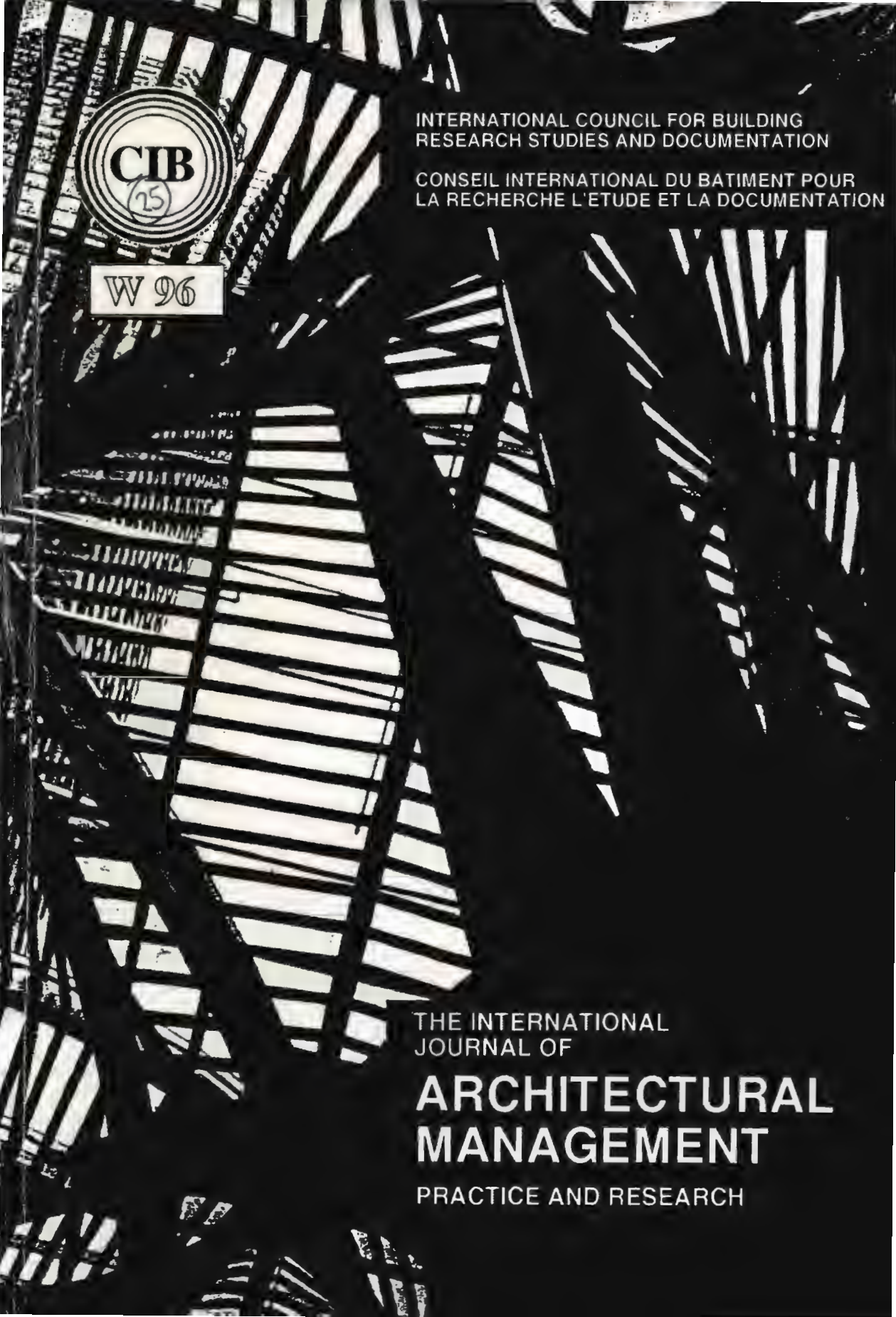
Architectural management : practice and research : proceedings of the CIB W96 architectural management workshop, held from 15-16 april 1993 at the Eindhoven University of Technology



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THE INTERNATIONAL
JOURNAL OF

ARCHITECTURAL MANAGEMENT

PRACTICE AND RESEARCH

ARCHITECTURAL MANAGEMENT PRACTICE AND RESEARCH

PROCEEDINGS OF THE CIB W96 ARCHITECTURAL MANAGEMENT WORKSHOP

HELD FROM 15-16 APRIL 1993 AT THE EINDHOVEN UNIVERSITY OF TECHNOLOGY

Nicholson, Paul; Prins, Matthijs editors

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Forward

This edition of "Architectural Management, Practice & Research" is the Proceedings of CIB, W96 "Architectural Management" workshop which was held at the University of Technology, Eindhoven, the Netherlands on 15 -16 April 1993. Our hosts were the Faculty of Architecture, Building and Planning under the direction of Prof. dr. ir. M. F. Th. Bax, Dr. ir. M. Prins and their collegues.

The workshop was well attended by members from the Netherlands, England, Scotland, Belgium, Italy and India. Most of the attendees offered papers which form the content of this edition of AMPR. The subjects of the papers gave an indication of current research in Architectural Management, and complemented the previously published in this area.

As CIB, W96 and AMPR will provide the central source material for research in architectural management & practice, an index of keywords is being compiled and published at regular intervals. Copies of AMPR are being lodged at the libraries of the University of Nottingham and the University of Eindhoven and will be available to international researchers through interlibrary loans.

M. P. Nicholson & M. Prins

Introduction

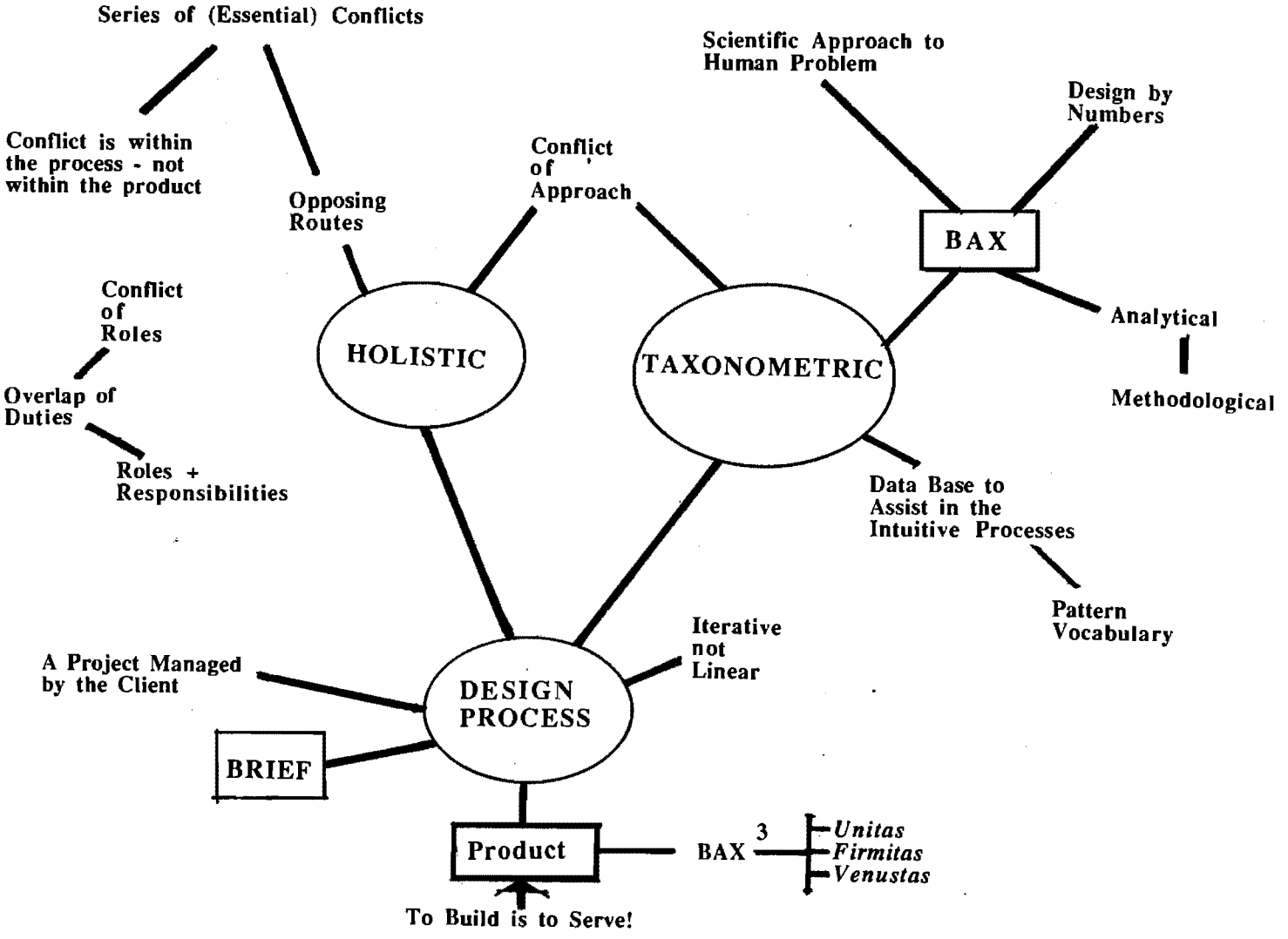
It became clear as the W96 Eindhoven workshop developed that without any form of stricture or control, the central topic of discussion was of design method in architecture. The papers indicate two indentificable approaches to the design process, one which is holistic and intuitive, the other is taxonometric and routine. The holistic approach was very much a British convention whilst the scientific approach was fundamental to the Dutch or Continental system: Both representing two approaches to design teaching in differing schools of architecture. The process of design will no doubt be the subject of much future research and discussion.

Another feature of the discussion was the almost paranoiac worry "who does what" question by the British members, whilst this was of little import to other collegues who in their turn were fascinated by the process or methodology. Roles and responsibilities of the architect were exchanged for an analyitical scientific approach to the design process. Again there will be fruitful debate in developing both of these approaches independently whilst studying areas where they overlap and each can be enhanced by the other.

Conflict is a word which appears in a number of guizes. The conflict of approach to the design method may be sharpened by what one author refers to as essential conflict within the design process. Most arguing that the conflict of ideas, of physical incompatabilities, of interests, will be the generators of the best architectural solutions to human problems.

Finally an air of calm & centrality was introduced by a remeinder of the three pillars of architectural wisdom : *utilitas, firmitas & venustas.*

Contents


Series of (Essential) Conflicts
Conflict is within the process - not within the product
Opposing Routes
Conflict of Approach
Scientific Approach to Human Problem
Design by Numbers
BAX
Analytical
Methodological
Conflict of Roles
Overlap of Duties
Roles + Responsibilities
HOLISTIC
TAXONOMETRIC
Data Base to Assist in the Intuitive Processes
Pattern Vocabulary
A Project Managed by the Client
Iterative not Linear
DESIGN PROCESS
BRIEF
Product
BAX 3
Unitas
Firmitas
Venustas
To Build is to Serve!

ARCHITECTURE AT THE CROSSROADS

The Need for a New World Map

Dr George M Cairns
Department of Architecture and Building Science, University of Strathclyde, Glasgow, UK

This paper outlines 2 key theories in support of the need for improved communication and mutual understanding between parties to the design implementation process.

It introduces the notion that conflict of cultures and ideologies between members of the team is not, in itself, a precursor of conflict in working relationships and that it is, in fact, a possible source of strength and inspiration to the production of design excellence.

In accepting that diversity of ideas may be advantageous to the design process, the paper supports the notion that diversity of approaches may be similarly advantageous.

The conclusion of this paper is that conflict is itself an attribute which should be nurtured within, not eliminated from the design process and that the sharing of mutual goals should not be confused with an invalid desire for shared ideologies and methodologies.

The acceptance of paradoxical synthesis is the key to successful design implementation . Improved communication , mutual respect and understanding are the tools for its resolution.

Keywords: Hegelian dialectic, paradox, conflict, synthesis, communication, trust

Tunnel vision is always the degenerative disease of specialists and the price they pay for 'professionalism' and for their narrow focus.
Peter Drucker[1]

Introduction

Within his intellectual framework occidental man (woman) is accustomed to the mind-set which programmes his thinking towards the elimination of conflict being a primary step in the resolution of any problem. Our culture primes us to recognise right or wrong, black or white as being acceptable outcomes. We are not, however, programmed to accept, comfortably, the concept of right and wrong, black and white being acceptable and complimentary outcomes to a situation.

The principle of convergent problem solving is understood to us; the elimination of conflict in pursuit of a definitive goal; whereas the notion of divergent problem solving; the resolution of paradoxical synthesis in search of one goal from many; is an anomaly which we find disturbing and irrational.[2]

Analysis of the key concepts which the architectural profession presents as its unique contributions to the development of the built environment shows that they are, to a large extent, founded upon paradox; architecture as art and science, as analytical and intuitive and as forward thinking yet founded in history.

Perhaps the failure of the architectural profession, as currently perceived by it and the society it serves, may be seen to lie in the failure to accept that such paradoxes are its strengths, to be broadcast aloud, rather than its weaknesses, to be eliminated by analysis and contemplation.

Similarly, the conflict of opinion which must arise between such a schizophrenic profession and its client base may be seen, not as yet another conflict to be resolved, but as a conflict to be embraced and nurtured to the benefit of both parties.

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The Hegelian dialectic

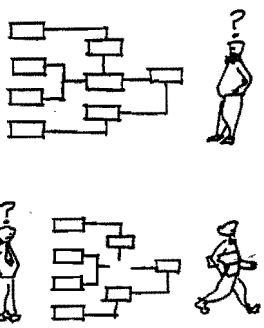
The nineteenth-century German philosopher Georg Wilhelm Friedrich Hegel proposed a theory[3] that acceptance of the 'correctness' of opposing arguments in any dialectic need not result in a self-cancelling and, therefore, ineffectual conclusion to the discussion.

He cites the possibility that the summation of a viewpoint, the thesis, and its counter-argument, the antithesis, may result, not in stalemate and inertia, but in a synthesis of ideas into a new theorem which is equal to, or greater than the sum of the parts.

Acceptance of the validity of the Hegelian dialectic enables us to consider that conflicts in ideology and methodology between parties to any discussion should be seen as positive advantages which, if accepted and carefully nurtured by all, might result in a resolution of the problem in the most beneficial manner through consideration of the widest range of options.

The case for conflict

The resolution of the Hegelian dialectic and of paradoxical synthesis is dependent upon recognition of the simultaneous validity of diametrically opposed views. Recognition of the existence of the paradox is obviously a pre-requisite of recognition of its validity.



The physical environment which man constructs may, itself, be seen as a paradoxical entity; its creation the result of man's thought processes; its existence the stimulus of these processes. The multi-faceted, multi-layered nature of man's interactions with his constructions cannot be represented solely by rational models of sequential thought and action; of specific input stimulating predictable output.

To reduce the design process to a series of boxed and labelled activities is to deny the legitimacy of man's passion and irrationality as inputs to the process. To accept their relevance to the process is to open the door to conflict.

Conflict between participants in any process is an inevitable consequence of the recognition of the validity of intuitive thought.

The need for synthesis

Once it is accepted that conflict of ideology and methodology are inevitable and, indeed, desirable consequences of the consideration of all available inputs to a process, the major need, thereafter, becomes not the elimination of the conflict but its resolution. In this model the key aim of resolving the paradox is viewed not as an attempt to achieve equilibrium in a static mode, but as an effort to achieve controlled disequilibrium in a dynamic mode.[4]

In consideration of any proposition, study is undertaken of the opposing proposition; neither is entirely eliminated from the discussion and both may make contributions to the solution.

The use of such dynamic modelling for study of thesis and antithesis throughout the design process can be seen to be much more likely to result in an end product which will suit the interactive and dynamic processes of users of the environment than one in which

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every question has a definite 'yes' or 'no' answer. No question will ever be answered by a definitive statement and no answer will go unquestioned. Consideration of options within the questioning at design stage will lead to greater flexibility for use in the occupied environment.

What must be seen, however, is that the synthesis of paradoxical ideas does not lead to the answer 'maybe' to any question, it leads to the answer 'yes and no'; both being true simultaneously.

Resolution of conflict in a synthesis of ideologies can only be achieved through negotiation and understanding. These must be founded upon mutual respect and directed through effective channels of communication.

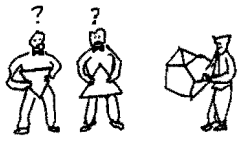
Lack of respect will, undoubtedly, lead to the dominant character within the intercourse forcing the ideas of others into subservience to his own pre-conceptions and lack of effective communication will lead to misunderstanding and misinterpretation of ideas.

Models of communication

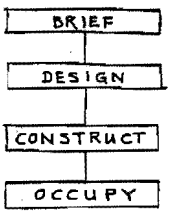
Man has known for many centuries that the world in which we live is not flat, is not 2-dimensional, and yet we persist, by and large, in our thinking and in our conception of models for application to our processes, in seeing the relevant 'world' as being a 2-dimensional space. We then develop 2-dimensional maps for navigation around this 'world' and we invent 'states' with 'borders' within which to restrain our thinking and our actions.

In the direction of our thought processes within this paradigm we construct 'road maps', akin to the route planners which we utilise on our holiday travels, showing the starting point and intended end point of our journey, along with major landmarks along the way. On the journey we may, as we would on holiday, wander off the indicated route, but only within 'safe' limits; not daring to risk late arrival or non-arrival at our final destination.

Such 2-dimensional travel through the thought processes of our intellect will immediately place restrictions upon the manner in which we determine our ability to work with others in pursuit of shared goals. If the journey of thought which we are taking is across a 2-dimensional mental map towards a pre-determined destination then, although we may believe that we are investigating alternative solutions to a problem and, within a team, offering options for appraisal, options are likely to be mere variations on a theme.



The choice of routes offered to the individual within the team expedition can only be permitted to meander a short distance from the pre-determined optimal route for the journey, or else he will be seen by his fellow travellers, at best, as wasting time and energy or, at worst, as being totally lost.



For all their (perceived) training in a discipline which sees itself as being an holistic synthesis of analytical and intuitive thought, of science and art, of forward thinking informed by historical precedent, architects are, when it comes to design process, confirmed within this paradigm as being guilty of tunnel vision which mitigates against full understanding of user organisational and behavioural needs and the means of their fulfilment within a built environment.

ARCHITECTURE AT THE CROSSROADS

The Need for a New World Map

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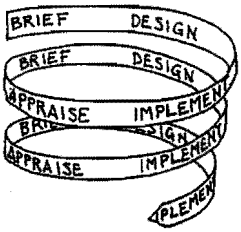
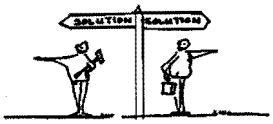
The design process is perceived as a linear development from inception to completion, starting with the client's brief and ending with a building for occupation.

To the user client, however, the briefing process is the end of a current state of space occupancy and the completion of the building process the commencement of a new state. This new state may, itself, lead to a future brief for the next state of occupancy by the user and should, at least, provide input to the designer's book of reference for his next project.

The design process can be seen, then, to be better represented by a spiral model; a 3-dimensional model in which the third axis represents time. This is a model which, in 2-dimensional view, revisits its previous points of reference on its 3-dimensional journey.

This model is in itself, however, only representative of the most general over-view of the summation of processes which result in the construction of the built environment.



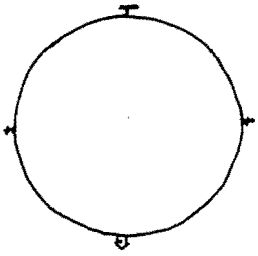


3-dimensional mapping

The use of 3-dimensional mental mapping will, as with physical cartography, open up new concepts of travel through the intellectual thought process.

Imagine 2 travellers standing at the north pole, sharing the common desire to travel to the south pole. They may set off upon their journey in diametrically opposed directions and yet, after an agreed lapse of time, may meet up with one another at their mutually agreed destination.

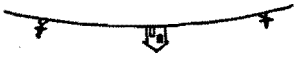
Each may have travelled in a 'straight' line to his destination or may have wandered off in another direction at some point on the journey. Even diversion at right angles to the original direction will eventually bring the adventurous traveller back to his point of digression and he may, on his travels, have met up with his fellow adventurer and have shared experiences of mutual interest, to mutual benefit.



On completion of their adventure the travellers may, subject to continuing mutual respect and trust, engage in intellectual intercourse by which each will benefit from the acquired knowledge of the other.

Until recent decades the limitation of such a journey of 2 independent, yet dependant spirits would be seen to be their inability to communicate during the journey. Each would have to have relied upon trust that his companion was keeping to the agreed programme and was still heading toward the agreed destination.

Modern technology will, however, enable the travellers to remain in constant communication with each other; to share information, experiences and advice and, even, to agree to a radical change in the direction, time span or, even, to the ultimate destination of their travels.



Similarly with intellectual pursuits, advanced thinking should stimulate development of a new paradigm for the design process. New models must be developed within a 3-dimensional mental map in which travellers share a goal which may, by mutual consent, be static or dynamic and in which they may follow diverse routes on the same journey. On their travels they may share different experiences simultaneously at separate times, together whilst apart.

Whether such a map of the totality of a 3-dimensional process can be successfully constructed or, if it can be, could be usefully applied in

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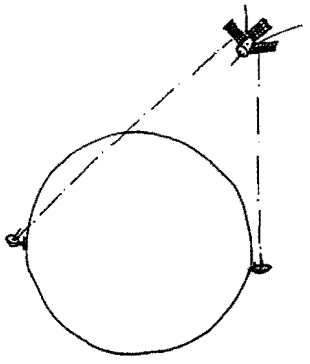
all circumstances is open to question. Certain factors relevant to the successful completion of the journey, whether across charted or uncharted territory, are, however, apparent.

The keys to successful navigation through such a 3-dimensional map are mutual trust and effective communication. The journey will not, however, be hindered by a difference of opinion over the route or mode of travel, provided that the shared goal and timescale for arrival are seen to be predominant.

The way.....forward?



Within the new paradigm of a 3-dimensional map it is seen that the way forward may be the way backward and may be both simultaneously.

Navigation across the map may, at first, be considered haphazard and likely to expose the traveller to unknown dangers. It should be borne in mind, however, that we live in an age of satellite communications and computer-controlled astral navigation. At no point in time is there any need for the traveller to become lost, relative to known points of reference, or to loose contact with his fellow travellers in search of the shared goal.

It should, by now, be recognised that the successful completion of the expedition into the design process may, if set within a 3-dimensional mental map, be dependant upon a few predetermined fixes, a well considered strategy for determining the goal and, primarily, the establishment of mutual trust and effective communications from the outset. The latter factors, in particular the trust, must be maintained at all costs throughout and beyond the journey in order that it may be successfully completed and that the maximum benefit may be gained from it and shared by all.

The primary fix at the outset is not the goal itself, either in terms of product or timescale, but the agreement as to whether the goal is to be static or dynamic, or whether it is to be dynamic at the outset and become static at a pre-determined point in time.

Similarly, in terms of route through the process, what is required at the outset is not the route-planner, as discussed earlier, which states destinations, the order in which they will be visited and defines the route to be taken. All that may be required as a fix prior to departure is an agreed list of destinations which must be visited and, if applicable, agreement to the dates on or by which this must be done.

Even within this loose framework destinations can, of course, be added or removed from the itinerary at any point in time, provided every member of the expedition is notified of the change.

Again, trust and communication must prevail.

Conclusions

'effective strategies do not result from specific analyses but from a particular state of mind.....a thought process which is basically creative and intuitive rather than rational'

Keniche Ohmae[5]

The writer has previously argued that the great failure of architects is to view 'product' as being more important than 'process'.[6] The

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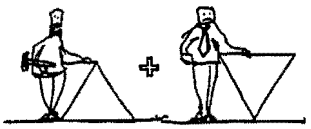
development of this paper has, however, led to a change of this opinion, in acceptance of the notion that 'product' may be considered, not only, to be predominant over 'process' but, also, to be the only factor worthy of shared consideration between participants in an infinite variety of design processes.

This change of thought pattern arises from the realisation that the process which is of interest to the user is not that of the design development, but his own inter-active process in intercourse with the product. The product of the design process is not derived from the rational nature of the process per se, but from the thought processes, communications and interactions, some rational and many irrational, which may have taken place within and without any rational design programme.

If we eliminate consideration of process, as such, from our study of the design purpose, we will start to see that the priority of our thinking should be directed towards development of mutual trust and effective communication in pursuit of shared goals.

The architectural profession must promote 'product', not for its own ends in the glorification of an art form, but as the shared goal for itself, for its user clients, for its co-professionals and for society. The goal must be recognised not as the completion of the built structure, but as the completion of the built environment. That is to say, the goal is to be found within the continuation of the spiral process shown above, with the successful interaction of user and environment in pursuit of the user's own organisational and behavioural goals.

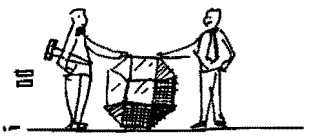


The architectural profession must, then, prioritise the development of the communications systems necessary for receiving the inputs which will show it what the product must do and for transmitting the signals of what the product can do.

Most importantly, architects must develop and master the running of the intellectual communications centres which will process the multitude of signals and carry out the necessary simultaneous translation into the language of any and all interested parties.

Success in the development of new models of communication and design implementation will be dependant upon the development of new mind-sets which reject the paradigms of 2-dimensional thought and of the need for resolution of conflict.

Such developments will be promoted by those who embrace a transformational thought process, seeing that what is needed for future development is not more of the same, done better, but.....



.....now for something completely different
Monty Python[7]

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4 for further discussion on the subject of 'constructive disequilibrium' see
Pascale, Richard , 'Managing on the Edge', Penguin Books, London, 1990, pp152-54
5 Ohmae, Kenichi, 'The Borderless World', Fontana, London, 1991, p1.
6 Nicholson Paul (editor), 'Architectural Management',E&FN Spon, London , 1991, pp336-340.
7 'Monty Python's Flying Circus', BBC Television..

Research Project - Inputs to the Design Process at Inception and Feedback Stages
CIB Commission W96 - Architectural Management
University of Strathclyde - Department of Architecture and Building Science

A Definitions

Please utilise the following **definitions** in decision making for answers to the questionnaire:-

brief	written statement (including drawings, charts etc) of physical, technical, financial and aesthetic attributes to be met during the design and production phases.
procurer	person/group responsible for confirming the first appointment of the designers and/or primary supplier(s).
project manager	person/group responsible to the procurer for liaison, co-ordination and direction of the input of other parties to briefing, design and production.
designer	person/group responsible for making recommendations for the means of translation of functional and/or aesthetic briefing requirements into physical form.
supplier	person/group responsible for the production of physical entities for incorporation into the completed product in compliance with the design requirements.
owner	person/group retaining legal ownership of the product on completion.
user	person/group whose fulfilment of business and/or social function derives from direct and beneficial physical use of the completed project.

B Project Team

Please indicate, by drawing a **circle around**, the members of the team who contributed to the project; drawing a **line through** the title which most accurately reflects your organisation's role:-

procurer project manager designer supplier owner user

C Questionnaire

Please answer all questions. Where offered multiple choice answers, please draw a **circle around** the relevant answer (or answers) in the right hand column.

