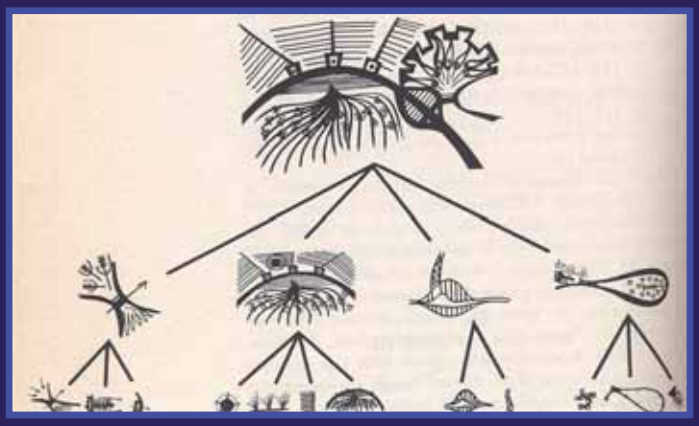
Systemic approach and the role of human sciences in understanding architecture - users and buildings, people and places.

An introduction /2

May 10, 2012



Prof. Carlotta Fontana
Dottorato Tecnologia e Progetto per l'Ambiente Costruito **AA. 2011-12**
Dipartimento di Scienza e Tecnologia dell'Ambiente Costruito - BEST
Politecnico di Milano

Systemic thought in architecture relates to the ways in which we conceptualise the design process

The ways in which we conceptualise our own settlements – cities, the built environment in general – Affects our approach to the design process

Metaphor:
A figure of speech in which a word or phrase literally denoting one kind of oject or idea is used in place of another to suggest a likeness, an analogy between them

Systemic thought in architecture relates to the ways in which we conceptualise the design process

And before that

The ways in which we conceptualise our own settlements – cities, the built environment in general

Systemic thought in architecture relates to the ways in which we conceptualise the design process

And before that

The ways in which we conceptualise our own settlements – cities, the built environment in general

In simpler words: our idea of what our settlement (a city) is, deeply affects the way in which we approach the design process – or: how we plan and design our environment.

In science as in culture, we often use metaphors to make clearer our idea of a complex entity

A metapho ris a figure of speech in which a word or phrase literally denoting one kind of oject or idea is used in place of another to suggest a likeness, an analogy between them

Architecture and uman settlements as

You may remember, last time I told you that we may think of the built environment as the specific ecological system of the human species

Of course it is not exactly like that, our environment is a mixed techno/ecological environment, nevertheless out action can represent a real threat for it and for the species itself, as in true ecological system.

Another useful concept we utilize in our knowledge processes is the idea of PARADIGM

We could say that this thought of a neo-ecological system should help to define a new paradigm we need to shape our operational thougts.

What is a paradigm?

It is a What is a PARADIGM?

Generally speaking, it is an exemple, a pattern

More precisely, in philosophy as in science, a paradigm is a theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated; *broadly* ***: a philosophical or theoretical framework of any kind***

Going back to our first concept, that of metaphor, we can say that

Architecture has been conceptualised according to various metaphors:

