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132 Cost information system for building projects: state of the art in Turkey

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Abstract

The growing size and complexity of projects has generated a need for increasing volumes of information in the construction industry. Extensive developments in computer technology and database techniques facilitate information transfer between participants within the building process. This study aims to develop a computer system which will allow the transfer of cost information with consequent benefits to cost modelling. Its ultimate purpose is to take step of establishing a cost data bank which will operate in the Turkish Construction Industry. This paper will report on the characteristics of the principal cost information sources in the industry, which will form the first part of the study.

Keywords: Cost Modelling, Cost Information, Data Bank.

Introduction

We live in an age of information. The establishment of adequate information sources and channels is seen as a "necessary precondition" for rational decision making. As is known well, rational decision are usually made in the light of the information available at the time of the decision. The increasingly important role of information in decision making is a growing area of concern in management theory and practice. The rapid developments in telecommunication and computer technology have greatly increased the potential for the storage, processing and distribution of information gained all over the world.

The reflection of the industrial development followed in other fields of production on the construction industry and the growing size and complexity of construction projects have generated a need for increasing volumes of information. It is true to say that the building process is information intensive. Each stage of the process requires the continues collection, updating and exchange of information by, and between the various parties responsible for the production of building. The processing and communication of this information is vital for achieving success in the construction industry. The availability of information of the correct quantity, quality and type, the suitable formulation of that information and its subsequent application and use are key elements in increasing efficiency of construction management.

There is a mounting awareness of the significance of modelling effective information systems as an important area of building research worthy of commanding funding support. For this reason, a number of attempts have been made to improve data co-ordination between the users of data in the building process.

Rising prices, restrictions on the use of capital and high interest rates have led increasingly to the need for reliable and useful cost data in the management of design and construction process as well as maintenance. In the construction industry, an effective cost information service is vital to ensure that resources are used to the best advantage. It was for this reason that banks of cost data were established in several countries (BCIS and BMCIS in the UK, UNTEC in France).

Turning now to what currently exists in Turkey, the construction industry is in lack of a standard for the description and structuring of information exchange between the various parties involved in the act of construction. The major problem faced by the industry is the absence of communication media between the users of data.

This paper describes a research project which aims to develop a computer-based cost information system for building projects. The ultimate purpose of the research is to take step of establishing a cost-data bank to be operated in the Turkish Construction Industry. The research will give emphasis to the need of harmonisation of national practices in the construction sector so as to allow cost information to be exchanged between countries.

The paper has been prepared at the commencement of the research cited and has attempted to review the major sources of cost information available to the Turkish Construction Industry, by indicating their shortcomings.

2 Sources of cost information

It is generally recognised that the act of cost estimating and control is dependent upon the availability of cost information sources to the industry. As mentioned previously, the first step of the research project described in this paper is to review the major published sources of cost information in Turkey.

Although the preliminary phase of the study will end up in December 1991, it is intended, in this paper, to draw general conclusions about the published cost information and the cost studies prepared by the industry.

The main sources of published cost information may be reported under five headings.

- Input prices
- Unit prices
- Building cost
- Cost indices
- Cost studies

2.1 Input prices

One of the published information on wage rates, material prices and plant rates is supplied by the Ministry of Public Works and Resettle-

ment. In this publication, wage rates are based on different skill levels, and material prices are provided for different material ranges. Supplementary information is also supplied on delivery place of material. As for plant rates, they are priced in terms of different tasks (Table 1).

In public sector projects the pricing of work items are subject to the afore said list which appears once a year. In addition, it is possible to find this type of information in the journals concerned with design and construction. Due to the rapid increase in input prices, these journals provide information about the current state of the tendering climate.

2.2 Unit prices

Apart from the list of unit prices, the Ministry of Public Works and Resettlement also supplies a list of unit prices for measured work items which is published annually. In this list, work items are broken down into 30 categories. Unit prices for each element of work include a profit margin of 25 per cent, excluding transportation expenditure.

Table 2 shows breakdown of unit prices for typical work items.

Since the major cost significant factors such as location, size of contract, type and form of construction, and market conditions are not reflected in the prices, it is necessary to make adjustments in case of tendering for private sector projects.

