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BUILDING RENOVATION – A NEW INDUSTRY?

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Abstract
Based on construction economics, building economics and assessments of building service life, the renovation need of buildings is notably higher than the actual amount of building renovation. As energy saving renovations become more common, the volume of building renovation is forecast to grow even further. Building renovation suffers from both a lack of suppliers and tailored solutions.
This study has searched for a reason for this phenomenon. This is a theoretical study in economics, testing the rationalisation ability of three different economics theories, including the theory of construction economics, evolutionary economic theory and the theory of creating customer value.
In accordance with construction economics theory, renovation construction competes in all owner sectors with other expenditures, and since renovations can be postponed, they often are. Demand is not activated by interesting supply or by supply corresponding to the needs. Renovation projects are implemented with a production-oriented new construction concept. In addition, a user-oriented approach does not produce a good outcome if it does not include catering for the special features of renovation construction.

Keywords: renovation, building stock

INTRODUCTION

In developed countries construction has long been used to respond to a quantitative demand for new buildings. There has been a preference to demolish old properties to make way for new construction rather than renovate them. In the past, fires and wars have destroyed the building stock and thereby removed the need for renovation. As a result of new construction, the building stock has expanded greatly, and the cultural heritage it represents is valued as a part of sustainable development.

The battle against climate change has increased interested in renovation. Significant cuts in greenhouse gas emissions can be achieved by making the building stock more energy-efficient. Because the building stock consumes a great deal of energy, it promises a hefty potential benefit. In contrast with many other consumers of fossil-based energy, the energy requirements of the building stock can be satisfied with low-emission sources of energy or with renewable energy.

As a result of the expansion and ageing of the building stock and new requirements for its energy-efficiency, renovation is seen as a growth sector in developed countries. Renovation has also become a commercially interesting market for businesses, as property owners have relinquished their own maintenance organisations.

Renovation is undergoing a transition, with several development alternatives to choose from. Should the existing building stock be made more energy-efficient through renovation, or should existing buildings be replaced with new and more energy-efficient ones? To what extent will digitally produced services, logistics and new forms of working reduce the need for space?

The building stock and its properties have been widely studied. In contrast, renovation has received much less attention from researchers than has new construction. And when it comes to improving energy-efficiency, the focus has been on technological development, without giving proper consideration to how this technology is to be installed in buildings.

RESEARCH QUESTION

The object of this study is renovation as business. The primary aim of the study is to identify a workable theory to describe the development of renovation. A theoretical basis is needed to enable improvements in renovation and thereby respond to identified challenges.

RENOVATION

The term 'renovation' is used in statistics to distinguish between construction work on existing building stock and new construction; it includes both repair work and work undertaken for other reasons. Sometime the superior term for the concept discussed here is not 'renovation' but 'repair', defined as the altering of a built object towards a desired state, either technologically or functionally. Hierarchically they are an umbrella term for the following:

- 'refurbishment' and 'renewal', where a building or parts thereof are renewed,
- 'modernisation', 'rehabilitation', 'retrofit or refit', 'refresh' and 'upgrading', where the quality of the object is significantly improved, for instance by improving the energy efficiency of a building, linking it to the water and sewer networks, or installing a lift,
- 'rebuilding' and 'reconfigure', where the purpose or manner of use of a building is altered, and
- 'restoration', which aims to preserve or bring back the cultural historical value or architectural value of the object.

'Demolition' is the destruction of a building. Materials can be 'reused' or 'recycled'. If a new building is then built on the same plot, even if it is similar to the previous one, this is 'rebuilding'.

THEORIES

Construction economics, a well-developed theory applied in several studies, links construction to development of the social and economic structure (Ruddock, Lopes 2006). According to the theory (Bon curve), the purpose of construction is to build spaces, areas and connections. When they are taken into productive use, construction's proportion of gross domestic product (GDP) shrinks. The utility of the theory has been demonstrated by comparing economies at different stages of development or comparing regional development (Crosthwaite 2000). These analyses have been achieved by comparing construction investments or profits as a proportion of GDP.