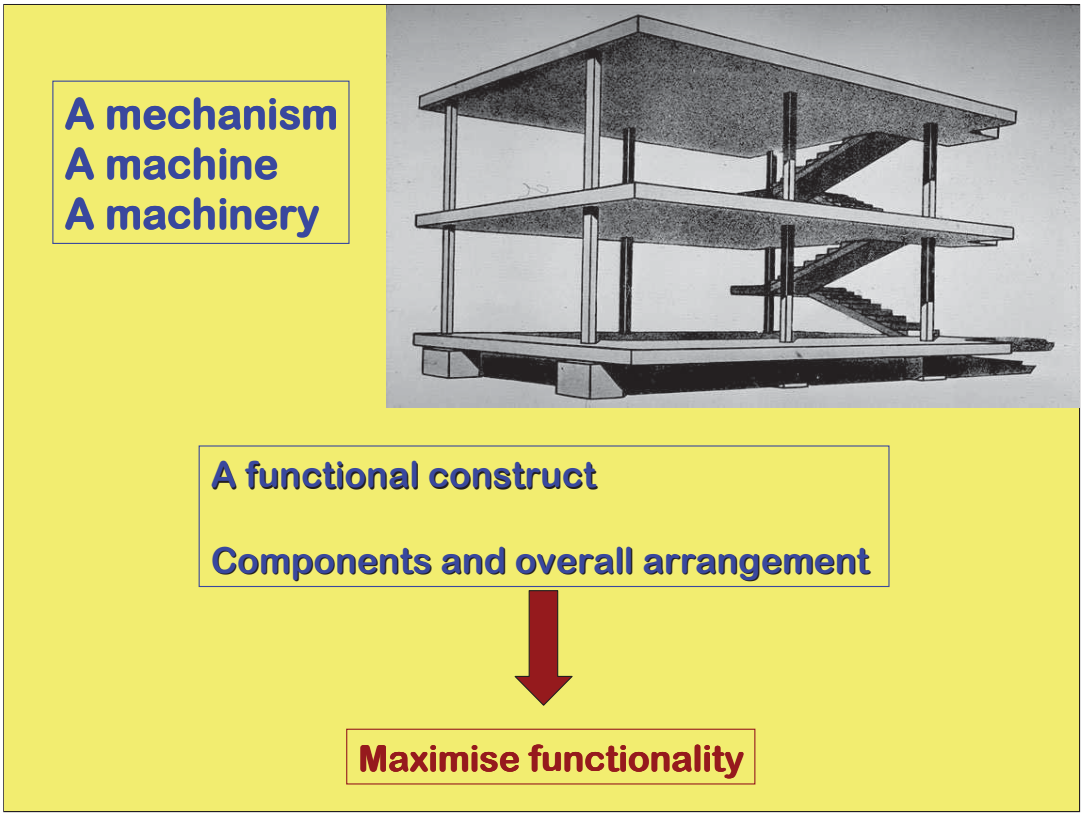
A work of art

A mechanism

An organism

The metaphor of the work of art identifies architecture as an artistic creation that relies upon the individual ability of the artist, who expresses by personal intuition the social and symbolic significance and the different values that the object of his/her creation is going to embody

- See the Renaissance architect



The mechanic metaphore :

Its main characteristic is that it conceptualises the idea of a building – as well as a city - as an artifact with a primarily functional character –

A machine, a machinery whose component parts and overall arrangements are specifically designed to maximise functionality.

This metaphor was very popular in the XX century, The Machine Age at its outmost.

"All men have the same organism and the same functions. All men have the same needs."
(Le Corbusier, *Vers une Architecture* - 1923)

The rationalist idea of *standard*, established by "logic controlled by analysis and experiment" is based upon the idea of users being a homogeneous public, with homogeneous needs, desires, ways of life etc.

You may well remember Le Corbusier famous statement of the house as a Machine à habiter.

In fact, functionalist theories of the first half of the XX century soon gave way to highly dysfunctional outputs, moreover conveying a mechanical idea of human life and human needs which also helped to make contemporary architecture quite unpopular...

Pruitt-Igoe Housing,
St. Louis, 1952-1955
arch. Minoru Yamasaki

American Institute
of Architects Award, 1951

Demolished 1972

This late-"rationalist" example was demolished after proving absolutely un-rational and dysfunctional, and after being heavily damaged beyond rehabilitation by its unhappy inhabitants

But this is not the core of our interest here.

Method

from the Greek:
μητα οδοσ – Methodos

“along the way”

a well-defined procedure to develop an activity in order to pursue a stated aim

Process – phases – analysis criteria – goals – evaluation .....

What I want you to focus your attention on today, is that the mechanistic metaphor is more likely to generate the idea od a DESIGN METHOD, that is: the idea that design can be treated like a process , divided into phases, all of them aimed at controlling a stated quality of the output. Most of these entities can be described by means of quantitative factors, according to specific criteria.

In ancient Greek philosophy, a method is a set of rules that one must follow to pursue knowledge.

Knowledge is consistent only if the way to get it is correct.

