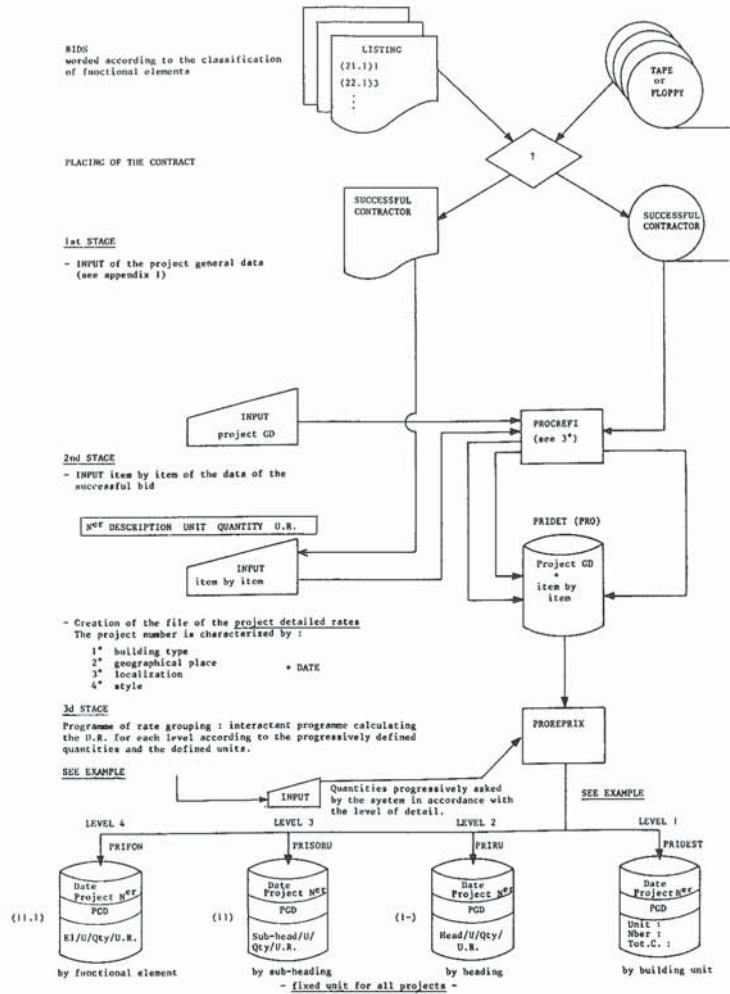## SUCCESSION OF THE FILE CREATION STAGES

Figure 1

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

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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.

La Structuration Des Donnees Du Batiment Pour Des Logiciels
D'Application A L'Usage Dans Une Interface Standard

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KEYWORDS

Information, Donnees, Interface logicielle.

ABSTRACT

Jusqu'a present, la normalisation du format a adopter dans la
presentation et le traitement electronique des donnees dans le domaine
du Batiment s'est peu developpee en Grande-Bretagne et en Europe.

Dans cette etude nous proposons une methode de structuration des
donnees echangees entre certains utilisateurs selectionnes dans le
Batiment. Une telle methode mettrait a la disposition de chacun des
utilisateurs les donnees dont il a besoin sous une forme qui lui est
immediatement comprehensible et acceptable. Cette structure de
donnees permettrait un traintement de l'information par ordinateur.

Nous presentons une etude des besoins d'information de certains
groupes fonctionnels dans leur contexte informationnelle. Nous
decrivons les caracteristiques et les complexites ainsi mises en
evidence et nous analysons les structures qui ont evolue pour
faciliter un echange de donnees.

Nous examinons en detail une voie de communication particuliere, par
rapport aux donnees requises. Nous passons en revue les methodes de
travail des groupes fonctionnels qui utilisent cette voie, ainsi que
les structures de donnees formalisees dont ils demandent l'acces.

Pour conclure, nous proposons une structure de donnees reduite au
strict minimum, qui peut etre etendue pour inclure les principales
donnees requises par chacun des groupes fonctionnels compris dans
l'etude.

Introduction

Within the U.K. building industry, procedures are almost exclusively
based upon either complete separatation or complete integration of the
design and construction processes. In support of these processes a
large number of professions and trades must come together.

