Maintenance of university premises - principles, tools and experiences in practice

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Abstract

The importance of renewal and repair older ecucational buildings is rapidly growing. Changes in use and at same the time the aging of HVAC-systems and building stocks causes need to plans repairs beforehand. The fair divide of costs is more and more important because of lack of funds. The positive side of lack of resources is that to day both the owner and the user have to think very carefully which rooms are really important. In the paper two simple pc-tools are presented. Both can be used when making long time maintenance plans and diving the costs of renovation by transparent and fair way.

Keywords: maintenance, maintenance costs, university premises, quality

1. Background and purpose of the lecture

In the real estate business the owner manages and maintains facilities for which the user, in the role of the client, defines functionality goals. In many cases the requirements set for facilities during the construction phase change. Alongside a long-term technical maintenance and repair plan, it is necessary to compile a facility development program based on the needs of the client, in other words, a functional maintenance and repair plan.

Program integration is a technically and administratively demanding process that requires customer service management, integration of a technical repair plan, efficient quality assurance during the repair process and careful documentation after implementation. To deal costs by transparent and right way betveen the owner and the user - that is in many cases the most hardest phase.

The currentness of the problem is rapidly growing. Educational, office and commercial buildings in Finland will enter their technical renovation phase in 2010 - 2020. The need to make functional changes grows as clients use facilities more efficiently. So far, no rules of the game or theories for implementing the process have been compiled.

In this presentation I'll show you some examples of simple pc-tools by which we can use to shed light on problems that arise when integrating technical and functional maintenance programs.

2. Planning of renovation

2.1 The Basis

Maintenance keeps the technical properties of a building in operating condition that corresponds to the original level. Programming of maintenance refers to a process in either the construction phase or the maintenance phase whose goal is to implement maintenance on the basis of a real estate strategy approved by both the owner and the client. A real estate strategy describes the goals which the owner and user set for the functional use of a facility. If the owner and user do not have a common real estate strategy, it is necessary when programming repairs to simultaneously examine a technical maintenance plan compiled by the owner and a functional maintenance plan compiled by the user. In such a case the plans are integrated by either speeding up or delaying technical maintenance according to the dictates of functional changes. Figure 1 presents common goals for which a real estate strategy is compiled. The importance of the goals varies, depending on the functional use of the building.

Safety in use
No disturbances in use
Support to the customer's business idea
Possibility to focus earmarked funds for planned renovation works
Possibility to measure services right and by that way find smooth stress of resources
Possibility to combine owner's and use's maintenance processes

Figure 1:. General goals for optimized maintenance and repair

The programming process consists of four phases. It includes parallel development tasks. The programming process is presented in figure 2. In phase 1 the process is assigned objectives based on the real estate strategy, and tools for cooperating are created for the owner's and user's organizations responsible for maintenance process. Repair and renewal plans are compiled in phases 2 and 3. The owner's repair plan is technical and focuses on maintenance of external structures and the building's basic technical systems. The user's renewal plan includes improvements caused by functional changes to the facility and repairs to the distribution systems of the building's technology. The limits of responsibility for maintenance are agreed on in phase 1. Phase 4 is critical from the standpoint of the success of the process. The user's customers are informed of the progress of the repairs and, for example, achievement of the goals set for the indoor climate. The measures are documented on the basis of rules of the game agreed on in phase 1.

Quality assurance covers both the technical quality of the measures and the functional quality of the process. Necessary development measures are implemented and the process is made into a routine.

In phase 4 repair costs have to be dealed between the owner and the user. Usually the owner is responsible all the planned repair costs. The functional aging cause needs for new rooms and better technical systems.

Part of these costs belongs to the user. The common way is that the the owner pays the renovation and the costs are to be included to the rent.

Co- operation process of renewal and repair work between the owner and the user (the client)
Repair and renewal plan for technical aging made by the owner
Repair and renewal plan for functional needs made by the user
Combinition of technical and functional repair and renewal plan

Figure 2. Phases of the maintenances process between the owner and the user

2.2 Implement the co-operation between user's and owner's maintenance organizations

In the 1st phase of the process the user's and owner's representatives agree on the principles to be applied in making more efficient use of the facility. These principles are:

- distribution of responsibility for maintenance between the owner and the user
- principles to be followed during implementation of repairs
- entry of changes made during repairs into the real estate information system and documentation of repairs
- planning meeting agendas and schedules

Development of cooperation is the key question of the process. The significance of this activity increases as buildings age and the need for repairs become concrete. Development of co-operation in new buildings can take place more freely.