2.3 Building cost

Building prices per m^2 for various types of building have been published annually by several public or private organizations for different purposes.

Rates per m^2 are adopted in the calculation of professional fees for building work. For public sector services the calculation is based on the list which is disseminated annually by the Ministry of Public Works and Resettlement. Another list that is produced by the Chamber of Architects exhibits some differences when compared to the former. It makes allowance for regional variations. Table 3 and Table 4 show the format of each.

Apart from these two lists, the Ministry of Finance and Customs prepares a list of building prices per m^2 to be used in the calculation of property tax.

2.4 Cost indices

One of the real weaknesses of the Turkish Construction Industry is the inadequacy of published cost indices which will provide an empirical guide to changes in building costs. It stems from the lack of consistency between various published indices. For this reason, there is a clear need for development of reliable building price indices. This is an issue which requires action by both the government and industry.

In Turkey, the index data is compiled by the Business Research and Publication Department of the Ministry of Commerce, the Istanbul Chamber of Commerce and the Price and Trade Statistics Division of State Institute of Statistics. The most commonly used indicator of changes in the general price level is wholesale price index. Two types of wholesale price indices have been developed in the country.

Table 1. Input Prices
(1000 TL = 0,339 US \$ at the end of December, 1990)

ITEM	DESCRIPTION OF ITEMS	UNIT	UNIT PRICE (TL)	DELIVERY PLACE
CONSTRUCTION MATERIALS:				
4.0070	Fine sand for plastering, sieved and washed	m ³	4,416	at quarry
4.0081	Normal Portland cement, as bulk	ton	89,000	"
4.0180	Factory manufactured bricks:			
	A) Facade clay bricks (190*90*50 mm.)	each	160	at factory
	B) Horizontal holed (190*190*85 mm.)	each	130	"
	C) Vertical holed (190*190*135 mm.)	each	175	"
	!) Light bricks (190*190*135 mm.)	each	770	"
4.1510	Sawn pine wood, 1.st quality	m ³	1,225,000	at site
4.1610	Wooden parquet, 1.st quality	m ²	65,000	"
4.2510	Reinforcing steel rods, ST 1, 8-12 mm.	kg	753	at factory
4.2560	Steel sections	kg	1,075	"
4.4070	White glazed wall tiles, 150*150*6 mm.	each	410	at site
4.6532	Normal glass, 6 mm thick	m ²	19,972	"
LABOR				
1.0020	Skilled worker for floor tiling	hour	2,145	
1.0030	Skilled worker for glazed wall tiling	hour	2,145	
1.0080	Skilled worker for wooden joinery works	hour	2,145	
1.0120	Plasterer	hour	2,145	
1.0130	Wall builder	hour	2,145	
1.0190	Steel bender	hour	2,145	
1.0230	Painter	hour	2,145	
1.4011	Heavy truck driver	hour	2,442	
1.4090	Formen	hour	3,077	
1.5010	Unskilled worker	hour	1,403	

Source: Ministry of Public Works and Resettlement (Extract from the list of Input Prices, 1990)

Table 2. Unit Prices for Measured Works of Construction
(1000 TL = 0,339 US \$ at the end of December, 1990)

ITEM	DESCRIPTION OF ITEMS	UNIT	UNIT PRICE (TL)
MASONRY WORKS:			
18.0010	Red clay brick wall with 200 kg cement mortar	m ³	142,479
18.0110	Red clay brick half-wall with 250 kg cement mortar	m ²	15,664
18.0112	Half-wall with facade clay bricks	m ²	24,504
18.0311	Load bearing wall with 200 kg cement mortar and factory manufactured clay bricks (block or vertical holed)	m ³	187,957
18.0312	Wall building with light-weight, vertical holed bricks sized as 190*135*190 mm.	m ³	98,549
18.0313	Ditto, brick sizes are 240*115*235 mm.	m ³	100,016
18.0314	Ditto, brick sizes are 240*145*235 mm.	m ³	94,827
18.0315	Ditto, brick sizes are 240*175*235 mm.	m ³	93,620
18.0316	Ditto, brick sizes are 290*190*235 mm.	m ³	67,393
18.0317	Ditto, brick sizes are 240*240*235 mm.	m ³	86,145
18.0318	Ditto, brick sizes are 240*300*235 mm.	m ³	83,473
18.0319	Ditto, brick sizes are 240*365*235 mm.	m ³	113,902
18.0710	Wall building with 200 kg cement mortar and factory manufactured, horizontal holed clay bricks, all sizes	m ³	73,021
18.0711	Half-wall building with 250 kg cement mortar and ditto	m ²	8,095
18.0810	Load bearing wall with 200 kg cement mortar and factory manufactured clay bricks (block or vertical holed), all sizes	m ³	82,912
18.0811	Half-wall building with 250 kg cement mortar and factory bricks, vertical holed, all sizes, modular	m ²	13,703