A method entails such conceptualizations as process, phases, analysis ctiteria, goals, evaluation …

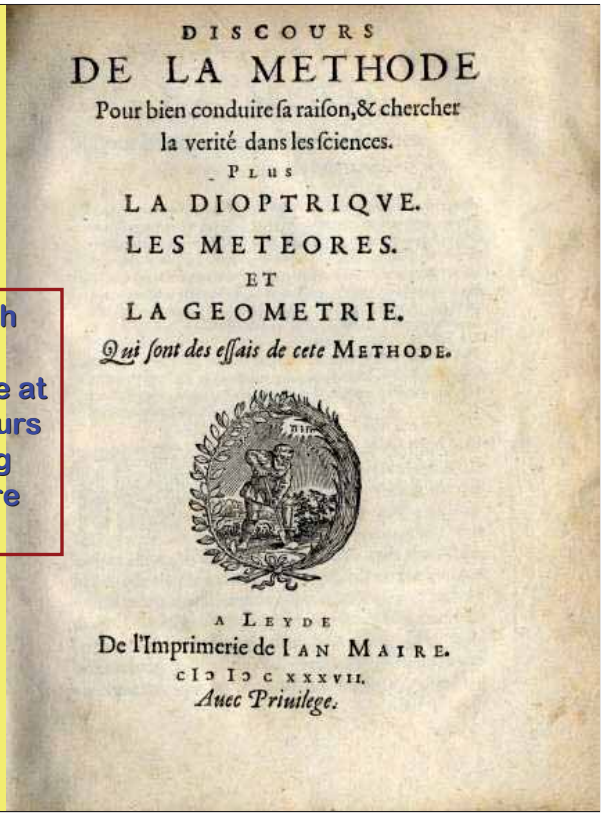
In experimental science, founded in late Renaissance, hypotheses are tested against reality.

A hypothesis is in any way conceived in terms of mental images based on what we know about the real world.

When we perform an experiment we set up a model based on things which are familiar to us within the world we know and use this model as a way of explaining things we don't know – also, things we cannot see or whose physical consistence is beyond our experience.

Galileo said that "one concluded experiment is enough to batter to the ground a thousand probable arguents"

The rational method divides each problem in its smallest components (Cartesius, Regulae at directionem ingenii,1628; Discours de la Methode 1637), proceeding from the easiest ones to the more complex.



DISCOURS
DE LA METHODE
Pour bien conduire ſa raiſon,& chercher
la verité dans les ſciences.
PLUS
LA DIOPTRIQVE.
LES METEORES.
ET
LA GEOMETRIE.
Qui ſont des eſſais de cete METHODE.

A LEYDE
De l'Imprimerie de IAN MAIRE.
cIↃ IↃ c XXXVII.
Auec Priuilege.

In the 17° century, the French philosopher Renè Decartes dedicated most of his work to understand how knowledge happens, and how one can be sure of the rightness of the process of knowledge: [BROADBENT, p. 59 - A]

USA, UK
WW2
1950's

Problem solving techniques

Reducing uncertainty
Mathematics of probability

Techniques of analysis, prevision, control

Process: plan, program, design, production

During 1950's, mainly in the USA and UK, research in the field of military activities – mainly started during WW2 - and industrial processes was developed, with the main purpose of developing new problem-solving activities which could account for ever increasing complexity of industrial production and the need of increase speed and reduce uncertainty in the processes.

The scientific outlook and main "tools" about problem solving referred particularly to the mathematics of probability.

The aim was to establish a rational sequence going from the problem definition to its solution.

Research developed techniques of analysis, prevision and control. And defined processes for activities, and their phases: plan, program, design, production.

A FIVE-PHASED DECISION SEQUENCE

1. Defining the problem
2. Analysing the problem
3. Developing alternative solutions
4. Deciding on best solution
5. Conveying decision into effective action

P. Drucker, The Practice of Management, 1955

One of the first steps in problem solving research is establishing the structure of a decision sequence.

Here we see one example, loosely derived from the achievements of the American philosopher John Dewey, who in 1909 published his *How We Think,* questioning the patterns of decision making .