2.3 Compiling a technical repair plan

A preliminary repair plan should be made already when the building is taken into use. The objective of a theoretical repair plan is to assess the proper level of costs during the life cycle. The assessment is based on suggested repair and renewal phases and investment costs. The assessment makes it possible to calculate a reservation for maintenance, which indicates what portion of the rent income from the facility needs to be set aside for future maintenance. Because tax legislation does not allow advance transfer of reserves for maintenance, the significance of the calculated reservation for maintenance is to indicate to the owner and user the magnitude of the costs. The theoretical assessment does not need to be very detailed, it is only used to determine the target level.

A repair plan that covers the entire life cycle or a life phase includes an estimate of costs and the timing of measures that will be implemented. The need for repair is grouped as follows:

The renovation phases can be selected in 5-year periods, for example. The economic life is usually considered to be 25 - 100 years. It is recommended to make the plan for 50 years The calculated interest rate

can be freely selected (see figure 3). In planning life cycle-long maintenance, assessment of alternatives should take into consideration both the costs of the investment phase and future energy and maintenance costs.

The estimation is made by LCC. It gives us oppurtunity to see, what is the relation between investment costs and repair and renewal costs. This method is very usable in new constrcution models (so called Life Cycle Models). Anyway it must be remembered that the plan consists only repairs and renewal based on technical aging. Most cases changes in rooms are much bigger need for renovation in real life.

REPAIR PLAN 2000 - 2049			Economical life time				50			Building volume, rm^3			109734
	Educational Building 1		Internal rate of interest				4			Building area,brm^2			27000
	Rakennustyyppi						*0,0466*			Room area,htm^2			25304
RO	Kuvaus	yks	Amount yks	Investment cost [€/yks]	Repair costs KUST [€/yks]	Life cycle for renewal jakso [v]	Life cycle for repair [v]	Present value of repairs NA [€/brm^2]	Present value of renewal NA [€/brm^2]	Annual costs of repair vuosikust [€/brm^2,a]	Annual costs of renewal vuosikust [€/brm^2,a]	Annual costs of investments vuosikust [€/brm^2,a]	LCC [€/brm^2,a]
A1	Surface structures of site area	brm^2	27000	15	3	50	25	1,13	0,00	0,05	0,00	0,70	0,75
A2	Outside equipment	brm^2	27000	2	0,5	50	25	0,19	0,00	0,01	0,00	0,09	0,10
A3	French drains and piping	brm^2	27000	8,5	3	50	25	1,13	0,00	0,05	0,00	0,40	0,45
A4	Other earth and ground work	brm^2	27000	6	2	50	10	3,30	0,00	0,15	0,00	0,28	0,43
B1	Surface structures of outer walls	brm^2	27000	240	24	50	25	9,00	0,00	0,42	0,00	11,17	11,59
B2	Balconies	brm^2	27000	1	0,5	50	25	0,19	0,00	0,01	0,00	0,05	0,06
B3	Roof	brm^2	27000	9,5	5	25	10	8,24	7,06	0,38	0,33	0,44	1,15
B4	Windows	brm^2	27000	24	12	50	25	4,50	0,00	0,21	0,00	1,12	1,33
B5	Outer doors	brm^2	27000	6	3	50	25	4,95	0,00	0,23	0,00	0,28	0,51
C1	Internal doors	brm^2	27000	12	3	25	10	4,95	8,92	0,23	0,42	0,56	1,20
C2	Surfaces of rooms	brm^2	27000	76	25	25	10	41,21	56,48	1,92	2,63	3,54	8,09
C3	Fittings, equipments and installations	brm^2	27000	50	17	25	10	6,38	37,16	0,30	1,73	2,33	4,35
D1	Heating system	brm^2	27000	17	8,5	50	25	3,19	0,00	0,15	0,00	0,79	0,94
D2	Plumping and sewage system	brm^2	27000	28	14	50	25	5,25	0,00	0,24	0,00	1,30	1,55
D3	Ventilation system	brm^2	27000	58	29	50	25	10,88	0,00	0,51	0,00	2,70	3,21
D4	Electicity system	brm^2	27000	80	40	50	25	15,00	0,00	0,70	0,00	3,72	4,42
D5	Lifts	brm^2	27000	30	15	50	25	5,63	0,00	0,26	0,00	1,40	1,66
D6	Other HVAC-works	brm^2	27000	2	1	50	25	0,00	0,00	0,00	0,00	0,09	0,09
	Yhteensä, euroa									(b) 5,82	5,10	30,96	41,88

Figure 3: The magnitude of repair costs is determined with the help of a maintenance plan compiled in the investment phase. It is recommended that the repair plan is based on life cycle costs, not only investment costs.