The theory describes the market of quantitative demand. In addition to quantity, demand for construction is affected by changing needs (Gruneberg 2009). Even if the economic structure is stable according to quantitative metrics, changes in content require construction. Internal structures do not assume permanent form, in fact their rate of change accelerates. Old economic sectors become more productive, die out, split or generate new sectors. Growing productivity frees up resources for entirely new sectors. According to **evolutionary economics**, among other theories, this sort of development is a prerequisite for sustained growth (Saviotti, Pyka 2004).

With the development of new technologies, a number of different theories have emerged about the birth of new sectors. Observations to the effect that old sectors can split into new ones or that technology can give birth to an entirely new sector can be seen as falling under the rubric of **business economics** (Hamel 2000). Various sector emergence mechanisms have their advantages and drawbacks. When an old sector is reinvented, the resources of the old sector can be harnessed for new activity. Blue Ocean Strategy (Kim, Mauborgne 2005), for example, puts forward a number of cases to demonstrate that it has been possible to renew traditional and even challenging sectors by reconceiving the market. The strategy places value innovations in a key position.

When a sector is conceived from nothing it does not have an old sector's burdens, such as the need to "unlearn" practices or to unlock potential. This route is defended by the theory of Disruptive Technology (Christensen 1997), which says that improvements alone have never had revolutionary effects. Disruptive technology emphasises renewal by way of technological innovation.

New sector generation is studied with reference to a number of sectors. A model of sector generation has been built by drawing together research from different fields (Gustafsson et al. 2010). Generation of a new sector requires a trigger, an industry identity, an activity network and commercial viability.

EMPIRICAL MATERIAL

The explanatory ability of the theories is tested against Finland's renovation market. Three cross-sectional studies of renovation in Finland were carried out by Pajakkala & Lehtinen (1982); Vainio, Nippala & Lehtinen (1991) and Vainio, Jaakkonen, Nippala, Lehtinen & Isaksson (2002). The studies gathered information both about renovation projects and about business participation in renovation work.

Since 2000, Statistics Finland has compiled information about construction companies' renovation activity (Statistics Finland 2010). At the end of the 2000s, qualitative information about renovation was compiled for the Ministry of the Environment's implementation plan for the Strategy for Renovation 2009–2017 (Ministry of Environment 2007), and for monitoring the measures outlined therein. Pipe repairs are examined as an example from the perspective of value return to the client (Paiho et al. 2009).

DEVELOPMENT OF BUILDING RENOVATION IN FINLAND

Building renovation in the 1980'

Drivers. The primary reason for renovations was to save energy and the secondary reason was related to functionality (spatial reorganisation). Deteriorated condition was only the third reason for renovation because on average age of building stock was only 23 years. Building renovation concentrated on buildings constructed before 1960. (Pajakkala, Lehtinen 1984)

Commercial renovation. Most renovation projects were carried out by building owners or their organisations. Only a quarter of building renovation activity was commercial. That was the reason why developers, designers and the industry did not even consider building renovation a construction activity. Nor did the banks what paralleled loans for building renovation with the consumption credit. (Pajakkala, Lehtinen 1984)

Barriers. The undeveloped technology of the construction industry, the inability to produce tailored solutions and the general lack of know-how became the technical challenges for building renovation. Housing associations were unable to decide whether or not to carry out renovations. (Pajakkala, Lehtinen 1984)

In order to resolve the technical issues, a research programme that examined building renovation from 1986-1990 was started in the middle of 1980s. The research programme concluded that building renovation would develop into a secondary sector of the building industry.