1	**Project Details**	
	Form/function. eg aircraft/civil, building/hospital, boat/ferry	_____
	Period (in months) of:-	
	briefing	_____ months
	outline design	_____ months
	detail design	_____ months
	production (of first unit)	_____ months
	Capital cost to owner (per unit)	£million _____ sterling
2	Was item intended for production as:-	single multiple
3	Was item subject to production of prototypes?	yes no

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4	Was a written brief produced?	yes	no
5	If yes, which parties participated directly in its production?	procurer designer owner other (specify)	proj manager supplier user
6	Was the brief defined in terms of:-		
	statement of needs (definitive)	yes	no
	statement of wishes (negotiable)	yes	no
	defined uses and activities to be accommodated	yes	no
	defined technical performance standards to be met	yes	no
	defined quantity of users to be accommodated	yes	no
	defined quantity of space to be provided	yes	no
	defined visual attributes to be provided	yes	no
	other (specify) _____		
7	Do you consider that the brief was defined primarily in terms which are:-		
	quantitative (space, cost, performance etc)	yes	or
	qualitative (image, aesthetics, feel etc)	yes	
8	Was the brief 'frozen' prior to commencement of:-		
	outline design	yes	no
	detailed design	yes	no
	production	yes	no
9	Please identify any relationships between parties, eg:-		
	procurer is owner	yes	no
	owner is user	yes	no
	procurer is user	yes	no
	other (specify) _____ is _____	yes	
10	Where obtained, was user input to brief directed through:-		
	an individual	appointed	elected
	a group	appointed	elected
11	Can the individual/group identified at 10 be definitely stated to have represented the views of the user:-	individuals unions equity holders	management workforce other (specify)

Research Project - Inputs to the Design Process at Inception and Feedback Stages
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12 Members of which of the following professional groups were directly involved in the preparation of the brief:-

note :-
'design' includes architecture, interior design, landscape
'engineering' includes mech., electr., marine, aeronautical

design engineering
legal accountancy
medical trade union
other (specify)

13 Where, on the relevant scales, would your organisation consider the priority to have been attached to each of the following factors by the procurer of the design process?

	low					high
technical performance	0	1	2	3	4	5
flexibility in use	0	1	2	3	4	5
capital cost	0	1	2	3	4	5
emissions (CO_2 etc)	0	1	2	3	4	5
delivery time	0	1	2	3	4	5
user friendliness	0	1	2	3	4	5
aesthetic quality	0	1	2	3	4	5
reliability	0	1	2	3	4	5
energy consumption	0	1	2	3	4	5
cost-in-use	0	1	2	3	4	5
exchange (re-sale) value	0	1	2	3	4	5
image value	0	1	2	3	4	5
user management strategy	0	1	2	3	4	5
re-cyclability	0	1	2	3	4	5
user satisfaction	0	1	2	3	4	5
durability	0	1	2	3	4	5
user advertising value	0	1	2	3	4	5

14 Did the brief anticipate and allow for non-cosmetic change to the product's form, function or performance:-

by procurer during construction	yes	no
by users after completion	yes	no

15 Would your organisation say that the brief, as it stood at the time, accurately reflected the true needs of the eventual users at the following stages:-

inception	yes	no
outline design	yes	no
detailed design	yes	no
construction	yes	no
completion	yes	no

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CIB Commission W96 - Architectural Management
University of Strathclyde - Department of Architecture and Building Science

16 For this project, was successful implementation of the brief assessed on completion by:-

technical appraisal by design team (analytical)	yes	no
technical appraisal by third parties (analytical)	yes	no
questionnaire of views of users (subjective)	yes	no
lack of complaint from users (reactive)	yes	no

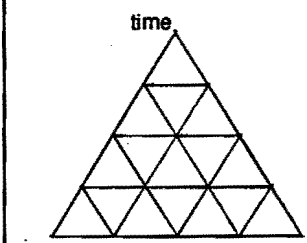
17 Do you consider that communications between the following parties, where represented, were in any way hindered by lack of shared understanding of professional terminology?

procurer	other parties	yes	no
designer	other parties	yes	no
project manager	other parties	yes	no
owner	other parties	yes	no
user	other parties	yes	no

18 Do you consider that communications between the following parties, where represented, were in any way hindered by lack of shared understanding of culture and values?

procurer	other parties	yes	no
designer	other parties	yes	no
project manager	other parties	yes	no
owner	other parties	yes	no
user	other parties	yes	no

19 Please mark an **X** on the matrix at the point which you consider would best interpolate the balance of importance awarded the criteria shown during the design development process by concensus of the entire project team.



D Additional Comment

Please add any comment which you consider may be relevant to analysis of the questionnaire, or to development of the research. Expansion upon any 'yes' answers to questions 17 and 18 would be particularly helpful. (use additional sheet)

I would like to thank you for taking time to fill in this questionnaire and hope that the results of the research, when completed, will be of interest to you and your organisation.
I am sorry that, due to the numbers involved, I am unable to acknowledge individual returns.

If you wish to discuss the research further I shall be pleased to do so.
Address, telephone and fax numbers as covering letter.
Telephone extension 3173

The Client's Brief: more than a questionnaire

The Client's Brief as a basis for quality

The planning, building or rebuilding of accommodation is usually a far-reaching business for the client, user and the surroundings. As a rule, a relatively large investment is involved. For the client and/or user, the new or rebuilt accommodation often has consequences for business operations and personal well-being. In addition, the new building, partly because of the relatively long life-span, often has a major influence on the physical and social environment. The result must therefore not be a disappointment, particularly to the client and the users, since the job cannot just be done again. Clients and users will be satisfied if their accommodation needs and the resulting requirements, wishes and expectations are met. Of course, all this must fit in with the restrictions which are imposed by, for example, the financial possibilities, the location, legislation and regulations.

In other words, they will be satisfied when "quality" is delivered. In the NEN-ISO 9000 series, which deals with quality management, quality is defined as "... the whole of properties and characteristics of a product or service which is of importance for meeting requirements which have been stated or obvious demands". Quality is delivering what is asked for. Quality is delivered when a building matches up to what was agreed with the client and/or user beforehand. In order to be able to deliver that quality, the partners in the building process - the architect, the consultants, the contractors, suppliers and so on - must be very well acquainted with the demands of the client or user. The right medium for conveying those demands has been, for many years now, the Client's Brief.

The client and - insofar as they are already known to us - the users can make it clear by means of the Client's Brief what exactly they want or what 'performance' they expect from their new or rebuilt accommodation. The problem is that only a few clients and users are able to formulate precisely what requirements their accommodation should meet. Often, what is involved is quality which they wish for implicitly but are only able to make explicit with difficulty.

That is perfectly logical and partners in the building industry cannot and must not expect clients and users to produce a good Client's Brief on their own. After all, most of them are laymen in the building field. Partners in the building process - or other consultants - must counsel and/or advise clients and users in the formulation of their accommodation demands. In practice, this too often fails to happen so that the planning process often

acquires a trial and error nature. The architect makes a draft plan and submits it to the client with the question "Was this roughly what you wanted?". In all probability, it is not entirely what the client had in mind and the architect has another try. This can be repeated throughout the whole of the planning process. There is a good chance that the client will come up with far-reaching supplementary requirements or wishes at a late stage.

An example.

It is late in the afternoon, three days before the work is put out to tender. The client rings the architect and says that he would, after all, prefer another type of ceiling. Can it be changed? Really, it is not possible: the plan and the drawings have been finished and the budget does not really cover it. But still: the customer is always right. The next morning, a draughtsman and specifications writer are put to work. Things are crossed out, stencilling is done, texts are changed here and there. Later, during building, it emerges that the attachment points for the ceiling have not been made in the floors. This has been mentioned in the specifications but it is not on the design drawings for the floors and only on a few architectural drawings. The holes will now have to be drilled while painting has already started inside. The result is noise and dust, quite a lot of additional work and painters walking away in anger. An unexpected source of expense and, whoever may be responsible, quality is not delivered.

When clients and users do not provide the right information about their 'demands' at the right times during the process, there is no basis for adequate (quality) control of the planning process. If the demands are clear and on time, then this creates, for the planning, construction and supply partners, the conditions for going about their work systematically and doing as much as possible right the first time. But it is the partners themselves who must indicate which information they require at what times from the client and/or the users. If desired, they must provide advice during the gathering and processing of that information.

In short: a good Client's Brief constitutes the basis for good quality control in the building process. It goes without saying that, in terms of the final result, it is of extremely major importance for the building process partners who will be contracted to understand their job! Drawing up a Client's Brief is a question of good cooperation between clients and users on the one hand and their consultants on the other. Sometimes, an architect will act as a consultant but this can also be done by an organisational consultant, a housing consultant or several consultants together.

A new Client's Brief Model

Traditionally, Programmes of Requirements have characteristically been 'questionnaires beforehand'. In practice, there are disadvantages to this, a few of which we would like to mention here.

- A building is a complicated product with many aspects which are often difficult to grasp in all their complexity beforehand, even by experts.
- (Over-) detailed Briefs sometimes exclude unsuspected, creative solutions for the accommodation needs.
- In larger buildings, there is often a long period between drawing up the Client's Brief and occupying the new accommodation. In the interim, the organisation or the working methods can have changed in such a way that the building is, so to speak, out-of-date on completion.
- Building can lead to change. Clients and/or users can wonder whether it is really that logical for the organisation to work in the way it does work. This has a lot to do with raised awareness. Processes of increasing awareness require time. Practice shows that raised awareness is stimulated by the discussion of (provisional) plan results. A rigid Brief can make this sort of communication more difficult.

In June 1992, the Stichting Bouwresearch (Building Research Board) in Rotterdam, the Netherlands, published a new Client's Brief Model which can deal with these disadvantages of 'traditional" Briefs. This was publication number SBR-258: 'The Client's Brief: an Instrument for quality control'. The Client's Brief as it was described in the publication develops in phases from rough to fine together with the plan. The basic principle of the system is that the Client's Brief contains, prior to each planning phase, the minimum amount of information which is necessary to be able to direct the plan in that phase. There is therefore a strong connection between the development of the Client's Brief and the development of the plan, but they are two fundamentally different things. We can define programming as the development of the demand and planning as the development of the supply. The connection is shown in the form of a diagram in figure 1.

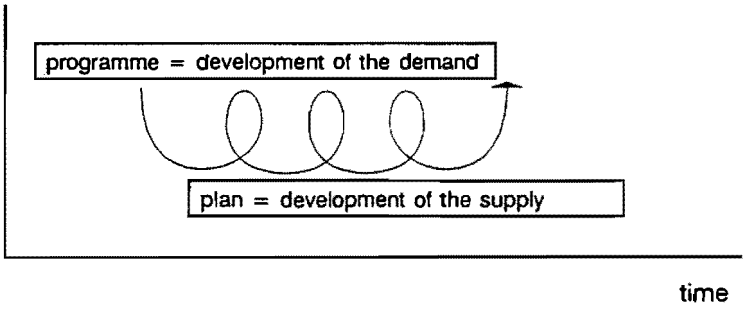


Figure 1: connection between programme development and plan development

A phased development of the Client's Brief results in a number of advantages for clients and users. The most important are set out below.

- The phased development from rough to fine enables clients and users to become familiar with the problems and to become aware of the possibilities which new (or rebuilt) accommodation can provide for introducing changes in their own organisation.
- A phased development offers clients and users the opportunity to introduce their requirements, wishes, expectations and conditions into the planning process at strategic moments.

The latter must, incidentally, take place in such a way that a controllable planning process is created. A situation must be prevented in which clients and users introduce requirements and wishes at any moment which make necessary the revision of planning decisions which have already been taken. Process control makes it necessary to ask the right questions at the right times.

In SBR-258, the Client's Brief is not seen as the traditional questionnaire beforehand but as a means of communication between the client and users on the one hand and the partners in the building process on the other in which the results of consultation about the required and offered performance can be recorded moving from rough to fine.

It goes without saying that this way of working makes demands on the attitude of the partners in the accommodation process. The client must take enough time and trouble to allow the requirements to develop in a meticulous way.
Above all, it is necessary to analyse the accommodation need. This applies, of course, when the client himself is the (or *a*) user of the accommodation but also when the client is building 'for the market'. In the latter case, he can base the analysis on knowledge of the market or market research. The analysis of the accommodation need provides the basis for a list of requirements, wishes and expectations.
After a feasibility study - given opportunity and restrictions - there finally results a set of data which serves for an initial formulation of the performance and conditions which the requested accommodation must provide. From this, there arises a global but complete Brief which has to be worked out in detail in the course of the planning process in close consultation with the selected planning partners.
Those partners must be prepared to enter into the consultation process with an open mind and to see it as an essential part of the professional service.
With respect to the 'traditional' way of working, this means, for many building process partners, a different sort of expertise, a different way of approaching their profession and a different market approach.

The development of a project-oriented Client's Brief

The instrument described in SBR-258 enables clients and users to introduce requirements, wishes, expectations and conditions at strategic moments in the building process. The start of each new planning phase in that process marks a strategic moment of this kind. A process acquires quality when it is split up into phases in view of the fact that this results in an increase in controllability. Phasing offers clients and users the opportunity to assess the building-to-be as a whole several times along the way, at moments when adjustment is still possible. We make a distinction during the building process between four main phases and eleven phases, as shown in figure 2. This classification into phases is used in various publications and in various developments in the field of quality concern in the building industry in the Netherlands.

MAIN PHASES:	PHASES:
• programme:	1. initiative 2. feasibility study 3. project definition
• planning:	4. structural plan 5. provisional plan 6. definitive plan
• elaboration:	7. specifications 8. pricing/contracting
• realisation:	9. work preparation 10. construction 11. completion/hand over

Figure 2: phases of the building process

The development of the Client's Brief covers, according to SBR-258, phases 1 to 6 inclusive. The connection between the development of the Client's Brief ('programme development') and the development of the plan ('plan development') during these phases is shown as a diagram in figure 3.

It is the task of the partners in the building process - the architect, the consultants, the contractors, the suppliers - to deliver a product which matches up to the required performance and expectations. In the building process, it is necessary in this respect to keep one's eyes open at all times.

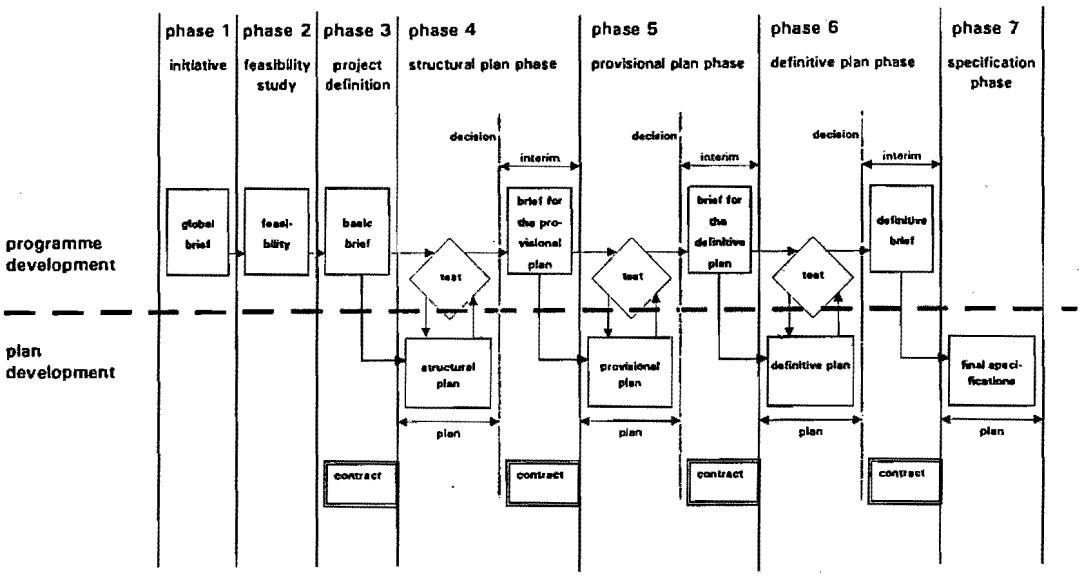


Figure 3: The connection between programme development and plan development in greater detail

Regular appraisals must take place to see whether, on the basis of provisional results, it can still be anticipated that the required performance will be delivered in the end. It is best for formal tests to take place at the end of each phase. The phase classification has been chosen in such a way that a complete and testable provisional result is yielded which can nevertheless still be adjusted. The Client's Brief plays a central role in the testing of provisional results: it forms, as it were, the test framework for the plan.

In the first three phases of the building process, the emphasis is placed on programme development. In the initiative phase, a 'Global Brief' is created on the basis of an analysis of the organisation or household to be accommodated. In phase 2, this global is tested for feasibility. In phase 3, project definition, the global Client's Brief is worked out in greater detail, with the 'Basic Brief' as the end result of the whole programme phase. At that point, a decision also has to be taken about the way in which the accommodation need will be met: rental, leasing, rebuilding or new building.

When a choice is made in favour of rebuilding or building, the client enters into an agreement, on the basis of the Client's Brief as it now stands, with one or more planning partners for the making of a Structural Plan. The basic Client's Brief must, for this purpose, contain the minimum information necessary for directing those planning decisions contained in the Structural Plan phase. The agreement, which is laid down in a contract, marks the start of the Structural Plan phase. When the

information necessary for directing those planning decisions contained in the Structural Plan phase. The agreement, which is laid down in a contract, marks the start of the Structural Plan phase. When the Structural Plan has been completed, it is tested against the basic Client's Brief. On the basis of the test results, the client decides whether to continue with the project or not.

Despite the meticulousness with which a Client's Brief can be drawn up, it will often not prove to be possible to achieve a perfect 'match' between the plan and the Client's Brief. It is possible that certain requirements, on closer examination, conflict with one another or that there is a discrepancy between the requirements and the available budget. Perhaps the location imposes restrictions on the solutions or the project partners are not competent enough...

Whatever the case may be, the client must, at a certain phase, decide whether he is going to accept the Structural Plan or not. If this decision is negative, the structural Plan is looked at to see whether it can be adjusted. If not, the project is terminated. If the decision is positive, the Client's Brief is worked out in greater detail. It is supplemented with the minimum amount of information required for directing plan development in the provisional planning phase. The supplemented Client's Brief constitutes - together with the Structural Plan - the basis for agreement for drawing up the Provisional Plan. This agreement, which is laid down in writing, marks the start of the Provisional Plan phase. The same procedure is repeated in the following phase.

The programme information is worked out in ever-greater detail here, corresponding to the current phase of plan development.

The parts of the Client's Brief

In a Client's Brief, various questions can be dealt with, each of which have their own aims and their own significance. In the publication, all these questions are classified into five units:

- unit 1: use requirements
- unit 2: function and performance
- unit 3: visual expectations
- unit 4: internal conditions
- unit 5: external requirements and conditions

The content of each unit can be described as follows.

Unit 1: Use requirements. These are the demands made of the accommodation on the basis of the intended use. Clients and users can, in general, formulate the use requirements fairly well themselves. The basis must always be an analysis of the accommodation needs of the intended user. Important aspects here are, for example, the company culture and the work organisation.
Here, it is assumed that looking for new accommodation can lead to a re-

examination of one's own organisation and - where appropriate - to the introduction of changes.

Unit 2: **Function and performance.** Use requirements as such do not provide enough of a foundation for directing the planning process. They are, after all requirements relating to the use of the building and not requirements relating to the building itself.
They must therefore be qualified and quantified in such a way that it is possible to check, both during the process and after its completion, whether what has been asked for has actually been delivered. In other words, user requirements must be translated into the 'performance' expected of the building. This is specialised work which, in general, has to be done by consultants.

Unit 3: **Image expectations.** These are the expectations, often socially or culturally determined, which clients and users can have with respect to the visual form of their accommodation, its architecture. In SBR-258, this element, which does not traditionally appear in Client's Briefs, is included explicitly for the first time.
Many types of performance can be expressed in measurable, and therefore controllable, units. The space requirement can be expressed in square metres, the desired room temperature in degrees Centigrade.
Other types of performance are impossible to translate into numbers. The most familiar example of this is the design of a building. The assessment of this is, to a very considerable extent, subjective and often difficult to talk about. Nevertheless, a client or user will have certain 'visual expectations' concerning his (new) accommodation.
These can, for example, relate to the image or the character which the organisation - a bank or a housing corporation, for example - wishes to convey to the outside world. The degree to which the image expectations are satisfied determines in part whether the client/user is, in the end, satisfied with the result or not. Therefor it should, at the very least, be possible to discuss them.
In addition to one's own satisfaction, the reaction of outsiders will also count when answering the question of whether a building is a success or not in all respects. The consultants, of course, play an important role here but the client, as the person behind the initiative, is mainly responsible for the reactions the building provokes.

Unit 4: **Internal conditions.** The client, user or occupant asks for a certain performance but also imposes restrictive conditions on the solutions. For example, he or she can set a fixed limit to investment costs or the rental price. Other examples of 'internal conditions' are requirements relating to running costs, energy consumption, service-friendliness and/or restrictions on the environmental load. It is important to make a clear distinction between requirements and conditions. If it is not possible to satisfy all the requirements and wishes as well as the conditions set, priorities must be drawn up. From the very beginning, it is necessary to look at whether the requirements and conditions are in balance in order to prevent a situation at a later phase in which certain things turn out to be impossible.

Unit 5: **External requirements and conditions.** Restrictive conditions can also be imposed from the outside by, for example, the government. Such

'external requirements and conditions' usually arise from legislation and regulations.
Examples are: zoning plans, possibilities and restrictions of the location, (local) environmental legislation, fire regulations and utility regulations. It can make sense to point out, in the Client's Brief, the existence of specific external requirements and conditions, although without describing them extensively.

In figure 4, the five units of the Client's Brief are shown in a diagram. The diagram shows that the organisation to be housed is always the starting point for the Client's Brief.

You can look at an organisation in different ways:

- from the point of view of the surroundings (the social activities of the organisation or the household)
- from the point of view of the organisation or household themselves (the technical/logistical functioning of the organisation)
- from the point of view of the people in the organisation or household (the way the individuals operate in the organisation).

Looking at organisations from those three points of view can lead to different sorts of requirements and wishes which, in some cases, can be in conflict with each other. As an example, we would like to mention the physical conditions in the building in the 'function and performance' unit. Physical conditions in a building required by industrial processes can be extremely different from the physical conditions required by employees. There are, for example, industrial processes which work best at a temperature of 10 degrees Centigrade, not exactly a temperature in which the employees will be able to work comfortably.

Figure 4 also shows that performance requirements based on use (function and performance) cannot be viewed separately from the internal conditions, the external requirements and conditions and the image expectations. From the very beginning, all these things have to be balanced and continuously tested against each other. The internal conditions constitute, in the figure, literally the framework for the (solutions to the) performance requirements.
The whole has, in turn, been positioned in the surroundings: the socio-cultural context. The external requirements and conditions are part of that context while the image expectations are also influenced by it to an important degree.

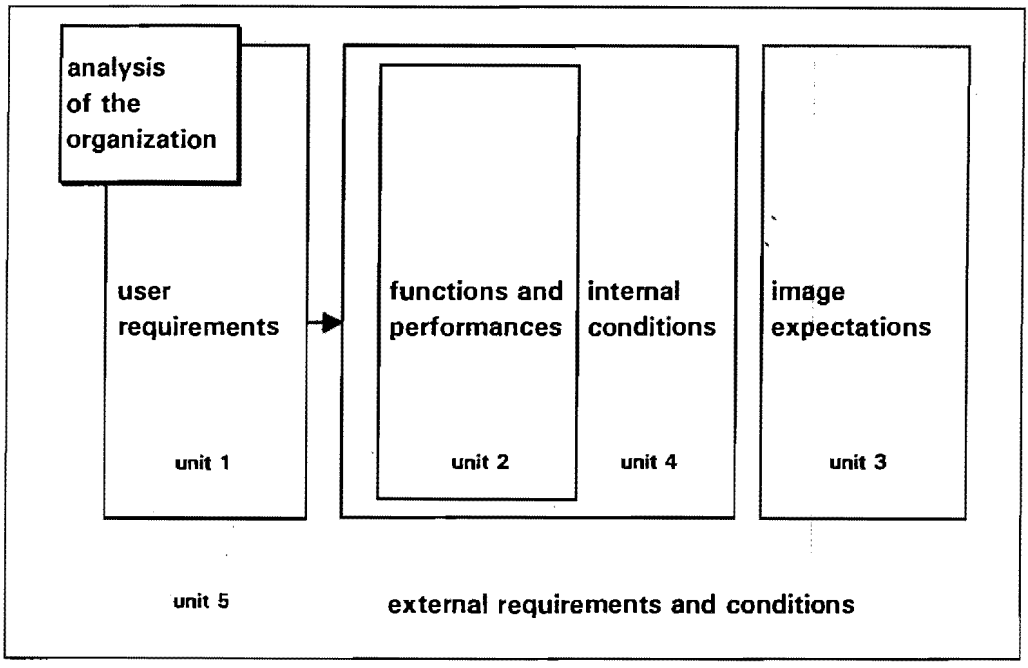
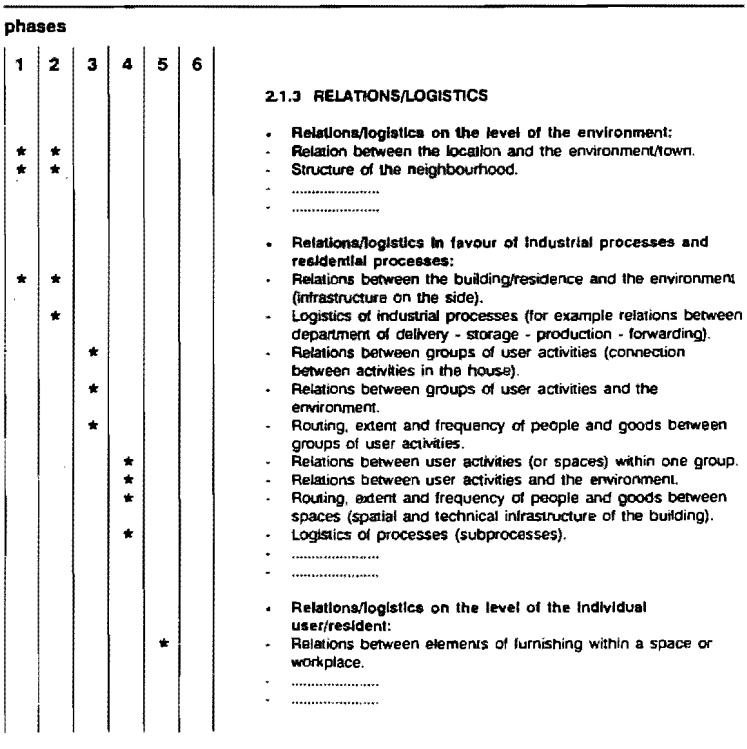


figure 4: Diagram of the five units of the Client's Brief

Checklist accompanying the Client's Brief

SBR-258 includes an extensive checklist which can be used as an aid when drawing up a Client's Brief linked to a project. The checklist covers all the quality aspects of accommodation and is split up into the five 'units' of the Client's Brief which were mentioned above. In the checklist, there is an indication of which performance requirements can/must be set in the various programme and design phases in order to achieve a qualitatively controlled accommodation process. A fragment of the checklist has been included in figure 5 in order to illustrate this.
The performance requirements are, in each phase, in terms of level, always attuned to the planning decisions which, in an ideal process, will be taken in the following planning phase.



phases						
1	2	3	4	5	6	
						2.1.3 RELATIONS/LOGISTICS
						• **Relations/logistics on the level of the environment:**
*	*					- Relation between the location and the environment/town.
*	*					- Structure of the neighbourhood.
						- .....
						- .....
						• **Relations/logistics in favour of industrial processes and residential processes:**
*	*					- Relations between the building/residence and the environment (infrastructure on the side).
	*					- Logistics of industrial processes (for example relations between department of delivery - storage - production - forwarding).
		*				- Relations between groups of user activities (connection between activities in the house).
		*				- Relations between groups of user activities and the environment.
		*				- Routing, extent and frequency of people and goods between groups of user activities.
			*			- Relations between user activities (or spaces) within one group.
			*			- Relations between user activities and the environment.
			*			- Routing, extent and frequency of people and goods between spaces (spatial and technical infrastructure of the building).
			*			- Logistics of processes (subprocesses).
						- .....
						- .....
						• **Relations/logistics on the level of the individual user/resident:**
				*		- Relations between elements of furnishing within a space or workplace.
						- .....
						- .....

Figure 5: Fragment of the Checklist accompanying the Client's Brief

Finally ...

'Quality' is defined as the degree to which a product or service meets the requirements, desires and expectations expressed beforehand. The new Client's Brief Model enables clients and users, together with their consultants, to formulate the request for accommodation with precision. The Stichting Bouwresearch is convinced that it is making an important contribution here to the development of integral quality concern in the building process. However, the instrument will only have an effect when it plays a very concrete role in the daily practice of partners in the process. In the coming year, practice with the system will be gained in a series of demonstration projects. The experience acquired will possibly be included in a second version of 'The Client's Brief: an Instrument for Quality Control'.

The publication: 'The Client's Brief: an Instrument for Quality Control' (publication number SBR-258) is obtainable from the Stichting Bouwresearch (Dutch Building Research Board), Postbox 1819, 3000 BV Rotterdam, the Netherlands, tel no. 010-4117276, fax no. 010-4130175. The publication is available in August 1992.

Ir. D. Spekkink
Ir. F.J. Smits [1]

[1] Ir. D. Spekkink, director EGM onderzoek, Dordrecht and ir. F.J. Smits, director C&D in Architecture, Rotterdam acted as respectively autor and coordinator of the SBR-study: 'The Client's Brief: an Instrument for Quality Control'.

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- 'Voldoet mijn gebouw?, SBR-publication 222.
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BRIEF FORMULATION : THE ARCHITECT AS MANAGER

Abstract

Traditionally the briefing process, its formulation and development, has grown out of dialogue between the client and Architect. This relationship has increasingly found itself under scrutiny. Architects have been seen by many clients as lacking the expertise, interest or inherent sympathy to perform objectively and in their client's best interest on complex projects. A tendency has therefore developed to see the architect as the recipient of a developed brief to perform design consultancy services under the overall control of others who have taken responsibility for brief formulation.

This paper examines this trend and identifies those key areas of involvement and management which the architect must offer if this vital stage of a project's development is to be regained.

Introduction

It is axiomatic that, in the context of Architectural Design, an appropriate and successful design will be routed in a good brief. It is similarly self evident that a Client's dissatisfaction in the final product, which may then lead to dispute and litigation, will often stem from a mis-match between expectation and reality. Rarely would this be the result of mischievousness on either party but, rather, inadequate briefing and communication procedures.

The brief, in its inception, development and formalisation, has traditionally represented the essence of the architectural profession's skill. By the conclusion of its development process the perceived needs of the Client will have been transformed from a verbal and written expression of functional problems related to the Client's business activity into a three dimensional graphic expression, in a state ready to be turned into production to achieve a building. This may be defined, for UK Practitioners, as the conclusion of Stage E - Detailed Design - under the RIBA Plan of Work. It is, in my opinion, this overall period which constitutes the minimum briefing stage. It may, on fast track projects, frequently extend beyond detailed design into the process stages of production information and even on to site.