The accumulation of repair costs during use is usually not linear. The need for maintenance in the initial phase is minor and the need increases as the building ages. Nevertheless, in order to plan maintenance, an estimate of maintenance costs is needed. An educational building is used as an example, where the economic life is considered to be 50 years and the calculated interest rate is 3 %. Figure 4 present accumulated maintenance costs during the life cycle.

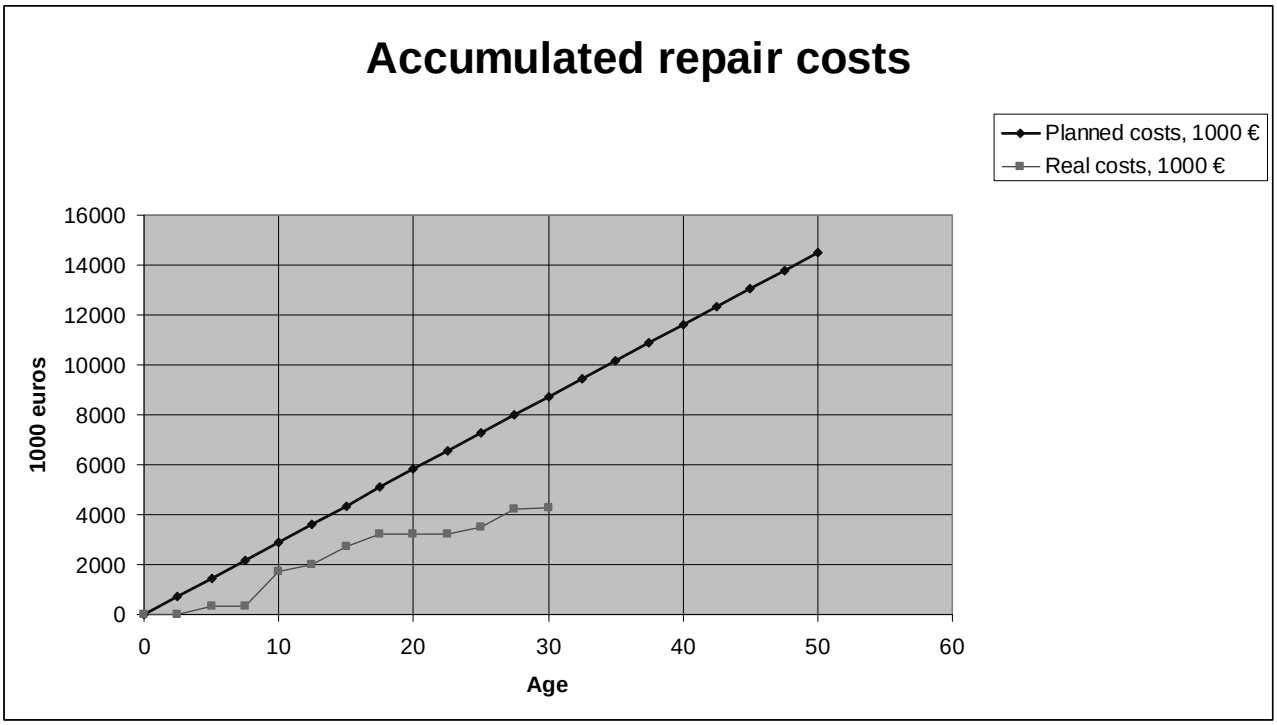

Figure 4: Timing of maintenance costs during the life cycle when accumulated maintenance costs are assumed to be linear. The white arrow indicates the difference between actual and theoretical repair costs during the life cycle.

In practice, it is not possible or even expedient to adhere completely to the theoretical repair model. There is considerable variation between the maintenance phases of different buildings, and other repairs resulting from changing needs in functionality are also always done in conjunction with maintenance.

In actuality, the need for repairs is based on periodic condition assessments and supplementary condition studies. A general operating model for condition assessments has been developed in Finland for both residential buildings and commercial and service buildings. Guidelines also exist for the most important condition studies.

A repair plan is always separately compiled for building components for which the owner is responsible (structures, building's technical systems) and for facilities where responsibility for maintenance can be divided between the owner and the user.

