing sector. The doctoral thesis provides a contribution to this colossal task.

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