Expectation and Reality

Many Architects would regard such briefing activities as a virtual birth right. Indeed the American Institute of Architects in its publication *How to Find, Evaluate, Select and Negotiate with an Architect* describes the process as follows "Only a known need and a few ideas exist at the outset to define the scope of the project. These ideas and requirements become the basis for the architectural programme, the conceptual design,

and ultimately, the working drawings and specifications from which the facility will be constructed. For a period of months or years, your Architect effectively becomes a partner in your organisation".

However, in a Society increasingly nervous of the quality of advice which it receives the notion of such professionalism is breaking down. It may be understood in concept that the professional person offers objective advice without fear or favour addressing the wider issues of responsibility to both Client and Society. In practice, the reality for many Clients would seem to require a prescriptive approach to the commissioning of an Architect. The Client is increasingly concerned to obtain objective guidance and protection in an increasingly complex market. Recognition of this complexity has identified in the UK client's mind the need for an additional level of advice and co-ordination. The professionalism, objectivity and management expertise of the Architect charged with the design is implicitly under review and a new discipline of Project Manager or Client Representative has established itself. This position, requiring as it does free access to a Client's working methods and in-house activities, may be seen as inherently incompatible with the Consultant Architect's primary business which ultimately thrives on the production of the design solution. Such a prescriptive attitude to the briefing of the Architect could be seen to be formalised in the recently published RIBA SFA/92 documentation where it is specifically stated to be the Client's responsibility to supply the Client Requirements, Budget and Timetable. This could be read to signal a significant shift in attitude within the Architectural profession in the UK. Clearly the Client must progressively sanction these matters which are the very essence of the brief but this wording would suggest that the Client is now expected to bring to the table at the outset of any project a fully formed idea of needs which already anticipate the core of the design. This process of separating the brief formulation and development activity from the process of design is additionally being further tested by the tendency towards competitive tendering for Consultancy Services. It could be argued that Society's trend towards competitive tendering indicates an assumption that the brief is comparable to a Bill of Quantities. If so, this would imply that provision of a "Full Brief" requires only a design consultancy.

This short paper is not intended to rehearse the arguments regarding these issues, but merely records them as fact and acknowledges the need in most projects of any complexity for the Architect to separate the functions of Architectural Management and Architectural Design. The term Project Manager within this paper refers to the person undertaking the former function.

The Brief in Context

The traditional Client/Architect relationship is inherently based on the premise that the construction process involves:

- A Client who knows what he wants;
- An Architect who can translate those wants and needs into drawings and specifications;
- A Builder who provides a price to carry out the work.

Most of use know that this never happens. Instead:

- The Client is multi-headed. Decisions are made by Committee and may not follow any consistent pattern or relate to any agreed development objectives;
- The Architect is one of a number of Project Consultants, together with Surveyor, Engineers, Estates Advisor, Letting Agent, Financial Advisor, Premises Manager, some or all of whom may be direct appointees of the Client. This can make co-ordination towards a common goal virtually impossible since there is no single party with overall authority for design, cost and timing;
- The time necessary to complete detail design and billing prior to tendering is often seen as uneconomic. Pressure is therefore exerted to obtain contact prices and achieve an early site start before the completion of the design stage;
- The project timescale is such that market conditions, Client resources and Client requirements may all be very different on completion from those anticipated at the outset. The consequences can be major cost and time overrun, abortive work by all parties and unsuitability of the finished product.

The Client's preliminary brief constitutes a set of expectations both explicit and implicit. In whatever form it first appears in the initial approach to the Architect it will rarely be as random and insubstantial as might first be thought. In reality, by the time the Architect joins the process the project will, in all probability, have progressed through a series of stages of internal debate, gathering self interested parties and acquiring political overtones.

Setting Up the Controls

It is vital to the success of any project that the process of developing and agreeing the brief is co-ordinated and controlled. Uncertainties and deferred decisions will affect both costs and programme target.

Many Clients will be unfamiliar with the complex processes through which a development proposal must pass towards successful completion. Also, for most Clients, direct involvement in the development process will be entirely subsidiary to their function as a

business so that the one person dedicated to the management of the Client's requirements with regard to the procurement of the project will be the Project Manager.

The central role of the Project Manager at this time will be to make clear to the Client the Project Team's needs in terms of the timing and quality of the decisions. This cannot be a one-sided list of demands from the Project Team but, rather, a joint activity based on mutual understanding of each party's priorities and commitments. Just as it is frequently lamented that Clients do not understand what Consultants do, it is as often the case that Consultants take little interest and show as little appreciation of the constraints under which the Client must operate in order to survive in business.

The building of trust and mutual respect is central to the process of brief development. Both parties can bring erroneous preconceptions to the initial meetings. Clients may quickly feel threatened/patronised/ignored by the Consultant Team and, understandably, become dissatisfied with the quality of service which they perceive that they are receiving.

Equally the Client who professes to be happy to "leave it to the Consultants" is storing up problems for the future. This attitude, frequently encountered in major organisations where an ad-hoc Management Team has been thrown together to ostensibly generate a brief, is an abdication of responsibility by the Client. Consultants who initially welcome this approach as allowing design freedom, and they are not uncommon, will almost certainly encounter extensive abortive work and recrimination when, at some inevitable stage, the product can be seen by the Client to be largely inappropriate to the initially identified needs.

In short the process of mutual education between Client and Project Manager requires a significant investment of time and money by both parties. In most cases the motivation for this will need to be generated by the Project Manager.

In formulating the preliminary brief it is quite likely that decisions will have been confined to key personnel within a company, probably at Board level. One of the Project Manager's first tasks should be to emphasise the need to broaden this base of control to include additional parties within the Client's organisation, who will need to contribute to the detailed briefing and approval process.

It is most unlikely that complete responsibility for progressing the scheme will be delegated to the Project Manager. It would be neither practical nor desirable. It is essential therefore that the Client establish an appropriate Management Structure to over see and approve as necessary the development of the project. The Project Manager will assist in this process. Typically this will require the formation of a small Committee,

with delegated powers coming from Board level. It will meet regularly to consider proposals put forward from the Project Team via the Project Manager and be given clear authority on the project to make strategic decisions in response to the Project Manager's recommendations. In addition, the Client may also identify a single employee, often the Premises Manager, who will act as the named point of contact between the Project Manager and the Client.

Equally importantly, the Project Manager must be seen within the Client organisation to have the authority to request and receive information from wherever may be necessary in order to fulfil responsibilities in the formulation of the brief and approval of Project Team proposals.

The Project Manager should also have the authority to chair a User Group Committee, to establish staffing levels, floor space requirements, expansion policies and cost implications which may be set against individual departments' budgets, and ensure that these are properly built into the brief.

In practice, this critical stage of setting up the controls can prove to be one of the most difficult of the entire development process. It will often meet with both passive and active resistance from a Client. It takes time to get it right and imposes obligations of both time and energy on the Client organisation. It will frequently expose long established functional and political nonsenses within the Client operation which will require tactful determination to resolve.

If such issues are not properly addressed at this stage the grounds are usually laid for the polarisation between Client and Consultant and the lines of authority and communication become confused. However, time is spent at this stage to set up an appropriate Management Structure will remove much of the uncertainty, frustration and mis-understanding which traditionally can occur in both client and professional Consultant's camps during the design stage.

Brief Development

Having set up an organisational structure with direct Client authority and clearly defined roles and responsibilities, the brief can now be developed. It is alarming how, traditionally, this vital document can be little more than a Client's statement of intention to build. The Project Team is then left to put forward proposals on what information they can glean in hope that somewhere in the Client's organisation someone can understand the suggestion and make constructive comments. Again it is the Project Manager's task to develop, with the Client, the briefing documentation for communication to the Project Team.

Firstly, it is vital that the central objectives of the project are established and agreed with the widest possible consensus. In any project three strategic elements must be balanced - time, quality and cost. The relative importance of each element will differ depending on the basic requirements of the Client:

- A Client facing the falling in of a lease has an absolute time deadline.
- A Client concerned to achieve a well considered corporate image will be wishing to achieve the highest quality.
- A Client with low capital budget but high revenue income resulting from the project may sacrifice both quality and time in favour of cost.

Such examples are, by necessity, simplistic since projects are rarely clear cut. A Client will, however, usually expect 100% in each area and it is the task of the Project Manager to reconcile this conflict.

A balance must be struck to achieve the optimum solution to the Client's requirements. In marrying these strategic criteria with the client's broad objectives a strategy will emerge which will enable the Project Manager to advise on the alternative procurement routes available and, from that, the basis for developing an appropriate plan of action and brief. It is vital that this strategic level is properly addressed and agreed at an early stage before the whole process becomes bogged down in specific detail.

In building up the initial briefing document the Project Manager will, through the structure he has established within the Client's organisation, ensure far clearer channels of communication than might be traditionally enjoyed at this stage of the development. The result should be greatly more effective interaction between the Client and the Project Team.

It is important to clarify those key issues on which direct Client approval will need to be sought. Key decision points requiring Client authority for approval and instruction to proceed would typically be:

- Outline Design Proposals and the preparation of Scheme Design;
- Final approval of Full Scheme Design/Design Freeze and preparation of Tender Documentation;
- Approval to tender.

It should be the Project Manager's responsibility to ensure that each presentation to the Client is comprehensive and clearly stated, with key points and issues requiring decision

simply summarised. It is important that there is a consistency and continuity in one Report to the next so that a logical progression can be followed.

The Reports prepared for the Client's approval at key stages of the design development process form the evolution of the brief. Their importance cannot be overstated. Taken together they are the base documentation defining the agreed brief and against which any future uncertainties would be checked.

If there are key players within the Client organisation whose influence, if not understood at the outset, could radically affect any building proposal, then the Project Manager must require their early involvement in the approval process. These could include Maintenance Managers, Trades Union Officials and Disabled Access Officers whose specific responsibilities and authority to ensure compliance may often extend beyond generally accepted standards.

Clear identification of the degree of detail requiring formal approval the personnel involved and the recording of such approvals based on satisfactory and comprehensive report material is a key role of the Project Manager, on behalf of the entire Project Team, throughout the Brief Development Process.

Conclusion

The inception of any project is a fragile period overlaid with a range of conflicting emotions of enthusiasm, optimism, uncertainty and sensitivity. The work of the Architect is critical throughout this stage. The goal must be to achieve a full understanding of the Client's aspirations, not to make assumptions and certainly not to implicitly dismiss stated aims under the principle that the Architect can deliver a product which the Client will come to respect over time. If the relationship between the Client and the Architect and, through the Architect, the entire design and construction team, is to be strong it is at the initial stages that the vital foundations of confidence and mutual respect must be laid.

As the project moves into the Brief Development stages it becomes the responsibility of the Project Manager to ensure open communication and understanding between the Client and the Project Team and to put in place the necessary controls to manage the process.

Simon J Pilling, March 1993

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Architects as conflict managers

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Discussion paper to CIB W-96 Architectural Management at Eindhoven, April 1993.

Abstract: Professional practitioners each have a distinctive view of the world which determines and constrains their decision-making. Architecture is an inherently subjective process which, because of the complexity of modern buildings, cannot be reduced to a set of objective rules and procedures. Construction contracts often contain clauses which allow the architect to retain control over decision-making by subjective criteria, but fears of liability are reducing the use of such opportunities.

The architect's role has reduced over the last two hundred years, and it appears as though there is little need for an architect's skills in many projects. Many of the developments in construction project organization have made the switch-over from architect's responsibility to fabricator's responsibility happen at an increasingly earlier point in the process. If architecture is to survive as a discipline, this trend needs to be reversed.

In pure management terms, one of the most important and time-consuming tasks for a manager is to manage and resolve conflicts of various types. The central task of design management is similar. If architects are to maintain an influential role in construction projects, they must become adept conflict managers. This means they must also become good contract managers. The training and background of architects, and their supposed skill at using subjective processes to advantage, ought to put them in an ideal position for managing the whole construction process. Individual architects cannot rely upon their professional institution to take the kind of initiatives that are now required. Construction projects simply need people who can deal with conflict and manage contracts. Individual architects are in a strong position to compete for such work.

Keywords: Conflict, contracts, architect's role,

Introduction

The criteria involved in coming to decisions depend upon training and background. Professionals are appointed to exercise their judgment and discretion. Schön (1983) has shown that there are differences between practitioners in their use of media, language and the repertoires used to describe the different frameworks of reality within which each of them works. This is the cause of many of the difficulties confronting practitioners when trying to understand each others' role and value.

Architecture is a creative process, involving subjectivity. The training of architects is largely based around the exercise of subjectivity, involving whole tasks and critiques, rather than absorbing a series of techniques and concepts piecemeal. Indeed, for two hundred years the profession has focused upon architecture as an art. Bowley (1966) reveals how the organization of the building process was viewed as a chore by architects, and a waste of artistic talent, being a task that should be delegated. However, it is for their lack of practical knowledge that architects are castigated most frequently and severely.

Project managers, construction managers and quantity surveyors each work typically with very different agenda for decision-making. Their training is largely based around disaggregation and objectivity. Bills of quantity, BS 5750 (British Standards Institute, 1981) and other control documents are based solely on objective criteria, by their very nature. Indeed, BS 5750 begins by defining quality as 'conformance to requirements'. This definition dictates that requirements can be specified in some measurable way at the outset of a piece of work. The procedures of many construction professionals are often reduced to a set of formal, objective, procedures. For example, standard methods of measurement used by quantity surveyors in compiling bills of quantity.

Construction contracting in the UK is based upon the assumption that design and construction are two separate activities. The designers produce documents, and the contractor is obliged to produce precisely that which is documented (see for example clause 2.1 of the UK's standard form of building contract JCT 80). Where there is a need for subjectivity, discretion or judgment to be retained by an architect, phrases such as *subject to the architect's satisfaction* are used in the bills or specification documents. Such devices enable an architect to retain control over parts of the work which should not be left to the discretion of the contractor. However, they also render the architect liable when mistakes ensue. Amongst other influences, the current prevalence of claims against professional indemnity insurances has driven the RIBA to re-draft the standard contract of engagement for an architect (RIBA, 1992). This seeks to reduce the liability of professional architects, which is seen as a good thing, but it is done by reducing the authority of an architect, which, presumably, may be seen as a bad thing. This seems to be an example of the way in which an institutional reaction to threats tends towards the reactive and defensive. It forms a striking contrast with the concept of an entrepreneurial individual, responding to threats as challenges in a positive and pro-active way.

The changing role of the architect

The way in which the role of the architect has been successively eroded over the last two hundred years is interesting. Some of these changes have been brought about because of the demands of clients, some because of the demands of technological complexity and some because of institutional defensiveness. The progressive reduction in responsibility can be traced through the developments of general contracting, quantity surveying, town planning, accountancy, structural engineering, services engineering, project management, construction management and contract adjudication. A client who employs all of these specialists has little need of an architect, other than as an ornamental designer.

There is a well established pattern for construction projects to be designed by one person, then managed by another. As mentioned earlier, this is the basis of traditional general contracting. There is a point in the process when the lead designer effectively hands over responsibility for the project to a project manager or general contractor. Newer developments such as construction management, management contracting, design-build and so on, tend to move this point to an earlier part of the process. Clearly, this is <u>not</u> the only choice.

Replacing the architects' central role with another profession may or may not be in the best interests of the client. In any case, merely switching roles emphasizes different agenda, but does it actually change anything other than turning the tables? Architecture is not just about satisfying client requirements for a particular project, but involves a wider responsibility. This has been called *social responsibility* by some commentators. Presumably, there are other facets to these wider issues.

A project which not managed by an architect may be controlled instead by criteria dominated by client interests. Such a project needs external control in terms of architecture. This is the kind control which is applied by town planning legislation for example. This raises the question of whether 'architecture', as opposed to 'architects' can really be external to the project. Replacing the architects' central role, therefore, needs to be considered in terms of 'architecture' (whatever that may mean). In other words, the issue is whether or not architecture should form part of the internal project management function, or the external control of the construction industry. Projects which are controlled by criteria dominated by architectural considerations are internally controlled in terms of architecture. Obviously, this has been the situation for over one hundred years and it reflects the dominant position of RIBA as one of the senior chartered societies in UK. However, we do not need to look far to see the effects of not controlling the process in this way (pre-mid-nineteenth century in UK, other countries which do not enjoy the same political power play in their industries). It would be interesting to compare the output from different systems in architectural terms.

The identity of the profession

One of the key features of the two sides of this debate is the accessibility of architecture. When the process is deregulated, it may produce buildings which are more readily identifiable and accessible by their users. This is the immediate appeal of quality control as envisaged by the BSI (British Standards Institute, 1981). Perhaps an internally controlled profession becomes so inward-looking that it is in danger of becoming too esoteric and impenetrable to the uninitiated. In this sense, the deregulation of architecture should be welcomed.

The deregulation of architecture brings with it another set of issues. What are the consequences of doing away with the architect's subjective dominance during the fabrication of the building? Alternatively, what are the advantages of the architect's leading role in the process of fabrication, and what are the advantages brought by those who would seek to compete for this role?

These issues may cover some emotive ground for a profession which, as a whole, has habitually led the process. The current vogue may seem to be something of a threat to those who are theoretically, but not practically, qualified to run a building contract. This role is no longer an automatic assumption, but has to be competed for, even though the design commission has been won.

The fact that many people are successfully taking over this part of the architect's traditional role is symptomatic of either (a) clients perceiving an advantage in having someone other than the architect manage the contract or (b) clients are simply being misled in to believing that the traditional way is worse.

Designing a central management role for construction projects

The discussion so far highlights the kinds of problems associated with dealing with the problems at the level of the professional institution. It no longer makes sense to conduct business as if the members of any one institution are all equally able and accomplished.

The claim to authority of a professional discipline, or its claim to expertise in a particular area, is substantially based upon its ability to demonstrate its specialist knowledge in its interactions with its clients (Schön, 1983). For many years, architects have been the first port of call for clients. Inexperienced clients most commonly make their first approach to the industry through an architect (NEDO, 1983). Clients may find themselves less than satisfied with the service they receive from the industry, but Bresnen and Haslam (1991) confirm that a process of habituation ensures that traditionally selected arrangements are often favoured for no other reason than a wish to avoid the uncertainty and disturbance which might follow any departure from 'normal practice'. Indeed, it takes a considerable amount of dissatisfaction before a 'critical mass' accumulates and precipitates the kind of moves made by the British Property Federation ten years ago (British Property Federation, 1983). In their manual for a building procurement, they attempted to re-define the traditional roles of the professionals, notably the quantity surveyor, and these proposals were met with howls of derision and pessimism from the professional institutions. The objections of the professional institutions were predictable. It is an inevitable consequence of institutionalization that ultimately an institution becomes very concerned about self-preservation. This is often concealed behind the facade of service to the client. Thus, any perceived threat to the traditional power base of a profession will automatically be attacked as counter-productive, ill-considered and misguided.

Since the current trends in business favour individual initiatives and freedom to trade openly in an unfettered market, it is worth considering how we might dispense with the tired clichés of construction organization, and think about what is truly needed to improve the service offered by the construction industry to its clients.

An interesting view of the processes currently taking place is given by Williamson (1975), who makes it clear that all clients interact with the market in pursuit of their objectives. In our terms, they interact with the construction industry when they wish to procure a building. Small firms, and inexperience firms, are forced to rely upon what the market offers them. Thus they approach the industry in the traditional way. However, larger and more experienced clients, particularly those who build frequently, can afford to develop their own methods of doing business with the industry. This often involves either the development of in-house expertise, or the utilization of design team leaders who are not architects. This happens so frequently that construction managers, project managers and other specialist managers are increasingly been perceived as a better answer for the

experienced client. The surge in popularity of management contracting and construction management forms of procurement in the UK, and of construction management in the USA, show that this phenomenon is no mere passing fad. The problem facing architects is that as the phenomenon grows, the threshold of experience, at which clients turn away from traditional solutions, lowers.

One of the most urgent tasks for any manager is the resolution of conflict and change. This *takes up the largest single chunk of managerial time and energy, and is not always well done at the end of it all* (Handy, 1986). Conflict is a tremendous source of dynamism and creativity within any organization (Pascale, 1991).

Are architects resolvers of conflict? The current stereotypical image of an architect is outdated. Most of the caricatures are based on the concept of an architect as a designer who produces images and models which are to be fabricated by expert builders, and controlled by expert controllers. The stereotypical process has missed the point that the management of the design process is a continuous resolution of *necessary conflict.* Interestingly, the management of the fabrication process is also a continuous resolution of conflict, although the extent to which some of this is necessary is a moot point. Clearly, there are different kinds of conflict. For example, much conflict arises due to the way in which change emerges on a project, but it also arises due to different interest groups rightly and properly defending their interests. Conflict also appears in different levels. Gardiner and Simmons (1992) give a very useful description of different kinds and levels of conflict (see table I). This shows quite clearly that conflict has a central role to play in the construction process.

The art of leadership is not merely a question of accepting a stereotypical role arising from a reflex action of a client. Certainly, it would be wrong to select automatically a project organizational structure which reduced the architect's role to that of an ornamental designer. But the pressure for the latter is growing. Prince Charles' views on architecture strengthen the hand of those who wish not to be aesthetically challenged. And accountants are increasingly important in determining the priorities for construction projects.

Conflict management and contract management

Conflicting requirements will always need to be resolved in complex projects. Therefore, conflict cannot simply be disinvented. Like cost, or time, the thing to be controlled is a resource to be expended as wisely and effectively as possible, not a phenomenon to avoid. The aim must be the resolution of conflicting requirements such that the project represents the best compromise from amongst the alternatives. This is the inherent nature of the design manager's role (Gray *et al*, 1993). Perhaps it could be suggested that the failure of architects fully to grasp this idea has precipitated approaches which circumvent the traditional authority of the architect. The need to resolve conflicts effectively, and neutrally is the same during the design stage as it is during the construction stage. Indeed, the ambiguous role of an architect under many building contracts, simultaneously acting as employer's agent and independent certifier, is exactly designed to deal with this situation. Unfortunately, too few people appreciate fully the reasoning behind this role.

Table I: Different types of conflict (after Gardiner and Simmons, 1992)

Latent conflict	This refers to the source of a conflict. Due to the nature of the work, certain conflicts 'should' occur. There are three basic types; (i) interest group conflict, (ii) authority conflict and (iii) co-ordination conflict.
Perceived conflict	This generally follows from latent conflict. It is the fist stage of becoming aware of a divergence of views, but as yet involves no emotion. When a conflict is only mildly threatening, it may not go any further than this.
Felt conflict	When perceived conflict grieves the parties involved, it becomes felt conflict. This involves not only emotion, but also stress and tension.
Manifest conflict	This involves openly aggressive behaviour. It involves a conscious decision to obstruct another parties' goal achievement in order to achieve one's own goals. It can happen in a construction project when any of the parties allow their own organization's goals and priorities to take precedence over those of the project.
Conflict aftermath	This is the response to, and the outcome of, conflict and it may involve change. If a conflict is resolved then the parties feel more satisfied, but often the resolution involves merely a reversion to an earlier stage in the conflict escalation process which results in grudges and dissatisfaction.

The latest development in the progressive reduction of the role of the architect is *contract management adjudication* in which all independent decision-making is assigned to another professional consultancy (Baden Hellard, 1988). Whilst this move successfully eliminates the role ambiguity, it also means that the agenda for such decision-making may not be primarily driven by architectural considerations. Under such circumstances, the design philosophy can easily become secondary to other exigencies. Clearly, if architecture has a role to play, it is in establishing a comprehensive design philosophy for a project, and ensuring that this philosophy underpins every decision on the project. This is why the skills of a good conflict manager are equally applicable to contract management. Therefore, an architect who cannot manage a building contract is not an architect at all. Architects are singularly failing in their duties in discharging contracts, as many lawsuits have shown. Obviously, the professional title of the person exercising this role is of little consequence. What matters is the skill and experience they bring to the project, and the framework of criteria they establish for effective management and control.

Conclusions

The effective modern architect, then, has to do many things. Vigorous marketing is needed to assuage those who feel that architecture is too *arty*. Architectural ideals must be communicated more effectively across the divide between those who do, and those who do not understand the language of architecture. The image of an architect as resolver of conflict is an image which will help to propel individual people into the commercial realities of managing long and complicated processes. It embraces the idea of individuals exercising their unique skill and judgment, rather than acting as institutional clones. This requires central and urgent attention to effective conflict management to dispel the popular image of the architect as an 'arty' designer uninterested in commercial realities.

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THE ARCHITECTS ROLE IN THE CONSTRUCTION PROCUREMENT PROCESS

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Architectural Management
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Abstract
The architect's role in the construction procurement process is examined by the generation of role models for each procurement method and comparison with the architect's role in practice. Comment is made on the effect the procurement method selection has on the architect's role, the competitors for the services which "traditionally" belonged to the architect, identifying those areas within which the competitors had been most successful and the procurement methods which allowed the greatest deviation from the "traditional" architect's role. The research findings are discussed with respect to the apportionment of responsibility, contractual liability, role definition and the design of project team organisations.

Key words:
roles, architectural practice, procurement, responsibility, liability, role ambiguity, project organisation design.

INTRODUCTION

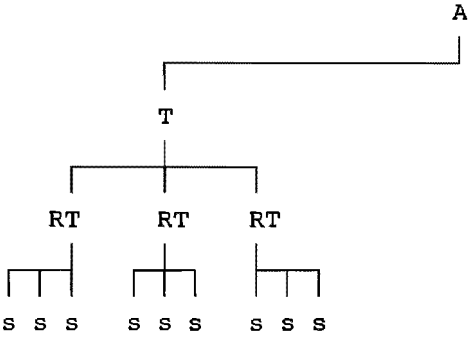
This research was undertaken with respect to the procurement options in the UK but the wider implications of the change of architectural practice have been discussed by such renowned figures as Robert Gutman and hence show the international relevance of such work.

"There is just more space in architecture for differing points of view on how to define it, ways to organise the work process, the kind of services architects should offer, and the methods the profession should use for getting work."

Robert Gutman, 1990

METHODOLOGY

Robert Gutman states that the practice of architecture cannot be precisely defined so the role of the architect is open to interpretation. One of the objectives of the research was to establish any change of the architect's role brought about by the selection of procurement method. In order to comment on any change of the architect's role it was necessary to establish the services that may be provided by the architect. This was possible by considering the structure of project organisations. Diagrammatically this can be represented as follows:



Project organisation structure

A: Appointer
T: Title of project team member
RT: Role Title
S: Service

The contract between A and T defined the services to be provided by T. Each project team member, T provides many services, s which may be categorised according to the role titles, RT.
To comment on any changes of the architect's role caused by the selection of procurement method it was necessary to establish a ground/base role against which any changes may be observed. This was possible by categorising the "traditional" services which belonged to the architect according to role titles.
The architect's role was de-constructed using the following role title categories;

1. CLIENT ADVISOR
2. PRIME PROFESSIONAL
3. DESIGN MANAGEMENT
4. CONTRACT ADMINISTRATION
5. SITE INSPECTION

ROLE TITLES USED TO DECONSTRUCT THE ARCHITECT'S ROLE

CA : Client Adviser:	Advises the client on construction procedures and alternative methods of organisation or working throughout the project.
PP : Prime Professional:	Organises the professional team.
DM : Design Manager:	Coordinates the design inputs and the flow of information throughout the design team.
D : Designer:	Own design input in the scheme.
C : Contract Adminstr:	Administers the contract according to the contract conditions.
S : Site Inspector:	Inspects the works as they progress and prior to certification.
P : Practice Adminstn:	Management of own practice to meet the project requirements.

The base role was termed the "traditional" role as defined in the traditional form of procurement, as prescribed within JCT 80. This title was selected accepting that the term "traditional" may be misinterpreted as historically the architect's role has changed quite considerably. Using the structure devised for the de-construction of the traditional architect's role presumptive models of the architect's role within different forms of procurement were established.

A questionnaire and interview of architects was conducted to establish the services provided by the architect in practice using the procurement options;

traditional procurement
design and build
management contracting
construction management.

The questionnaire also identified other team members providing any of the services stated in the RIBA Architect's Appointment. This enabled comment on;

1. any deviation between the architect's presumptive role for each procurement method and that executed in practice.
2. the identification of team members providing services which traditionally belonged to the architect i.e. the competitors for the architect's role
3. the establishment of the fields within which the competitors were successful in usurping the architect
4. the procurement methods which allow the greatest deviation from the traditional architect's role.