2.4 Compiling a functional repair plan

The owner's task in the maintenance process is to maintain such features of the building which ensure that the user's activities are safe, healthy and as profitable as possible. The user's needs change over time. Changes in functions may require

- new construction to provide additional facilities

- changing the facilities to better serve activities (dividing or combining rooms)

- improving the properties of facilities by technical means (structural improvements or technical improvements)

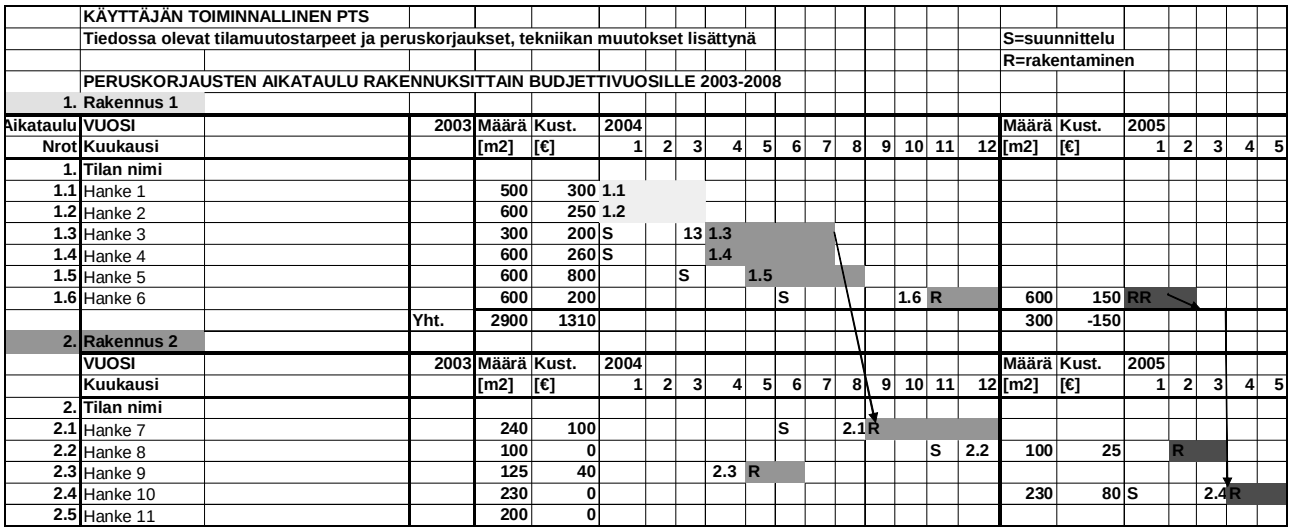

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Figure 5: The user compiles a general schedule for functional improvement projects, which is integrated with the owner's technical maintenance plan.

Small user organizations usually do not have resources for programming functional changes. The problem with large users is the considerable number of customers, in which case programming needs to combine many different wishes.

Figure 5 presents a good example of a maintenance plan compiled by a user, where projects are timed over the planned period. The length of the planned period is usually 5 years.

2.5 Integration of the technical and functional plans

In order to be able to integrate technical maintenance, which is the responsibility of the owner, and functional improvements, which are the responsibility of the user, the user's maintenance plan needs to be joined to the technical maintenance plan. Part of the cost effects belong to the maintenance responsibility of the owner, and part are the responsibility of the user. In practice, the owner usually has the repairs done, and changes which are clearly caused by functional needs have an effect on the rent of the facility.

In integrating it is important to determine how the responsibility for repairs is to be divided between the user and the owner. The distribution can rarely be made only on the basis of the technical age of the building components, since it is possible that varied amounts of repairs have been made to the building components during their usable life. Furthermore, functional changes are made in the facility which result in changes to its properties. Figure 6 presents a model for dividing costs.