Over recent decades a specialist industry with scientific and
rationalised methods has evolved. However, although the character of
the industry has changed there has been no significant alterations in
the design and construction processes, with respect to working
methods, the functional role of each participant in a project and
the terminology used. The change has been in the greater
responsibility and performance standards attached to the roles, in
response to an increasingly complex information environment[1].

The growing complexity of projects has generated a need for increasing
volumes of information to be produced, both general information
applicable to the majority of projects and specific information
applicable only to the 'one off' project, (see Figure 1). The design
and construction of buildings requires the continuous collection,
updating and exchange of information by, and between, the various
participants in the building project. The processing and communication
of this information is central to the industry for creating a
comprehensive and descriptive information model of the building
project.

The specialisations which have evolved in the industry have resulted
in a fragmented and distributed industry, lacking in consistency of
standards, as well as data co-ordination, within its processes.

The Industry's Response

For many years there have been numerous attempts at proposing
solutions to the problems that result from inadequate information
transfer. These essentialy adopted a manual view of the problem. The
introduction and application of computers and in particular database
techniques to the building industry was seen as a possible way of
integrating the diverse methods of transferring data between
participants into one co-ordinated system for use by all. In effect,
complex data relationships could be handled by the computer giving
immediate access to the data in several forms. However, this requires
the use of precise and strict rules for data classification, storage
and retrieval. Though much useful work was done by the Working Party
on Coding and Data Co-ordination[2], the development of a single
classification system, acceptable to all data users in the industry
for all their separate purposes, proved to be an insurmountable
problem which inhibited acceptance and use of computers throughout the

DATA CAPTURE ENVIRONMENT OF THE DESIGN & CONSTRUCTION PROCEDURES

INTERNATIONAL STANDARDS
BRITISH STANDARDS
CODES OF PRACTICE
BUILDING REGULATIONS
TECHNICAL PUBLICATIONS
TRADE ASSOCIATION
PUBLICATIONS
RESEARCH ORGANISATIONS
REPORTS & PAPERS
SUPPLIERS INFORMATION
METHODS OF MEASUREMENT
PHRASEOLOGIES
MARKETING LITERATURE
BUILDING SPECIFICATIONS
COST INFORMATION
PRICE DATA
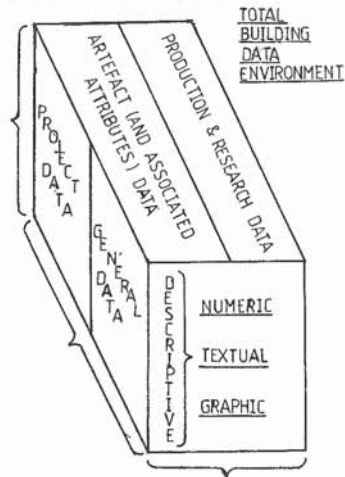
CLASSIFIED & CODED USING A VARIETY OF
TECHNIQUES SUCH AS U.D.C, CIS S.M.M. etc.
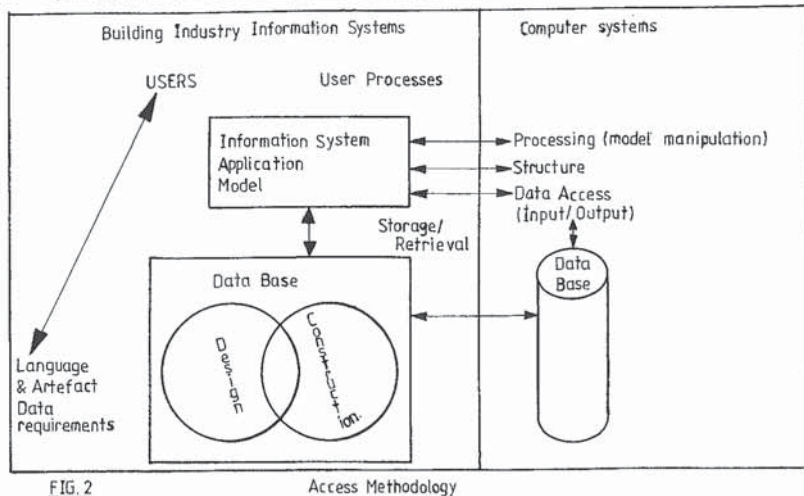
FIG.1

BUILDING INDUSTRY : DESIGN AND CONSTRUCTION

FIG. 2   Access Methodology

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industry. The reason was not the lack of any one set of classification standards but the existence of many classification systems and coding systems in various states of development.

