An application of the REN manager in the field of housing management

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ABSTRACT
There is a continuous and urgent need for standardisation of discussion about quality of real estate. On behalf of this discussion, a tool called REN Manager has been developed. REN is an abbreviation of Real Estate Norm, a client-oriented tool for measuring, planning and communication in the field of housing management. The development of the REN Manager is a continuation of REN research project. In this paper we start with an introduction of the REN research project. Further we focus on the application of the REN tool in the field of housing management as part of a set of tools for strategic portfolio management. After this introduction we will elaborate more about the REN and the underlying analyses. One of the essential functions of REN is the match between the demanded and offered performance of a dwelling estate. By several surveys among tenants the relevant aspects and parameters are determined. These parameters are related to the performance level of a dwelling as well as to the weight of these levels. This part of the paper deals with the results of these analyses and the problems involved in the method used. The results are used as the input for the REN Manager. At the end we will discuss the functionality of the REN Manager as a decision support system on both operational level (matching) and strategic portfolio management (allocation of investment).

1 THE PROJECT
In order to be able to have an objective evaluation of the quality performance of buildings, in our case ‘dwellings’, there is a need for a set of general accepted performance measurement criteria. These criteria should be clearly described and free of ambiguous interpretations. They should also be complete in a sense that all-important demands of the end-user are covered.

During the last decades there were several initiatives to define methods that can be used to describe the quality of housing (Akin et al. 1995, Hill 1997, Groot 1999). One of these initiatives was the development of REN, an abbreviation of Real Estate Norm. The Real Estate Norm is a product of the REN Netherlands Foundation. The foundation was the initiative of DTZ Zadelhoff Consultancy, ARCADIS Management Consultants, and Jones Lang Wootton Corporate REAL Estate Services (Real Estate Norm Netherlands Foundation 1992). The official aim of the foundation is the continuation, improvement and promotion of a user-oriented standard that objectively determines and measure office accommodation and location performance called Real Estate Norm (REN). The foundation also stimulates the development and continuation of an educational institute for the use of REN, as well as everything that is related to or beneficial for this subject.
The first edition of the Real Estate Norm, which was published in 1991, focused on office buildings and factory buildings. Since then not only several updates have been developed, but also new sets of performance criteria, each related to a specific building type or based on a specific target group. An example of the latter is the development of the BBL-REN for the Bank Brussels Lambert, a Belgium banking organization with a portfolio of about 1100 offices.

To be clear, the REN is not developed for the determination of the economic value of real estate. It is a method, which makes the quality of real estate measurable and open to discussion by the use of a set of unambiguous definitions. It is a mean to improve and extend communication about buildings including their environment. The aim is to minimize differences of interpretation.

REN describes the performance criteria of real estate on different levels. A set of criteria, a so-called performance profile or simply profile is derived from the primary process of an organization that uses (or will use) the real estate and from comprehensive interviews with end-users.

A profile has a tree like structure. In case of the Office-REN there are three top levels namely Location, Building and Workplace. Every criterion, also called aspect, has several sub criteria. These sub criteria can sometimes go up to four or five levels deep, depending on the complexity of the underlying building type or organization (see figure 1).

It is obvious that for every building type like office, school building, dwelling, there should be a specific performance profile. These profiles must be defined very carefully to facilitate real objective evaluation of the quality performance of buildings and as such become general accepted. In the next paragraph we focus on the development of a profile for dwellings as part of an ongoing research.

![Figure 1: Example of the first five levels, extracted from the Office-REN](image)

2 THE UNDERLYING ANALYSES

2.1 The method

The REN manager is one of the tools for strategic management in the field of housing. This general method and the other tools are described in an earlier paper. (Smeets 1993, Smeets and Maussen 1998).
Figure 2: **Steps to match demanded and supplied performance**

The method underlying a scan for housing is based on two assumptions. The first assumption is that the level of satisfaction can be interpreted as the degree to which the needs of a person are fulfilled by his or hers specific housing situation (Burie 1972). Also others (Fransescato et al. 1987) state that satisfaction with the dwelling situation can be seen as a reflection of how residents feel that their housing situation enables them to achieve certain goals. The second assumption is that in case of a mismatch between supplied and demanded performances, dissatisfaction will occur and interventions areas are necessary. We know that satisfaction research is criticized. Recently we argued that, when the market situation is constrained and the aim is to match demanded and supplied performance (or, in other words, to improve housing performance as to enhance housing satisfaction) satisfaction research is still adequate (Smeets and Teklenburg 1999). If the aim of the research would be the prediction of consumer responses to new products, preference research would be a more adequate choice.

