A Framework for Interactive Cost Information Exchange in the Australian Building Industry

C A LANGSTON and C Y ONG
University of Technology, Sydney (UTS)
Australia

ABSTRACT

This paper describes a research project currently underway at the University of Technology, Sydney to investigate, design and implement a prototype system for the interactive exchange of cost information in the Australian building industry. If successful, the project will represent a significant improvement to the manner in which the industry operates and will further encourage the development of specialised systems that share data electronically between professional disciplines. The project already has the support of key industry groups who have made cost information available to the research team. The project is expected to be complete by 1995.

Key Words
cost data base; interactive data exchange; information technology; cost information; prototype

INDUSTRY NEED

The building industry in Australia, like other countries, has failed to take full advantage of the rapid growth in information technology (IT) and has therefore lost significant opportunities to become more efficient and productive. The industry is characteristically conservative and competitive and it is these two aspects in particular that are primarily responsible for the slow pace of information technology implementation at an industry-wide level (Atkin, 1989).

One significant activity within the industry of interest to the authors of this paper is the use of both historical and current information for the purposes of prediction of the cost of future building work. In Australia there is presently no industry cost information service other than price books (such as those prepared by Rawlinsons and

Cordells) and manufacturers' product information (distributed on disk by AEC DataLink).

The time period between collection and distribution of this cost information can be considerable, but even disregarding this delay the time period over which the data is typically used means that it is inherently reliant on some form of escalation adjustment. Furthermore, there is no means of selectively analysing the information to determine, for instance, the number of projects contributing to the average rate, the details of these projects and the means by which the rates are compiled and time indexed. Existing cost information is largely intended for prediction of construction work, yet a significant proportion of a building's total cost is a function of maintenance, replacement, cleaning, energy and other operating costs, for which adequate data is not available.

It is generally recognised that averaged cost information from a number of projects can improve the accuracy of estimates (University of Reading, 1981). But it is argued that cost information is context dependent, and this is particularly so when operating costs are considered. The number and diversity of projects that pass through any one firm are generally insufficient to support the range of applications to which the information is put.

The opportunity exists for cost information to be shared on an industry-wide level. Although this is not a new idea, the application of IT can greatly improve the level of information available while still protecting the competitive advantage of individual firms (Atkin, 1990). This paper explores the development of an interactive cost information system that has the potential to enhance the accuracy of predictive costing and to deliver benefits to the industry previously unrealised.

STRATEGY

There are numerous objectives that must be met if an industry cost information service is to be established and have sufficient patronage to be successful. These comprise:

1. The data must be comprehensive and diverse, suitable for estimating at all stages of a project's life cycle.

2. Cost data must be supplemented by other project information so that it can be viewed in context.

3. The data must be divided into historical information (averaged prices from previous projects) and current information (present costs of labour, materials and plant from suppliers and sub-contractors).

4. The advantages offered by the service must significantly outweigh the contribution cost of the users.

5. Statistical analysis and interrogation of cost data must be supported.

6. The competitive advantage of organisations contributing cost information must be protected.

7. The service must ensure that delays between compilation of cost information and its utilisation are minimised.

8. The service must be easy to access and use.

The strategy suggested to meet these objectives is relatively simple, yet it is dependant on a level of information technology that is quite sophisticated. The organisation managing the service must also be seen to be independent and have the respect and confidence of the industry. The strategy in detail comprises the following aspects:

1. The design and development of a prototype system will be undertaken as a research project by the University of Technology, Sydney, in consultation with key industry groups.

2. Cost information shall be classified as either historical prices or current costs. The former shall be obtained from project design teams and contractors while the latter shall be obtained from suppliers and sub-contractors.

3. Users of the system will be charged an annual fee to gain access to the data, and this fee shall include compilation of all data that they may wish to provide. Suppliers and sub-contractors will also be charged an annual fee to have their products and services included in the database. The annual fee in both cases is expected to be small and no differential charging based

on the quantity of information received or the level of activity of an organisation is expected at this stage.

4. All consultants, client authorities and contractors involved in a particular project will have access to all levels of information available for that project. Users will otherwise be limited to viewing averaged project costs, although they will be able to interrogate the projects contributing to this average and choose which projects should be included or excluded.

5. Information will be made available in any of three ways: (i) on-line computer access, (ii) downloading of information by modem or (iii) distribution on CD ROM (for which a separate charge will be levied per disk). Users must be registered to gain access and must possess the required hardware and software to run the system.