Source: Ministry of Public Works and Resettlement (Extract from the list of Unitprices, 1990)

Table 3. Building Cost Per Square Meter
(1000 TL = 0,339 US \$ at the end of December, 1990)

CLASS 1	140.000TL/m ²	CLASS 2	200.000TL/m ²	CLASS 3	400.000TL/m ²	CLASS 4	600.000TL/m ²	CLASS 5	840.000TL/m ²
-Workshops, studios 100m ² -Sheds, barns -Open sport places	-One storey workshops -One storey garages -Open swimming pools -Two story house buildings -Simple factory buildings	-Multi storey workshops -Dormitories -Multi storey garages -Dispensaries -Primary schools -Gas stations -Houses (no elevator and no central heating)	-Simple office buildings -Halls, stores -Swimming pools -Hospitals -Simple religious buildings -Apparment with elevator and central heating -Factory buildings -Administrative buildings -Social and sport buildings -Hotels (one or two stars)-All type restorations	-Banks -Hospitals (more than 100 beds) -Cultural buildings -Holiday villages -Cinema and theatre buildings -Department stores -High quality houses -Religious building -Hotels (three, four and five stars)					

Source: The Istanbul Chamber of Architects.

Table 4. Building Cost Per Square Meter
(1000 TL = 0,339 US \$ at the end of December, 1990)

CLASS 1	112.000TL/m ²	CLASS 2	220.523TL/m ²	CLASS 3	CLASS 4	CLASS 5
-Huts -Retaining walls	-Towers -Small houses	GROUP A 371.621TL/m ² -Simple industrial buildings -Simple holiday villages -Social houses -Simple sport facilities -Simple office buildings GROUP B 424.710TL/m ² -Industrial buildings -Simple libraries -Office building -Social houses (with central heating) -Multi storey garage -Dormitories	GROUP A 477.799TL/m ² -Complex school building -Saunas -Administrative buildings GROUP B 530.888TL/m ² -High quality houses -Office buildings -Stadiums and sport facilities -Campus buildings -Office buildings (banks) GROUP C 637.065TL/m ² -Hotels (3 or 4 stars) -Hospitals -Cultural building -Swimming pools -Hostels	GROUP A 796.331TL/m ² -Embassy -Administrator houses GROUP B 955.598TL/m ² -Congress centers -Concert holes -Museums GROUP C 1.114.864TL/m ² -High quality hotels -Big radio and television buildings GROUP D 1.306.800TL/m ² -Theatre and opera houses -All type restorations		

Source: Ministry of Public Works and Resettlement

2.5 Cost studies

Since the 1970s, a number of building cost studies have been undertaken and supported by the National Research Organizations and the universities. In recent years, private construction firms and institutions have found it profitable to give attention to the research and development of cost forecasting and control.

Among the national research organizations, the Scientific and Technical Research Council of Turkey combines the work of several organizations. The Government finances the work undertaken by the organizations affiliated to the Council. Regarding these organizations, the Building Research Institute has been conducting extensive research programmes into various aspects of building cost since it was formed in the late 60s.

Further research has been carried out at the universities into building cost studies. The results usually obtained during these studies are often published to contribute to the developments which take place within the construction industry.

3 The research project

As has been mentioned earlier, this paper is concerned with a research project which intends to develop a computerized cost data base and information service. The research will be conducted by the writers to do the following.