RESULTS

This research established;

1. deviation from the presumptive model role was observed when using each procurement method

2. in each instance the architect's role was reduced

3. the ranking of the procurement methods according to the extent to which the architect's role was reduced
   MOST REDUCED
   - construction management
   - design and build
   - management contracting
   - traditional procurement

   LEAST REDUCED ARCHITECTS ROLE

4. the aspect of the architect's role which was most frequently provided by other team members
   MOST COMPETITION
   - Client Advisor
   - Prime Professional
   - Design Management
   - Contract Administration
   - Site Inspection
   - Design

   LEAST COMPETITION

5. the team members which have been most at providing services which may be provided by the architect, the competitors
   MOST SUCCESSFUL
   - Project Managers
   - Quantity Surveyors
   - Construction Managers
   - Management Contractors
   - Client
   - Contractor
   - Mechanical and Structural Engineers
   - Client's QS

   LESS FREQUENTLY SUCCESSFUL

SAMPLE 5 : CONTRUCTION MANAGEMENT
Graph 2

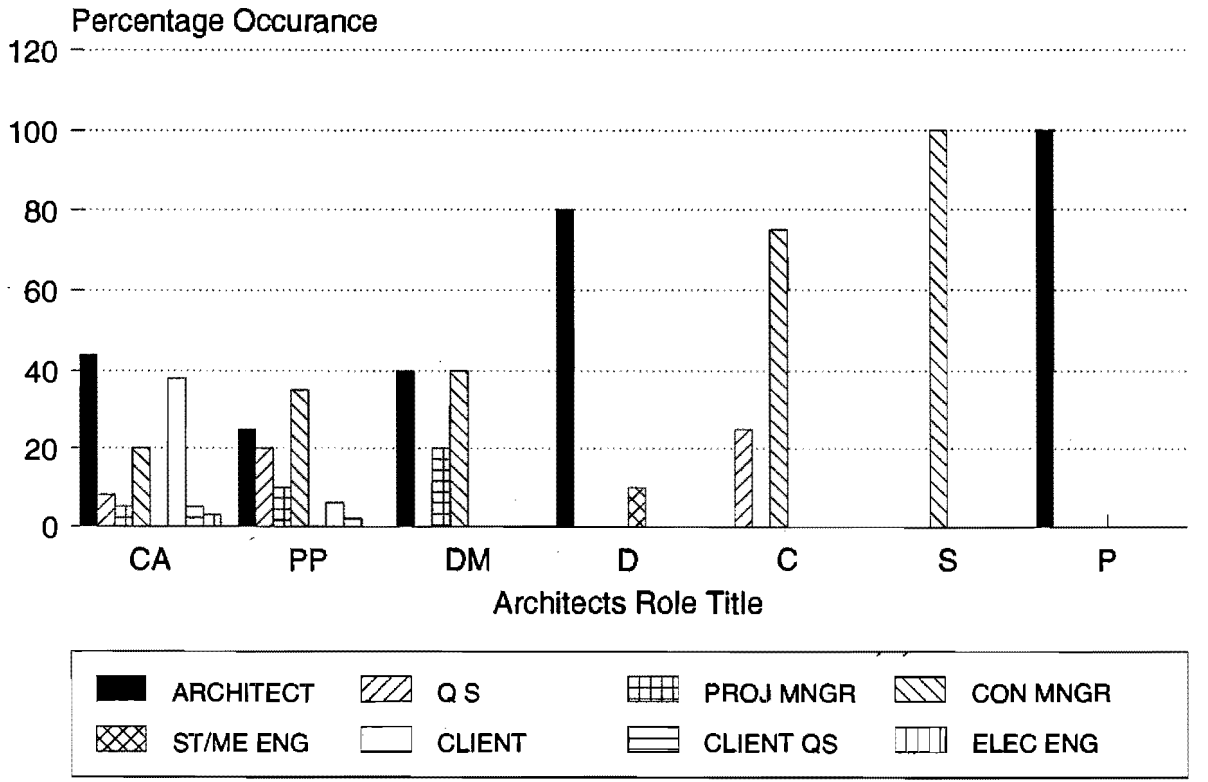


Fig. 7.15

CONCLUSIONS

PROCUREMENT SELECTION

This research has established that the architect's role does vary according to the selection of procurement method. The selection of procurement method may thus be interpreted as a determinant of the architect's and the other project team member's roles as each procurement method defines a range of services that may be provided by each team member. The variance of services provided by each team member within a procurement method is an indication of the lack of clearly defined roles and the opportunity for role adjustment.

It has been observed that project team members from other disciplines may be appointed to provide services which form part of the architect's "traditional" role. This verifies the observation made that other disciplines are capable of providing aspects of the architect's role, (Gutman, 1990). This research has shown that a finite number of services exist within the "traditional" architect's role. When these services are not provided by the architect they are provided by another team member i.e. none of the services are eliminated by the selection of alternative procurement methods.

CLIENTS BUYING MECHANISM

The client's buying mechanism can be considered to determine the role of the architect and to be an expression of the client's perception of the architect's appropriateness for that service. This is because there are no bars to providing of services which "traditionally" belonged to the architect,

> "a butcher, baker or candle-stick maker is permitted to design a building of any size or complexity, apply for planning permission and building approval, and supervise its construction".
>
> Huru, 1992.

It is apparent that the architect has no defined role and in common with other team members offers a portfolio of services which may or may not be required by the client. The client must decide at the appointment stage that they would rather a service be provided by another team member in preference to the architect. The RIBA plan of work divides the architect's services into design and management and has been cited as one of the reasons why the client has been able to separate the management functions and to appoint this function to another professional (di Leo, 1991).

DUPLICATION OF SERVICE

A duplication of service was observed when using the various procurement options. This may have occurred because of the client's appointment of an individual within their own organisation to confirm the decisions made by consultants e.g. employing their own QS to monitor the budgetary control of the project. This is considered to be most prevalent when using the management forms of procurement and when the project is large or complex (Bennett, 1991). This research has similarly established that it is the management aspects of the architect's role which are most frequently provided by other team members and that project managers were the most successful at providing services which "traditionally" belonged to the architect. The sophisticated of clients and their desire to have a greater involvement in the management of the project has been observed (CSSC, 1989). The duplication of services may thus be the conscious intention of the client, aware that a reduction of the project's efficiency will result as the client is paying for a service twice.

An overlap of services provided by the appointed consultants was observed. This indicates that the appointment document did not clearly define the services to be provided by each of the team members or alternatively that roles are being assumed by the project team members, as services are being provided for which they were not appointed. In either instance the project organisation fails to define the service of the team members. This demonstrates the absence of a precise role for each team member and the drawback of the use of titles.

The title of each project team member may be assumed to relate to a discipline and perhaps a professional organisation which has a preconceived identity and role. The introduction of various procurement options has allowed greater versatility of the service provided by each professional so the defence of the stereo-typical role should have been eliminated. Rather than commenting on procurement selection and professional role protectionism I would like to give consideration to the improved design of project organisations. The definition of the roles, responsibility and relationships of the team members is determined by the contract and appointment documentation. It has been demonstrated that the selection of procurement method alone fails to unequivicably define roles and relationships of the team. Therefore it is necessary that the contract and the appointment documentation define the services to be provided and to apportion responsibility for that service.

ROLE AMBIGUITY

This research was undertaken ostensibly from an architect's perspective but the findings have wider implications on the design of project organisations. My principle concern is the role ambiguity observed and its effect on the apportionment of responsibility amongst the project team members. If the services to be provide by each of the team members has not been clearly defined it is difficult to determine who assumes responsibility for that service. One may assume that if the

responsibility for a service is ambiguosly defined that the contractual liability is similarly confused. It may be considered that this causes adversarial behavoiour as a contractual dispute will require litigation before responsibility can be ascertained.

The lack of clearly defined responsibilities and relationships within the project organisation causes a blurring of roles and assumptions will be made as to the services to be provided. This may result in the disciplines present resorting to defensive "traditional" professional roles. The separation of design from management within newer procurement methods has allowed the emergence of new disciplines e.g. project management without adequately defining the lines of authority or the relationships of the team members. It is a deficiency of most contracts that the relationships within the project organisation are not defined. Although not expressly defined, the relationships lines of authority and methods of working are most consistently adopted when using the traditional procurement method. This may be considered to influence the default to the architect's "traditional" role in the absence of clear role definition. The defensive approach may also be attributable to the introduction of different procurement methods which has consistently resulted in the diminusisation of the architect's role.

PROJECT ORGANISATION DESIGN

One characteristic of the project organisation is that the organisation is temporary. The organisation is formed for the duration of the project which will be disbanded upon completion. The team member's role within the project forms only part of an individual's wider role with continued allegiance to their employer's organisation and a professional institution. These multiple allegiances can result in role ambiguity and/or conflict. One response to role ambiguity defined by organisational theory is the attempt by the individual to clarify the role by;

* reinforcing his role expectations on other members of his role set
* asking for clarification, either specifically or by precedent (Handy, 1976).

Both responses to role ambiguity provide explanation of the defensive resort to "traditional" professional roles by team members.

The duplication of service and role overlap observed means that contractually the definition of responsibility is confused. I would concur with the approach that the project organisation needs to be designed at its inception to reflect the project's characteristics (Bennett, 1991). This enables the client to determine their level of project involvement and select the services which will be provided by each member of the team, this acknowledges that each project is unique and has it's own constraints. It has been demonstrated that although the procurement method establishes the project's structure there is flexibility within the design of the organisation to interpret the particular requirements of the project. The necessity for change during the project to the organisation's structure and hence the roles, responsibility, relationship and services provided by the team, complicates the design of project organisation and emphasises the importance of this function.

The consequences of the decisions made at the inception stage have been demonstrated to have long term effects on the project and ultimately the completed building. The "client advisory" aspects of the architect's role include the selection of procurement method but must also take into consideration the design of the organisation which will be designing, managing and constructing the project. The appointment documentation must unambiguously define the services provided by the team and apportion responsibility for this service. Together the contract and the carefully drafted appointment documentation should reduce role ambiguity, adversarial behaviour and litigation as responsibility has been expressly apportioned.

It is my belief that for each project organisation it is necessary to

* unambiguous definition of the services to be provided by each team member
* eliminate role ambiguity,
* make the responsibilities and authority of the team members explicit

in an attempt to reduce the assumption of defencive professional roles, adversarial behaviour and to reduce the default to litigation. This service is necessary as it has been established that the procurement method and the standard forms of contract do not define roles and responsibility and therefore fail to eradicate service duplication.

It is my proposition that in order to explicitly define the liability of a team member it is necessary to unambiguously apportion responsibility for a specified service. This necessitates the apportionment of each service required to particular team members and eliminate the duplication of services.

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ESTIMATING DESIGN COSTS - THE DATA DILEMMA.

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ABSTRACT

This paper is concerned with the implications to design professionals in the Construction Industry of the increased use by clients of fee competition in the procurement of professional services. In particular, the need to accurately estimate the cost of these services is identified; and a methodology which has been developed to provide data for developing cost estimates, and improving estimating skills amongst design managers is described.

1. INTRODUCTION.

In recent years, the long established relationship between clients of the construction industry and the project designers has been fundamentally altered by changes in the method of procurement of construction projects and the professional services of the designers of these projects. This has, led in turn, to a need for design organisations to more accurately predict and control the cost of their work. In particular, factors such as the spread of Compulsory Competitive Tendering (CCT) in the public sector, the increase in the use of the Design and Construct procurement system, and the increasing application of fee competition amongst designers by clients using the traditional system has increased pressure on design organisations to review their management approaches. The authors have suggested in a previous paper (Blackwood et al, 1992) that the combination of such pressures will necessitate a move by design organisations, from their previous reliance on management systems which were predominantly cost control based, to systems which involve a more accurate estimate of the necessary staff resources for effective project design. In order to adopt such an approach it is implicit that design organisations would have to draw on a database of information on previous projects to accurately assess the cost of design for new commissions. This paper considers the practicality of the creation of such a database, particularly in the context of civil engineering design within the United Kingdom water industry.

2. THE NATURE OF THE DESIGN PROCESS

The application of planning and estimating techniques to construction operations has been thoroughly researched and documented (Ogunlana, 1989), but little published literature exists on the application of these techniques to design work. There are a number of factors which will influence the applicability of contractors' planning and estimating approaches to design work, including differences in the nature of the organisations that are involved in design, their traditional management systems, and the nature of their employees. The most significant difference however, is the nature of the design process. The design activity has been described as "a sub-set of the general class of action known as decision making" (Markus, 1972). This decision making process is essentially iterative with the ultimate solution being developed by a series of refinements to the most suitable conceptual solution selected from a range of possible original solutions. Many models models have been developed to represent this process including descriptive models (Cross 1989, Jones 1990) and prescriptive models, which are concerned with developing the most appropriate sequence of operations for effective design (Wallace, 1984). These models vary in complexity but the common theme of the models is summarised in Figure 1.

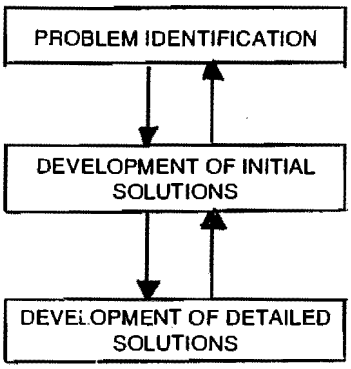

Figure 1 - General Model of the Design Process.

The most significant feature of the model, with respect to estimating design costs, is that the links between the stages are not one directional and the solution is developed in an iterative manner, as shown by the feedback loop between the stages. Consequently, the boundaries of design stages and constituent work packages are extremely difficult to define, and serious doubts must be raised about the practicality of recording meaningful cost data against a sufficiently large number of work packages to enable estimates of design costs to be built up from historic data.

3. THE DATA COLLECTION DILEMMA

The dilemma facing design managers in an increasingly competitive environment is how to develop systems of data collection which will provide sufficiently detailed and accurate cost information to permit realistic fee estimates to be made, whilst maintaining the practicability of the data collection system. The problems associated with the definition of work package boundaries makes the recording of design times through timesheets an onerous and time consuming activity for staff, with a high possibility of erroneous recording due to the lack of definition of the work packages. It is probably significant that a recent survey of design managers demonstrated that design organisations do not currently possess detailed cost information which can be readily used for fee estimation (Blackwood et al, 1992). The survey showed that design managers use intuitive approaches to estimate design costs, because their design office cost control systems are based on a very small number of work packages which do not provide sufficient data for detailed estimates of future fee bids.

The authors are currently engaged on a programme of research work to develop a micro-computer based system which will help Architects and Engineers prepare estimates of the costs of their professional services and, in order to address the data collection dilemma, part of this programme constitutes the development and testing of a data collection methodology.

4. DATA COLLECTION CASE STUDIES.

The case studies are based in one sector of the construction industry, civil engineering design within two Scottish Local Authority Water Services Departments. However, the survey of design managers demonstrated that the problems of fee estimation were common to all design sectors of the industry. Research in the United States Of America (Deikman, 1987) demonstrated that design management systems could only be successful if they were used directly by those actively involved in the design process. A data collection methodology, based on a design project management system, was therefore developed which could be used directly by designers and would provide instant feedback on the income, expenditure and progress on the current projects, thereby encouraging the use of the system, and promoting greater accuracy in the recording of data.

The system operates on a spreadsheet so that it could be installed directly on the project engineer's computer. Three projects of varying durations and magnitudes were chosen, one with one local authority and two with the other. The shortest trial, eight weeks of the latter stages of the design of a sewerage project is described in detail here, but similar approaches were adopted in the other two projects: a water main; and a sewage treatment works; of six and fifteen months of design work respectively.

4.1 Planning and Estimating Stage

The first task was to identify the appropriate work packages. These must be selected to ensure that a common set of work packages can be used across the organisation to maximise the production of data for each work package. They should also be clearly defined to minimise the problems of identifying boundaries between work packages, as discussed earlier in this paper. The project management system was therefore designed to be compatible with the Department's Quality Assurance system, with the project plan based on the quality plan for the project, and the work packages on the appropriate quality assurance procedures. In this case, six relevant procedures were identified and one was subdivided to give seven work packages as follows:

QP408.1 Structural Design/Calculations
QP408.2 Drawings
QP410 Tender Documents
QP409 Bill of Quantities
QP411 Consultation with interested parties
QP413 Drawings (Final preparation)
QP415 Drawing Approval

4.2 Project Design Programme and Resources

Having identified the work packages, the engineers then prepared a resourced programme for the project. This consisted of a bar chart as shown in Figure 2 together with a list of the necessary resource inputs, classified by salary grade.

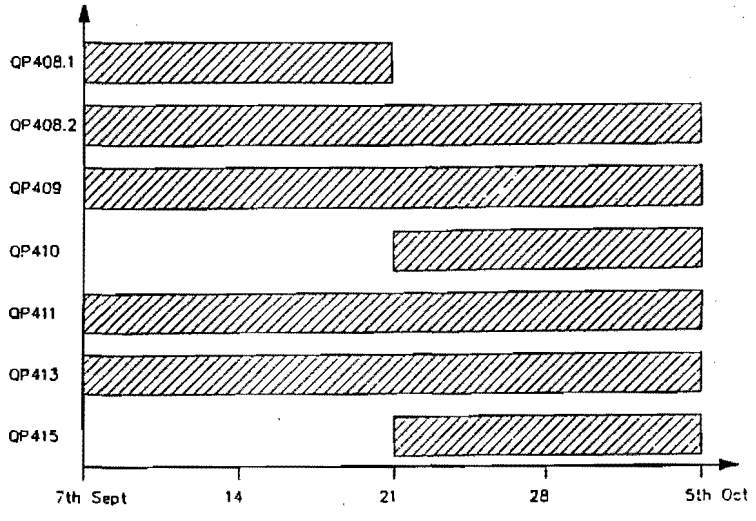

Figure 2 - Project Design Programme

It must be appreciated that the key objective in managing design work in the department has traditionally been to ensure that an annual programme of capital expenditure is adhered to, and the engineers have used the available staff to ensure that tender documents are issued on time. However, the project management system is designed to enable the project engineers to consider not only time but design costs in managing the projects. This is a significant change in emphasis and an immediate consequence of this change was that no data exists to support the engineers in the estimate of the resource requirements for the design work. (The project management system is intended ultimately to produce such data). The resources for the various work packages had to be estimated intuitively.

4.3 Data input and analysis

The spreadsheet contained a section whereby the resource data could be directly input in hours for each grade of engineer for each work package, and charge rates were included for the different grades. Another section of the spreadsheet allowed the programme to be input in terms of percentage complete per week of each work package (PERPLAN). The spreadsheet now calculated:

(i) the total costs of the design work;

(ii) the percentage that each work package contributes to the total cost (PERCONT), and

(iii) the weekly overall planned progress on the project which is given by:

$$\sum_{i=1}^{n} (\text{PERPLAN} \times \text{PERCONT})$$ where n = number of work packages

This is shown cumulatively as the proposed progress line on the graphical output from the system. (see Appendix A)

4.4 Project Monitoring and Control Stage

Data for project monitoring were collected from timesheets which were completed by all staff involved in the project. A specimen timesheet is included in Appendix A. The work package codes correspond with the quality assurance procedures and this, if this system were used across the department, would eventually produce consistent data for predicting the costs of future work on these work packages. In addition to recording hours spent, the project engineer was required to prepare a weekly estimate of physical progress in terms of the degree of completion as a percentage of each work package (PERCOMP).

The data were input using linked spreadsheets which replicate the timesheet shown in Appendix A with each linked spreadsheet covering a four week period. For the purpose of the trial, the data were input and processed by Dundee Institute of Technology but the system should be used directly by the project engineers in future. The project management spreadsheet now calculated:

(i) the actual cumulative cost of the work: i.e the sum of the hours recorded multiplied by the charge rates, with suitable adjustment for overtime periods. This was then expressed as a percentage of the original budget which is shown as the actual cost line on the graphical output (Appendix A);

(ii) the actual weekly progress which was given by:

$$\sum_{i=1}^{n} (\text{PERCOMP} \times \text{PERCONT})$$, where n =number of work packages

This is shown cumulatively as the actual progress line on the graphical output (Appendix A).

4.5 Users Comments on The Project Management System.

Some minor comments were made on the layout of the timesheet and it was suggested that staff should be given more information relating to the completion of the timesheets. The main problem identified was the difficulty in keeping up to date records of hours worked, because the department's central office management clocking in system returned data the following Tuesday at the earliest, and the information required for the central system was much less detailed than the data required for the project management system. To overcome this, separate records had to be kept on a day to day basis by each person involved in the project. Serious doubts were raised about the practicability of this, and the accuracy of the data which would be produced. This was considered to be a particular problem for more senior staff who could be involved in a number of work packages over a number of projects in any week. The data were input and processed by Dundee Institute of Technology and this led to unavoidable delays in the production of output. Consequently, the potentially useful quick feedback of data was not achieved but this should be rectified in future by the direct input and processing of data by the design department's staff, preferably the project engineer.

5. CONCLUSIONS AND OUTLINE OF FUTURE WORK

The trial of the data collection methodology on the two projects in the other local authority experienced similar difficulties. However from the positive feedback obtained from all the design engineers involved in the trial it can be concluded that the design project management system is a potentially useful tool for project engineers, and that it can produce cost data for future estimating purposes.

It is doubtful if the level of detail of data used in the trial can be collected on a long term basis in design organisations. Both organisations requested that modifications should be made to the operation of that part of the system which deals with the calculation of actual cost. Initially, the engineers were required to input timesheet data directly into part of the spreadsheet, as it was thought that this would remove the time lag between engineers completing their timesheets and the production of cost information from the department's central office management system. Furthermore, this direct entry of data was intended to permit a greater sub-division of work packages which would generate more specific data for use in the estimation of cost of future projects. This proved not to be satisfactory for two reasons.

Firstly, the physical size of the linked spreadsheet became a problem for projects involving a number of engineers and spread over a long period of time, both in term of the hardware memory requirements and the processing time. Secondly, where engineers were involved in a number of projects, the efforts of keeping detailed records of time spent on a large number of work packages proved to be prohibitive. Consequently, in future data on actual costs should be produced by the departments central office management system provided that action could be taken to speed up the return of cost information to the project engineers. The only drawback of this strategy is that the central systems can only utilise a limited number of work packages and therefore data for future cost estimation will be limited in detail. The trail run has suggested that this is unavoidable and that any estimating system will have to operate on data which are project specific, but not detailed with respect to the component work packages of the project.

The final stage of the research work will involve the development of the cost estimating element of the project management system so that it may use the limited data collected by the office management system to predict the cost of future projects. The revised project management system has been installed in one of the departments and is currently being linked electronically to the office management system. This will continue to provide data for the development of the predictive cost model.

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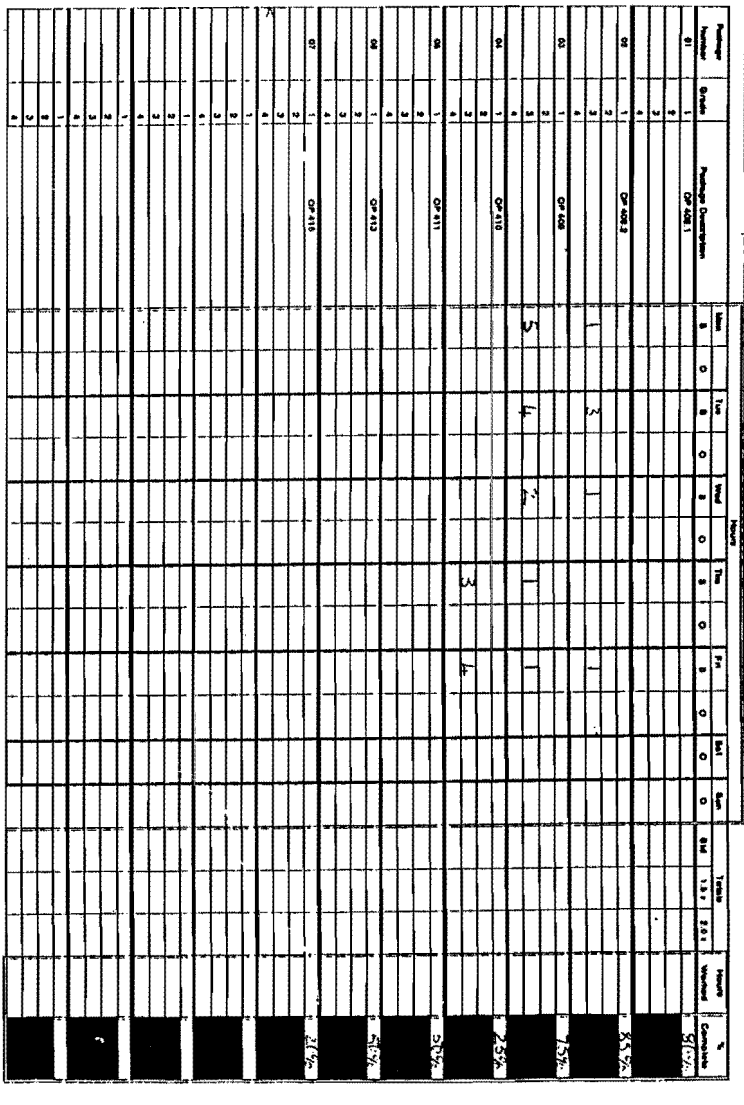
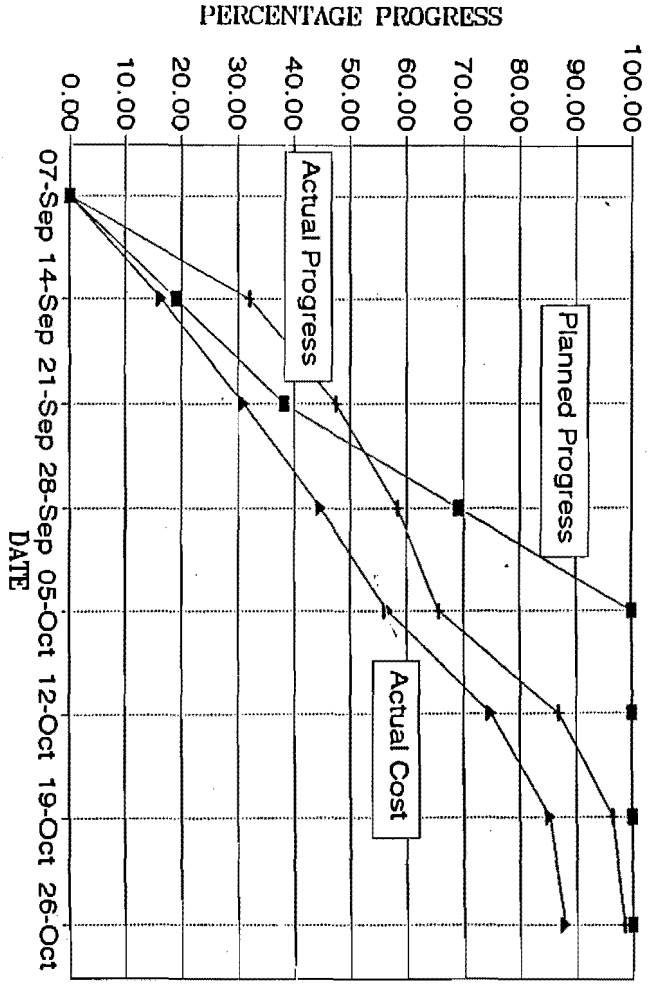
APPENDIX A - Specimen Timesheet



PROJECT TIME SHEET

Project
Project Engineer
Week no

APPENDIX A - Graphical Output



A TAXONOMY OF CONCEPTS IN ARCHITECTURE

A new tool for analysis and synthesis in architectural design processes according to Domain Theory

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TAXONOMY IN DOMAIN THEORY: ORDERS & DOMAINS, LEVELS AND PHASES

Domain theory is an architectural design theory in which architectural design is considered a complex activity which takes place simultaneously in three interrelated design or decision fields. These fields are respectively defined by *modalities of space: **morphological levels, functional domains and procedural phases.*** As such, architectural space can be represented in the form of a three-dimensional matrix, which is the core of a model of "architectural space in transition" and of the Domain theory.

- Each architectural artifact can be represented on the level of the ***(urban) environment*** of the building, the level of the ***building*** or the level of the parts or ***details*** of the building. Levels in this respect are levels of specification.
- An architectural artifact can be represented also in three ***domains of architectural design***, namely those of utility, durability and technology, corresponding to three categories of objectives and performance relating to ***utilitarian and static and technological*** aspects of space.
- An architectural artifact can be further interpreted in relation to different phases of the design process: as the outcome of a historical process in the ***past,*** as the ***actual*** decision-making in the present, and as the seed of a ***future*** process still to come, guided by expectations and images.

All these artifacts and processes belong in Domain Theory to the ***Physical order*** and lead as such to a physical plan, but only together with a (financial) economic plan and a social (political) plan does that physical plan form part of an environmental or architectural plan. These economic and social plans are the outcome of design activities in, respectively, the ***Economic order*** and the***Social order.*** Together they form the three *orders of (architectural) planning.*

DOMAIN

A field of knowledge and action for decision-making parties in the building process; domains and parts of domains (subdomains) are characterized by three categories of functions: ***usability, sustainability*** and ***manufacturability***. Domains form one of the three dimensions of the GOM model of space in transition; as such, they are articulated in levels and phases and are attributes of physical elements. Domains are decision or design fields in which partial, or domanial, ***designs*** are developed by disciplinary parties. These designs accord with systems which compose the fabric of the building: circulation, structural system, climatic system, etc.

ORDER

A field of knowledge and action for decision-making parties in the building process; each field contains three domains. Which orders are taken into acount depends on the characteristics of the building assignment. There will always be a physical, a social and an economic order, each individually containing three domains. Within each order ***parties*** are responsible for decisions and draw up ***plans***, characteristic of that order: a physical-spatial plan, a social-political plan and a financial-economic plan, etc. These plans accord with ***systems*** containing ***elements*** which are expressed in variables of a ***physical, social*** or ***economic*** nature: space and material, social groups and their mandates, and amounts of money, respectively measured in entities such as meters, decibels, guilders, etc.