Information for a particular project may be gathered from one or more of the engaged consultants, the contractor or the client authority itself, and it is expected that firms will take advantage of a service that compiles and maintains all their in-house project data. Suppliers and sub-contractors should be encouraged by the advertising of their goods and services to those interested in their specification.

SCOPE OF INFORMATION

The potential information that the service will offer is very comprehensive. The database shall be capable of storing photographic information, floor plans and elevations, design variables, functional costs, elemental quantities and rates, full bill of quantities items subdivided into resources, specification, cost distribution graphs, energy usage data, maintenance costs, service lives, material costs, plant hire charges, labour award rates and productivity constants. The information shall be classified as project-related (historical) or product-related (current).

All registered users will have access to the product-related information and compiled historical averages. Those users involved in a particular project's design or construction will have access to all stored information for that project, while others will be restricted to a brief description of those projects contributing to the average.

The capacity to store both construction and operating costs will be a feature of the database. Details of occupancy patterns, location and maintenance history will place these costs in context and hence provide useful feedback for predictive purposes on similar projects.

PROTOTYPE FRAMEWORK

The prototype framework, already well-developed, is capable of providing information suitable for budgets through to detailed resource costing for a wide variety of projects. The system should be attractive to those involved in predictive estimating of building work and maintenance. Although the prototype will initially be limited to Sydney projects, it is planned to be expanded nationally so that projects can be selected and averaged on the basis of a variety of criteria, including location.

The prototype has been called the Australian Building Cost Database (ABCD) and operates under Windows or OS/2 on a personal computer. Dynamic data exchange (DDE) is supported so that information can be transferred to other applications including estimating software and CAD.

Figure 1 illustrates an overview of the prototype system. Project-related information is found under the "historical" option. Prices can be viewed as functional, elemental or detailed costs per unit for both construction and operation. Project details can be investigated from any screen. Product-related information is found under the "current" option. Costs can be viewed as material, labour and plant costs per unit for both construction and operation.

An allied project in progress at the C.S.I.R.O. (Commonwealth Scientific and Industrial Research Organisation, Division of Building, Construction and Engineering) involves the development of a national building classification system. The outcome of this project will be the basis of cost coding and retrieval strategies for ABCD. In both cases the objective is to improve the productivity of all industry participants through co-operation and communication.

