A rate data bank integrated into the CAD

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Data bank, Aided design, Cost, Price estimate.

Abstract:

It seems that the computer enables the client, the architect and the contractor to improve the cost estimate of their future project in accordance with the level of detail of its design as far as some standardization of the bill items and a structurized grouping of the cost data can be reached.

As part of the research "Definition of a computer system for the building sector" subsidized by the Institute for the encouragement of scientific research in industry and agriculture \(^{(2)}\), the BBRI has studied:

- a classification of functional elements, applicable to the building sector and enabling a standardization and a modernization of the procedures
- a cost estimate programme of a building plan based on the functional element method.

\(^{(1)}\) In French: "Centre Scientifique et Technique de la Construction" (C.S.T.C.).

\(^{(2)}\) In French: "Institut pour l'encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture" (I.R.S.I.A.).
Introduction:

The circulation of the cost data should allow the creation of two complementary data bases for the building sector:
- a data bank of investment costs (bids)
- a data bank of running and maintenance costs (building management).

Both of them require a grouping of data for their statistical processing. This grouping should be decentralized in order to collect the data at the root. It should be carried out methodically and reduce the constraints to a minimum in order to avoid any mistake.

The integration of this instrument of economic guidance for the future projects among architects and clients (central, provincial, communal authorities, architect offices, contractors, ...) and its efficient use by the latter rely first of all on the versatility and the rapidity of the creation and the consultation of these data bases.

The present analysis will apply for cost estimates of minor projects (family house) as well as for estimates of more important projects (hospitals, administrative offices) for the study can be adapted to the user's computer (from personal to big computers).

1. Creation of data banks

1.1 The data bank of investment costs (fig. 1)

In answer to the bids invited established by the client and the architect for a determined project (plans - specifications - detailed bill), each bidding contractor provides his bid under the form of:
- a typed document
- a computer listing
- and in the near future, data mediums such as magnetic tapes or floppy disks.

After a comparison of the bids, the placing of the contract is stored in the data bank.

1st stage: the general data of the project - C.D. -

The general data of the project are entered.
- The first four data define the project, that is to say: the building type, the geographical place, the localization and the style.
- Thirteen geometric data give the main characteristics of the building (site area, gross floor area, ...).
- Ten technical data (lift, structure, heatings, ...) state the techniques used.
- Six economic data specify the costs of the building great entities (land costs, road costs, foundation costs, ...).
- Five specific data out of standard can be defined.

About thirty data on the whole are to be collected and entered for each project under the architect's responsibility. The object of these general data is to allow a selection of the buildings in the data bank for a better estimate of a new project.
2nd stage : the contract data are entered item by item according to the classification of functional elements.

N.B. : the work will be much more difficult if there exists no standardization of the bill items for all the projects from the bid invited.

This second stage is limited to a file transfer if the unsuccessful contractor could use a data medium compatible with the architect's material to present his bid.

The data which are stored in the file of the detailed rates (PRIDET) are item by item the following ones :

<table>
<thead>
<tr>
<th>Item n°</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>A/N</td>
<td>2 x 30</td>
<td>16</td>
<td>15 N,</td>
</tr>
</tbody>
</table>

that is to say : 104 characters per item.

For example : a bid of 1000 items would use
1000 x 104 = 104,000 characters
+ general data 200
104,200 characters (+ 100 Kbytes).

3rd stage : the programme of rate grouping.

At the outset of the file of the detailed rates (PRIDET), an interactant programme calculates the unit rates by grouping level from the quantities progressively defined by the architect for each element of the level.

One has to state the grouping level wanted. The programme checks all the elements concerning this level, that is to say, for the

- level 4 : ± 256 functional elements
- level 3 : ± 58 sub-headings
- level 2 : ± 9 headings
- level 1 : the building unit (hospital bed, hotel room, ...).

The user will have to enter for each element the quantities corresponding to the studied project and to the proposed unit.

Example of grouping : 11.1 - Excavations - m³ = 163,000.

The data come from PRIDET - Quantity x U.R. = TOT.C.

11.1.01 Manual excavations m³ 20,000 920,00 18,560,00
11.1.02 Mechanical excavation m³ 143,000 238,50 34,105,50

Average U.R. = 52,665,50 FB = 323,10 FB/m³.

N.B. : the only data entered in example for the rate grouping is the quantity 163,00 m³.