So, the method for optimisation of housing performance and households demands is based on a match between the actual performance of dwelling situation and the performance with which different groups of households are satisfied. To achieve this match several steps have to be taken.
First of all data from previous surveys in Eindhoven are merged together to one data file. One can not only distinguish more target groups in a larger data-file, but also the reliability of the demand profiles for each target group will increase as the amount of participants increases.

For each target group, the performance level as well as the weight of all aspects of the dwelling, measured in the survey are determined. The demanded level is determined by linking objective performances of the dwelling (e.g. size of living room, number of bedrooms) with satisfaction-data of the surveys (Smeets 1996, Dogge and Smeets 1998).

The weight for all aspects of the dwelling and the complex (dwelling estate) can be determined with correlation-matrix for each target group. By calculating the correlation between e.g. characteristics of the dwelling and the report mark of the dwelling, the importance of the different characteristics of the dwelling can be determined. The same can be done for the characteristics of the complex. By calculating a correlation-matrix with correlation’s of characteristics of the dwelling with the report mark of the dwelling and characteristics of the complex with report mark of the complex, the importance different target groups attach to the characteristics of the dwelling/complex can be discovered (see figure 3).

<table>
<thead>
<tr>
<th>Characteristics of the dwelling</th>
<th>Correlation with report mark of the dwelling</th>
<th>Correlation with report mark of the complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>- aspect 1</td>
<td>Correlation r</td>
<td>n/a</td>
</tr>
<tr>
<td>- aspect 2</td>
<td>Correlation r</td>
<td></td>
</tr>
<tr>
<td>- aspect 3</td>
<td>Correlation r</td>
<td></td>
</tr>
<tr>
<td>- ....</td>
<td>Correlation r</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristics of the complex</th>
<th>Correlation with report mark of the dwelling</th>
<th>Correlation with report mark of the complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>- aspect 1</td>
<td>n/a</td>
<td>Correlation r</td>
</tr>
<tr>
<td>- aspect 2</td>
<td></td>
<td>Correlation r</td>
</tr>
<tr>
<td>- aspect 3</td>
<td></td>
<td>Correlation r</td>
</tr>
<tr>
<td>- ....</td>
<td></td>
<td>Correlation r</td>
</tr>
</tbody>
</table>

**Figure 3: Correlation-matrix target group A**

To calculate the demanded performance level of the various characteristics of the dwelling and the complex, the satisfaction-data of the surveys need to be linked to the offered performance of the dwellings and complexes. By means of a code, placed on every questionnaire, it is possible to link the performance of the complex to the appreciation of the respondent who is living in it. One can only link the objective performance with the satisfaction-data if the objective performance is measurable and available.

Subsequently, all satisfaction-data are being linked to the available objective performance-data. By means of satisfaction curves it is possible to determine the level of performance, 70% of the respondents are satisfied.
Available aspects of dwelling

<table>
<thead>
<tr>
<th>Available aspects of dwelling</th>
<th>Available aspects of dwelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of the living room</td>
<td>Number of bedrooms</td>
</tr>
<tr>
<td>Size of the kitchen</td>
<td>Amenities in the bathroom</td>
</tr>
<tr>
<td>Size of the bathroom</td>
<td>Equipment in the kitchen</td>
</tr>
<tr>
<td>Size of the master bedroom</td>
<td>Security against burglary</td>
</tr>
<tr>
<td>Size of the second bedroom</td>
<td>Heating</td>
</tr>
<tr>
<td>Size of the storage room inside the dwelling</td>
<td>Noise insulation</td>
</tr>
<tr>
<td>Size of the balcony</td>
<td>Thermal insulation</td>
</tr>
<tr>
<td>Size of the garden</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4: Aspects that are already available

<table>
<thead>
<tr>
<th>Performance Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>&gt; 35 m²</td>
</tr>
<tr>
<td>4</td>
<td>30 – 35 m²</td>
</tr>
<tr>
<td>3</td>
<td>25 – 30 m²</td>
</tr>
<tr>
<td>2</td>
<td>20 – 25 m²</td>
</tr>
<tr>
<td>1</td>
<td>&lt; 20 m²</td>
</tr>
</tbody>
</table>

Figure 5: Imaginary satisfaction curve ‘size living-room’ for target group A and B

As it turns out from figure 5, target group A is satisfied with a performance level of the living room from 4. This means, (more then) 70% of the respondents of target group A is satisfied with a living room with a size between 30 and 35 square meters.