OPERATIONAL RESEARCH (O.R.)

decision sequence

improvement in the performance of a process

problem analysis

A mathematical model of the process numerically relates the various part of the problem

Such sequences are typical of a very important branch in the studies of decision procedures called OPERATIONAL RESEARCH, developed in WW2 at first as a method to hunt submarines!

The main thing is: O.R. is about establishing a decision sequence to obtain an improvement in the performance of a process AND in the performance of the final product of the process itself; the solution – that is, the decision sequence itself - may be synthesized by means of a mathematical model.

The construction of a mathematical model allows to numerically relate the various part of the problem

1. Formulating the problem
2. Constructing a mathematical model
3. Deriving a solution from the model
4. Testing the model and the solution derived from it
5. Establishing controls over the solution
6. Putting the solution to work: implementation

C.W. Churchman et Al., ***Introduction to Operational Research***, 1959

1. Statement of the problem involved
2. Collection of relevant data
3. Analysis of data to provide a model of the real-life situation, and checking the validity of the model
4. Manipulating the model to estimate what will happen under varying circumstances
5. Selection of the optimum course of action
6. Continuing check on the validity in the model in the light of fresh data

M.J. Sargeaunt, ***Operational Research for Management***, 1965

Here we see two different formulations of the decision sequence, by two authors.

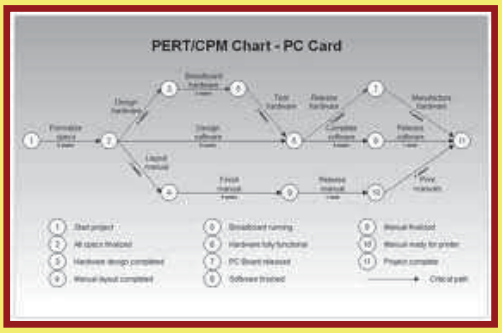
Many techniques have been developed under this O.R. heading, some of them, as Broadbent says, became attractive to designers and design theory as developed from the 1960's onwards. The second one, as we can see, gives more importance to the issue of feed-back – without naming it. It hints that the process is virtually never-ending

O.R. techniques

Linear programming

Network Analysis

PERT – Program Evaluation and Review Technique
CPM – Critical Path Method
CPA – Critical Path Analysis
…



There are many Operational Research techniques. The most frequently used are

Linear programming

When the relationship between variables is linear (if plotted on a graph)

Network Analysis

Various kinds of Network analysis, which derive from the military field as well, starting from identifying activities involved in a project and setting all pertaining events (starting and finishing points) in the most convenient arrangement – such as PERT, CPM, CPA and many more, all of them developed in the Fifties and early Sixties.

Once the activities pertaining to a project have been defined, they can be placed in logical sequence.

PERT uses a network representation to capture the precedence or parallel relationships among the tasks in the project. As an example of a precedence relationship, the frame of a house must first be constructed before the roof can go on. On the other hand, some activities can happen in parallel: the electrical system can be installed by one crew at the same time as the plumbing system is installed by a second crew.

Define activities

RIBA Handbook (1965)
"Activity: a task which takes time and usually consume resources"

PERT was and still is widely used to establish activities in the building process.

A military O.R. technique is its own right, it was mostly developed in the 1950's by theUSA and British Navy to design nuclear powered "Resolution class" submarines armed with Polaris missiles

The first step in PERT design is to define activities

The RIBA, UK, in its 1965 Handbook for architects defined the activities involved in building a house.

Table 10.5—Activities involved in building a house

Ref:	Activity description	Starting event No.	Finishing event No.	Estimated completion time
A	Order bricks	0	1	1
B	Order plant	0	2	7
C	Order concrete	0	3	1
D	Strip site	2	5	1
E	Excavate	5	6	2
F	Deliver concrete	3	6	3
G	Lay foundations	6	7	3
H	Deliver bricks	1	7	14
I	Design and order joinery	0	4	14
J	Build walls	7	8	10
K	Build floors	8	9	5
L	Build roof	9	10	4
M	Deliver joinery	4	10	14

and so on.

(from: Broadbent, Design in Architecture, 1973

In this table we see all the activities involved in building a house, and the estimated time which each activity will take.