1.2 The data bank of maintenance and running costs

Each administration will have to create its data structure of the run patrimony in order to check the management costs of the building and to obtain an estimate base. Three types of costs will be stored for each building from an analytic accountancy :

- the running costs : heating, ventilation, air-conditioning, water, telephone, insurances, ...
- the maintenance or "usual" costs : cleaning, painting, boiler maintenance, lift maintenance, ...
- the repair or "exceptional" costs.

The last two types of costs are classified according to the same structure as the one of investment costs i.e. the structure of the functional elements limited to the 56 sub-headings whereas running costs have their own classification.

Example :

<table>
<thead>
<tr>
<th>CODE</th>
<th>HEADING</th>
<th>UNIT</th>
<th>Min. UNIT Rate/yr</th>
<th>TOTAL/(1) COST/yr (in yrs)</th>
<th>FREQUENCY</th>
<th>BRIEF DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.4</td>
<td>Window frames</td>
<td>m²</td>
<td>700</td>
<td>-</td>
<td>5 years</td>
<td>(paintwork + joints)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>900</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7,000</td>
<td>-</td>
<td>25 years</td>
<td>replacement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9,000</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) In cases where it is easier to estimate the total cost rather than a unit rate

In order to allow a study of the Life cycle cost of each sub-heading of the building, the discount of the running and maintenance costs should take into account :

- a discount rate adapted to each type of running costs based on the unit rate increase of the latter (automatic calculation)
- a standard discount rate available for the whole building, for all the other costs.

2. Estimate of the building costs of a new project

2.1 Estimate of the investment cost

Four stages are to be distinguished according to the level of detail of the building plans. A method of quick estimate of the building cost is defined from the same data bank for each stage.

1st stage : preliminary study - expediency - feasibility.
The estimate method : the building unit.

2nd stage : programme / finance ment.
The estimate method : the gross floor area (9 standard headings).
3d stage: outline plan.
The estimate method: the functional elements by sub-headings (+ 56 standardized sub-headings).

4th stage: sketch plans.
The estimate method: the functional elements (+ 250 functional elements).

The method is made up of two main parts:
1. the selection of the buildings taken as reference in the calculation
2. the calculation and discount mode of the unit rates.
The programme interactivity enables the architect to propose his own rate data for some building elements which are known.

2.2 Estimate of the maintenance and running costs

A calculation method is being studied at present in order to enable the architect to choose between several solutions of a same functional element in considering more particularly the life cycle cost of every solution taken into account.

This requires a sufficiently representative data bank.

Conclusions

The integration of the studies required by the CAD from the project design until its realization and management compels all partners of the building sector to work for a standardization of procedures. The structure of data banks (graphic and alphanumeric) set up as part of the computer aided design should refer to a general classification of the building elements.

In the same way the economic evolution of a project following the various stages of its design should possess a similar structure and answer to the next criteria:

- RELIABILITY
  Estimates should be representative of the real rates and take into account the evolution of the rates in the sector.
- RAPIDITY
  In the design previous stages the architect should reckon with the aid of a rapid instrument requiring few data to be entered.
- PRECISION
  It should be greater as the design proceeds.
- COMPATIBILITY and COHESION
  The various estimate methods used during a project design should have the same references.
- METHOD COST
  It will depend on the estimate methods which have been used.
  It will be higher if the project design is at an advanced stage.

REFERENCES


5. ...., “Kostenanalyse”, Bouwkosten – Misset.


Structuring of Building Industry Data for use in Standard User Interface for Application Software

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KEYWORDS
Information, Data, Software Interface

ABSTRACT
Standards for information format for application software for computer use within the building industry of the United Kingdom and Europe are little developed at present.

This paper proposes a method for structuring data exchanged between selected users within the building industry. Such a method would allow each of the users to access the data they require in a form which is both immediate and acceptable to them. This data structure is intended for implementation upon a computer.

The paper relates research into the information requirements of particular functional groups and their information environment. The resulting characteristics and complexities are described together with an analysis of the data structures which have evolved to facilitate information exchange.

One particular information channel is investigated in detail in regard to the data requirements. Further, the methods of working of the functional groups in this channel together with the formalised information structures they access are reviewed.

In conclusion a skeletal data structure is proposed which is expanded to incorporate the dominant data requirements of each functional group considered.