A rate data bank integrated into the CAD

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KEYWORDS :

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.

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Une banque de données de prix intégrée à la C.A.O.

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MOTS CLES :

Banque de données, Conception assistée, Coût, Estimation de prix.

Sommaire :

Il apparaît que, grâce à l'outil informatique, le Maître d'ouvrage,
l'architecte et le promoteur immobilier ont la possibilité de mieux
estimer le coût de leur futur projet au fur et à mesure de sa conception
pour autant qu'une certaine uniformisation des postes du métré et qu'une
collecte structurée des données de coût puissent se mettre en place.

Dans le cadre de la recherche "Définition d'un système informatique pour
la construction" subsidiée par l'I.R.S.I.A. (Institut pour l'encourage-
ment de la Recherche Scientifique dans l'Industrie et l'Agriculture), le
C.S.T.C. a étudié :

- une classification en éléments fonctionnels, applicable au secteur de
  la construction et permettant une uniformisation et une modernisation
  des procédures

- un programme d'estimation du coût d'un projet de bâtiment par la
  méthode des éléments fonctionnels.

Introduction :

The circulation of the cost data should allow the creation of two comple-
mentary 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 contraints 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 determinated 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 - G.D. -

The general data of the project are entered.
- The first four data define the project, that is to say : the buil-
  ding 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 responsability. 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 successful
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 :

	Codification
Item n^{er}	10 A/N
Description	2 x 30
Unit	3 A/N
Quantity	16 N
Unit rate	15 N,

that is to say : 104 characters per item.
For example : a bid of 1000 items would use

$$1000 \times 104 = \quad 104.000$$
$$+ \text{ general data} \quad \underline{\quad 200}$$
$$\overline{104.200} \text{ characters } (\pm 100 \text{ Kbytes}).$$

3d stage : the programme of rate grouping.

At the outset of the file of the detailed rates (PRIDET), an interac-
tant 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 : $\pm$ 256 functional elements
- level 3 : $\pm$ 58 sub-headings
- level 2 : $\pm$ 9 headings
- level 1 : the building unit (hospital bed, hotel room, ...).

The user will have to enter for each element the quantities corres-
ponding 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	m^3	20,000	928,00	18.560,00
11.1/11	Mechanical excavation	m^3	143,000	238,50	34.105,50
					52.665,50.

$$\text{Average U.R.} = \frac{52.665,50 \text{ FB}}{163 \text{ m3}} = 323,10 \text{ FB/m}^3.$$

N.B. : the only data entered in example for the rate grouping is the
quantity 163,00 m^3.

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 :

CODE	HEADING	UNIT	Min. UNIT Max. RATE/YR	TOTAL$^{(1)}$ COST/YR	FREQUENCY (in yrs)	BRIEF DESCRIPTION
(31.4)1	Window frames	m^2	700 900	– –	5 years	(paintwork + joints)
			7.000 9.000		25 years	replace-ment

(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 / financement.
The estimate method : the gross floor area (9 standard
headings).

3d stage : outline plan.
         The estimate method : the functional elements by sub-
         headings ($\pm$ 56 standardized sub-headings).

4th stage : sketch plans.
         The estimate method : the functional elements ($\pm$ 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 func-
tional element in considering more particularity 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 COHERENCE
  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.

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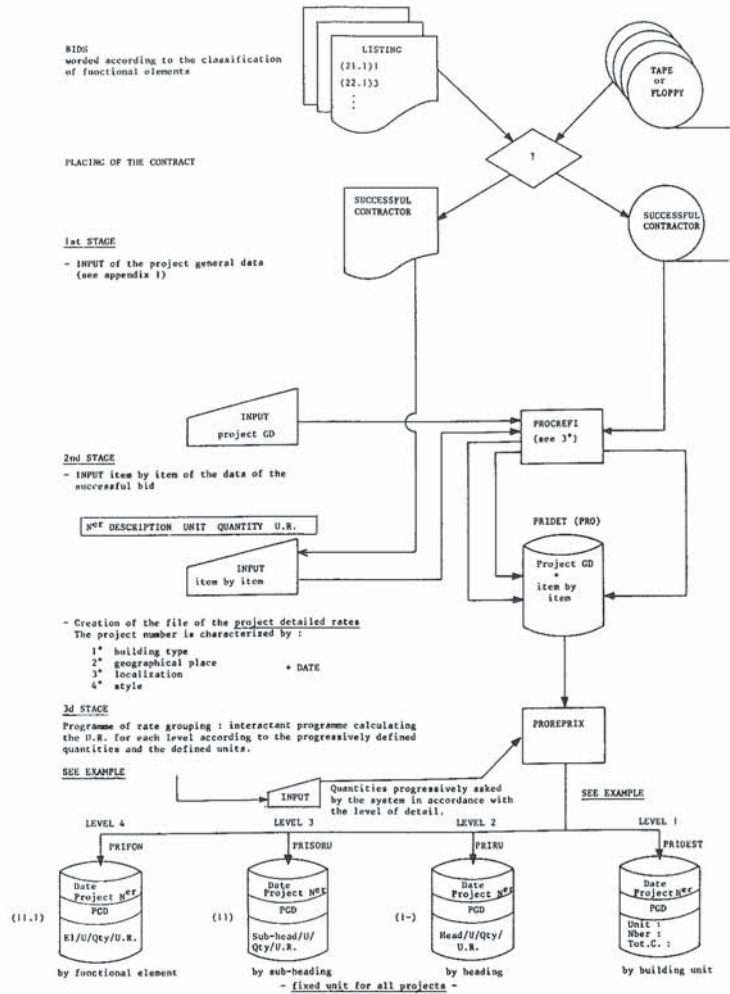
SUCCESSION OF THE FILE CREATION STAGES

Figure 1

Structuring of Building Industry Data for use in Standard
User Inferface 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 sturcture is proposed which is expanded
to incorporate the dominant data requirments of each functional group
considered.