Then the table must be translated into the conventions of network analysis

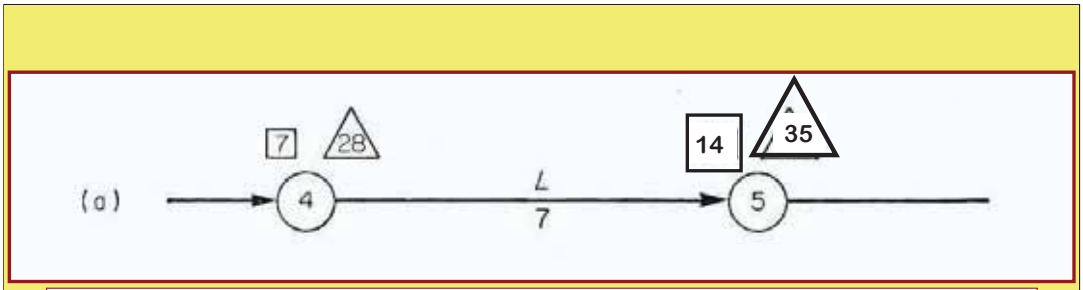


Figure 10.3—Activity *L*, build roof, presented in typical notations. It starts with event No. 4, finishes with event No.5 and takes 7 days. Event No. 4 could start, at the earliest, on day 7 and finish, at the latest, on day 28. Equivalent starts for event No. 5 will be 7 days later.

Activity = arrow →

Events (start, finish) = circle ○

First possible starting day = square □

Last possible starting day = triangle △

Conventional symbols of network analysis for activity L – Build Roof

P.E.R.T. Diagram for the building of a house
From: Broadbent, 1973

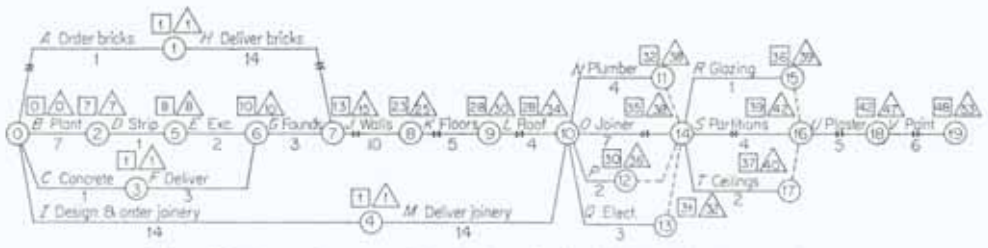


Figure 10.5—The complete network showing the critical path indicated by the symbol

A critical path is the time-path connecting activities which must not overrun, not to affect the completion date for the project

A complete network diagram for the building of a house could be like this.

The sequence of activities allows the underpinning of critical paths: that is, the time path connecting activities which must not exceed their allowed time, not to affect the completion date for the project

The contributions of operational research, the increasing development of computing devices and the contemporary development of disciplines dealing with complexity in production, such as those listed here were well available to design theorist at the beginning of the decade of 1960's.

At the Hochschule fur Gestaltung established in 1949 at Ulm, in Germany, following the Bauhaus legacy, Tomàs Maldonado promoted a strongly scientific orientated line towards design, based on analytical methodology.

Hans Gugelot
Industrial designer, teacher at Ulm

Design method (1963)

