more easily prepared than unco-ordinated ones.

Estimates produced in Clywd through CARBS operations embrace, in fair detail, the superstructure of a building; they do not, however, at present measure and value non-standard substructures, drainage and site works and the estimated cost of these is achieved by relating them to ground floor area and by manual appraisal. Work aimed at obtaining greater accuracy in these aspects is currently under development.

Figure IV illustrates a sample of the estimating output which is obtained from the computer.

An additional important function of the system aimed at rapid appraisal of the design performance of a building is a facility which allows a user to obtain ratio calculations for any selection of quantity, cost or heat loss. Clywd data banks have been structured in such a way that they accumulate quantities, costs and losses of certain elements and sub-elements and thus ratios critical to design evaluation are obtainable on command. (e.g. wall/floor, window/wall, cost per metre, average "U" value for perimeter walls etc).

Conclusion

CARBS provides the basis of an adaptable estimating system that can be utilised by the full range of QS practices from the large integrated designs to the smaller QS firms. It will operate efficiently on a number of different computers and can be made available on a bureau basis for those who do not already have access to a machine.

The measuring facilities, without a doubt, provide a high degree of accuracy but, as with any computer system, the overall accuracy is dependent on the accuracy of the data which is in-put and although the graphic in-put can be checked through the provision by the computer of drawings, the costings produced depend for their accuracy upon the rates included in the data banks.

It is a system which utilises to a great extent the strategy of Data Co-ordination and introduces to the design team a logic which, through its success, provides a definite point of integration which is generally sadly lacking in the construction industry and allied professions.

Prices or Costs—

A conspectus on Terminology concerning the use of the words and the nature of data they describe in the Building Industry

By E. R. Skoyles, FRICS (Fellow)

The words "prices" and "costs" are frequently being confused, misused and regarded interchangeably in the construction industry. It is essential to clarify the nature of each word, its background and give definitions so that the data described can be clearly understood.

This paper discusses the background which has lead to the present confusion, the necessary data base of builders' prices and builders' production costs, and stresses the need for each word to be used more carefully to describe only one measure of resources.

Introduction

The words "price" and "cost" are frequently confused and misused in the construction industry. It is essential to clarify their definition in any discussion concerning resources to ensure the various facts and references are clearly expressed. Due to the nature of the data referred to by these words, it is necessary to give brief background facts about the data bases they describe.

The definitions of price and cost have been given as:[1] [2]

Price – The cost to the client

Cost – The cost of labour, plant and materials incurred by contracting and sub-contracting organisations.

In this paper to avoid confusion the term "price" is used to mean the investor's resources, but when a

published paper is referred to and it uses the word *cost* meaning the same thing, the word is italicised. But prices (as *cost* to client or investor) are completely unrelated to costs of production. A German has reported that "French prices bear no resemblance to performance",[3] but only one person in the UK, apart from the present author, appears to have strongly stressed this point.[4]

In his paper on Public Accountability Mr. T. Brett-Jones says: "One of the most important aspects of the future of our profession is in cost feedback from site and factory to the designer and client so that they may make their decisions with a proper knowledge of the resources involved. If I had to state a priority for quantity surveyors in future I would stress this need for a complete understanding and knowledge of cost data as distinct from price data."

One expatriate quantity surveyor abroad refers to *cost* analysis as the developer's cost, and contractor's price, but is one of the few people to do so.[5] He is also one of the few English authors to define labour costs. Two leading quantity surveyor authors contend *cost* is the investor's price.

James Nisbet; in Estimating and Cost Control, Batsford, 1961

Cost and Price

"Cost is the amount paid by a purchaser and Price is the amount received by the vendor. Consequently, a tender is at one and the same time both the cost incurred by the client and the price offered by the builder. Since the professions are acting for the client they are concerned with his 'costs' ".