Target group B is satisfied with performance level 2, i.e. a living room with a size between 20 and 25 square meters.

3.2 The results

The research has resulted in a set of specific target groups based on the number of members and the age of the head of the household. The complete list of target groups is:
• 1 person per household, <25 years
• 2 persons per household, <25 years
• 1 person per household, 25-34 years
• 2 persons per household, 25-34 years
• 1 person per household, 35-54 years
• 2 persons per household, 35-54 years
• 1 person per household, 54-74 years
• 2 persons per household, 54-74 years
• 1 person per household, >74 years
• 2 persons per household, >75 years
• Families with young children
• Families with older children
• Single parent

As mentioned above, for each target group the performance level as well as the weight of all aspects have been determined. An example the ‘families with young children’ target group is shown in figure 6.

<table>
<thead>
<tr>
<th>Total Living Situation</th>
<th>Demanded Performance</th>
<th>Weight</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>families young children</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dwelling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size livingroom</td>
<td>0.33</td>
<td><img src="image" alt="Performance" /></td>
<td></td>
</tr>
<tr>
<td>Size kitchen</td>
<td>0.29</td>
<td><img src="image" alt="Performance" /></td>
<td></td>
</tr>
<tr>
<td>Size bathroom</td>
<td>0.33</td>
<td><img src="image" alt="Performance" /></td>
<td></td>
</tr>
<tr>
<td>Size master bedroom</td>
<td>0.39</td>
<td><img src="image" alt="Performance" /></td>
<td></td>
</tr>
<tr>
<td>Size second bedroom</td>
<td>0.39</td>
<td><img src="image" alt="Performance" /></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 6: Part of a profile**

4 THE REN MANAGER

4.1 Introduction

In order to support the REN method effectively, the REN foundation together with Design Systems and Calibre – research groups within Eindhoven University of Technology - developed the REN-Manager, a strategic decision support tool for professional real estate managers. The REN Manager is a MSWindows oriented client-server application running on Windows NT. The functionality of the application can be divided into four main areas:
Management of general portfolio information
Management of the performance profiles, both demand and supply
The match procedure
Reporting facilities

4.2 General portfolio information

Because the REN Manager is used for strategic analysis of a real estate portfolio, the first step to start with is entering information about the portfolio like location, rental costs, ownership, available square meters and other general information which is needed by the real estate organisation. Pieces of this information can be used in the match procedure, as we will explain later.

![Complex Properties]

Figure 7: Entry of portfolio information

4.3 Management of the performance profiles, both demand and supply

Within the management of the performance profiles we identify two main functionalities, namely: data definition and data manipulation functionality.

The data definition is concerned with the creation and editing of profiles and aspects. A profile has a treelike structure. The aspects are the leaves of this tree. For every aspect a small description and 5 performance levels are defined (see figure 5 and 6).
By data manipulation we refer to the creation and editing of demand or supply profiles for a certain target group or complex. A specific profile is the instantiation of the general performance profile. So to get a specific profile of a complex we first get the general profile of the category to which this complex belongs and then the performance levels of this building can be entered. A demand profile for a target group has besides the performance level also a weight factor and an ABC factor. The weight factor expresses the relative importance of an aspect within the profile for the underlying target group. The ABC factor is used for a general indication of the preference of a user within a target group. ‘A’ means for the user, that the aspect is of great importance. ‘C’ can be seen as a ‘wish’. The ABC factor is especially valuable during interactive communication between professionals and clients.

4.4 The match procedure

The match procedure describes is the calculation of a REN-score which is a measurement for the difference between demand and supply. If the demand of the client is higher then the supply we have an underperformance, and if the demand is lower, an over performance situation. The match procedure can be divided into three steps:

1. Filter the portfolio based on general criteria
2. Determine the difference between supply and demand
3. Calculate the REN-score

   Step one is used to filter suitable objects (complex or dwelling) from the total real estate portfolio based on general portfolio information. A filter-rule could be something like “the rent should be less then 400 per month” or “the object must be in a certain ZIP-area”.

   In step two the resulting set of objects of step one, each with its own supply-profile, is compared with one or more selected demand profiles. The results of this match are used to calculate de final REN-scores.