Building renovation in the 1990s

Drivers. Changes in use were the reason for renovating other types of buildings. The study found that the efficient use of square meters in new construction led to an increase in the need to renovate even newer buildings. The interiors and fittings of residential buildings were customised, but the structures were not renovated until the technical life span of the building was reached. Proportionately, buildings constructed prior to 1960 were still renovated most often and most extensively. (Matilainen, Lehtinen & Vainio 1991)

Commercial renovation. Commercial building renovation has increased during the decade before the study and by 1990, it accounted for 40 percent of all renovations. (Kontuniemi, Lehtinen & Vainio 1991)

Barriers. A number of areas needed improvement. Know-how was required for surveying, determining the renovation needs, planning the renovation and for carrying out the actual work. Also issues related to cooperation between the different parties of the project needed improvement. Deficiencies were identified in the availability of services connected with building renovation, model agreements and suitable materials, prefabricated products as well as machinery and equipment. The expertise of designers and builders who worked on new constructions was not applicable to renovation projects. The study recommended expanding training to include building owners. (Matilainen, Lehtinen & Vainio 1991)

The renovation technology for prefabricated buildings, as well as the maintenance know-how of real estate owners and the tools to assist them, was added to the existing list of developmental needs. To address these issues, a research programme called Remontti (Renovation) was carried out from 1992-1996.

Building renovation in the 2000s

Drivers. The average age of the building stock is 30 years, which means that half of the building stock has reached an age at which renovation is increasingly required. The fact that the renovations of older public buildings are being postponed is backfiring – and resulting in more costly renovation projects. Still it was obvious that changes in the content of building renovation as well as higher quality requirements will increase the amount of building renovation more than factors such as escalating building stock or ageing. (Vainio et al. 2002)

Commercial renovation. Seventy percent of building renovations was done commercially and at the same time, both the share of the owner's own work and that of voluntary work in building renovation had reduced. The share of commercial renovations increased due to legal requirements to involve skilled labour in the planning and implementation of any projects that received public funding. Structural changes towards partial renovations have increased the share of specialised contractors that carry out the actual work. (Vainio et al. 2002)

Barriers. The renovation of buildings is often neglected due to problems with financing or the high level of associated costs. Financing is a particular problem when it comes to the renovation of public buildings. For residential buildings, decision-making remains the most problematic issue that slows down the renovation activities. The problems in the renovation work itself are often technical, but they may also be related with the quality or availability of resources. (Vainio et al. 2002)

During 2000-2010 many research programs and campaigns have been carried out. Many of them are focused to solve existing mold and moisture problems. Also energy efficiency has been on the research agenda. The ministry of environment has also launched the strategy for renovation 2017 (Ministry of Environment 2007). One part of it is developing renovation processes. The idea is that demand arouses supply.

According the statistics renovation and new building are today nearly equal size. Building renovation can no longer be seen as merely an activity that balances the economic cycles of new construction. From the beginning of 1980' the share of commercial renovation has grown form quarter to 70 percent (table 1).

Table 1. *The development of renovation markets (Source: Statistics Finland).*

	Building renovation % / new %	**Commercial renovation per total renovation %**
1980'	25% / 75%	25%
1990'	35% / 65%	40%
2000'	40% / 60%	70%
2010'	45% / 55%	70%

The share of renovation activities is in Finland lower than in Europe, where building renovation already receives over half of all the investments in construction (figure 1).

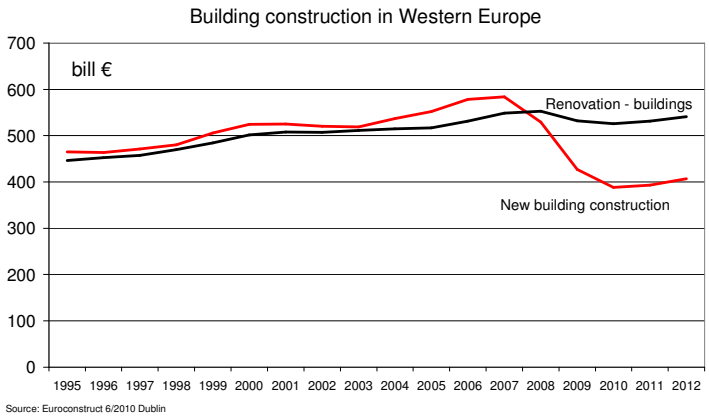

Figure 1. *Building construction in Western Europe, besides European Union member states includes also Norway and Switzersland, but excludes new EU members states*

There is no sign of specialisation in renovation work among companies with payrolls larger than 20 employees (figure 2). Rather the contrary expect HPAC contracting. Companies operating in the expanded renovation market are smaller than this (fewer than 20 employees). Real estate services companies and building materials retailers have also claimed their share of the market. The retail building materials and construction products sectors have developed a range of products for DIY renovation and also provide installation services. Increased demand has been met with technology developed in new construction.