To foster the use of life-cycle costing methods in investment appraisal

To provide relevant data to developers or financial institutions for evaluating competing proposals

To enable contractors to make better contract pricing decisions

To provide architects with up to date and reliable information needed for making rational decisions at design stage

To assist property managers in the establishment of a maintenance policy for the building.

The study will be carried out in the following steps:

1. The development of a theoretical model of cost information system
2. The translation of the above model into a computer model
3. The application of the computer model designed
4. The establishment of the Turkish Cost Data Bank

The collection of information of the correct quantity, quality and type, the suitable formulation of that information and the application of suitable interpretive techniques will form the basis of modelling the system.

Validity of the computer model to be proposed will be tested through a pilot study. It is intended that the pilot study will be conducted on sample of projects from tourism sector.

The starting point of the work is to treat the present cost information sources and cost studies available to the industry. In the

(1963=100)

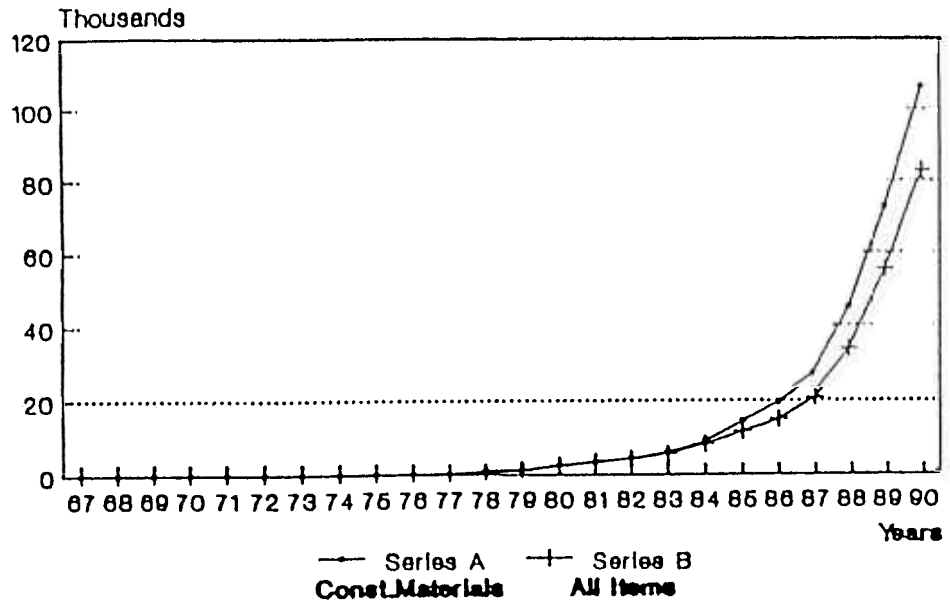


Fig.1. Wholesale price index of the Istanbul Chamber of Commerce.

The whole sale price index of the Istanbul Chamber of Commerce has been published in the Price Indices Journal of the aforementioned organization since 1951. No coefficients are used for the items included in the index which is calculated by the unweighted geometrical mean. Since the beginning of 1965, the index numbers have been adjusted to different base years; 1958=100, 1963=100 and 1968=100. As for the indices prepared by the Business Research and Publications Department of the Ministry of Commerce, total production values are taken as indicators both in the selection of items and grouping. Originally 1938 was taken as the base year for the index numbers calculated using the Laspeyres formula and later the base year was shifted several times to 1953, 1958 and 1963.

Each of these wholesale price indices covers prices of construction materials. But the main shortcoming of these indices is that they take no account of the implications of differential price movements in construction materials. However, within construction materials as a group, prices of some materials may change faster than others.

Figure 1 shows in graph form the wholesale price index of the Istanbul Chamber of Commerce over the period 1967-90.

course of this phase, a data base will be compiled to provide the relevant data.

4 Conclusion

For some years, there has been a growing concern with regard to the availability of reliable building cost information. It has been proved that the successful management of the building process is based upon the sound cost information. Though the importance of cost information is well understood by the protagonists of construction, one of the primary weaknesses in the Turkish Construction Industry is the lack of an effective cost information system.

Hence, the research project described herein was commenced with the aim of developing a computerized cost data base and information service. It is hoped that if such a system can be established, it will stimulate the exchange of cost data between countries.

Acknowledgments

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