Ferry; in Cost Planning of Buildings, Crosby Lockwood, 1964

"By cost of building we mean the amount which the client, the building owner, will have to pay the contractor to build it for him, we do not mean the actual cost to the contractor for building it."

Why define the terms "Prices and Costs" ?

The one word that it is believed causes more misunderstanding than any other in publications of building work, conversations etc., in the construction industry is the word "cost". It usually refers to investors' resources, but it equally and perhaps more rightly should apply to the producers' costs.

Terminology has been highlighted as being one of the initial main constraints preventing international communication.[6] One of the principal building problems is the control of resources. Yet with this pertinent issue, the definition and terminology concerning the two sectors of investors' and producers' resources is weakened by the failure of any party, (except perhaps the Institute of Quantity Surveyors, who introduced the term Design *Cost* Planning to avoid confusion with Contractors' costs), to take a lead in agreeing to make distinctions in describing them.

The upshot is that "cost" is used without any qualification throughout Europe to mean either what the investor has to pay for the project or what the producer incurs as his expenses. (See the two short bibliographies at the end of the paper). Moreover, in many cases the term is used interchangeably in the same paper or lecture etc. (At a major conference of Chartered Quantity Surveyors held in the mid 60s, the Chairman referred to "costs" on nine occasions. On four of these occasions it can be assumed he meant "contractors' costs", on the remaining five he meant "the *cost* incurred by the client". The point he was attempting to make was not appreciated by his audience). Prices and Costs need very careful appreciation. Hastily written or spoken words can convey the wrong meaning, particularly if the terms are not defined in presenting research work.

Accurate data can be obtained from studying actual costs, but this is very expensive by present methods. The author believes that the confusion existing in semantics is so widespread that both words are used indiscriminately and interchangeably. Misunderstanding the nature of the data is leading to much confusion. It could be preventing the necessary reorientation of data to production-biased thinking so necessary to reconcile the isolation of production from design.

History has played a part in the confusion which exists today between the use of the terms "prices" and "costs". References in the Bible and in Shakespeare to "*costs*", are dealing with the financial liability of the employer; books about the mediaeval period of building demonstrate that "costs" are the charges of the craftsman. Legal definitions are of little help either, since prices are usually referred to as "rates", whilst "costs" are generally charges which courts themselves collect.

Meaning of the Terms

What do the terms mean? Are they used correctly in differing circumstances? Which gives the most appropriate tool for working and control of resources data, based upon prices or derived from costs? To elucidate these points it is necessary to examine briefly the nature of the data each term represents and how it is constructed.

Both "prices" and "costs" are predictions involving many variables and uncertainties. "Prices" are based to some extent on estimated *costs*, with allowances for additional variables. "Estimated *Costs*", some people wrongly believe, are based upon actual costs from site feedback. The main drawback is that site information is in more general terms than the descriptions which have to be "priced" or "costed", hence no accurate feedback is available for estimating costs. The main point to recognise is that one man's price is another's cost. Once this is acknowledged, it can be seen that to refer to either in isolation is meaningless. Use of the words ought always to be qualified by reference to the party concerned, ie the builder's price and the client's cost in these circumstances are the same amount, whilst the builders' cost is most likely to be a different amount.

Thus, if "price" and "cost" are going to be used without qualification in practice, then "price" should be used to mean the contractor's price or the client's cost, and "cost" should mean the contractor's cost. The term becoming widely used, "Design *Cost* Planning" is thus really "Client's *Cost* Planning", or "Price Planning". This term distinguishes the type of data from the contractor's cost planning routine, which is associated with cash flow. Likewise the growing number of Quantity Surveyors whose 'brass plates" now describe their practices as "Construction Cost Consultants" are "Client's Construction *Cost* Specialists", for few Quantity Surveyors know anything about builders' con-

struction costs. In practice relatively few builders know these at all accurately themselves, due to the present system of tendering, inhibiting feedback at a practical and sensitive level. Moreover these data are highly variable.