DEFINITION OF CONCEPT

* Each concept covers the ***whole extent*** of the building or the part of the building under consideration; most concepts refer to both the spatial and the material aspect of the buidling.
* Concepts refer to ***every state of development*** of the building; it may be the building in the form of a situation such as existing state of the building, but it may equally refer to the programme of demands as to the desirable state of the building.
* Concepts refer to actual buildings as well as to ***representations*** of buildings, which are made in accordance with building conventions, such as drawings, scale models, diagrams, etc.
* Concepts, by their notional and imaginary content, contain ***information*** in the form of images inspiring or leading the designer as he proceeds, and criteria which put the results of such a process to a test. They can therefore be used both in the analysis and in the synthesis state of a design process.
* Concepts are primarily functional and, as such, objective-oriented. They are simultaneously ***means and ends*** to achieve ends on a higher level still in the target structure.
* Concepts are results of design processes in the past, within a specific (functional) field of design; they belong to the heritage of specific professional groups. As such they represent a ***historic balance*** between opposing functional demands, a field of tension, modelling the form of the building at that time.
* Concepts define ***fields of design*** in which more or less autonomous design processes lead to partial designs, which have to be integrated in the totality of the overall design. These design fields are the territory of parties participating in the design process. These parties are groups of people who take an interest in the building as the result of the process and professional groups such as architects, structural engineers, contractors, etc. These "players" are factors in a design process which can be replaced merely by factors at work within the head of a solitary operating designer.
* Concepts of architecture always have a ***visual nature***, which means that each conceptual (functional) system of a building can be represented in accordance with the elements of that system. The boundaries of the elements of the various elements will certainly not coincide.
* etc.

BASIC CONCEPTS OF ARCHITECTURE

*0. **Architectural** concept:* the self-evidence of the building.
The building as a whole, as an organism.
Representation of the building on a scale ranging from artificial to natural.

*1. **Cultural** concept:* the environment of the building.
The building as a commonwealth.
Representation of the building on a scale ranging from a historical to an ecological orientation.

2. ***Professional** concept*: the ability to organize the planning and design of the building.
The building as workmanship,
representation of the building on a scale ranging from a solistic to a participatory attitude on the part of experts.
*3. **Scientific** Concept:* the foundations of the building.
The building as a hypothesis. The building as a representation of knowledge.
Representation of the building on a scale ranging from traditional to innovative, from implicit to explicit knowledge.
*4. **Esthetic** Concept:* the artisticity of the building.
The building as a work of art.
Representation of a building on a scale extending from impression (for the beholder) to expression (for the creator).

*5. **Morphological** Concept*: the discernibility of the building.

The building as an appearance (shape).
Representation of the building on a scale extending from fragmentation to coherence.
*6. **Temporal** Concept*: the changeability of the building
The building as a mo(nu)ment.
Representation of the building on a scale extending from static to dynamic.

BASIC CONCEPTS OF ARCHITECTURE

7. Social Concept: the territoriallity of the building.
The building as a social good, a habitat.
Representation of the building on a scale ranging from individual to collective.
8. Economic Concept: the marketability of the building.
The building as an economic good, the building on the market.
Representation of the building on a scale ranging from investment to exploitation.

9. Utility Concept: the employability/ workability of the building
The building as a utilitarian system accommodating an organization.
Representation of the building ranging from mono- to multi-functional.
10. Structural Concept: the maintainability of the building.
The building as a structure or installation, directed at the preservation of a desired situation.
Representation of the building on a scale extending from passive to active.
11. Technical Concept: the "makability" of the building.
The building as a building system, as work.
The result of a construction and production process directed at the creation of a desired state.
Representation of a building on a scale extending from factory to site.

SCALE CONCEPTS OF ARCHITECTURE

I. Concept of Design; domains of design
The concept of design derives its completeness from the principle of change.
The domain of Durability contains all factors which resist change, the Manufacturability domain all factors which produce change and the Usability domain all factors which are neutral to change as long as the requirements are stable. Reference to change, in which respectively, a negative, a positive and a neutral position are concerned, forms a complete series. The principle of change occupies a central position, because design itself is directed at purposeful intervention in existing and non-satisfying reality. All three concepts according to the thre domains of the Concept of Design contribute to the balance of the concepts involved in the Concept of Planning. Because the connotation of the three domainal concepts is primarily physical, they represent the complete content of the Physical Concept on the higher level of the taxonomy. This concept is represented in the diagram of the taxonomy by an empty unnumbered field. On a lower level the content of the concepts may be subject to further detailing. This happens in the development of the Concept of Utility, in which physical, physiological and psychological aspects are introduced for the description of the concept. In the Concept of Design the building is represented as a balanced comming together of the concepts in a tripartite concept. The building simultaneously fulfils requirements of utility, durability and manufacturability. In terms of functionality the concept of Design is designated as the ***Concept of Change.*** The concept as a decision field is articulated into ***domains.***

SCALE CONCEPTS OF ARCHITECTURE

*II. **Concept of Planning***; orders of planning
In the practice of planning a complete plan always comprises at least 3 partial plans: a Physical Plan, a Social Plan and an Economic Plan. These plans correspond to the so-called orders in Domain theory.
The latter have a certain autonomy and are characterized by their own categories of *ends and means*, expressed and measured in *variables and entities* specific to each order. Social problems require solutions or means associated with that particular order. In *architectural planning* physical, not only social and economic means will have to be applied. These means, within their own order, can be interpreted as ends or goals, which for their part can be attained using means from the distinctive orders. The complexity of such a system of goals and means can be represented in the form of a "goal tree", or a "goal fabric". It is the task of the planner to decide which means have to be deployed and with what intensity. There always is a certain *interchangeability* or *substitution* of means possible for the attainment of a certain goal. Privacy, for example, can be attained, by either physical or social means, or by both together; at the same time there will always be a acquirement for economic means. This approach is characteristic for planning activities and also well known in the fields of *"environmental design"* in which the various categories of environments accord with orders.
In the concept of Planning, the building is represented as balanced integration of the three distinctive orders, which for their part will appear to be partial concepts in their own right. The building is simultaneously a social good in so far as it reflects social conditions, an economic good in so far as it reflects economic conditions, and a physical good. In the practice of planning and design this means that the designer is free to find solutions in every order. This activity generally takes place in parallel processes in which decisions are taken simultaneously on physical, social and economic matters. At certain moments in the overall process the results of these processes are harmonised.
In functional terms the concept of planning is designated as the ***Concept of Interchangeability.***
The concept as a decision field is articulated into ***orders.***

SCALE CONCEPTS OF ARCHITECTURE

III Spatial concept; dimensions of space
The three partial concepts of this concept are similar in that all three are all modalities of space. The morphological concept determines space in relation to the extension of the building within the context of its environment; the Temporal concept determines space in relation to the period of time which the building has already existed or will exist; and the Functional concept determines space for the performance of the building as formulated in norms with their upper and lower limits. These three concepts represent the three ***dimensions*** of the so-called "space in transition" in the GOM model. This space is simultaneously determined in a formal, a functional and a procedural way, corresponding to, respectively, the y, x, and z dimensions of the model.
In this model the designer is in the middle and finds his bearings, while looking for a solution to the problem of the six possibilities which the model offers him. The three dimensions guarantee the completeness of the Spatial concept, determined by a space and time that are meaningful for people and structured in accordance with their norms and values.
Function and Form as studied in Morphology and Semiology traditionally form a discernible but not separable pair; these notions, however, have to be connected with the notion of Process which positions them in the flux of time, creating space for the dynamics of buildings.
The trio Form, Function and Process also form the core of General Systems Theory, creating form-, function- and process-bound systems. In the terminology of Domain Theory these systems are designated Level bound, Domain and Order bound, and Phase bound systems (lit.). In functional terms the Spatial concept is the ***Concept of Spatiality.***
The concept as a decision field is articulated into ***dimensions.***

SCALE CONCEPTS OF ARCHITECTURE

IV. Mental concept, orientations of experts

The Mental concept, as a result of the integration of the Professional, Scientific and Artistic concepts, represents a triplet which has existed since Aristotle. It refers to the three basic mental attitudes: knowing, feeling and wanting or doing (**cognitive, affective and conative attitudes**). It is, however, also possible to argue their unity and completeness from their various positions in relation to reality. The aesthetic concept is the concept of artisticity in which the form functions as a bearer of meaning. With this symbolic function it relates to an upper level of reality, called Hyper reality by Umberto Eco. The Scientific concept refers to structures underlying reality, providing the foundations of the objective observable world (hypo reality). The Professional concept is aware of these upper and underlying levels, but expresses itself in the routines, in the positive sense of the word, of daily reality. As such, the concept mediates between practice and theory. Because the triad of levels is exhaustive the tripartite concept is complete. The functional designation of the concept is the ***Concept of reality.***

The concept as a decision field is articulated into ***orientations.***

SCALE CONCEPTS OF ARCHITECTURE

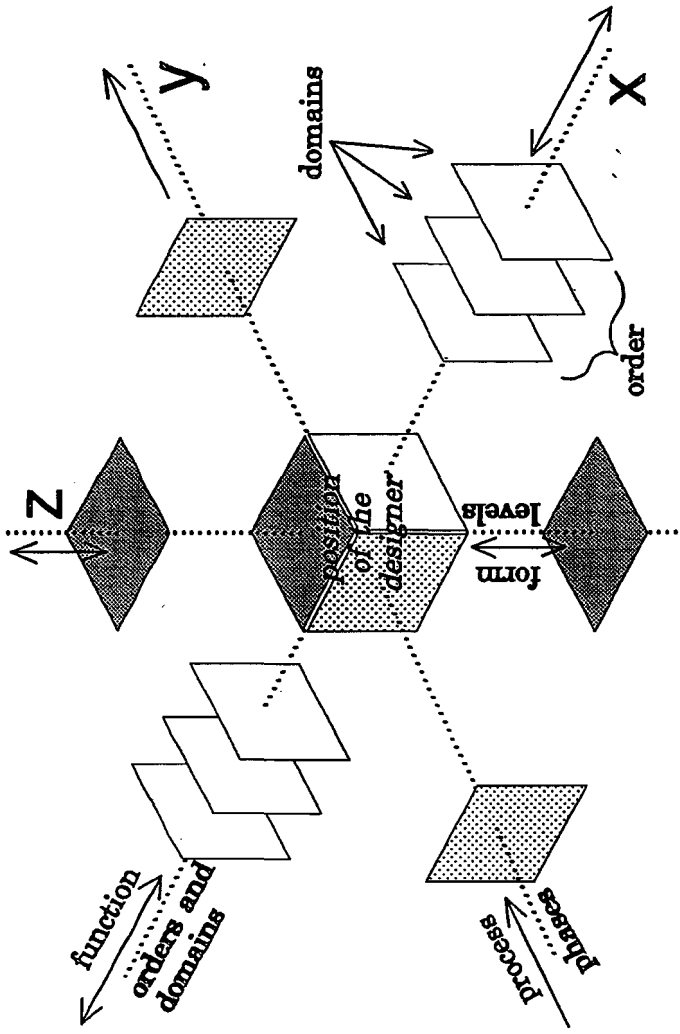
V. Cultural concept

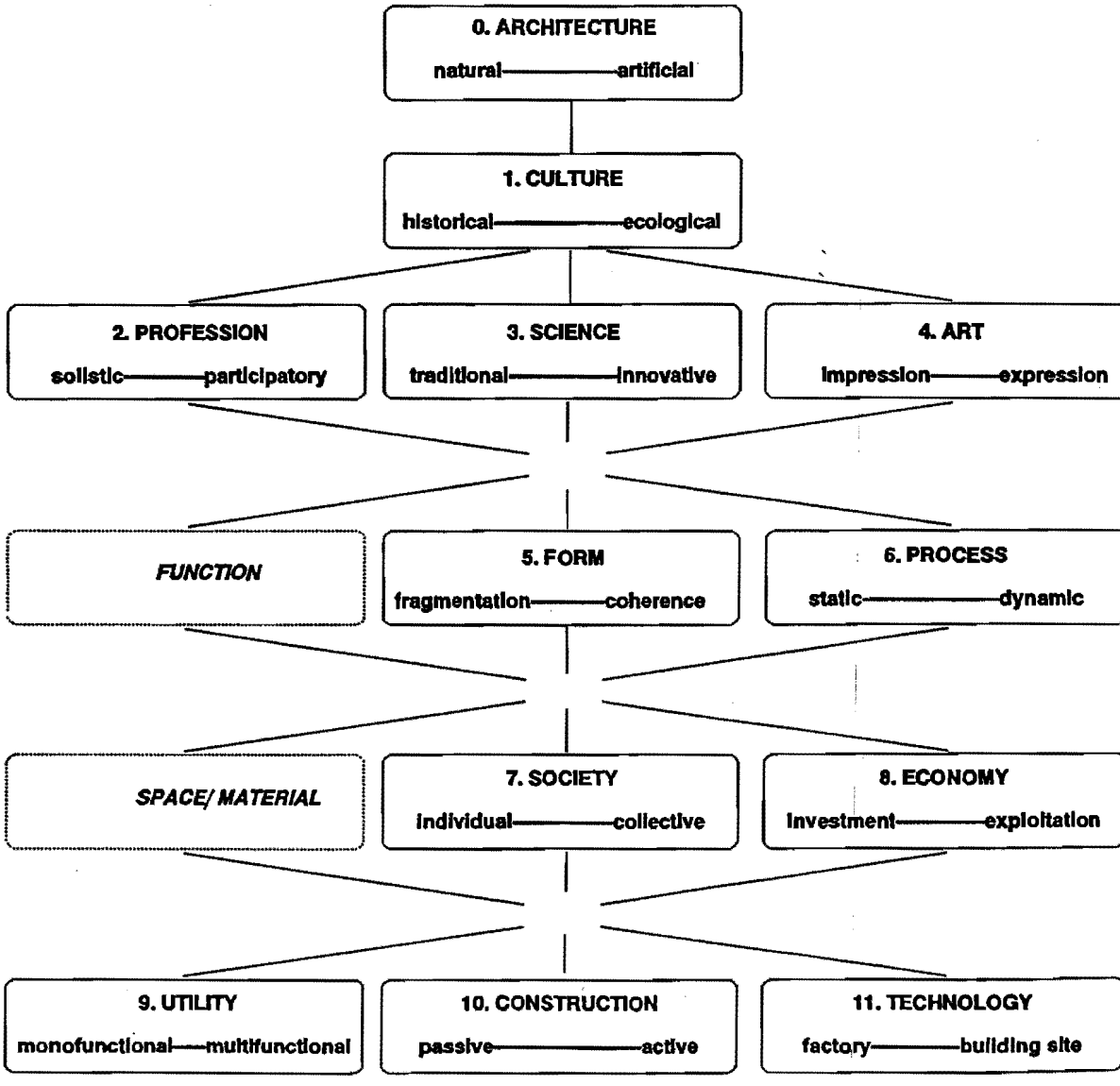
This concept is the result of the integration of lower concepts in the hierarchy of concepts and adds to that the specific qualities of this level. The concept reflects an overall quality of a holistic nature, in the field of architecture traditionally referred to as an architectural type. The typology of this concept, like those in other concepts, is simultaneously of a formal, functional and procedural nature, refers both to situations and programmes of demands, and also to *history and to ideas* and expectations regarding our future. The architecural type fixes the *conditions* within which design with regard to knowledge and technique is possible and functions as a *seed* from which the building comes into being. In this respect the concept is a "milieu" in the meaning of both environment and madium. In other words the architectural type is a "milieu" in both senses. The concept represents a *style*, a form, but also a work method, not only related to building, while it also shares common features with other expressions of life in our *culture*. This culture is not restricted to the culture of the spirit, the "cultura animi", but also comprises the culture of nature, the "cultura agri", a notion which can be extended to our *ecological* niche. This concept is referred to as the ***concept of "milieu".***

SCALE CONCEPTS OF ARCHITECTURE

VI. Architectural concept

This concept is also the result of the integration of all the lower-level concepts and adds to it what makes the architecture of a building. The cultural concept becomes enriched because the building no longer manifests itself as artificial and as belonging to the realm of culture, but is returned to *nature.* For the building the maxim, "Ars est celare artem", is valid, which means: Art is to hide the art. It refers to the self- evident existence of the building: the way it presents itself and the way it inserts itself into its environment. The building is defined in itself functions as a self-regulating system, just like a living being, continuously exchanging material, energy and information with its environment. It is an elegant solution to the problem, which means that there is no superfluity, but economy in the Vitruvian sense of the word. The building is finished, the architect can part it and society accepts it. This concept is the concept of ***Self-evidenceness.***


y
domains
x
order
z
position of the designer
levels
form
function orders and domains
process planes


0. ARCHITECTURE
natural—artificial
1. CULTURE
historical—ecological
2. PROFESSION
solistic—participatory
3. SCIENCE
traditional—innovative
4. ART
impression—expression
FUNCTION
5. FORM
fragmentation—coherence
6. PROCESS
static—dynamic
SPACE/ MATERIAL
7. SOCIETY
individual—collective
8. ECONOMY
investment—exploitation
9. UTILITY
monofunctional—multifunctional
10. CONSTRUCTION
passive—active
11. TECHNOLOGY
factory—building site

SOME THOUGHTS ABOUT MODELLING THE FIELD OF ARCHITECTURAL MANAGEMENT

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ABSTRACT
In this paper it is tried to define the field of architectural management. The aim of the research is to define inputs and outputs, relationships to and overlap with other fields and area's of specialisation within the field. Besides that we are seeking for a model which makes it possible to classify existing methods en techniques used in an architectural management context. After defining management in general and especially architectural management, we make a proposal for a global meta-model. The paper ends with an attempt to define a matrix which makes it possible to classify architectural management activities. The paper is based on ongoing research and is not pretending to be an end-product.

1. Introduction to Architectural Management

We define architectural -project- management as programming and control activities in all phases of the building process with the aim of reaching best -or wished- quality for a specific building object. Architectural management can be seen as a specific form of project management. In general projectmanagement can be divided in process management and product management (see figure 1).

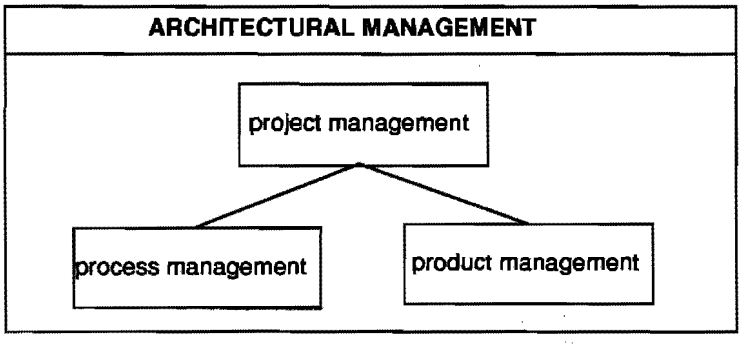

Figure 1: Architectural management

In this paper we will restrict the discussion to AM activities carried out in the context of the design process. Contextual knowledge for AM activities can be obtained from the field of architecture and design & planning methodolgy on one hand and form the project context and its expected, actual or future use on the other hand. We name these two contextual environments respectively the internal and the external environment of AM. These two environments determine the selection of some specific design strategies which together with AM activities will result in a actual project. The full context in which AM can be defined is drawn in figure 2.

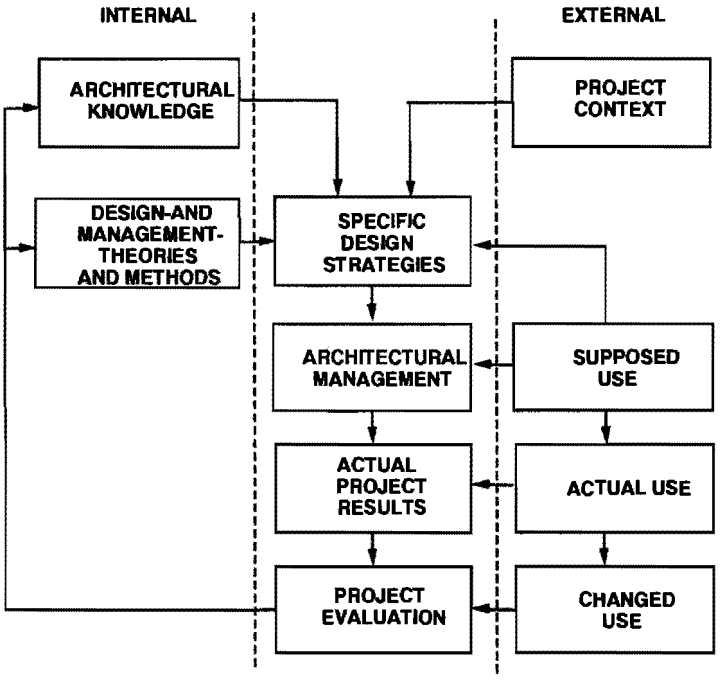

Figure 2: The contextual field of knowiede for Architectural Management.

2. Phases of the design process (Design and planning methodology)

There seems to be a broad general consensus about how to devide building -design- processes to several phases. Resembling, for instance the BNA PIM matrix (BNA, 1984) and the RIBA plan of work, almost the same phases are defined. We adapt a model of SBR and distinguish 8 phases form initiative to demolishing. These phases are: program phase, design phase, specification phase, realisation phase, maintenance phase and recycling phase.

Each of the phases of the design process is characterised by an input A (A is a building object, either conceptual in the design process or really in a physical state in the later phases) and an output A' which is the object A transformed according to the phase bounded actions. The characteristics of the transformations are typical for each distinghuished phase.
Because the transformation is part of a process required for obtaining a wished specific product, the way the object A is transformed is goal oriented and based on a specific program. This program specifies which activity has to be carried out to obtain a certain quality, and to which belonging constraints this activity is bounded.
Figure 3 shows such a phase of the design process in general.

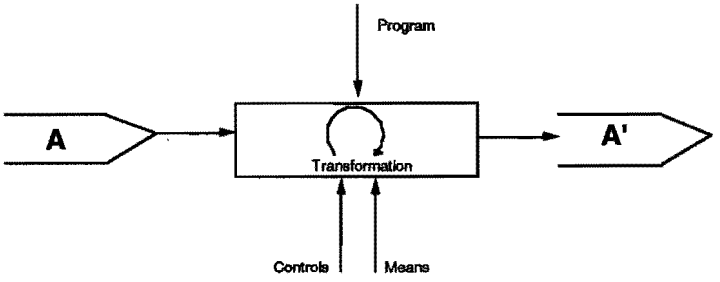

Figure 3: The transformations of a building object A due to a specific phase of the building process.

3. Managerial aspects (management theories)

In the field of management theory general consensus is reached about the main topics (aspects) of management activities. These topics are: money; time; (product) quality; organisation, information, means (see figure 4).

GENERAL MANAGEMENT ASPECTS
- Money
- Time
- (Product Quality)
- Organisation
- Information
- Available means

Figure 4: General management aspects.

As was stated before project management in general can be distinguished in product management and process management.

Product management is about the formulating of the program for the transformation of the building object from one state to another (A-->A'). Specific programming activities are: formulating program requirements and constraints on the basis of analysing (e.g. situation and client wishes and needs) and evaluating (the building object (A), which is result of the previous phase of the process. The field of productmanagement is summarised in figure 4. The general managerial aspects are positioned on the right of this figure. Each of these managerial aspects can be linked to one of the programming activities positioned on the left side.

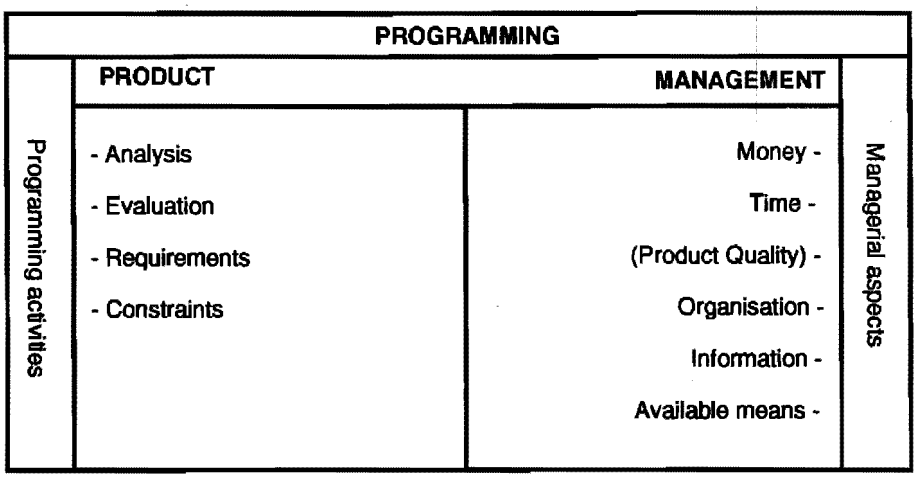

Figure 5: Architectural -product- management.

Process mangement is about how to control the transformation process. This means things as how to use the available means for the required transformation in an effective way, controlling the factors which have effect on, or are interacting with the transformation process etc. Typical process management activities are: steering, correcting, guiding, monitoring and organizing. In figure 6 the field of process management is summarised. The controlling activities positioned on the left side of the figure, again can be linked with the general managerial aspects which are positioned on the right.

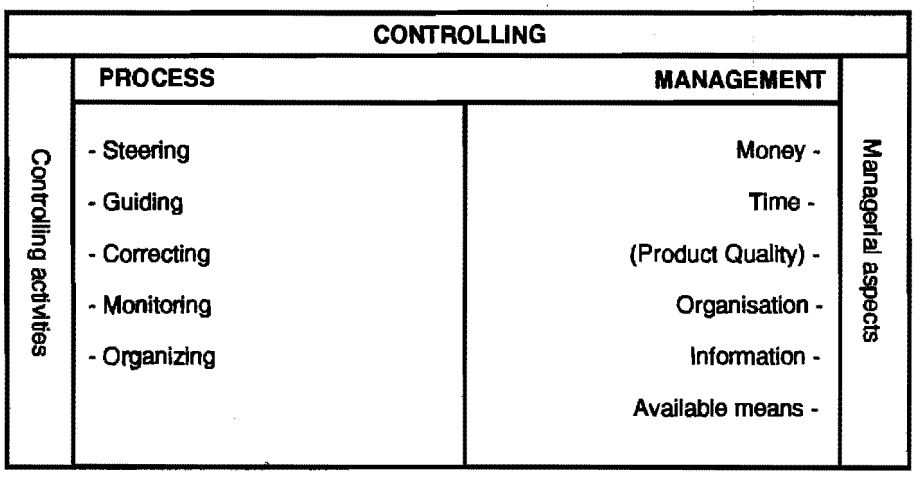

Figure 6: Architectural -process- management.

4. Architecture (architectural knowledge and project context)

Judging acitivities wether they belong to architectural management or not, is strongly depending on the way the field of architecture is defined.
To the authors there is only one systematic approach known for defining the field of architecture. This is the so called Architectural Taxonomy, based on domain theory and developped by Bax and Trum.
This theory forms the basis for the Article 3 of the European Directive on Architecture which enumerates the demands to be met by European education and training programmes in the field of architecture.
The architectural taxonomy theory is based on the idea of systematically ordered concepts. A concept is a special aspect-oriented image of the architectural design. The taxonomy is supposed to be complete and consistent. In total 6 so called hierarchically ordered scale concepts are distinguished. Each of the scale concepts can be worked out in more detailed so called basic concepts. The following concepts are distinguished, respectively from global to detailed: design concept; planning concept; spatial concept; mental concept; cultural concept and a architectural concept. How all the concepts are systematically ordered is shown in figure 7.

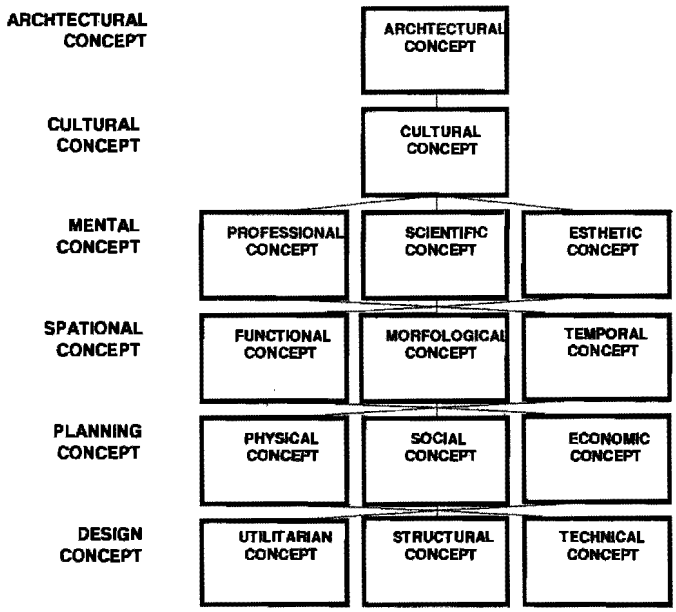

Figure 7: An architectural taxonomy according to Bax & Trum.

The architectural concept represents the building as a whole, as a living organism on a scale ranging from artificial to natural. The concept is a result of the integration of all the lower level concepts.
The cultural concept also is a result of the integration of the lower concepts and represents the building as a commonwealth on a scale ranging from historical to an ecological orientation. It deals especially with the environment of the building. The concept reflects an overall quality of a holistic nature.
The mental concept is about the orientations of experts as a result of the integration of a professional, a scientific and an artistic concept as three basic mental attitudes.
The spatial concept deals with the dimensions of space.

The morphological concept determines space in relation to the extension of the building within the context of his environment; the temporal concept determines space in relation to the period of time which the building has already existed or will exist; and the functional concept determines space for the performance of the building as formulated in norms.
The planning concept represents the building as a balanced integration of three distinctive orders, which for their parts will apear to be partial concepts in their own right. These concepts are the physical, the social and the economic concept, each representing a partial plan of the building.
The concept of design represents the building as a balanced coming together of the concepts which determines requirements of utility, durability and manufacturability.