Research Method

As a consequence of the extensive development of computing technology and database techniques during the decade of the seventies, the research team considered that it was opportune to address the problem once again.

It was agreed by the research team that an attempt should be made to specify a standard for the description and structuring of information exchanged between participants and computers in the building industry, such that a database linked to a standard user interface could ultimately be developed, (see Figure 2).

This approach was consistent with the recommendations of a previous European Economic Community funded project completed in 1977[3]. The European proposal inferred that the solution to the adoption of computer technology lay in a language, for use on computers, orientated to the building industry. The reseach identified here adopted the broader definition of "language development" as given in the recommendations to mean communication aid development between computers and computer users. The link suggested is in the form of a software interface between the building participants natural methodology and the more specialised syntax of the semi-formal languages used when accessing computers. The research emphasises the importance of the exchange of building data at communication interfaces within the industry and the possibility of obviating any communications problems through the use of computer technology.

In recognition of the scale of the problem in proposing such a data structure the research concentrates upon a specific information flow, i.e. from the stage where the design proposals for the building project are interpreted as artefacts, by the quantity surveyor, through to the use of this information in production resource analysis. This line of communication is fundamental to the whole construction process. The main criticisms from the industry concerning this information flow are centred upon the lack of that essential data which is required for the various procedures used by the contractor in his planning, estimating and purchasing systems, the successful performance of which would enable greater efficiency to be achieved in the cost, planning and tendering stages.

The development of a method for structuring data so that it may be transferred between users must take these criticisms into account and must not restrict itself to simply accepting and confirming the inadequacies of current practice.

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This research develops a structure which attempts to reflect the data requirements of the procedures within the above data flow and to specify standards for that structure so that it may subsequently be adopted for use by computers. This structure when implemented on a computer will enable the computer, via the interface to handle the storage and retrieval of the data needed by each user their functional tasks.

Structural Base Upon Which The Technology Will Rest

It is suggested that in order to make the computer more acceptable within this area, methods of data storage, retrieval and exchange must be developed from existing information systems that interrelate and support the existing procedural routines. These systems, many of which were analysed in this research, independently deal with numerous aspects of the building project from various viewpoints. Together they are capable of satisfying the data requirements of many procedures from design through to construction. The limitations of these systems must also be investigated in order that the structure developed is responsive to the processes it feeds and does not dictate or constrain them.

A comprehensive information structure is dependent upon two concepts. The first, is defining the data base of artefacts, encountered in the information flow from design through to construction. The second is defining the method of accessing that data to meet the needs of all the users. In this research each sector of the industry and its related procedures is considered as being associated with a data domain. These data domains should have two properties. Firstly, they should contain all the data used by the functional groups within that sector. Secondly, they should have a structure built into the data to allow that data to be accessed as required to meet the users requirements. Within these larger domains there are sub-domains for functions such as estimating, planning and construction. As a consequence of the complexity of the data flow, the domains investigated in this research have been restricted and do not include the consultant engineers or specialist sub-contractors to any great depth.

Analysis of the classification systems used in the building industry enabled the common facets and attributes relevant to the chosen information channel to be identified. Also, investigation and consideration of the operations carried out by each of the functional groups allowed a basic structure which would accomodate their functional requirements to be postulated.