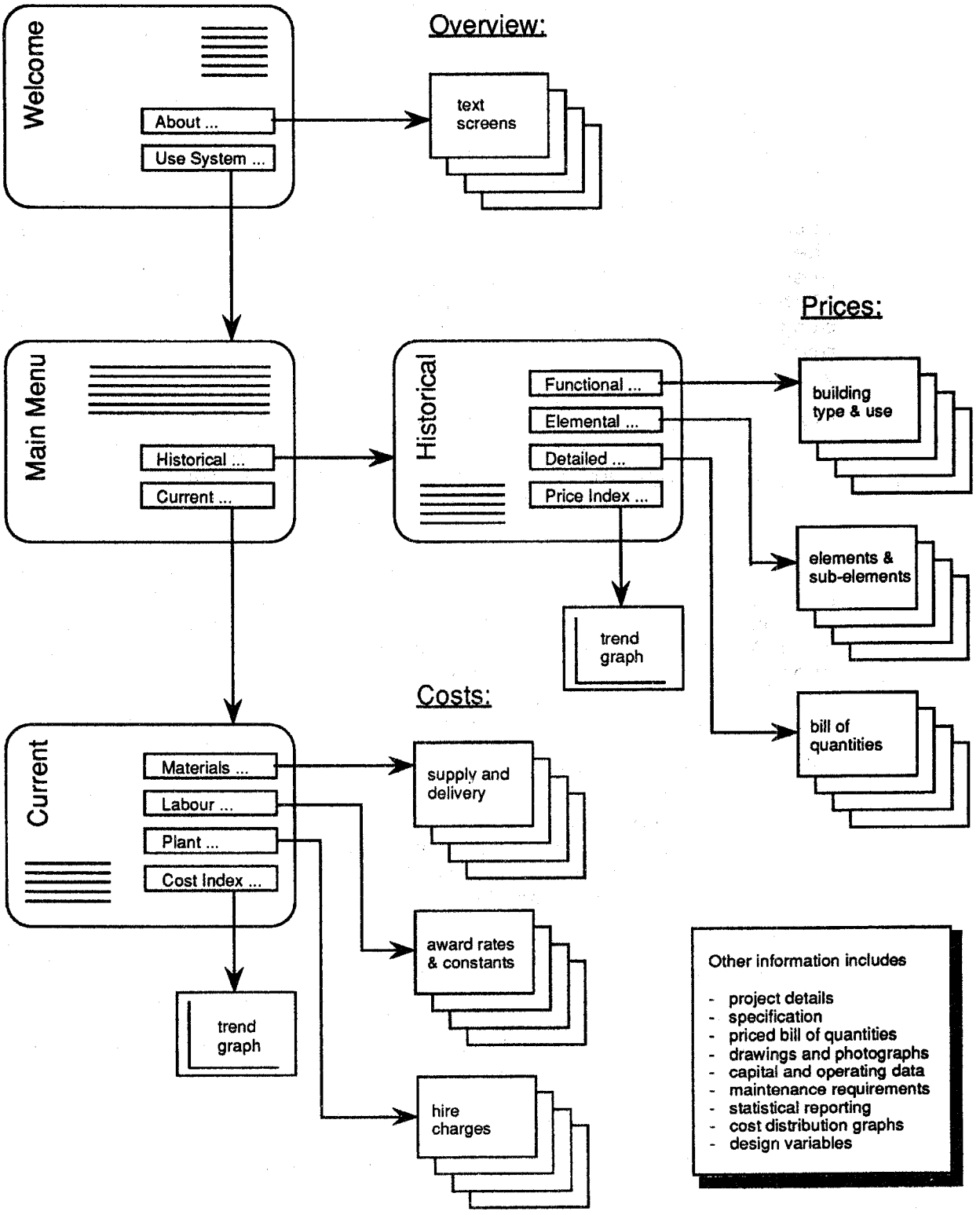

Figure 1: Prototype Framework

It is suggested that the benefits to the industry far outweigh the cost to contributors, but the success of the service is nevertheless reliant on industry support. Therefore the idea must be effectively marketed and the sponsorship of key industry groups must be secured. The role of government in this venture must not be overlooked.

PROBLEMS TO BE SOLVED

At the time of writing this paper there remains a lot of work to be done before the database becomes ready for release. Apart from programming and testing, a reasonable number of historical projects and current product information needs to be gathered. The time involved in these activities means that the release of the system is still several years away.

The means of cost classification is an important aspect of the database. It is hoped that there will be industry agreement on this shortly so that it can form the basis for the storage and retrieval of information. If no agreement is reached, a suitable classification system will have to be developed.

Finally, an organisation will need to be found or established to manage the cost database into the future. It is envisaged that this organisation will be responsible for the marketing of the cost information service as well as its maintenance and further development.

CONCLUSION

This paper has described a research project currently underway at the University of Technology, Sydney to investigate, design and implement a prototype system for the interactive exchange of cost information in the Australian building industry. If successful, the project will represent a significant improvement to the manner in which the industry operates and will further encourage the development of specialised systems that share data electronically between professional disciplines. The project already has the support of key industry groups who have made cost information available to the research team. The project is expected to be complete by 1995.

Escalation adjustment for historical projects is undertaken by use of a building price index which is based on a standard list of items, representative of normal building work, repriced each quarter. All escalation is automatically calculated, but users can modify the index to suit their particular requirements. A building cost index can similarly be found with the current product costs, and is based on the movement in a range of typical products and services. This index, however, is not used for escalation of product costs, which are gathered directly from suppliers and sub-contractors on a regular basis.

BENEFITS

The prototype framework supports interactive cost information exchange by enabling users to interrogate rates based on criteria they may nominate. Project-related information can be filtered so that the calculated average at any particular level of detail is "visible". Descriptive statistical and graphical representation are used to give insight into the reliability of the data.

The framework outlined in this paper has numerous benefits to the building industry in Australia. These include:

1. Cost information is collected, compiled and maintained by a central agency for a small annual fee, thereby overcoming duplicated effort and minimising the cost to individual firms.

2. Cost information is more comprehensive and diverse than would be possible when collected individually.

3. The competitive advantage of individual firms is protected while still enabling their information to be used by the industry.

4. The industry is further exposed to the benefits of information technology.

5. Time delays in compilation of data are minimised through on-line access.

6. Cost information can be linked to other applications, including estimating software and CAD.

REFERENCES

Atkin, B (1989), *A Study of Information Technology in the Australian Construction Industry* (unpublished report), Sydney: T.W. Crow Associates.

Atkin, B (1990), *Information Management of Construction Projects*, Sydney: T.W. Crow Associates.

University of Reading (1981), *Cost Planning and Computers*, London: Property Services Agency.