With the taxonomy of building concepts we have a theory by which means it is possible to describe in general the properties of every architectonic project. The taxonomy also can be used to classify architectural knowledge.
Besides the taxonomy the context of the architectonic project has to be defined. This context determines the environmental constraints, like programme, budget, terms, parties involved, the use process etc.
On the moment the context is defined, a specific type of design strategy, -based on general design and planning theories methods and techniques, and on general management theories- can be chosen. In fact this design strategy is the subject for our architectural management activities.

5 Architectural Management.

As was stated in the first paragraph of this paper we define AM as mangement activities implemented in the transfomation process of a building object from one state into another. Using an IDEF 0 like scheme we now can summarise the place of AM activities in the design process as in the scheme of figure 8.

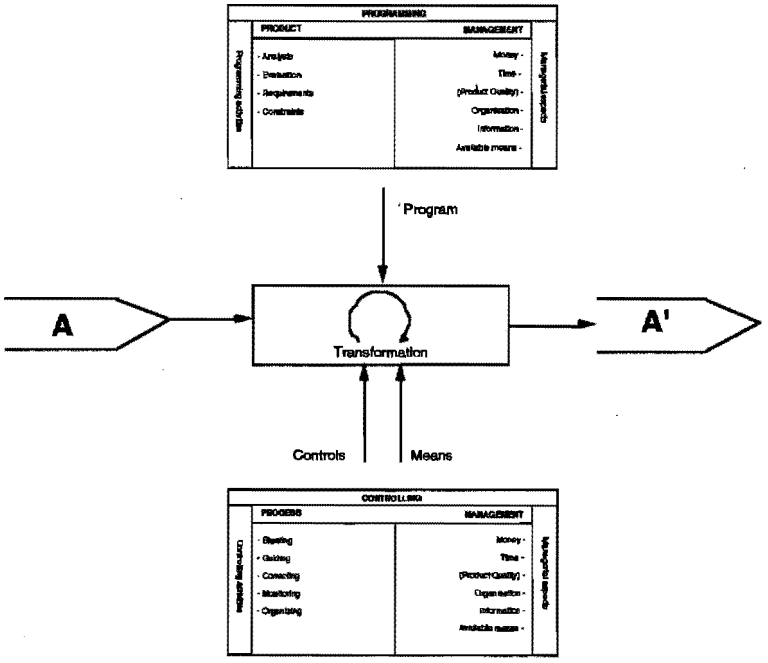

Figure 8: The field of architectural management.

6. Further research

Based on figure 8 one can imagine a matrix with on the one axis the process management and product management activities and on the other axis the process phases of the design process.
Figure 9 is a picture of such an empty matrix. On the axis from left to right each phase of the lifecycle of the building is displayed. On the axis from top to bottom the three views (product, process, management) are displayed. Each of them are defined in smaller aspects as is discussed above.

		program phase	design phase	specification phase	realisation phase	maintenance phase	recycling phase
product	- analysis - evaluation - requirements - constraints						
process	- steering - guiding - correcting - monitoring - organizing						
management	- money - time - quality - organization - information - means						

Figure 9: Architectural management matrix.

By analyzing cases all relevant AM activities can systematically ordered in this matrix. A conceptual inventory of the field of AM can than be made. An inventory of this kind has to be evaluated on his completeness and (cross cultural) valididty. We made a first attempt to position the subject 'clients brief' in the matrix. In each square only the relevant items are filled in. In figure 10 this filled in matrix is given.
Our further research will be concentrated in defining a workable matrix, so each item related to or in the field of architectural management can be quickly positioned.

subject: clients brief		program phase	design phase	specification phase	realisation phase	maintenance phase	recycling phase
product	- analysis - evaluation - requirements - constraints	- requirements - constraints	- requirements	- requirements	- requirements	- requirements	- requirements
process	- steering - guiding - correcting - monitoring - organizing	- steering - organizing	- steering - guiding - guarding	- steering - guiding - guarding	- correcting - guarding	- guarding	- guarding
management	- money - time - quality - organization - information - means	- money - time - quality - organization - information - means	- money - time - quality - organization - information - means	- money - time - quality - organization - information - means	- money - time - quality - organization - information - means	- money - time - quality - organization - information - means	- money - time - quality - organization - information - means

Figure 10 The clients brief in the architectural management matrix.

BAX'S CUBE: SOME REFLECTIONS

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Keywords
Management, architectural quality

Abstract
In the opening speech of the W96 workshop, (April 1993) Prof. Dr.T. Bax, (of Eindhoven) has evidenced two different arguments regarding building activities:
1. the following three elements of requirement: stability, makeability and utility,
2. the following reference points: form, function and process.
Such a definition of the problem, which is becoming the theme of our discussion, enables one to make brief considerations about the uniformity and differences between architectural management and management in other sectors of industrial production. These considerations have been suggested by the totally different needs which architecture must face and resolve respectively.
Moreover, this will permit us to think about the aim of our work focusing the trends and the innovations in studies on building quality.

The peculiarity of architecture viewed as an industrial product

To a visitor, sightseeing in many historical cities can be compared to a visit to a museum in which works of antiquity are exhibited. This aspect of building activity, that is, the presence of architectural works over lapses of time (which sometimes cover a millennium) - as some ancient cathedrals do - or at least a few centuries- is not present in any other productive field of endeavour.
In the building sector, we can notice the contemporary presence in action of works produced by ideas, men, processes and technologies, which are totally different from each other. This is due to the fact that architecture answers to a primordial necessity which has remained unchanged in its fundamental traits and could be summarized by this slogan: a house is a shelter, therefore it must be safe.

The question becomes even more complex when we consider the life expectancies of the buildings we design and build nowdays: 40 years for industrial buildings, 80 years for administrative buildings and 1
100 years or more for housing.
These data make us suppose that, within each life-cycle, the buildings will probably be used differently from what we cannot guess at the time of their construction.
This difficulty is never present in any industrial production, which always imposes the precondition that goods can only be used for their intended purpose.

A brief history of requirements

It is possible to recognize (see Fig.1) a continuum in the literary technical production on *ars aedificandi.*
The most ancient legislative text we know is the Hammuraby's Code. It was enacted by Hammuraby, the sixth king of the Babylonian dynasty, whose kingship lasted from 1792 to 1749 B.C. and the Code included the following injunctions:
" if a builder makes a house for someone and it turns out to be unstable; if the house he built collapses and causes death to owner of the same house, that builder will be executed"
" if a builder causes death to one of the children of the owner of the house, one of the builder's chidren will be put to death "
" if he causes death to a slave, he will have to give a slave of equal value to the owner of that house"
" if he damages some personal properties, he will have to refund everything back to the owner and, as the builder didn't make a stable house and it collapsed, he will have to rebuild it at his own expense"
As you have certainly noticed, that was a primitive legislation based on the law of retaliation. The Code never mentioned anything special about the necessary procedures to design the stability of a building, while it merely stated that the main requirement for buildings had to be stable; it also stated the consequent sanctions. Using modern terminology we could say that it was a sequence of prescribing laws - though very primitive ones - focused on the owner's demands and the work done.
In ancient Rome, the list of requirements seems to be more complex. Vitruvius is the author of *De Architectura.* This treatise in 10 volumes was written in 25 B.C., during the government of Caesar Augustus. In the first volume we can read that *architecture, to be rational, must build with regard to utility* (utilitas), *stability*

(firmitas) *and beauty* (venustas) (1) and, in the second book, we find various suggestions about the materials and the technical elements used in that period: bricks, tiles, pozzolana, masonry and building timber. You will note that they are mainly the same materials that we are still using today.

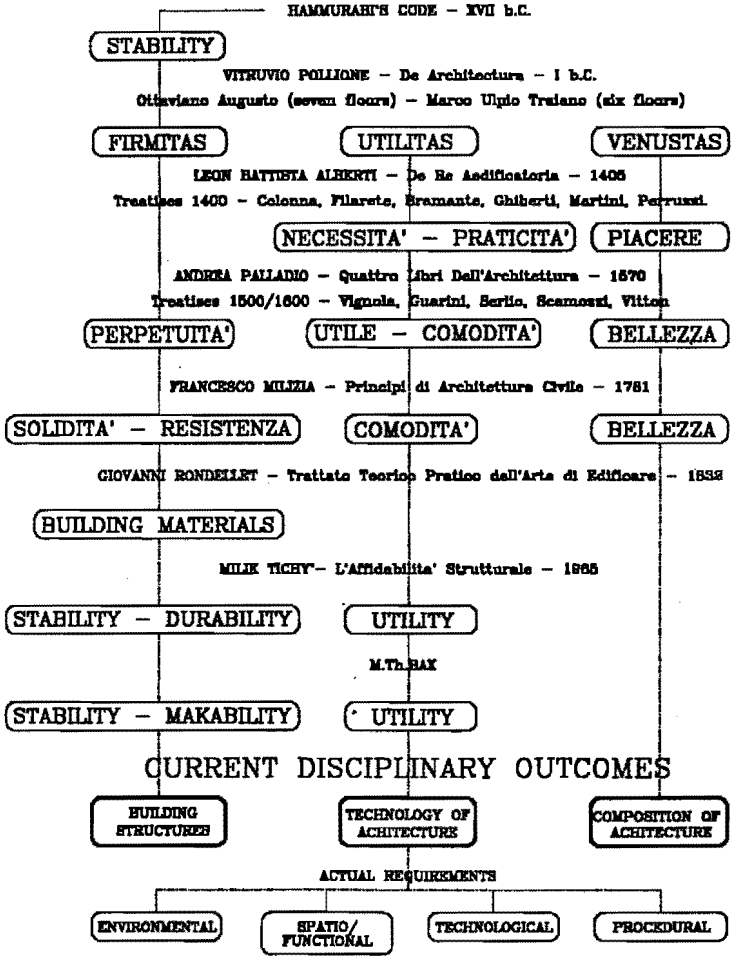

Fig. 1 - Requirements tree

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(1) Haec autem ita fieri debent ut habeatur ratio utilitatis, firmitatis, venustatis. (Vitruvius, *De Architectura*, I, III)

The Roman treatise can be considered to be a complete instruction manual for building activities, which not only stresses the requirements which architecture has to answer to, but it also states how to proceed with the works. The laws, therefore, indicate the means.
Let's come to our millennium. Leon Battista Alberti (1402-72) was a famous architect - see Rucellai Palace and the facade of S.Maria Novelia in Florence and the two churches of S.Sebastiano and S.Andrea in Mantua - he was also a well known literate and author of treatises. In his *De Re Aedificatoria* in ten volumes, he states the following requirements: necessity *(necessita),* usefulness *(praticita)* and pleasure *(piacere) (* 2)
It can be seen that Alberti does not mentioned the problems regarding stability, while he introduces a new quality: usefulness. We find the same outlines in several authors of treatises of that century such as Lorenzo Ghiberti (1378-1455), Antonio Averlino Filarete (1400-1464), Francesco Colonna (1433-1527),
Francesco di Giorgio Martini (1439-1502) and Donato Bramante (1444-1514).
Andrea Palladio (1508-1580) was both an author oftreatises and an architect - among his works is his Basilica in Vicenza, the Redentore Church in Venice and many Venetian villas. In his *Quattro Libri dell'Architettura* (Four Books on Architecture), in 1570, A.Palladio again presents the three Vitruvian requirements: utility *(utile - comodita),* perpetuity *(stabilita)* and beauty *(bellezza) (3).*
The same approach to the problem was given by some other authors of the 16th century such as Sebastiano Serlio (1475-1555), Giacomo Barozzi da Vignola (1507-1573), Vincenzo Scamozzi (1522-1616) and, in the following centuries, Guarino Guarini (1624-1683) and Bernardo Antonio Vittone (1705-1770).

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2 Huc omnis cura, omnis diligentia, omnis impensae ratio conferenda est: ut quae feceris, cum utilia et commoda sint, tum et praecipue sint ornatissima ac perinde gratissima, quoad qui spectent, nulla in re alibi tantum erogatum esse impensae malint quam istic (Leon Battista Alberti, *De Re Aedificatoria,* VI,II)
3 Tre cose in ciascuna fabbrica (come dice Vitruvio) devono considerarsi, senza le quali nessun edificio meritera essere lodato; e queste sono, l'utile, o comodita, la perpetuita, e la bellezza. (Andrea Palladio, I *Quattro Libri dell'Architettura,* I,i)

The problem of the architect and that of the engineer
Returning to the three Cartesian axes and the cube diagram - Bax's cube (see Fig.2), from which the title of this paper derives. As already stated, the Industrial Revolution split the design function into two specializations: the architect and the engineer. But this is not always true: we all know architects who are also excellent engineers and vice versa; but above all we believe that the best architectural works are even today - those which show the cohesion of all the specializations involved.

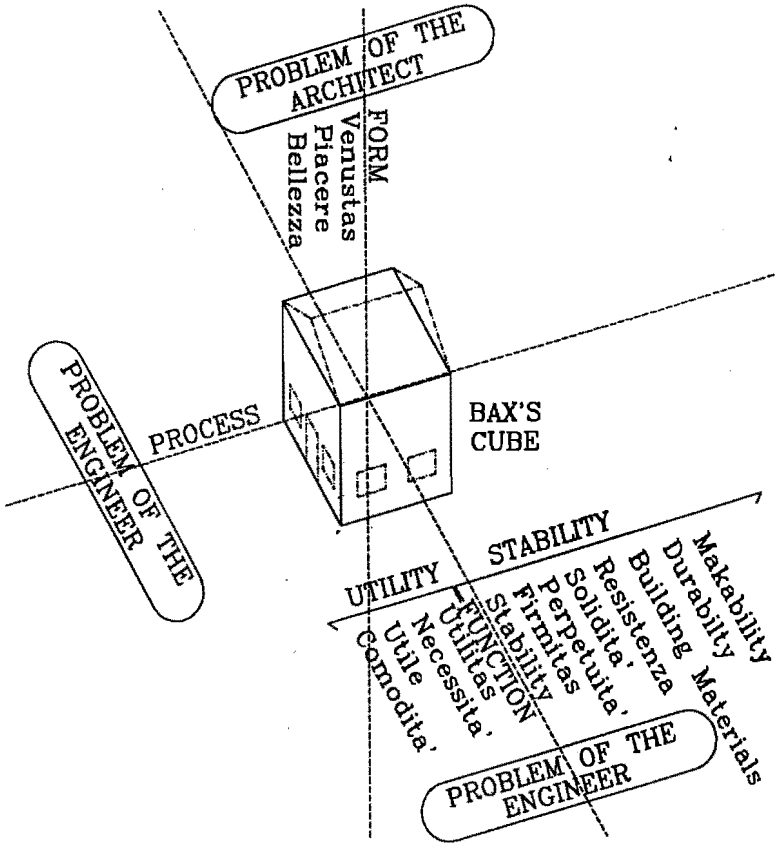

Fig.2 - Bax's cube

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4 Qulallmque fabbrica per essere compita deve sempre avere i tre requisiti seguenti: bellezza, comodita, solidita. (Francesco Milizia, *Principi di Architettura Civile*, Prefazione)

This time, the three axes evidenced in Figure 2 correspond to the four fundamental requirements. The Vitruvian ideals of utility *(utilitas)*, stability *(firmitas)* and beauty of form *(venustas)* have been enriched by the introduction of the problems involved in the building process and the related studies on the generalized cost and the life cycle cost.
If we add a saddle roof, a door and some windows to Bax's cube, the resulting picture will be very similar to a house, though of poor design. It can be seen, one has assigned the problem of form *(venustas, piacere, bellezza) to* the architect, while those of the building process, stability *(firmitas, perpetuita, solidita, resistenza, building materials, durability, makability)* and utility *(utilitas, necessita, utile, comodita)* to the engineer.

Final considerations

One should never forget that architecture faces a number of much more complex problems than any other industrial product and that at least two aspects of this question are not considered in the decisional mechanism in which they are generally involved. The first regards the fact that, considering the possible life-cycle of an architectural structure, we cannot guess how the consumer will actually use the building, except for a relatively short period of its existance.
A final consideration moves right from this point: the new attitude thus, should make us increase the number of studies on flexibility, similar to those already used for office buildings. Those studies should be applied to other ranges of usage, expecially housing. An erroneous estimation in this field could determine remarkable failures in management. Let us take as an example the heavy pre-fabrication after World War II: after less than fifty years - and this is a short span of life for housing - the only convenient solution is to demolish those buildings, rather then adapt or modify for modern use.
The second consideration is that the architectural problem does not differ from the engineer as they both consider the same question: architecture. Vitruvio stresses *utilitas, venustas* and *firmitas* while Bax emphasizes the ideal *of function, form* and *process:* but together they become the object of study for both the architect and the engineer.
We are all well aware of the fact that to leave aside the problems of form produces a significant reduction in the architectural and town-planning quality of large areas of our cities. Furthermore, when we consider that those buildings can last for years and years, then we would prefer that they had high mangement costs and a short life span.

PRESENTATION DDSS-CONFERENCE

A PATTERN DATABASE
- requirements for use
- conditions for production
a pragmatic approach

1. THE INFORMATION

In the architectural design process many decisions are taken in the beginning, when ideas are plenty and detailing is very little. These decisions can be based on talks, texts and drawings. They can come into existence by the imaginative capacity of a single person or by a process, taking into account the creative body of knowledge of many people involved in the coming to existence of that one design to be developed. In the latter case the design process can be structured by means of the ideas expressed and developed by Christopher Alexander in his books on patterns and the language that uses them. Patterns were clearly defined in his book "The Oregon experiment" as :

> ..any general planning principle, which states a clear problem that may occur repeatedly in the environment, states the range of contexts in which this problem will occur, and gives the general features required by all buildings or plans which solve this problem.

In "The timeless way of building" Alexander describes the fact that buildings are shaped, for many years, using pattern languages:

> Our pattern languages
> The people can shape buildings for themselves, and have done it for centuries, by using languages which I call pattern languages. A pattern language gives each person who uses it, the power to create an infinite variety of new and unique buildings, just as his ordinary language gives him the power to create an infinite variety of sentences.

An extensive example of a pattern language was given in "A pattern language". This book gives 253 patterns, divided in the levels towns, buildings and construction. It also describes the format of the patterns.

The works of Alexander inspired many architects to a different way of designing. A way in which time was given to a careful description of the starting points and goals of the design in general and in detail. For many reasons the designers, who apply the method, go beyond the use of the patterns formulated by Alexander. In many cases new patterns were and are made. These patterns are very often published in booklets and reports, connected to the design in question. In very rare cases the content of these publications is known to fellow designers. A lot of valuable information is not known, not

accessible and in fact lost for many people, who might be in need of the contained design ideas in the beginning of the design process. So the necessity of a database, containing patterns and accessible by anyone who feels an urge to help his own creativity by ideas, expressed and published by his colleagues in similar design problems, emerged. It was obvious that a university with all its possibilities as far as research time, available hardware and know-how in software is concerned, was asked to make such a database.

2. THE PRODUCT TO BE DEVELOPED

The product of this research has to be a database with the following characteristics:

- the content exists of as many patterns as can be collected from architects, students, research institutions and so on
- the patterns are available in full text, including the accompanying pictures and photo's
- the information in the database can be found by several keys, such as:
  - title of pattern
  - name of publication, in which patterns were published
  - name of author of publication
  - keywords related to the patterns
- the information is available in read-only version, but can be imported to be used in text editing programs
- the database is as user friendly as possible. It can be handled by a few keys of the keyboard and preferably by a mouse.
- the database is accessible for users inside and outside the university by means of networks
- the hardware needed to use the database has the same configuration as used by architects offices.

3. THE PRODUCTION

In session "Design Theory V" of last Wednesday Prof. Thijs Bax, Henk Trum and John Carp based their presentations on the so-called GOM-model. In my talk I shall do the same. For the definitions of the terms, for the overall presentations of this model I refer to the talks of the conference members just mentioned.
In the GOM-model three domains are mentioned[1], namely
1. USEABILITY
The artifact is analysed for its usefulness...The artifact is analysed for properties related to:
(a) qualifications as a means for a preconceived purpose (funtion): form; dimensions; anthropometric and ergonomic

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[1]International Journal of Continuing Engineering Education Vol. 2, no. 1, 1992, pp. 1-13
Henk M. G. Trum: Aspects of Quality in Continuing Engineering Education

adaptations; type of operation, performance; effect caused, including side effects and by-products; input/output of matter, energy and information; etc.

(b) adaptations between the artifact and its environment: to human physiological conditions and sense perception; environmental effect of use (matter, energy and information outputs, including waste); effects on health, etc.;

(c) the adaptation to (mental) faculties and activities:
- 'understanding'; identifiability, recognizability, comprehesibility;
- 'feeling': emotional effects; associations, meaning, symbolic/sign-function, styling, etc.;
- 'will': related to the need for control of the environment; acceptability, controllability, changeability, adaptability.

2. MANUFACTURABILITY

The artifact is analysed for properties related to its realization in terms of material, labour and tools:

(a) Matter, energy and information used for production; activities (labour) involved; experience/knowledege/disciplines applied; skills/crafts needed;

(b) Type of production process: hand-made, industrial production, legislation, regulation, decision-making, social action, negotiation, methods, techniques, procedures, program, etc.;

(c) Tools and/or machinery needed to manufacture;

(d) By-products/wastes generated during construction and demolition; environmental effects.

3. DURABILITY

The artifact is analysed for its stability through time:

(a) Properties related to firmness, solidity, reliability, maintainability, restorability, serviceability, etc.;

(b) Effects occuring when the artifact goes out of use: dissociation, storage, residue, pollution, re-use, recycling, etc.

It was more and more obvious that the development of a database can be regarded as a "normal" design problem, which means that it can be analyzed in the same way.

1. THE DOMAIN OF USEABILITY

THE USER

The user of the database to be developed is the same as the user of the patterns or the pattern language. This statement restricts the use of the database to a group of people, limited in number and technical means, but at the same time sharing the same way of thinking and working in a common field of action. The user can be described as a designer, an architect, who applies the method and its products in the preliminary phase of the design process. A student in ar-

chitecture can be considered to belong to the same category. The mere fact of applying it in reality, in the practice of the building process, or just in the imitation in a study context does not make any difference. The need of direct and adequate excess to relevant information might, for many reasons, be bigger in case of reality.

THE HARDWARE

The choice of the hardware is merely based on the field of application. As the final product is meant for architects and students in architecture, it is relevant to focus on the type of hardware that is used by them. The most common computer used by them is by far the PC. The most common types are Macintosh and IBM (and compatible). As the research was done on the latter type, the choice was decided upon this type, taking into consideration the big amount of IBM (compatible) PC's amongst the user group.
Because of the decreasing prizes of PC's over the last years the user can afford to buy a very good quality for a relative low prize. Good quality means at least an AT with a 286 or preferably a 386 processor, combined with a VGA colour monitor. Nothing revolutionary, as can be seen on many fairs and exhibitions, were lots of programs are presented for the same group of users by means of the same hardware configuration as mentioned here.

2. THE DOMAIN OF MANUFACTURABILITY

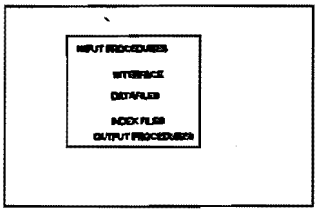
THE SOFTWARE

The choice of hardware leaves many options open for the choice of software. Therefore criteria have to be set to base the final choice on. Due to the product in mind, as is elaborated in the chapter 3, the software has to have the capacity to:
- manage and present a relative large amount of information
- present as well text as drawings
- present all information in read-only mode
- leave options for network use open
- make own applications, suited especially for the user.

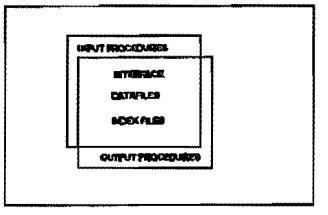
As the software is used by non-programmers (the database to be developed is made by architects, not by professional programmers) is it very vital that the software is supported by the computer centre of the University.
At the time this research project started, for IBM-compatible PC's no hypertext programs existed yet. This changed by the appearance of GUIDE, "*..the first hypertext system to be developed for personal computers, preceding Apple's Hypercard by two years*". Some investigation was done towards the use of this program. The conclusion was not to use it for further development of the database for the following reasons:
- the program did not give enough support for the management of the data
- linking all parts of related information with each other by means of "buttons" was quite time consuming and had to be done by hand.

- the possibilities to add own commands were too little.
These conclusions were based on version 1.0 of GUIDE, as used. The main reason not to switch to any hypertext program at all at this moment was however a more fundamental one: as can be noticed in our University Library many databases appear on many different subjects. These databases differ in several ways. The presentation can be with or without popup menu's, with or without colours and the searches can be done in some "own" language or in plain english. What they all have in common is the sequential presentation of information. This meant to the research team that the way followed until then definitely must lead to a good and useful product. Changing halfway to a complete different approach leads to the danger of not having a better product but having no product at all, by lack of time.

HOW THE PRODUCT CAME INTO EXISTENCE

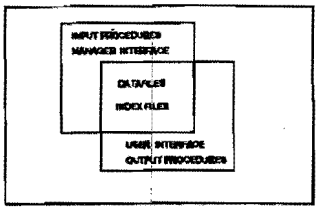


As mentioned before, the database was to be made by non-professionals. For some time this road was followed and a product came into existence that answered a lot of the requirements to be fulfilled. However, the design principles were not as sound as should be. Therefore cooperation with the computing centre of our University was asked. This meant quite an important step in the development of the database. Two principal decisions were taken. Decisions which proved to be vital steps in the way of thinking and the way of producing the database:



1. The total amount of information to be contained was distributed among a sound set of data files with all their necessary relations. On top of that a data file was developed which gathers, per search session, the information collected from the "original" files. This latter file is small, easy to handle and contains only information, requested by a specific user of the databank.
2. A clear distinction was made between to functions to be fulfilled, that is : making a database and using a database. This was elaborated further in the domain of maintainability. Making a database is an administrative job, done by a very limited group of people, who are very well aware of what they are doing. Professionals in the real sense of the word: it is their profession to do it. This means that the user friendly aspects of the program are less important than the accessibility of all possibilities.
Using a database is done by laymen, who do not want to be mislaid by to many options, who only who to find what they are looking for and preferably as quick as possible.
Splitting the database into these two functions meant too, that the databank could be made and filled, independent to a large extend from the way it should and even could look on the "out"side. It meant too, that the work could be done by two

persons simultaneously, one to fill the information files, one to develop the user interface.



THE USER INTERFACE
The user interface can be made in many ways. However it is done, it always has to fulfil the following demands:
- all possible options must be clearly presented
- the use of the keyboard must be as simple as possible
- the use of a mouse must be possible or at least not be excluded

As can be seen in many databank nowadays the popup menu is very popular. In fact it is a very good way of offering and presenting all possible actions at the same time. By means of the arrow a user chooses what he wants, by means of the <RETURN> key he activates the chosen option. The databank is therefore based on the same principle. On top of that the user has to use only one key more, the <ESCAPE> key, any time a choice is to be done of information presented on the screen. So he may chose an author, a keyword, a pattern, a publication. His choice leads to options (in popup menus) or additional information.

3. THE DOMAIN OF DURABILITY

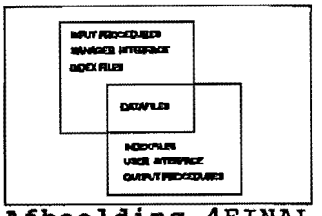
RECENT DEVELOPMENTS IN HARDWARE AND SOFTWARE

Information-technology is a high speed developing field. Any time a decision is taken or a piece of hardware is bought new developments put question marks in the mind of the research team members. In fact any step that is decided upon is not based on the latest innovation but on the lest old fashioned one. Quite frustrating. Examples of it are plenty available. Speed, processor type, disk capacity of hardware are changing in ever increasing rapidity. Software programmes appear in new, improved versions with decreasing intervals. Any update means an improvement in capacity, in possibilities and, mostly, in size. At the same time it means a considerable time lost in getting acquainted with all these new possibilities, which demand very often just a bit different approach or offer a complete change of the menu options.
Another phenomenon is added to this list of terrifying improvements: the change of ownership of huge software houses in order to become big on the market and to be able to set the trend in any field such as, in our case, datamanagement systems. Such changes raise questions about the staying into existence of programmes which, until then, were supposed to stay forever, in ever better versions. Even pagesize announcements in newspapers to assure software users, as Borland did after buying Ashton Tate, still leave some room for doubt, because "you never know".

THE DATAFILES AS A BASIS FOR NEW DEVELOPMENTS

As is mentioned before, the databank was split in an input

part and an output part. In fact the total can be split into three, relatively independent parts,
1. the information
2. program parts, to bring information in
3. program parts, to get information out.
1. The information
As the choice was done once to use DBase, the format of the information exists of .dbf files. The expectation is that any new development of Ashton Tate / Borland will leave this type of files untouched in essence. Therefore these files are considered as a "permanent" basis.