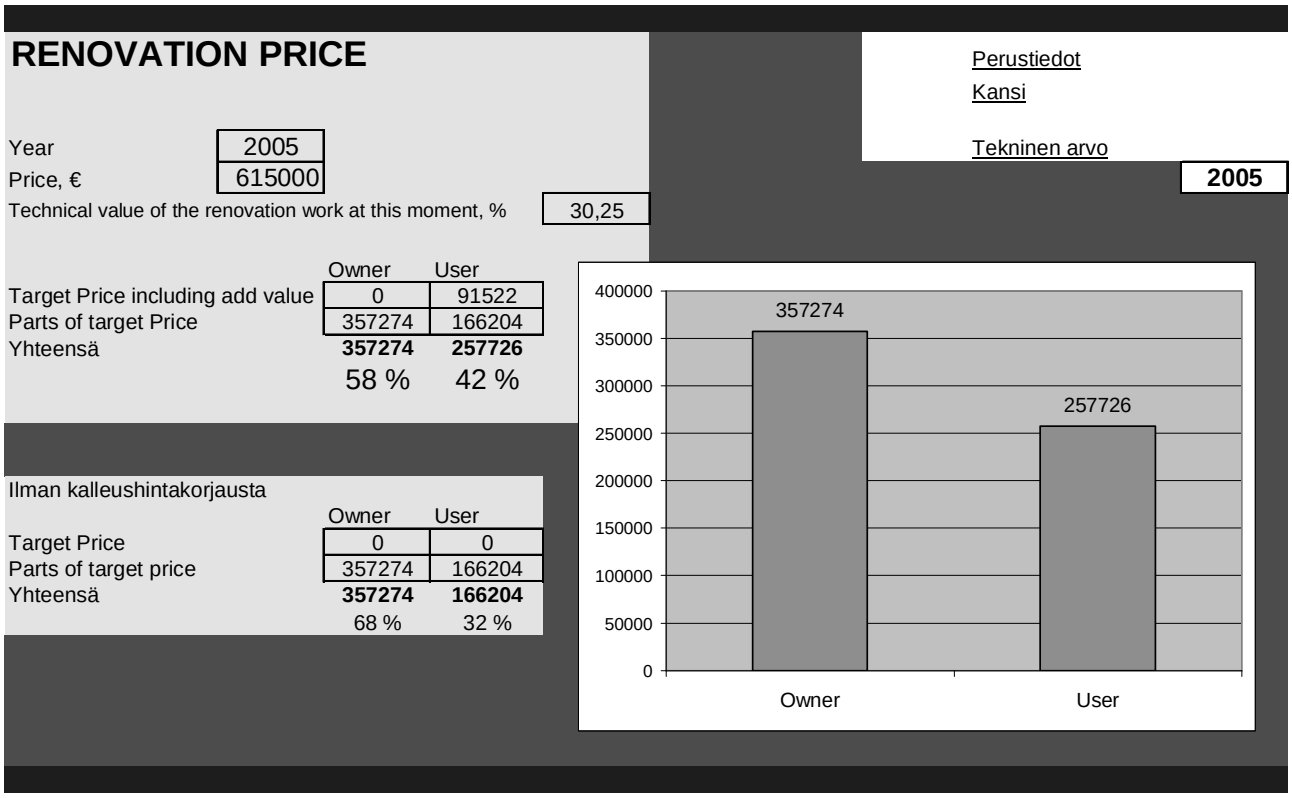

Figure 6: Cost distribution model for dividing the cost of facility repairs, where the change in technical value is based on progressive depreciation.

3. Conclusions

Organizations that are responsible for users' and owners' real estate management in Finland are generally professionally very competent. There is an abundance of technical tools for facility management. It has usually been possible to agree on the main principles used to reflect the costs of maintenance and modifications in facility rent.

The need for functional development of facilities in university buildings, in particular, will be very significant in Finland in the near future. Universities in Finland mostly operate in facilities owned by Senaatti-kiinteistöt. Senaatti-kiinteistöt is a professional real estate owner whose main objective is to function as a service organization and as far as universities are concerned, to be a responsible partner that develops its facilities. The development of the products presented in this presentation has been commissioned by Senaatti-kiinteistöt.

Enhancing partnership is a continuous process. At the strategic level, partnership can be developed, for example, as follows:

1. Compile a vision of operation in 2015, for example, together with the user
2. Compile an estimate of the facilities needed to implement the vision
3. Compile economic planning calculations of the effects of the costs of the target state on the user's operating costs and prioritize the vision's focal areas of development

4 Compile a plan of how technical repairs can be made to support implementation of the vision in the best way possible

5. Develop the owner's customer relations management, create real benefits based on a regular customer relationship.

At last - buildings are only resources. The money we need for maintenance and operations is also a resource. We have to remind that universities are places where the seeds of better global future are seeded. That is why it is highly recommended that co-operation process between owner and client consists of any high barriers. My own experiences after having involved as a small part of the process tor three years are, that people in both sides are so educated that provisions for managed co-operarion really exist.

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