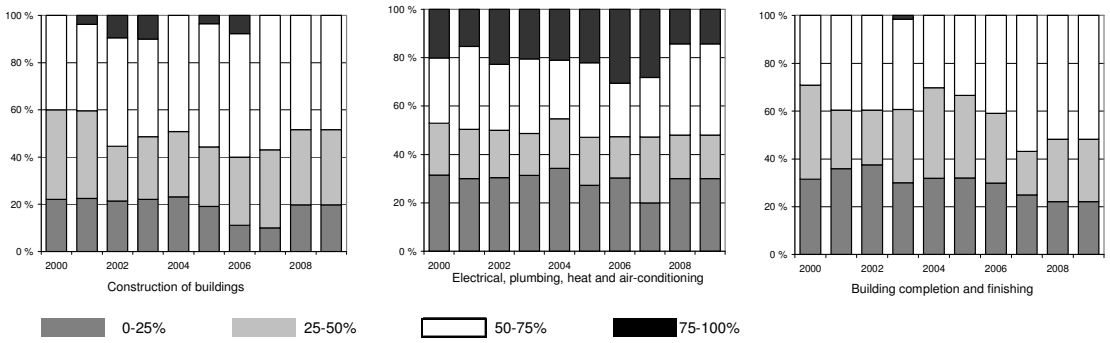

Figure 2. *The turnover from renovation building of building construction enterprises (Source: Statistics Finland).*

Generating customer value

As a result of the age structure of Finland's building stock, pipe repairs have become more common and created demand for special contractors in this field. Demand has created supply, and this is visible in the fact that for a large proportion of companies in this field, renovation is a more important business than new construction. For contracting companies, repair work is an almost identical technical procedure to installation of piping in new buildings. Of course, demolition of old structures and contracting are part of pipe repair work even in buildings that are in use.

Demand for pipe repair work has increased; demand has been met with products and services familiar from new technology. In 2008, both housing companies that had commissioned pipe repairs and the companies that had carried them out were surveyed on their experiences (Paiho et al. 2009). Both samplings were divided into projects that had gone well and gone badly. The customers were divided on the basis of their subjective answer to the question of whether they were satisfied with the purchased service. The businesses were divided according to their feeling as to how well the pipe repair work went.

The group of disappointed customers criticised the service ability of their chosen contractor. The criticism focused almost exclusively on the process. This is a feature that distinguishes renovation from new construction. New construction is an exclusively industrial activity in which, normally, customers only assess the final result. In renovation work, the object of assessment – more than the final result, even – is the process itself.

Satisfied customers valued the contractor's service ability as well as the workmanship and behaviour of the installers. They tolerated the disturbances and inconveniences caused by pipe repair work providing they were informed about them in advance. But if they came without warning, this prompted criticism. For this reason, renovation work is also seen as communications work. Companies also perceive communications to be a challenge. What makes it a challenge is that there is no need for it in the industrial process of new construction, and that non-professionals and professionals lack a common language. The recipients also vary in their ability to draw on and understand the information they are given.

DISCUSSION

Construction is a part of change

The Bon curve theory has been demonstrated by comparing economies at different stages of development. Examined this way, the development of construction has been made to look dramatic. The trend has been depicted in the form of a ∩-curve or even a Λ-curve. One gains the impression that construction is collapsing in developed countries, yet construction has not collapsed as expected, because quantitative demand has changed into qualitative demand and sustained new construction.