Afbeelding 4FINAL SETUP

2. The program to bring information in.
The choice of the Computer Centre, who developed this program, was based upon Clipper. This produced a good structured, useful program in a runtime version. It works good, reliable, fast. In case of minor changes support is given by the Computer Centre.
3. The program to get information out.
Maintenance of the program is to be done by members of the research team. There are several reason to that decision, such as independence from any other party, keeping touch with new developments in this field, having direct contact with users. It was this aspect of future maintenance that influenced the production of the databank to a large extend. Maintaining the program in the future made it necessary to produce it ourselves. Production could be done, by the fact that the input had become independent from the output. The decisive link between input and output became the .dbf files. On basis of that, taking into consideration the desired user interface, a program was made with DBase IV.

CHOICES OF THE RESEARCH TEAM

The production of a database as the one proposed by the members of the research team will never leave the phase of good intentions if no decisions are taken concerning the tools. As everything started to make important information accessible for designers, it is no use to stay considering possibilities without coming to conclusions. Therefore the database to be developed will be based on the following decisions, regarding:
1. the user
The user is a designer of an architectural artefact, who needs the information in the early design stage. His knowledge of computers is supposed to be absolutely none.
2. the hardware
The hardware configuration is a IBM (compatible) PC with at least a 80286 processor, 640 K memory and preferably a colour screen.
3. the software
The chosen software is DBase or a DBase application. These programmes are familiar to the user and supported by the computer centre of our university. The changes in ownership of these programmes in the near past justify the hope, that they

will stay into existence for several years, be it perhaps in new versions. It might also solve the problem of handling alpha-numerical and graphical information in the very near future.
4. the accessibility
The database will be accessible in 3 consecutive phases:
phase 1: the prototype on the PC of the research team can be used by architects by request
phase 2: users can buy the database on diskettes.
phase 3: the database is accessible by networks.

P. DINJENS
03-07-92

FLEXIBLE BUILDINGS FOR NEW FAMILIES.

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Keywords
Flexibility, Evolution of families, New lodging, Italian situation

Abstract

The population to whom the houses built with public financing are assigned undergoes the same changes as the society as a whole. In other words, we are assisting to an evolution in the composition of the families, a tendency which can be observed for almost all Italian areas. The traditional family, consisting in family head, father and mother and a more or less varying number of children has turned into groups of smaller "families", composed of the groups around the head, with a smaller number of children than in the past and the grand-parents living also in the house. We can also observe that the children have the tendency to remàin longer in the family consequently needing more space that garantees a certain autonomy. For the same reason also the older persons living in the household tend to stay with the children, altough they too pretend their proper degree of autonomy.
This means that the programming of private and public housing projects must in future take these changes into account. We have applied a corrective of that kind to the elaboration of a project for public house building, to be carried out with public financing. The data referring to the foresaid changes have entered into our project. A logic of this kind helps to render the housing units less obsolete and must be applied by means of a series of procedures tailored for the existing substance of buildings. This is possible, however only when the task is readaptation and restoration of housing units considered no longer utilizable according present day standards and because of their old age and the wear and tear of time, they have undergone.
Make a housing unit flexible means for istance that you have to find out which partitioning is structurally fundamental and cannot be removed and what spaces can be handled with a certain flexibility in the present and in the future.
The University Institute of Architecture of Venice is undertaking a research of this type. Its primary aim is to find out what kind of transformation is going on in the population of the housing units administered by the "Istituto Autonomo per le Case

Popolari" (Institute for Working-class Houses) of Venice. It also tries to ascertain what will be the future ones. By means of this kind of information you are able to programme the housing spaces for future habitants and ask from the planner more flexible spaces; all this makes it possible to requalify the operations of readaptation and restoration for the existing houses and to arrange the future ones correctly.

INTRODUCTION

Can it be correct to consider the family that will be settled in a new lodging as a non changing one, when operating in the field of planning new houses? Certainly not. The University Institute of Architecture of Venice has carried out a research programme whose aim was to develop an informative model about the users of public house building (ERP), which could offer the scientific base and prime motivations for designing flexible buildings. The research has been stimulated also by a specific work in designing about 100 lodgings at Mestre (Venice) mainland on behalf of the Istituto Autonomo per le Case Popolari (IACP).
The analysed sample refers to users settled into the new flats during a period of 11 years, from 1978 to 1988 by the foresaid authority, a period which was crucial in the realisation for the ten years housing programma. Beginning with the demand it laid the fondation for a quantitative increase of public house building and succeded in balancing the demand. There were in fact some desired results, at least from a general point of view: reduction of the housing demand keeping at the same time the families distribution unaltered, without taking into accont the microstructural changes of the latter.
The results suggest that more adequate thinking about the possibility of anticipating future evolutions of specific flats typologies is necessary. There are two main streams of thinking: one dealing mainly with the survey of the facts and their development, the other aiming at a better comprehension of future changes in flats. Both of them need deeper insights into what causes the change of the basic nucleus of house users, that is, of the family. It's changes set the landmarks for the planning stage. The changes, outlined by the data of the IACP of Venice, reveal extrinsic requirements, which have so far been provided for without affecting the traditional methods of planning. Here could lie the prime reason for formalizing flexible units for public house building.

STUDY CASE LIMITS

Any social research about the population settled in housing units needs a classifying identification of the tenant as a family. In public housing, we distinguish the users as groups, hold together by degrees of kindred. Thus the number of family components referred to the housing unit constitutes what we call a family.
Our classification makes use of the data collected by the IACP of the Venice Province in the years 1978 to 1988. They subdivide into six types of families classified as follows:
F2 - families of two components: usually referring to a head of family, that is couple of partners;

F3 - family of three components: consisting of a couple of partners with one child, underage, or adult, on an elderly cohabitating parent;
F4 - family of four components: consisting of the couple head of family with one or two children, underage or adult, and two or one elderly cohabitating parents;
F5 - family of five components: the couple head of family with one, two or three children, underage or adult, and one or two elderly parents cohabitating;
F6 - family of six components: the couple head of family and two, three, or four underage children or adult, together with one or two elderly parents;
F+6 - family of more than 6 components: the couple head of family and tree, four, five or more underage or adult children and one or two ederly parents cohabitating.
From the microstructural point of view this classification becomes necessary for laying down the possible variances in the family groups. Only thus it's possible to understand wether the applied space ambits are correct for the typology and the entity of the settled persons. A similar interest must given to movement around the head of family, which is due to an increase on a reduction of the number of persons. It can be interpreted as the basis for any social research since different aggregation usually means different requirements, producing diversified performances. This stage, which can be called a combinational one gathers all the possible aggregations around itself, yielding classes of analysis which can be referred to as the living contexts; thus it's easier to collect information regarding the changes for the period under examination.
In the period 1978 to 1988 there has been a constant linear increase for all families consisting of only the couple head of family. Then we found a sudden quantitative rise in 1984 regarding all groups, especially the two component ones; this was mainly due to the coming into effect of the 10 years' planning programme (law 457/78): this confirms a constant evolution in all families, reflecting the general tendency of the first period.
The variation of the 10,839 units to the 24,409 in 1988 shows a clear quantitative evolution, which had to be faced.
The data of the research reveal a social change of the population which entailed a change in the housing habits, if you compare it to former periods.
The socio-economic effects on the composition of families induce the couples to concentrate on their own life, avoiding quantitative growth, which could be negative for the economic situation of the single group. Another factor is ageing, being responsible for an autonomous collocation of the independant individual, or in straight contact with the children. We have seen that the single couples, most of them in advanced age, or at least not prolific, and the elderly people who have economic and emotional assistance from relatives are in continuos drastic increase. Another emblematic fact is the remaing in family of adult children, which is more evident in smaller families.
Families, with more components hawe a higher probability that the children will be looking for independance, trying to detach from the group. This phenomenon must be read within the social and economic context of the present. Socioligist attribute it to: to the difficulty to reach economic independence, to the increase of school years and to the real difficulty of finding lodgings at acceptable costs.
The growth of the elderly population is an established fact also on a national scale; it will probably stabilize in the future, but so far it creates a series of demands, which

have a considerable impact on public intervention; there are clear requirements which didn't exist before on which were met privately.

SPECIFICATION OF REQUIREMENTS

The demand coming from the group with elderly cohabitating people and children calls for new structures in public house building.
It must face the growing demand for new services. The surplus of users creates needs of independence also where a direct contact with the family enviroment is given. In other words, the cohabitating elderly and less elderly persons stimulate the demand for proper private ambits, where they can live alone. This fact stigmatizes the presence of more families within one environment; therefore the number of the listed families is less realistic than it seems, because the one group can be composed of more than one nuclei. Finally, we should not underestimate the fact that classic situations, that is one couple with head of the family and underage children are in a countertendency with the continuous and sometimes drastic reduction of this type of family.
The continuons increase of independent persons, or of those wishing to become so, e.g. adult children or certain elderly people, calls for flexible lodgings, which offer the possibility for subdividing the ambit, garanteeing a certain autonomy.
We must, however, underline, that the foregoing considerations are valid only if referred to the situations of our research and that a generalisation could be misleading. Any further application of our data to other geographical areas has probably to take into accaunt other factors, but we think that the basic lines, if adequtely adapted to other contexts can be useful to the designer.

PRACTICAL APPLICATION OF THE MODEL

As shown, before the demand seems characterized by the need for spaces flexibility. What does flexibility mean if one keeps in mind the videst possible difference beteween housing organism and lodging?
As housing organism, we understand, with Turchini, an agglomerate of spaces derived from a unitarian project capable of yielding a single manufactured element to be used by a group of families mainly for living. It consists of flats and the relative appurtenance, as service area and dwelling areas, as well as there for circulating.
As flat we understand the whole of designed spaces serving predominantly for housing and for one family. It is composed of common, individual and service ambits.
Therefore you must design spaces, which give an answer to the requirements of future users, keeping in mind the notion of quality. This strategy can be confirmed by a correct evaluation of the variable, "time factor", which influences all housing habitudes. The evolution due to the age of the users necessitates continuous modification and substitution, and perhaps also of the spaces to be used. But the adaptation of the manufactured spaces is undoubtedly more problematic, if it tries to cope with all the changing habits of the family.
An evolution of this kind can only find less than optimal answers, since its configuration cannot change without leading to traumatic operations; consequently, the larger unit will suffer of the same limits of performance. Yet some changes can be

coped with from the moment on, when the variation becomes manageable. In many cases an optimal answer could be the shifting of the families, but that turn out to be impossible in most cases, at this point what we need, is to operate with a dimensional "elasticity". Thus the concept of flexibility of the spaces seems to be the best one for meeting the changes going on among in a large number of users, bringing about a demand substitution / modification.
If you design flexible housing units you have a space concept, which is not rigidly predetermined but modifyable through a prestablished series of possible variants in order to avoid a future under, or overdimensioning. Keeping the outer cover unalterable it is, however, possible to plan a programmed or programmeable modification of the lodgings for the future. Any technical research must discuss the problem pointed out here. Where the technology allows spaces with horizontal flexibility they should observe the standard. Vertical flexibility seems to be more difficult since, intervention or more than one level means involving elements as for instance stairs; they contain physical constraints of elevated rigidity, resisting strongly to possible variations. Horizontal flexibility is definitely more easible: it can be done by internal partitioning creating an easy mobility; or it can be done by modifying temporarily the openings or the closures. These are programmeable already in the planning stage. Our data underline the need for medium and large sized flats with rooms of a certain degree of independence; they can be realized by creating independent accesseses and independent ambits, which allow the coexistence of a number of persons with a particular need for privacy. This is possible also where the single spaces are in direct contact with the common spaces of the main body. It simply means that we need flats which can be subdiveded into smaller housing units, but which don't lach the necessary services. Housing units with spacial and technological flexibility must be related if we want to give an answer to the trend emerging from the study. Similary smaller flats most have the possibility of beeing united with adiacent spaces, allowing a certain expansibility. This hypothesis underlines the necessity for certain flats to be reductible, when persons were out leaving new room for the neighbors. Yet this solution seems difficult because it depends mostly on the evolution of the single families, which cannot be always foreseen; therefore this solution is feasible only exceptionally.
The application of the method, we are discussing, has generated experimentations by which we tried lay down the lines of a planning which can offer tangible proposals for lined up houses.

THEORETIC AND FEASIBLE FLEXIBILITY

Wanting to come to terms with this problem we recurred to significant indications for our theme and to the bulletin number 2 CER (Public House Building Committee) which contains a classification of flexibility for each category. As a preliminary subdivision we use the terms housing unit and flat, as illustrated below.
The flexibility of the housing unit can be defined as its aptitude for:
1 - allowing the total or partial unification, vertically or horizontally with a number of continguons flats;
2 - transformation of a number of continguous housing equipments into different ones;

3 - modification of the use of housing equipments;
4 - substitution of flats with housing equipments and vice versa.
Analysis of the housing unit performance shows that the items 2, 3 and 4 are technically feasible, without burden some operations as long as you remain in the horizontal line. Item 1, total or partial unification of adiacent flats, turns out be feasible: you have to displace vertical internal partitionings with no load bearing function; very often it is sufficient to open doors. These operations must be formulated, however, in the initial planning, if you want to avoid later restructuring. Vertical modification is more difficult and traumatic, needing more onerous operations (like: modification of stairs and joisted floors). Consequently they are less feasible, although theoretically possible.
Flexibility operations are those which have a minimal impact on the hardware, both from technical and distributive points of view. They must offer a maximum of functional change and a software with a wide range of liberty for creating spaces without drawbacks for their use.
Flexibility of flats and their subdivision can be understood as the possibility to:
1 - allow internal transformation by changing the spatial units or their parts;
2 - allow internal transformation or fractioning;
3 - allow external transformation by means of particular or total unification of adjacent flats;
4 - allow substitution of flats with housing equipment and vice versa;
5 - allow flat ampliation by creating new spaces by a reduction of external spaces.
The discussion about the flat as primary nucleus gets more articulate, when it verges on the creation and the houses changing. Quality and flexibility are essential in house building.
In the light of the above hypotheses the transformation of spatial units on parts of them seems sufficiently feasible, also when the initial plan has changed if you apply flexibility or internal modification where you don't interfere with structural elements. Internal transformation by fractionning is less traumatic for the building hardware; the spaces organisation is less complicated as long as is planned from the beginning, or if acceptable thresholds of the current norms are given (e.g. dimension of rooms, windows etc.) or if a minimum functionality is given.
The third point, total or partial unification of contiguons lodgings is problematic in so for as it depends on the users evolution; here the dominant trend goes towards fractionning. The demand is usually for indipendent, very often, too big spaces. Another critical moment is when someone wants to get rid of contiguous spaces and when there is a need of expansion in the contiguous space. This is feasible only when a programmed distribution of the users exits, or when you accept the idea of permanent displacement, which seems however completely unfeasible.
Similarly the fourth point, substitution of flats by housing equipment and vice versa seems difficult because the manageing of the spaces - unless you accept high costs - remains difficult where you intervene on occupied spaces. But the technical and the economic side have a normal reasonable feasibility. On the other hand new problems come up when you think of buying spaces, destined to equipments wanting to transform them. Here you have problems with the different formal interpretations of unlike functions, interacting on the system hardware and ristring, of couse, to go over

the minimal threshold of the standards in force.
As to the fifth point - ampliation by creating new spaces by a reduction of external spaces - seems dequalifying, even when planned from the beginning. For us it seems reductive to consider housing units as work in progress, when we speak of expansion even where you have in mind unlimited expansion. This kind of planning can be useful for emergency cases but remains a specific case, set apart from the normal ones. Emergency should also be programmed, as well as the change and the diminishing of users. Probably a further demand change will come up but for the time being it seems logical to give an answer to the contiguous questions. The quality standard must not be overlooked; it must be garanteed by means of new qualifying programmes.
Basicly we consider feasible the items 1 and 2; we'll focalize on their planning aspects in the following.

WHAT DOES FLEXIBILITY MEAN

In present day house building flexibility is taking over the role of a very important requirement, especially after the housing demand changes, which focalizes on qualitative parameters. The trend towards total quality in industry enters also into house building, inspite of its chronic delay. Flexibility tends be present in the planning stage since considerable time ago and many operators are aware of its economic effect when you are modifying lodgings. This is due to the organic changes going on along with the constant acceleration of living, a reason why lodgings must change together with changes that are coming up.
Research in this field has been going on for a while very actively. Yet its amazing that you hardly get an adequate answer to the problem, in most studies available so far. The flexibility request and of independent spaces is undoubtedly a rather old hypothesis, although it hasn't yet been cleared completely. Correct planning for good perfomance cannot overlook fexibility, yet when we examin certain products, e.g. the ones built by the tender of the Liguria region, 100 flats in developmental building, we must state that here house building is understood as work in progress, which achieves flexibility mostly by adding new volumes at ever later stages. This remains, however just one part of the performance, even when planned from the beginning.
In the following part we try to illustrate our working hypotheses for reaching the feasibility of a flexible building.

A FLEXIBLE PROJECT

When you discuss suburbs requalifying, flexibilities means entering a field where some possibilities remain precluded from the beginning. This is the point where we are trying to intervene in public house building in an experimental way and in areas with certain spaces, prepared by demolition of decaying buildings. This case needs a series of instruments for improving the territory, but at the same time you find yourself in narrow constraints, which impede the future devolopment of the building body, unless demolishing of adjacent building is also allowed. This has little chance, also in future. This two hypotheses are left over: internal transformation by modification ambiental units or parts of them, internal trasformation by fractionning; external transformation

by means of total or partial unification of contiguous flats.
So, a flexible project seems feasible within a policy which works with the ambiental and technological models. The ambiental model must inconparate the needs of the users, so that it can offer flats, adequate for a homogeneous family as well as for one composed of a number of families. In the last case you must create common space for mone than one nucleus, or better, for one principal nucleus and for other cohabitating nuclei, such as adult children or elderly parents. This means that the flats must be adequate on one side for a reduction of the family components, on the other for future expansion. Consequently a technological model must be found, which can meet the ambiental needs by developing optimal structural parts, which have a minimal interference with the used spaces. Such a strategy could be to collocate the vertical and horizontal passages in an optimal position, so that they don't create impediment, and secondly, to collocate next to them the service rooms, then all the fixed structures and elements, which could hinder the constitution of a flexible product.
As already pointed out, the invariability of the outer cover shifts flexibility in to the interior. Thus we must need start with a basic "invariable" module, attributed to that building part which is situated between staircases, and which contains technological units and fixed components, that is, those parts which must be always present, no matter what will be shape of the module after having been completed by displaceable components.
In our case the basic invariable module consists of a framework, which can be completed so that you obtain a minimum of two adjacent flats of 95 m^2 and planned for 6 persons families on a maximum of two 2 flats, of 45 m^2 each, for two persons, plus 2 lodgings of 54 m^2. For better understanding read figure 1.

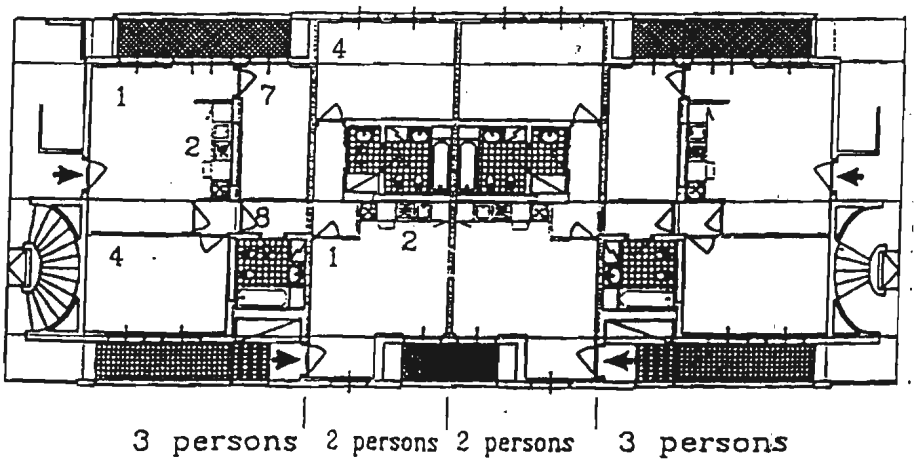

fig. 1 - invariable and fractionalizable module

Completing the invariable module you obtain different dimensions, which confirm flexibility as indicated, when we were looking for feasible conditions:
1 - constitution of an equipped wall for receiving the elements of the specific case on both sides;
2 - prevision of a series of "displaceable components": partition panels between one room and the other of the same flat; partition panels going in between two flats; displaceable panel provided with door and window frames;
3 - disposition of a double access so that one independent space remains set apart in the case of the big flat, which then becomes the main access for the second lodging in case you use a fractioned module.
We think not to be mislead in asserting that this planning strategy can represent an adequate answer to the independent spaces demand coming from families with a number of adult components. Here flexibility goes without saying.

SPECIFICATION OF THE EXPERIMENTAL PROJECT

The above stated connections between a project and a binding context, which imposes you to operate within a predetermined cover, priveleges technological values apt to quality and motivate experimentation.
The technical devices of the project are its outfitted walls.Two types of them are necessary: one must allow the application of the out fittings for one kitchen (gas, water, power, boiler chimney and vendilation flue); the other should make it possible to insert on one side the out fittings for a bathroom, or the other those for a kitchen.
The displaceable components are the partition panels, containing a door and one type of frames for door and window. They can also be of two types, with two different thicknesses: the fisst one, 20 cm is used for dividing two contiguous flats; the other one, 10 cm, dividing the rooms of one flat. The 30,cm wall serves as vertical extenal closure of the building; the 20 cm ones divide two contiguous lodgings, they also surround bathrooms, the 10 cm wall functions as inner partition. Another point for maximalizing flexibility is offered by the possibility to insert special outfilling for heating into the floor; thus you eliminate the obstacles of other heating types.
The same logic postulates a lowering of the ceilings from 2.70 to 2.40 m in rooms, where the standards allow it, so you can abtain the possibility to installate an automatic air exchanger inside of them.
Planning strategies and varions technological procedures make flexibility possible, especially if they help to neutralize restraints. The present research derives from a housing project, obviously, without remaining confined in it. Its methodology can be understood as an obvious way of proceeding. It can be adapted and expanded to other forms of house building, it meets the very criterion of flexibility, which has a major weight also in other fields, as in the tertiary sector or in the case of other building types.

CONCLUSION

The designer cannot but be constantly aware of the evolution of the demand on the

users side, with all its changing. He must find an answer to the requests for new performances by developing theories which interpret the produce not only with the criterion of efficiency. Their limits lie in the present technology; it conditions feasibility, which must be conceived with a constant eye on the aims; in other words the present technology cannot be overlooked. If you balance what you wold do with what is possible at the present state of the art, it possible to reduce the limits set by technology. The hundred lodgings to be built at Mestre (Venice) on behalf of the IACP must be seen as an experimentation, which applies the theory of flexible planning, keeping a constant eye on the evolution of the future users. The basic formula for definig the quantitative incidence of users and their probable evolution has made use of the data of the IACP, which refer to the period of 1978 to 1988, after having analysed the trend of changes in the demand. Another important contribution came from the check up of the state of buildings technology. We look the point of view of the current debate for recovering and of suburbs requalifying by offering a formal answer to the place of intervention.
We consider flexibility a valid answer, however partial, to the problem of the evolution in house building, especially to the ambient performance under the aspect of new life ways. The model we experimented - however straightly connected to the housing context - can undoubtedly be extended to other sectors, because of its reduced ambient impact of the technological elements, leaving big liberty for horizontal moving. The technology used in fact can become a common one, also for other functions, without alterating the efficiency. This logic finds application also in other geographic areas.

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INNOVATIVE ARCHITECTURAL MANAGEMENT - A CASE STUDY OF A LIVE PROJECT IN INDIAN CONTEXT

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Abstract
Central Building Research Institute (CBRI), India evolved innovative architectural management to handle with the designs and detailing of more than 100 projects spread over the length and breadth of the country simultaneously. The project is discussed in the paper in its totality with special focus on architectural mamagement.

Introduction

The Govt. of India has decided to establish one residential school complex known as Navodaya Vidyalaya in each district of the country with the objective of providing good quality modern education with Indian values to talented children particularly from the rural areas. Under the auspices of Ministry of Human Resource Development (MHRD), Govt. of India, an autonomous body known as Navodaya Vidyalaya Samiti has been set up to plan, establish and maintain Navodaya Vidyalayas. In first phase, 256 Navodaya Vidyalayas are being established in various parts of the country (Fig.1). These schools will have facilities for education through common medium of instructions i.e. Hindi and English, all over the country. The boundary conditions of a typical Navodaya Vidyalaya Complex include one school building for 560 students for classes from VI to XII (2 sections of 40 students in each class), Dormitories, Dining and Kitchen facilities, Teachers' houses, Infrastructure facilities - Roads, Water Supply, Sanitation, Electrification etc.

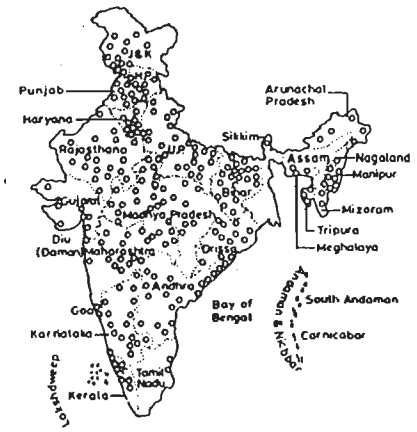

Fig.1. Location of Navodaya Vidyalaya Complexes

The total built-up area of each Navodaya Vidyalaya Complex is of the order of 12,000 m^2 in a land of about 8 to 12 hectares. Each complex would cost about Rs.2.5 to 3.0 crores and the envisaged cost for the entire project is expected to be more than Rupees five thousand million (160 million US dollars). The Central Building Research Institute (CBRI), ROORKEE, has been appointed as Nodal Agency, chiefly for planning and designing of the complexes.

Programme Identification

CBRI is engaged in conducting R&D on educational buildings for the last two decades. The R&D launched by CBRI in the area of Educational Buildings embraced multifaceted aspects like space standards, planning, design, exploitation of local materials and traditional skills, functional requirements, cost reduction, environmental preservation and speed of construction. It has culminated into packages of technologies suited to different geo-climatic conditions of our country. These take cognizance of optimisation of spaces, building efficiency, furniture and equipment, construction systems, experimental and large scale construction of school buildings.

In view of the R&D work on school buildings, CBRI was invited by Ministry of Human Resource Development, Govt. of India, to be a member of the Committee on Architecture for drafting the report on Architecture for Model Schools (known as Navodaya Vidyalayas) and was later identified as the Nodal Agency for providing complete S&T back-up including design packages for construction of Navodaya Vidyalaya Complexes throughout the country.

CBRI's Role

CBRI, as a Nodal Agency for planning & designing of school complexes, is expected to provide complete S&T back-up to the entire building programme. CBRI's activities for a typical school complex include : Survey of school sites; Formulation of space standards for different outdoor and indoor activities; Architectural designs of individual buildings and preparation of master plans; Computer software for design options; Soil investigation and foundation design; Structural analysis and design; Use of local building materials and innovative construction techniques for different regions; Demonstration of new construction techniques; Selection of specifications; Bill of quantities and cost estimates; Identification of construction and supervisory agencies; Guidance for quality control and overall planning of the project.

Project Management

The initial planning was done to assess the total quantum of work involved, manpower deployment, infrastructure facilities and the time targets to be met. To plan, design and coordinate the project, a NV Task Force was created at the initiative of the Director-General,

Council of Scientific & Industrial Research, INDIA (Fig.2) which is now fully operational, with the assistance of its 6 Extension Centres located at Delhi, Calcutta, Hyderabad, Ahmedabad, Bhopal & Trivandrum.

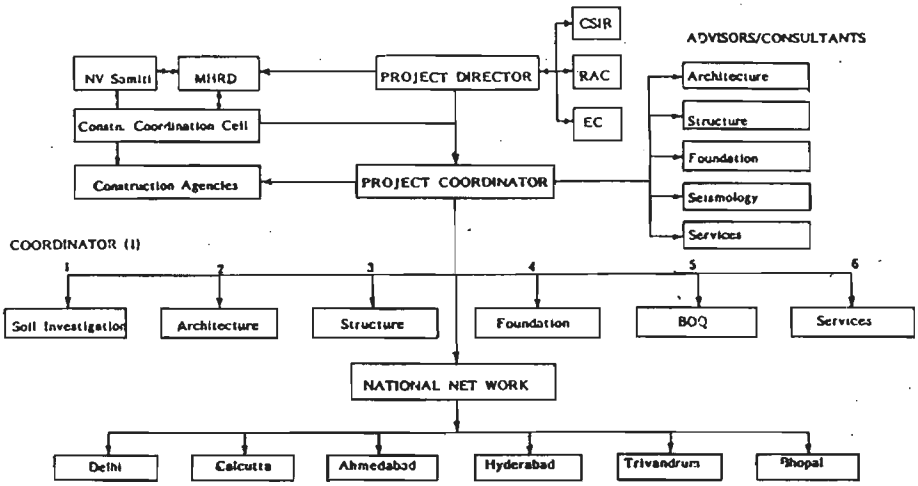

Fig.2. Navodaya Vidyalaya Task Force - CBRI

Development of Construction Techniques

Considerable R&D work has also been done at CBRI in the past three decades to develop economical, efficient and faster construction techniques. The thrust has been to develop new techniques as well as to rationalise the traditional construction practices. Foundations, walls, floors and roofs are the major elements in a building and they account for about two third the overall cost of buildings. Hence, emphasis has been laid on R&D work on these items.