Prices – their basis

Estimators use many variables and different principles on points of detail dictated by the circumstances adherent to each tender and trade. Ideally every price should reflect the typical factors which are influenced by the structure of production costs:

1. Labour and its costs including all statutory taxes etc (in practice due to the incompatibility of feedback, arbitrary norms have to be used).
2. Costs of materials, waste and cost of getting supplies not readily available.
3. Plant costs, including utilisation and allocation.
4. Overheads, ie contract management and plant, (generally called preliminaries) attendance, insurance etc.
5. Time of year work commences and date of bid related to current known increases in cost of labour and materials.
6. Geographical location of project.
7. Duration allowed for contract (if stipulated).
8. Basis of contract, ie negotiated or competitive.
9. Size of project and size of contractor relative to project.
10. Attitude of designer or client to quality.
11. Condition of National Economy with prevailing interest rates.
12. Work load of contractor who is bidding.

Prices vary considerably even when the same bids are compared, and it should be understood that "costs" in the context of synthesizing unit rates when production data are desirable but seldom available, means the estimated *costs* of each item in the bill of quantities, because they are the part of the rate related to performance in preference to the market conditions, are highly speculative. Whilst it is true to say that rates are based on estimated *costs,* the rates or prices in bills of quantities do not all have the same relationship to these *costs.* Even the most skilled quantity surveyor cannot identify with certainty the rates in a bill which have been adjusted for contractor's policy, ie allocation of overheads etc.

Prices, though based mainly on estimated *cost,* have considerably more variables, eg in terms of work load, market situation, than have estimated costs. At the same time, estimated *costs* have included in them at the moment a high proportion of "informed guesses" some of which, like the waste norms, can be proved wrong.

Estimated *costs* have three components:

(i) Estimated labour cost, which in the absence of satisfactory feedback, is based on "labour constants", usually found in books on the subject. These tend to be historical, and are, in effect, average outputs for bill items. Allowance has to be made for the "unmeasurable" elements, and for the variability of particular contracts. The "norm" is rarely defined but implied and experience is needed to clarify it.

(ii) Estimated plant costs which are calculated by taking "hire" rates, adding on estimated labour costs for the operator, together with fuel and similar items, making an allowance for "standing idle" time, maintenance time etc, and applying the result to an estimated output rate. Output rates are again to be found in books on the subject, and once more tend to be averages for an unstated "normal" contract.

(iii) Estimated material costs which are formed by obtaining a quotation from a merchant, often based upon the quantities given in the bills, and adding to this the estimated cost of unloading (estimated labour cost by estimated output) and a "norm" for waste. The waste norm is obtained from estimating books.

What the estimator is doing during pricing is in effect taking a "close look". Time allowed for tendering does not usually permit synthesis of every item in the bills, and standard prices applicable to each firm for various units under given conditions are often used. These rates are then adjusted using "experience", for many of the items. Rates which have a significant value in a tender, eg for large quantities or high value are usually "built up". Contract conditions greatly influence the estimator by their effect on his risks and these are considered when "experience" is used. The profit and overheads calculation is often not carried out until all the trade sections of the bills of quantities have been priced. Thus, the theoretical assumption that each rate has had profit and overheads added at the time of synthesis to make the estimated *cost* is frequently wrong.

Little feedback of value can at present be obtained by estimators, and discrepancies between estimated and actual costs are likely to be large.

It could be strongly argued that if variations could be dispensed with, the paramount need for unit rates to "sort out" the technical finances in the post-contract period would disappear. Although a rough idea of the value of the tender can be obtained on a square metre price basis, the scope and difficulties of a job can be better indicated under the present method by a close look at the individual items making it up. Hence, it is concluded that although prices have a value in establishing trends of the market (given sufficient qualification to cover the many imponderables), studies at any finer level of detail require information about actual costs. This applies particularly to comparative cost studies. At the same time it must be pointed out that even when carrying out research into market trends, prices are not the sole criterion.[7] One should also be taking into account such factors as the contract conditions, or even relative quantities of materials.