Theory that links the amount of construction to the structure of society has counted only new investment as construction. Including renovation does avoid the perception of collapse, but it does not constitute a major change in the theory's direction. Construction as a proportion of GDP in developed countries simply shrinks at a more gradual pace (Vainio 2010).

Disregard for maintenance and renovation has been and, unfortunately, remains the prevailing practice among decision-makers. In deciding on new investments, there is still a failure to simultaneously consider the degree to which future financial resources are committed to maintenance and renovation.

Renovate or replace?

In some cases, renovation work may be left entirely unaccounted for. Buildings may be used until technically or functionally exhausted, demolished, and then replaced with new buildings constructed in their place. This is financially justifiable if the price of the land is high in relation to the building's value, or if demolishing an old building allows a more profitable

business to be built in its place. New construction may be the more economical solution than renovation.

If the strategy is not to demolish and replace old buildings, the amount of renovation activity should grow linearly as a function of the amount of old buildings, and accelerate as a function of the buildings' age. The most surprising result of cross-sectional studies of renovation in Finland has been the high amount of renovation of buildings that are relatively new in relation to their technical operating life. Rather than being prompted on technical grounds, the renovations have been justified with reference to changes in premises requirements, among other factors.

Evolutionary economic theory about sector changes offers an explanation for this phenomenon. Changes and increasing complexity in the structure of the economy demand spaces that are different from those built for previous needs.

Renovation itself also embodies evolutionary growth theory, which says that growth requires both quantitative growth and diversification of content. The accelerating pace of change in economic sectors caused by exogenous variables requires renovation of the building stock. Endogenous growth factors are represented by a growing and ageing building stock. As each new generation of building stock comes up for renovation, the content of renovation activity becomes increasingly diverse.

Money flows matter

As is true of the construction market as a whole, the renovation market can be further divided into markets responding to demand from the private companies and housing companies owned by landlords, public sector and individuals. The two first ones have both revenues and expenses, the two last ones see only expenses.

Demanding clients, primarily construction professionals such as builders of commercial office space, are key drivers in the development and improvement of construction. New office buildings are also more technologically progressive than residential buildings. New construction technologies have first been adopted in construction of office buildings, whence they have gradually also spread to residential buildings.

There has also been a structural shift in commercial office space ownership. Companies no longer own their own premises, but instead operate out of rented premises and can easily move into new ones. Decisions to carry out renovation work on commercial premises are made on financial grounds. The buildings are renovated if it is financially sensible; otherwise they are demolished and replaced with new construction. International investment capital available in recent years has directed funds into new construction, with little effort made to renovate existing premises. Demolition will remain an attractive alternative in future, when implementation of new technologies in service production will see a reduced need for space. The virtual world is already becoming a noteworthy alternative to buildings and construction.

In public sector budgeting, too, decision-makers have been readier to approve new investments than direct funds towards maintenance of existing buildings. New construction has seen the accumulation of a large and, over time, aged building stock, as a result of which renovation needs now exceed the financial resources available to that end.

Housing companies are an interesting customer segment, because the prefabricated high-rise apartment buildings owned by them offer, in terms of their technology, a homogenous and moderately sized market even for companies operating in the local market only. As customers, housing companies are non-professional, decision-making is difficult and choices are made on the basis of price. Housing companies offer a large and interesting market, but they are of little or no help when it comes to product and production development.

Problems identified as far back as the 1980s continue to plague renovation. When problems have been identified, research programmes have been directed towards solving them. The most active actors in research programmes have been officials, property owners and representatives of the construction products industry.

The object of officials' concern has been the condition, housing health and occupational health of publicly funded buildings – especially rental properties. Officials have also been concerned about the condition of buildings in the education and health care sectors. Offices have received their own share of attention thanks to sick building syndrome (SBS). Tools have been developed to manage, assess and research the condition of buildings, to resolve air quality issues, and to plan renovations. What lacks is development of renovation site activities.

THEORY FOR RENOVATION AND FUTURE DEVELOPMENT

Evolutionary economic theory about the splitting of old sectors and the formation of entirely new ones offers an explanation for the growth in demand for both new construction and renovation. It also explains why so many space modifications are made to the building stock.