Foundations

One of the areas where FCBRI has made a breakthrough is in the case of foundations in expansive soils. Cracking of walls and floors constructed with strip foundations in black cotton soil areas is a common problem. R&D work done at the Institute has resulted in the development of underreamed pile, which is the most economical and efficient solution for foundation problems in expansive soils.

Numerous structures of various types have been founded on these piles because of its simplicity, speed and economy. Although originally conceived for black cotton soils, their use has now been extended to other problematic soils also. Further work on piles has resulted in development of bored compaction piles, which are particularly suitable in loose to medium dense, sandy and silty strata. These are cast-in-situ concrete piles which combine the advantages of both bored and driven piles.

Work on traditional foundation has resulted in its rationalisation with single course high steps in brick/block work located at bottom

of the foundation leading to considerable saving in the quantum of brick work/block work and the cost of foundation.

Walls

Studies have been conducted to determine the load carrying capacity of walls, considering various parameters i.e. strength of bricks, type of mortar, eccentricity of load, slenderness ratio etc. Based on the studies, it is now possible to design the walls on scientific basis and the recommendations have led to the formulation of an Indian Standard.

Search for a substitute for massive random rubble masonry walls has led to the development of precast stone/concrete block masonry. The technique has become very popular in areas, where stones are available in abundance.

Research work on composite action of reinforced concrete beams with masonry above has led to the use of thin precast RC lintels in masonry work. This technique has been adopted all over the country by various construction departments in place of conventionally designed lintels.

Flooring/Roofing

Another major achievement of the Institute has been development of partially precast flooring/roofing schemes. Criteria considered in the development of the flooring/roofing techniques are :

- Suitability for mass construction of houses and other buildings.
- Structurally efficient precast components and possibility to reduce the consumption of scarce materials like cement and steel and the overall cost of construction.
- Precast components to achieve faster construction.
- Manual production of components.
- Handy components with least possible weight to erect manually or with light equipment.
- Labour intensive techniques.
- Minimum use of shuttering.

In the area of building services, experimental work has been done on an eight storey mock-up with two service units located on each floor. The studies have led to development of single stack system of plumbing suited to Indian conditions. It is being used all over the country by various construction departments.

Classification of Designs

Architectural designs were prepared for plains of the Northern region of the country where good quality bricks are available (B7.5S), for

areas where stone is available in plenty and brick is costly (RR and CB), for the peninsular India where laterite stone is in plenty (LB). Type design B3.5D is applicable to 65 cities, B3.5S to 12 sites; RR to 2 sites; CB to 35 sites and LB to 5 sites. Similarly design packages have been developed for High Seismic Areas (EQP), Coastal Areas (C) and Hilly Areas (H). In addition location specific designs have also been prepared (Fig.3).

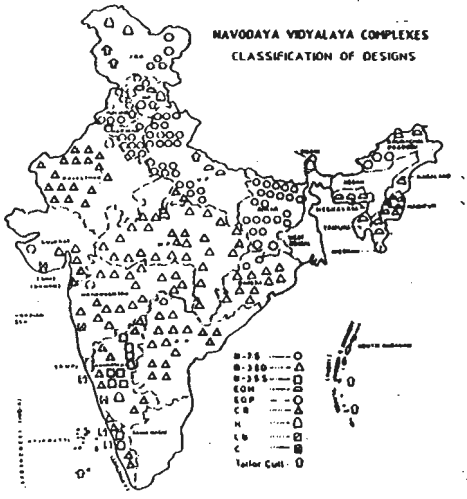

Fig.3. Classification of Designs

Technology Application

Proven techniques developed at the Institute have been incorporated in the design of Navodaya Vidyalaya Complexes for various regions of the country depending upon the availability of materials, skills, cost and suitability to the region.

Designed brick Masonry

Walls account for about 15 per cent of the total cost of a building. The concept of designed brick masonry developed at the Institute has been utilised in the design of load bearing walls for the buildings to achieve optimal use of materials.

Precast Stone/Concrete Block Masonry

Precast stone block masonry is being used for the construction of walls of buildings of Navodaya Vidyalaya Complexes at some of the sites in Rajasthan, Andhra Pradesh, Maharashtra & Karnataka as stones are available in abundance at these areas. The traditional practice in these areas is to have random rubble masonry walls 38 to 45 cm thick. Precast stone block masonry is an economical alternative to random rubble (RR) masonry. The blocks are produced with cement concrete mix 1:5:8 (1 cement : 5 sand : 8 graded coarse aggregate of size 10 mm and down) and stone spalls 5 to 25 cm size. The nominal length and height of the blocks are 30 cm and 15 cm respectively while the width is kept as20, 15 or 10 cm. These blocks have an average

crushing strength of 70 kg/cm^2. The technique is labour intensive and does not require high capital investment. With exposed stone texture, it gives aesthetically pleasing appearance to the walls. Compared to 30 cm thick RR masonry wall, this technique results in 26 per cent saving in cement consumption. It also results in about 20 per cent saving in cost of walls.

The concrete blocks are cast (Fig.4) with lean concrete mix having large size stone aggregates. One part of cement, 8 parts of coarse sand and 10 parts of coarse aggregate, 40 to 50 mm size, are used for casting of the blocks.[2] The blocks have an average compressive strength of about 80 kg/cm^2. With these blocks, buildings upto 3 storey in height could be constructed with 20 cm thick walls. The technique is being used for the construction of a number of school complexes in Uttar Pradesh, Andhra Pradesh and Rajasthan and is expected to result in a saving of about 20 per cent in the cost of walls.

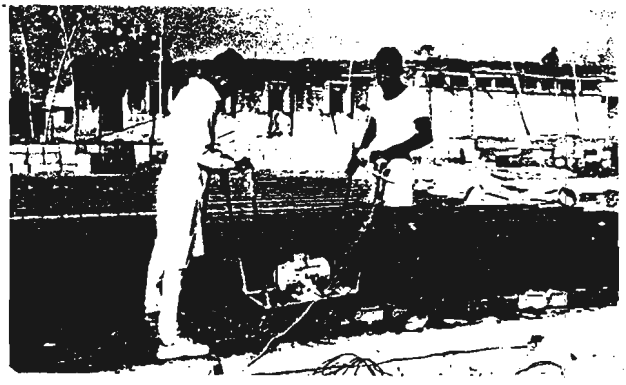

Fig.4. Casting of concrete blocks
NV Complex, Jhansi (U.P.)

RC Ribbed Slabs for Floors and Roofs

Floors and roofs account for about 25 per cent of the cost of a residential building in India. A number of flooring/roofing schemes developed at the Institute have been incorporated in the design of N.V. Complexes. RC Ribbed Slab[2] is one such scheme. It consists of precast/cast-in-situ RC ribs 11 x 20 cm size provided at a spacing of 120 cm c/c with 7.5 cm thick flange. Compared to conventional RC slabs, use of ribbed slabs will result in a saving of 13 per cent in case of school building. RC ribbed slabs are being used in construction in more than 70 NV Complexes all over the country (Fig.5).

RC Plank Flooring/Roofing Scheme

It consists of precast RC planks 40 cm wide, 3 to 6 cm thick and upto 143 cm long supported on partially precast RC joists 15 x 15 cm spaced upto 1.5 m c/c (Fig.6). Compared to insitu RC slabs, there is a saving of 14 per cent in steel, 27 per cent in concrete and 20 per cent in overall cost. As the components can be precast and kept ready, the construction time of floor/roof is reduced by about 25 per cent.[3] RC Plank Scheme has been incorporated in the design of NV Complexes in Kerala, Karnataka etc.

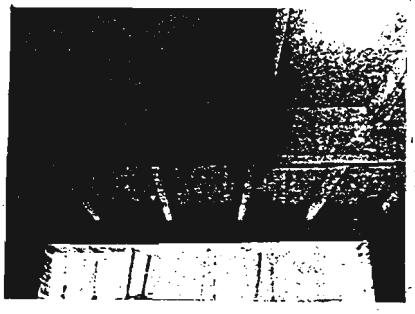

Fig.5. RCC Ribbed Slab Under Construction - N.V. Complex, Sultanpur (UP)

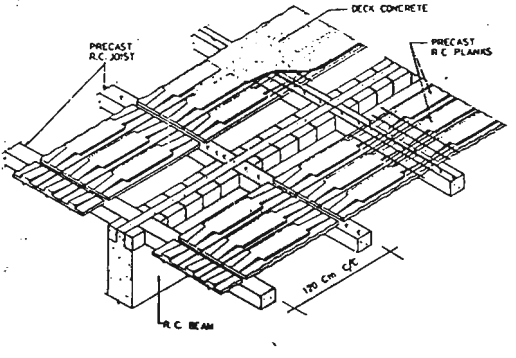

Fig.6. Precast Plank Roofing Scheme

Channel Unit Flooring/Roofing Scheme

Precast RC channel unit[4] is a reinforced concrete element trough shaped in section. The units are 30 cm wide, 12 cm deep with a flange/web thickness of 3/3.5 cm and upto 3.6 m long. 4 cm thick deck concrete is provided over the units. Channel unit flooring/roofing scheme has all the advantages of precast construction. Compared to conventional construction with in-situ RC slabs, it results in saving of steel and concrete, elimination of shuttering and about 10 per cent economy. Roofing with channel units (Fig.7) is proposed for NV Complexes in the states of Kerala, Karnataka etc.

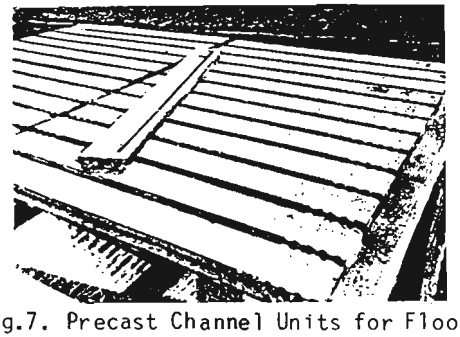

Fig.7. Precast Channel Units for Floors

Pile Foundation

Cost effective and well proven foundation technologies of the Institute, i.e. Underreamed and Bored Compaction Piles (Fig.8), have been adopted for Navodaya Vidyalayas coming up in difficult sub-soil conditions. Underreamed piles are bored cast-in-situ concrete piles[6,7] having one or more bulbs. The provision of bulbs is an important advantage in underreamed piles for achieving substantial bearing or anchorage. These piles are suited to expansive soils which are often subjected to considerable ground movements due to seasonal moisture variations and also as filled up grounds and loose or soft strata. Bored compaction piles are an improved version of normal underreamed piles in which boring and underreaming operations are the same as

for normal underreamed piles but the reinforcement cage is driven into the freshly laid concrete, achieving the compaction of the surrounding soil as well as of the concrete simultaneously. These piles are suitable in loose to medium dense sandy and silty strata particularly with high water table. Both these types of pile foundations are 20 to 40 per cent economical over conventional foundations.

Fig.8. Underreamed Pile

Based on the sub-soil conditions and superstructure designs, various alternatives using underreamed and bored compaction pile foundations have been prepared. Normal underreamed pile foundations have been provided for expansive soil strata, soft or loose soil strata with low water table and soft clayey strata with high water table. For loose silty and sandy soils with high water table, bored compaction underreamed piles have been used.

Apron

The apron treatment suggested by the Institute for buildings on shallow foundations in expansive soils, has also been adopted at a few sites where expansive soil is available only at top layers and provision of pile foundation was not feasible.

Single Stack System of Plumbing

The conventional method of building drainage recommended in municipal bye-laws involves use of two separate pipes, i.e. the soil pipe taking discharge from water closet and urinals & waste pipe taking discharge from baths, sinks and wash basins. In addition, ventilation pipes are fitted with both the stacks. A recent development in this area is single stack system[5] wherein all the appliances are connected to one pipe which itself acts as the ventilation pipe also (Fig.9). The experiment carried out at the Institute has shown that a 100 mm diameter stack with two units at each floor level can safely be used upto 5 storeyed buildings and the recommendations have been incorporated in the Indian Standards and National Building Code of India. Adoption of the system results in saving of materials and labour. An overall saving of 40 per cent is achieved in piping cost compared to conventional system with 4 pipes. Single stack system of plumbing is being adopted in the construction of Navodaya Vidyalayas throughout the country.

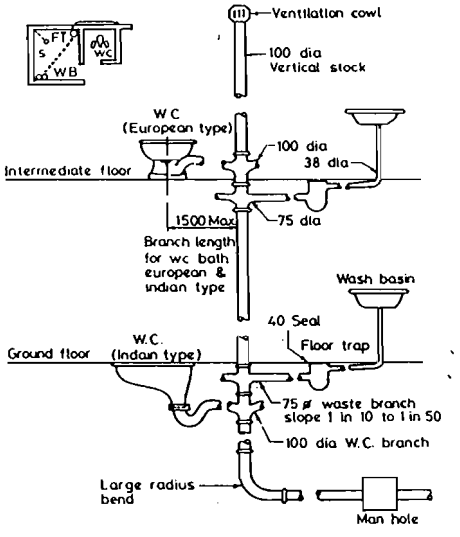

Fig.9. Single Stack System of Plumbing

Exploitation of Local Materials

In the design of N.V. Complexes, as far as possible, use of locally available building materials has been considered. Exploitation of the local materials will reduce the demand on manufactured materials, their long distance transport from factories to the site and the cost of construction. Use of local materials will also increase employment opportunities to the local people. Some of the local materials used in the construction of NV Complexes are briefly mentioned below:

Random Rubble Masonry for Walls/Foundations

In areas where building stones are abundantly available and RR masonry is competitive in cost it has been used for the construction of walls. A number of school complexes are under construction in Rajasthan, Andhra Pradesh etc. with RR masonry for walls. RR masonry has been adopted for construction of foundation of a large number of schools in Kerala, Karnataka, Andhra Pradesh, Rajasthan, Uttar Pradesh, etc.

Laterite Blocks for Walls

In the peninsular India extending from Konkan to Malabar on the western coast and in Pondicherry and other areas on the east, there are large deposits of laterite. For schools coming up in these areas, laterite stones are being used. The walls have been designed to suit the strength and size of laterite blocks.

Coursed Masonry with Lime Stone

In some parts of Gujarat, lime stones locally known as Bela stones are existing in plenty. These stones can be cut easily into cubical

blocks. Coursed rubble masonry with these stones is being used in the NV Complexes at Porbander in District Junagarh and Bucharwal in Diu.

Stone Slabs for Flooring
In areas where stone slabs are readily available, they have been used for floor finish. Marble tiles are being used in some complexes in Rajasthan and Cudappah slabs in Andhra Pradesh.

Burnt Clay Tiles for Flooring/Terracing
Where such tiles are being produced and the concrete flooring is comparatively costlier, terracing and flooring except in the laboratories, workshops and dining halls are being done with burnt clay tiles.

Lime ALPM for Masonry Mortar/Plastering
Lime and Activated Lime Mixture, wherever available, have been recommended for plain/composite mortar for masonry work and plastering.

Cinder/Flyash for Filling in Toilets
As these waste products are light in weight, they are ideal for filling the area around water closets, floor traps etc. in toilets and bath rooms.

Specifications and Cost Economics

Emphasis has been laid on judicious selection of specifications taking into account the cost implication both in initial and long run expenditure. Application of Life Cycle Cost Analysis technique, a concept of value engineering that takes into account all the recurring costs over the entire productive life of a building at planning stage rather than only the initial cost of construction, has proved to be a useful tool in selection of specifications to effect economy in the long run. Such analyses have been done when more than one alternatives are available for a particular element or component. To quote an example, life cycle cost analysis of mud thatch roofing, and A.C. sheet roofing indicated that the thatch roof, though initially cheaper by about 30 per cent compared to AC sheet roofing, comes out to be costlier by 35 per cent in a life span of 60 years. While choosing the specifications, special attention was given to conserve scarce building materials. For example, light gauge cold rolled sheet doors and windows have been specified and designed to minimise the consumption of timber to preserve ecology. However only country wood and secondary species of timber have been specified, for coastal and hilly areas.

Efforts have been made to curtail the cost of construction through cost planning techniques by working out the cost of various components. The elemental cost analysis of various buildings has been done to study and evaluate the elements which overweigh in cost. The elemental cost analysis of school building and residences in the complex is graphically represented in Fig.10.

Another important step taken is to prepare practically all the construction details much before calling the tenders in order to avoid time and cost over runs and minimise the extent of variations which

always tend to increase the completion cost and also create contractual problems.

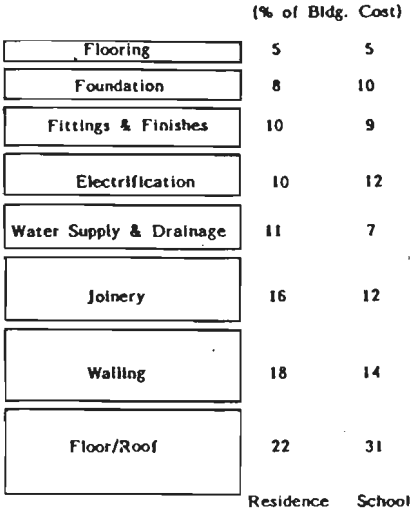

Fig.10. Elemental Cost Analysis

The optimum use of resource allocated to the development work encompassing water supply, sewerage, roads, electrification, horticulture has been made by phasing out the total development of complex of 8-10 hectares. The relationship of development cost and building cost of different phases is shown in Figure 11 which is self explanatory.

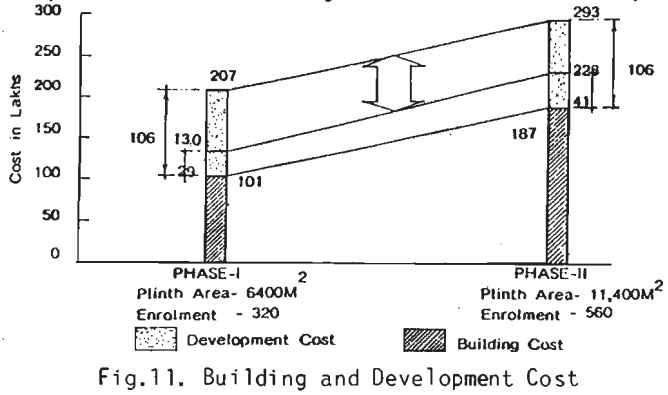

Fig.11. Building and Development Cost

The total cost of a typical NV Complex comprising various buildings is projected in Fig.12.

Use of innovative construction technologies and local materials discussed earlier is expected to result in upto 11 per cent saving in overall cost of construction as indicated below :

Technique/material	Savings (%) Building cost
Underreamed/bored compaction piles for foundation	2.5
Designed brick masonry/precast solid concrete block masonry/precast stone block masonry/laterite block/lime stone for walls	2.2
Ribbed slab/precast schemes for floor/roof	4.0
ALPM/composite mortar/lime for mortar & plaster	0.5
Burnt clay tiles for flooring	0.5
Single stack system of plumbing	0.8
Anti-termite treatment	0.5
Total	11.0

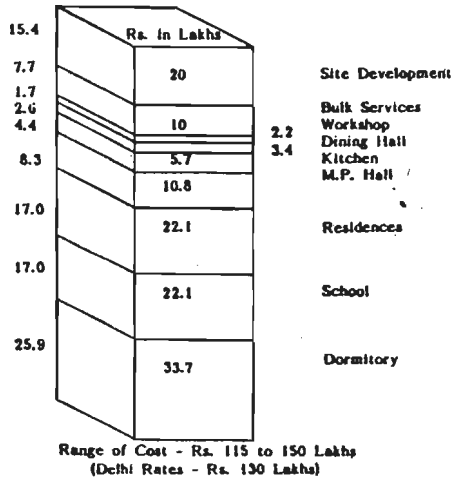

Fig.12. Cost of Construction - Phase-I

Technology Transfer Mechanism

The construction of each NV Complex is taken up in two phases. First phase is intended to meet the requirements for 320 enrolment and the second phase, when completed, will serve the requirement for total school strength of 560 students.

Designs prepared by CBRI are being implemented in different parts of the country through twenty seven central, state and other public sector construction agencies. While CBRI provides building designs

and complete S&T backup, NV Samiti accords financial approval and construction agencies execute the building programme. Construction Coordination Committee constituted by NV Samiti, Ministry of Human Resource Development approves the designs, over-views the project, takes policy decisions regarding cost phasing and other aspects of the building programme. A close link and coordination amongst CBRI. NV Samiti and the construction agency help plan and execute the construction of NV Complexes efficiently and economically in different parts of the country.

The construction work of Phase I has been completed on around 100 sites and work is in active progress on around 150 sites in different parts of the country.

Economic Impact

The architectural management and technologies being used in construction of Navodaya Vidyalayas in various parts of the country will have a multiplier impact on building industry particularly on those connected with construction of buildings in rural and semi-urban areas. The country is expected to save upto hundred million (3 million US Dollars due to S&T backup to the programme by the Institute. The construction programme of NVs provide ample opportunities for employment to skilled, semi-skilled and un-skilled persons almost in all parts of the country. The overall economy and efficiency will help construct future buildings also using local building materials and innovative construction technologies.

Conclusions

Implementation of architectural management dealing with the design packages for construction of about 300 projects in different parts of the country simultaneously is a unique example where R&D work conducted at a research laboratory has found application in large construction programme of residential secondary schools for rural areas in India. It has also provided an excellent opportunity to CBRI/CSIR to transfer its technologies throughout the country for the benefit of the masses.

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The new headquarters of the Ministry of Housing, Physical Planning and the Environment

The new headquarters of the Ministry of Housing, Physical Planning and the Environment (VROM) are located in the Spui district in The Hague, between the Rijnstraat - opposite the Central Station - and the Oranjebuitensingel. The site covers one and a half hectares, and about 3,100 people, as many as the population of the whole of Ameland, will be accommodated in the new premises.

This location complies with the policy objectives of VROM in every respect: it is situated in the city centre, in the immediate vicinity of the station, it is easy to reach by public transport, and is close to other ministries and parliament.

The following VROM departments will be housed in the new headquarters:
- central directorates, currently housed in The Hague;
- the Directorate-General of Housing, Zoetermeer;
- the National Physical Planning Agency, The Hague;
- the Directorate-General for Environmental Management, Leidschendam;
- the Government Buildings Agency, The Hague.

The Land and Public Registry Agency will remain in Apeldoorn. The provincial directorate and inspectorates will also remain at their present locations.

The foundation stone for the new ministry building was laid on 1 March 1989. The construction work reached its peak on 12 July 1990 and will be completed on 24 July 1992. The ministry's scattered accommodation, with all the organisational and logistical problems it entails, will then be a thing of the past. For instance, instead of having to travel fifty kilometres if he wants to meet with the directors-general, the minister will only have to walk a hundred metres.

The total size of the site is 75 by 140 metres. The total net office space is 30,000 square metres. The building has sixteen storeys, and is sixty metres high. Despite the fact that it will be one of the largest buildings in the Netherlands, it will have a very open character. In every respect it will be a transparent, public-oriented ministry.

In the journal "Architectuur/bouwen", the architect, Hoogstad, explains: "The design is based on three considerations: the structure must ensure easy orientation within the building, but must also provide good orientation points in relation to the outside world. In addition, the open structure should ensure that the building is clear and transparent when viewed from the outside. One of the characteristics of the design is that the non-functional space is larger than the functional space. The surplus space can be put to numerous alternative uses, such as terraces, gardens and pathways. All these factors will help to ensure that it is felt to be a spacious building and that the sense of being cooped up will decline."

Another characteristic of the building is the comb structure: five transverse bays, 22 metres apart, are connected by a "midriff" about a hundred and fifty metres long. Lifts, emergency staircases, toilets and installation rooms are situated at the junctions of bays and midriff. Special rooms such as archives, copying rooms and consultation rooms are also situated around the points of ascent. The structure of the building is such that the daylight falling on the residential buildings in the direct vicinity is not obstructed. The

first five floors of the building, counting from the ground floor, cover the whole of the site, while the other storeys are set back.

The new premises consist of a substructure and superstructure. The substructure comprises six floors. In the bottom two there will be parking space for some four hundred cars. At weekends and during late night shopping, the car park will be open to all, in return for a payment. Special rooms, such as cycle parks for six hundred cycles, the library, the training and computer centre, the storerooms, a crèche, and the entrance and central hall are situated from the ground floor up to and including the fourth floor.

The main entrance lies on what is still called the slow traffic route. To reach the main entrance from the Central Station it is necessary to cross the Rijnstraat. You then enter a large, very bright central hall, which covers about eight hundred square metres and is sixty metres high in places. During office hours this hall will be open to all, and will be similar to a station hall. About five hundred visitors are expected every day, including people with an appointment and people wanting a brochure, to use the library or to view one of the exhibitions. Immediately to the left in the hall are the rooms belonging to the Personal Information office, with an information desk. The reception desk, where visitors must report to, is situated in the middle. They are given a visitor's pass and are then directed to their destination. The passes are designed to increase security. In principle, a low level of security has been opted for. This is partly because complete security can only be guaranteed at very high expense and would probably give the building an unpleasant and uninviting atmosphere. All the staff will be issued with an identity pass which must be shown on request. A pass will also be required to gain access to the cycle park and car park.

To move from the central hall further into the building, it is necessary to take an escalator to the first floor, where there are four sliding glass doors at the edges of the hall. Immediately behind these doors is the main escalator leading from the first to the fourth floor. This is because the building is intersected by a tram line and a slow traffic route, and it is only there that there is room for a corridor over the whole length of the building. The forth floor therefore serves really as the ground floor. On this floor one of the sixteen lifts can be taken to the higher floors. The staff restaurant, which will have to cater for about eleven hundred people in the space of a few hours, is also situated on the fourth floor.

VROM sets a good example as regards access for the disabled, who can reach every storey in the building, including the car park, directly by lift. In addition, there are special doors next to the revolving doors, the lift control system is suitable for the blind and the building has been assessed by the Council for the Disabled. Everything has therefore been done to make it an open ministry.

Between the bays there are eight open spaces, or conservatories, extending over virtually the whole height of the building. These conservatories have a glass outer wall and roof. The roof consists of steel girders and panes of glass which can be opened. The roofs are 22 metres long and 11 metres wide and each weighs 35,000 kilogrammes. They are the quickest roofs of their type in Europe, for they can be closed in about fifty seconds. The outer wall of the conservatory looks like one large sheet of glass. It is composed of single sheets of glass 1.80 metres wide and 3.30 metres high. The resulting areas measure about twenty thousand cubic metres and have a controllable climate. On the fifth, eighth and eleventh floors there are galleries to reinforce the outer wall of the conservatories. These galleries take the form of suspension bridges between the bays, and create spectacular routes through the conservatories.

Up to the sixteenth floor, office storeys are situated around the conservatories and there is a through traffic route on each floor. The offices are situated on either side of a 1.70 metre

wide corridor. Most of the rooms are of three standard sizes. Over half the rooms measure 3.50 by 4.80 metres, or 16.6 square metres in all. A quarter of the rooms measure 3.50 by 4.15 metres (14.5 sq.m) and the rest 3.50 by 5.50 metres (19.4 sq.m). The inside walls are fitted with good sound insulation and are removable.

The offices have a glass outer wall from floor to ceiling. Convector heaters about 30 cm high are situated at desk height. In the skirting around the glass outer wall there are connection points for electricity, data communication and telephone. The lighting and air ventilation system are incorporated in the "ceiling islands". One can adjust the climate, sun blinds and light oneself. The interior has been kept light and neutral in colour.

The five bays consist of prefab concrete units. The five fixed cores give the building its stability. The elements of the midriff are suspended between the bays. The suspension construction consists of steel girders cased in concrete, which transfer the load to a spatial steel structure, a sort of spider above the sixteenth storey. This structure was chosen because the midriff has to hang over the traffic routes as a sort of bridge. The inside of the outer walls consists of prefab concrete units. The outside will be fitted with white aluminium plating. At the top of the bays there will be deep-blue frames, behind which the installations will be located. The building has a black skirting made of natural stone plates, accented with a red line.

A great deal of attention has been devoted to structural aspects such as sound-proofing inside and outside the building, the acoustics of the rooms and daylight access. The conservatories have an important influence on the indoor climate and also on the offices, almost all of which border onto the conservatories. They form a sort of buffer and have a moderating effect on wind, sound and temperature. The conservatories also allow the office windows to be opened, one of the requirements of the staff.

The temperature in the conservatories can be adjusted by means of closable ventilation openings in the outer walls and the roof. In the winter the minimum temperature of the conservatories will be 12 degrees celsius, comparable with the temperature in a shopping arcade. In the summer, the conservatories will be virtually no warmer than outside.

Environmental considerations played a major role in the architectural aspects of the new building. When choosing the materials major emphasis was placed on durability and maintenance. Thanks to the use of smooth and regularly shaped materials, the building is easy to keep clean. The building materials were also carefully chosen according to environmental criteria. Asbestos, for example, was avoided and only packed mineral wool has been used. No tropical hardwood or insulating material containing CFCs has been used. To reduce the use of gravel, it has been replaced in part by concrete granules. Fittings have also been chosen according to environmental criteria, such as the energy-saving high- frequency lighting.

Finally, we must answer the question: "Who is going to pay?" The new building will be paid for by the Public Servants' Superannuation Fund (ABP) under a lease agreement. The ABP will offer the new building in a form of hire purchase. The premises in which the departments are currently housed will be disposed of and the money raised will be used to pay the hire purchase instalments.

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