   The calculation of a REN-score is based on the difference between demand and supply, the weight factor of an aspect and the choice of the ABC-factor. The formal algorithm is as follows.

Definitions:

\[ P = \text{Profile definition} \]
\[ #(Pc) = \text{number of aspects in profile definition} \]
\[ T = \text{Target group.} \]
\[ Ta[index] = \text{Performance of the quality aspect of given index.} \]
\[ Tw[index] = (\sum Q) \text{Weight of the quality aspect of given index.} \]
\[ Tf[index] = (\sum \{'A','B','C'\} \text{ABC factor of the quality aspect of given index.} \]
\[ Ts[index] = (\sum B) \text{Is this aspect selected to be used in the calculation?} \]
\[ C = \text{Complex.} \]
\[ Ca[index] = \text{Complex aspect performance level.} \]
Algorithm for calculating the score of one aspect:

- We are calculating the under and over performance for a target group with a complex.
- $s \in \mathbb{B}$, $s$ is the option (Boolean) for if the individual aspect selection should be used.
- $u \in \mathbb{B}$, $u$ is the option for if the ABC factors should be used in the calculation.
- $f \in \{A', B', C\}$, $f$ is the set of ABC factors that should be calculated. These factors will be used if $u = \text{true}$.

1. $J = ([i : 0 \leq i < \#(P_c) \land \text{Ta}[i] \geq 0 \land \text{Ca}[i] \geq 0 \land (\not{s} \land \text{Ts}[i]) \land ([u \land \text{Tf}[i]) \land f) : i)$
   $J$ is the set of all aspect indexes that should be used in the over and under performance calculation. These are all aspects that are filled in at the target group and the complex, and which are selected in the aspect selection and as ABC factor. With aspect selection we refer to the functionality that the user can include or exclude certain aspects of the score calculation.

2. $rt = ([i : i \in J : \text{Ta}[i] \cdot \text{Tw}[i])$
   $rt$ is the sum of all target group performances multiplied with its weight.

3. $\text{r\over{}ver} = ([i : i \in J : \text{Ta}[i] < \text{Ca}[i] : (\text{Ca}[i] - \text{Ta}[i]) \cdot \text{Tw}[i]) / rt$
   $\text{r\under{}nder} = ([i : i \in J : \text{Ta}[i] > \text{Ca}[i] : (\text{Ta}[i] - \text{Ca}[i]) \cdot \text{Tw}[i]) / rt$
   $\text{r\over{}ver}$ is the over performance and $\text{r\under{}nder}$ is the under performance of the complex profile compared with the target group profile.

### 4.5 Reporting facilities

The results of the match procedure can be displayed in two ways: as a matrix of REN-scores (figure 8) and as a graphical presentation of the match profile. A match profile shows the difference between the supply and demand (figure 9). The graphical representation is often used as a starting point for further discussion with the client about the different quality aspects and their relative importance.

![Match Result / Ballpark Costs - 1](image)

**Figure 8: Match result matrix**
5 DISCUSSION

The REN-manager is of major importance to housing managers. It offers them a strong decision tool, which can be applied for the management on the level of an estate as well as a portfolio.

On the estate level the REN-manager makes on optimal match of a dwelling and type of household possible. It also indicates which investments should be done if the housing manager plans a refurbishment of a dwelling estate for a special target group; the REN manager shows the under-performance for that type of household.

![Figure 9: Match result detail](image)

On the portfolio level the tool supports him to find out which are the gaps in his product-market combinations, given the policy to provide special target groups. However, the user should not lose sight of the underlying assumptions.

We already stated that in the underlying research the level of satisfaction is interpreted as the degree to which the needs for housing are fulfilled; dissatisfaction reflects a mismatch. The degree of satisfaction and, accordingly, a successful match in influenced by the market situation. For suppliers in an overstrained housing market a optimal match is not always necessary, because housing seekers have limited possibilities to improve their situation. When the market unbends a better match will be desirable.

Secondly, the tool is based on a synchronical comparison between target groups. To make the REN Manager more dynamic, diachronical analyses should become added. For that purpose, the underlying survey should be repeated after a certain period of time (e.g. 3 or 5 years). Also it is recommendable to add some demographic trends and prognoses to the analyses. Especially, the ageing of households and the increasing amount of small households has a great impact of the degree in which dwelling estates can become matched in the future.
6 ACKNOWLEDGEMENTS

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