Production costs – their basis

Costs to the producer, in the main, have three components, each independent of the others.

(a) The cost of labour.
(b) The cost of plant.
(c) The cost of materials.

The labour cost is an amalgam of the hourly rate of the operative; additional amounts (often considerably above the applicable trade union rate) as an inducement to get a man on a particular contract against competitors in the locality; bonus, National Insurance, Graduated Pensions, Holidays with Pay, guaranteed time, overtime and any other payments which may be due by legislation and agreements. This must be adjusted by an assessment of

the time the site operative spends actually working – ie by deduction of time spent in tea breaks, meal breaks and other non-productive activities. The resulting rate is the cost of an hour's working time, and must be applied to his production during the period.

Studies in the field of labour have highlighted the great variability between outputs of men even under similar conditions, and the importance of interruption on the units of production. Moreover the amount of other non productive time (which has to be costed) can be significant.

This research work is not considered by estimators at present. The time employed on site is recorded at the end of each day by the operatives' foreman, chargehand or ganger, usually related to the various pieces of work. Theoretically, these should be true records. In actuality, since not all work is bonused, and since some targets are more advantageous than others, the records are sometimes loaded to maximise the bonus advantage. The plant costs will differ from the estimate mainly in the terms of the actual standing time and output.

Material costs can differ from the estimated costs in three ways. First, although the original quotation is based upon the quantities in the bills, the quantities supplied may well be in smaller lots purchased at a higher price. This is due to the practice of amalgamating items of similar description, as one item in the bill of quantities, without reference to their relative time of use. Second, the amount of waste of material varies considerably.[8 9 10] Third, the purchase price can rise due to increases in the market price or tax rate and discounts vary considerably for the same product between different firms.

Conclusions:

The terms "prices" and "costs" are used inter-changeably, usually without any qualification. Both terms can mean several things unless they are clearly defined. This is an area of terminology that quantity surveyors and all working in building economics should attempt to give more attention.

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REFERENCES

1. International Survey of Research into Building Economics and Quantity Surveying 1972 – Institute of Quantity Surveyors – London, 1973.
2. Suspended Concrete Floors and Flat Roofs – Economics of Suspended Slabs – E. R. Skoyles. September 1975 – Proceedings of the West Midlands Branch. *The Concrete Society Symposium 1975.*
3. Herr Mayer, Colloquium held in Paris on Optimum Economics and Devolution of Public Tendering for Works. Bouwirtschaft 1969 *23* (49) 4 December 1230–2.
4. A. T. Brett-Jones (as Chairman of the Quantity Surveyors Committee). Public accountability and the Quantity Surveyor. *The Chartered Surveyor*, Vol. 102 (No. 9) March, 1970.
5. A. C. Barratt. A Swedish Cost Plan Method. *The Building Economist.* August, 1970, p. 53.
6. CIB Report No. 29 (International Comparison of Building Prices and Costs).
7. Mr. Kaselicky (Czechoslovakia). Paper No. 4. Presented at CIB Working Commission W 44 – Report on agreed terminology.
8. E. R. Skoyles and H. J. Hussey, Wastage of Building Materials on Site. *Building*, 22nd February, 1974.
9. E. R. Skoyles. Materials Wastage – a misuse of resources – B.R.E. Current Paper 67/76.
10. E. R. Skoyles. The Avoidance of Waste – a paper at the IOB Seminar on Materials Handling, 24th September 1976.