The development of the construction sector can also be understood in terms of evolutionary theory. Over time, different parts of construction have diverged into their own separate sectors. This trend will continue. New companies will eventually develop in response to emerging markets, while the most active companies will attempt to mould the sector's offering to suit themselves.

According evolutionary theory the development of a sector can push into fast motion internal changes, such as the innovation of a new technology or the discovery of a so-called "blue ocean" in an existing market. Evolutionary economic theory emphasises the impact of external disturbances. In construction, external disturbances have resulted in changes and irreversible effects throughout history. At the 2010 CIB conference, it was observed of the global financial crisis: "a good crisis should never be wasted."

For renovation, such a crisis might be the declared aim to improve the energy-efficiency of the building stock and cut greenhouse gas emissions. Something similar took place in the 1970s. At that time the effects of the energy crisis left their mark on new construction, but not on renovation. The energy-efficiency of buildings constructed in the wake of the crisis improved, and now standards have been set for renovation. Repairs alone no longer suffice; what are needed are much greater energy savings.

Sectors have been successfully renewed in a number of ways. Traditional sectors have been challenged by the emergence of new technologies that allow the same product or service to be produced more cheaply. Old sectors with a strong identity have also been able to reinvent themselves by questioning the status quo and changing their approach.

The construction sector, which has its own strong sector identity, has been able to renew itself. It has moved away from simply meeting demand for new construction to producing a range of services. Companies with an international presence have recently appeared on the market, learning from the global nature and information-intensive approach of the ICT industry. These companies have commodified their activities, concentrated on their product and invested in the expertise and technology it requires.

From the perspective of companies, renovation is divided into several markets. Renovation of commercially owned buildings largely corresponds to new construction of the same buildings. Property owners make professional decisions on renovations and associated purchases in accordance with their strategy. The strategy may emphasise economy or sustainable development. Companies can themselves decide on the conditions on which they bid for contracts.

The market for renovation of public buildings is contradictory but interesting from the perspective of companies. The projects are large but bidding is decided on price, because the renovation needs of public sector buildings outstrip available financial resources. The projects themselves can be completed under production conditions, because in the larger-scale renovations the buildings are evacuated for the duration of the work.

The renovation market in small, household-owned houses and housing companies is substantial but problematic. The project size is well suited to smaller companies, but, as has been seen, renovation completed according to this concept does not achieve great strides in development.

CONCLUSION

This study examined the period from the 1980s, when building construction was not recognised as part of the building industry in Finland. In the past 30 years, the building renovation industry has grown almost as large as the new construction industry. Initially, building renovation was expected to become a subsector for the building industry. It offered companies an alternative market that could be used to balance the effect of the economic cycles on the new construction market. Studies have shown that building renovation requires a different set of skills and technologies that new construction. Despite this, it has been considered possible for a company to alternate between renovation and new construction.

Renovation is only one means of improving the built environment. In future, it will face competition on this front from demolition. The requirements of sectors change, and existing buildings do not necessarily lend themselves to new needs. For example, activities may change in such a way that space is no longer needed for working humans, but for machines. An increasing number of existing buildings will be completely renovated for new purposes, treating the building as a raw material.

But there are still activities that cannot be replaced with virtual solutions. There are also property owners who are committed to their premises. For the owners, the systematic demolition of buildings and their replacement with new ones is a financial impossibility, an ecologically bad move, and would require more resources than are available.

The development of building renovation as part of the building industry follows the principles of evolutionary economic theory. According to evolutionary economic theory, economic growth requires the development of existing industries, rising profitability and the creation of new industries. Over time, the different branches of the industry then become specialised.

The objectives set for the energy efficiency of building stock and for reducing greenhouse gases will create both qualitative and quantitative challenges for building renovation. Small steps are not enough to overcome these challenges. Instead, a major developmental leap is needed, one that will only be possible with companies that specialise to building renovations.

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