OVERALL MODEL : FACET AND ATTRIBUTE VIEW

FIG.3   LEVELS OF INCREASING FACET DETAIL & DEFINITION
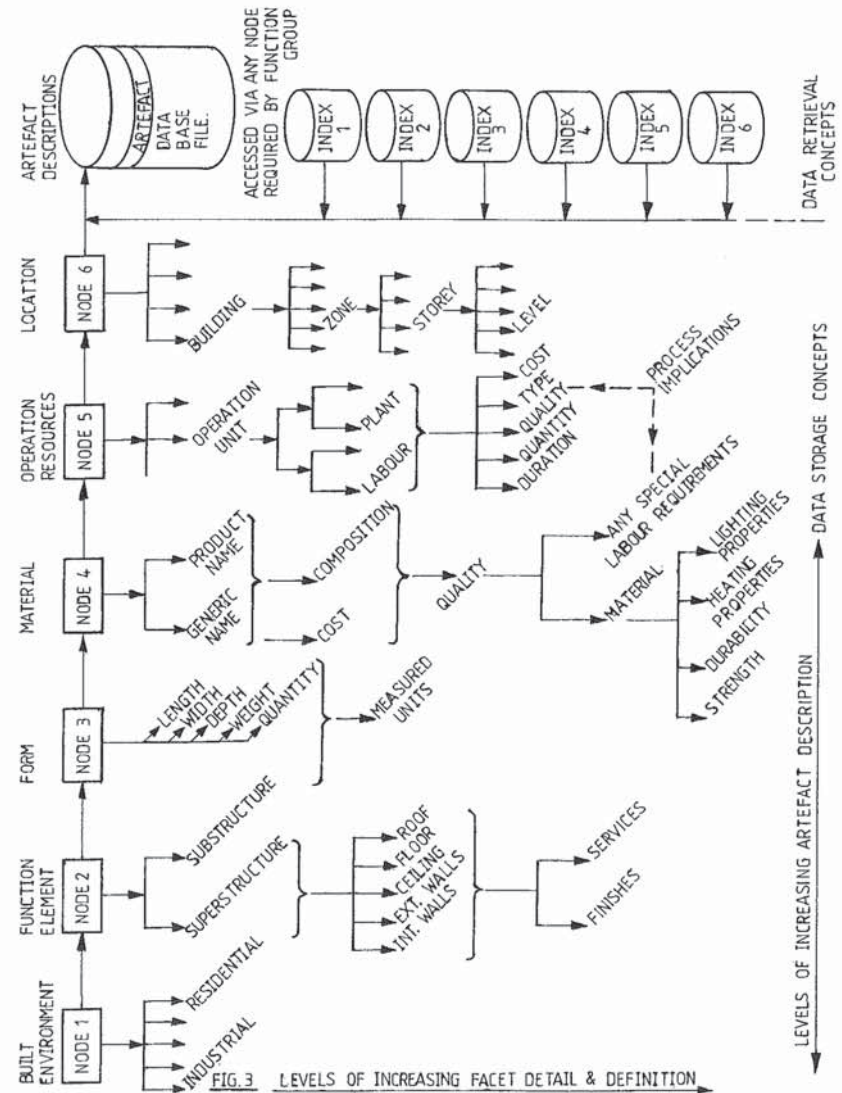
This work was done using the framework suggested by Ranganathan of, Personality, Matter, Energy, Space and Time. At the conceptual level this led to the following facets;

1. DESCRIPTION, 2. MATERIAL and PRODUCTS, 3. PRODUCTION RESOURCES, 4. LOCATIONS, 5. TIME RESOURCES.

Each facet is hierarchical in structure and consists of lists or tables of attributes giving greater detail as the hierarchical structure is followed.

In order to allow each group to access the data in such a way as to enable them to perform their functional tasks it is necessary to be able to extract information from several facets. The database would be structured to enable this to be done.

Of the many information sytems investigated it was found that CI/SfB was most closely allied to the principles of Ranganathan. To this end the CI/SfB system was modified as shown in Figure 3, a six facet structure being synthesised from the existing five facet structure.

It is hypothesised that the structure shown could form the basis of a database design and hence the development of a user friendly interface which would promote the exchange of information among the various functional groups in the design and construction processes.

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The Computer-aided Facility Management (CAD/FM) Program in the Government of Canada

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ABSTRACT

As a result of requests by a number of government departments for computer systems to address the facilities management process in buildings, in 1983 Public Works Canada (PWC) reviewed requirements, available systems, and potential benefits for a coordinated acquisition program.

The conclusion of the review was that no existing systems could address satisfactorily the wide range of needs, but that significant long term benefits could be obtained through the use of such systems, and that the basic capabilities for development existed in a number of Canadian firms.

Public Works Canada issued a request for proposal, which described features sought along with a proposed field trial approach, to some one hundred and twenty respondents to a letter of interest. The request suggested that the final product should be in a mid-price range and that field trials should take place in four government departments, starting with a basic drawing capability and evolving over the period of development to the final product. PWC reviewed sixteen proposals and conducted an extensive benchmark test for drawing production, manipulation, and storage on the final proposed start-up systems.

Public Works Canada selected two firms to produce products addressing computer-aided design for facility management (CAD/FM) through field trials with six departments. In all some thirty workstations are now in place and work is proceeding in a number of areas, starting with development of database structures and means of transferring files between the two selected products as well as to and from other systems.