SHORT BIBLIOGRAPHY TO THE USE OF THE TERM "COSTS" MEANING "PRODUCTION COSTS":

1. Contribution to the problem of studying building costs. O Rode Organisation et statistiques du batiment (OSB), 1950, *3*, (2), (Nov) 48–51 (FRANCE)
2. LC 1071. Variation of Building Costs as a Function of the Design Parameters and Assessment of Housing Standards. (From "Cahiers du Centre Scientifique et technique du batiment", No. 39, 1959, Cahier 311). By Ch. Noel, Ingineur en Chef, Chef de Service au CSTB, CIB Working Commission W44, Paper No. 4. (FRANCE)
3. Cost Control in the Construction Industry. J. Cobourne Newes – Butterworths 1973. (UK)
4. A Work Study in Bricklaying. HMSO. (UK)
5. New Forms of Documentation for Tendering. E. R. Skoyles. Building Technology and Management, May 1969. (UK)
6. Einfuhrung zur Anwendung des Baukostenplanes fur die Kostenuberwachung van Hochnauten (Introduction to the use of the Building Costs Plan in the Control of Costs in Buildings). K. Brunner. (Forschungs – Kommission Wohaungsbau – Zurich 1969 (MOPBW LT 441). (SWITZERLAND)

SHORT BIBLIOGRAPHY TO THE USE OF THE TERM "COSTS" TO MEAN "INVESTORS' COSTS", ie PRICES

1. Cost Planning, W. H. George. The Building Economist, December, 1973 148 et seq. Refers to "*Costs*" meaning "prices" and "costs" meaning "cost of labour" without any qualification. (AUSTRALIA)
2. Stahlbetan – Masswdecken, Vergleich der Her Stellungkosten im Wohnungsbau (1973) – Verlagsgesellschaft. Rudolf Muller. (GERMANY)
3. MOPBW LT 439. Also refers to "costs", meaning "production costs". (SWITZERLAND)
4. MOPBW LT 441. (SWITZERLAND)
5. MOPBW LT 279. (SWEDEN)
6. MOPBW LT 402. (FRANCE)
7. Housing costs in Europe Compared. M. C. Fleming. 12th October 1973. (UK)
8. Cost Control in Building Design. Cost Study, Building Bulletin 4, HMSO. (UK)
9. Specifications and Costs. Seely. (USA)
10. CIB Report 22 – "Cost Controllers". (Meaning "price controllers"). (CIB International)
11. Building Economics. I. H. Seeley. (Uses "cost" to mean "*cost* to the investor" but also without definition refers to "cost plus", to get cost – (uses term in sentences *actual cost,* p. 12 in both cases). (UK)
12. Cost is not defined in the Building Cost Information Service of the Royal Institution of Chartered Surveyors, it being implied it is design cost. (UK)
13. Cy Rackeur, Contractors Norms. Institute of Building Economics and Organisation. Costs for Prices. (HUNGARY)
14. The Planning and Management of Contracts for Building and Civil Engineering Work – HMSO 1964, (The Banwell Report). ("*Cost*" means "price" on p. 8, "labour costs" on p. 27). (UK)
15. Multi Storey flats, design building methods and costs. HMSO. Special Report 34. (UK)
16. R and D Bulletin. The Building Process. A case study from Marks and Spencer Ltd. HMSO 1970. (UK)
17. Building Cost Plan for Buildings. March 1969. Swiss Centre for Building Rationalisation. (SWITZERLAND)
18. Regression Technique for the Increased Knowledge of Costs. P. Janson (Bygginastaren 1970). Department of the Environment. LT 468. (SWEDEN)
19. Rapport of Norwegian BRS No. 0.3045 Pt. 1. 0.3659 Pt. 2. Analysis of building costs: models and principles of investigations and analysis. (NORWAY)
20. ABS Cost Performance Study, US Department of Health Education and Welfare. A typical study uses costs without definition too. (Construction costs mean prices). (USA)
21. Returns of School Building Costs. Janson P., Stockholm 1969. (SWEDEN)
22. Comparison of Construction Costs in Latin American Countries. M. R. Alberga – Department of Housing and Urban DevelopmentWashington DC ("*costs*" and "costs" both used without definition in same statements). (USA)