1. Information stage
2. Research stage
3. Design phase
4. Decision stage
5. Calculation
6. Model-making

Carousel-S slide projector, 1963

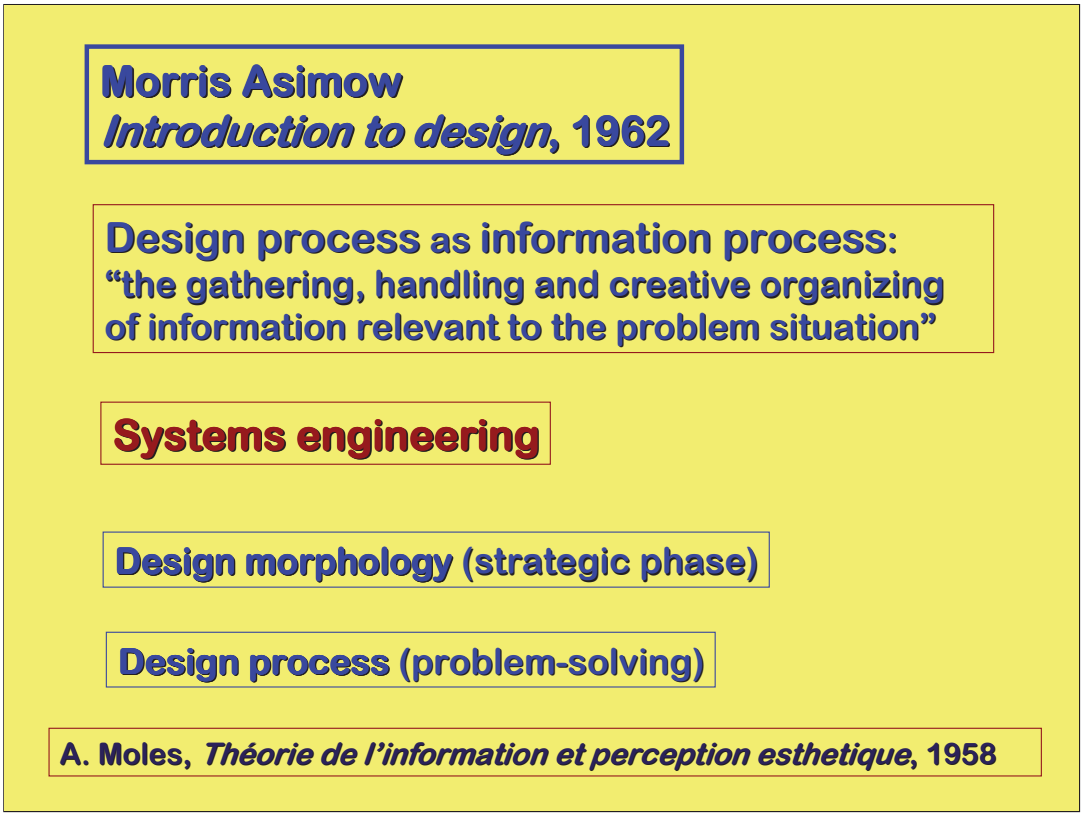
Electric razor, 1962

The analytical method was aimed at reducing uncertainty, risks, process faults, focusing on commercial aspects as well as on production ones

(broadbent p.252 - B)

Hans Gugelot, a Duch-born industrial designer and teacher at Ulm, outlined a designed method in these 6 steps:

It was mainly interested in functional and organizational issues, ending up in very simple and unadorned design, though quite elegant – and coloutrless – that is, in various degrees of grey with white to black parts.



In 1962, ar seminal work had been published in the field of the design of industrial projects: Introduction to Design, by Morris Asimow

His method is divided into two scales of operation :

A first Strategic phase called design morphology

A general process for solving problems called design process

Each step in the design morphology contains the sequence of events listed in the design process.

It is widely influenced by information theory and it is in fact mostly a dedicated informational process. In Asimow's own words, it is "BROADBENT p. 254, C.

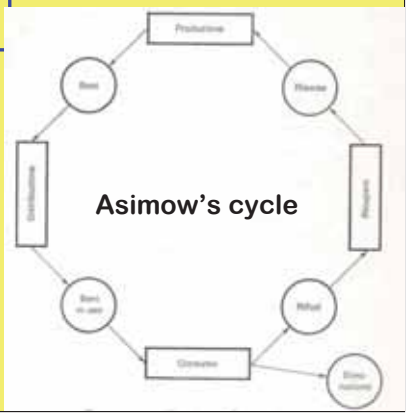
Morris Asimow
***Introduction to design*, 1962**

Design morphology

1. **Feasibility study – phase I**
2. **Preliminary design – Phase II**
3. **Detailed design**
4. **Planning the production process**
5. **Planning for distribution**
6. **Planning for consumption**
7. **Planning for the retirement of the product**

Design process

1. **Analysis**
2. **Synthesis**
3. **Evaluation and decision**
4. **Optimization**
5. **Revision**
6. **Implementation**



Each step in the design morphology contains the sequence of events listed in the design process.

This formalized process could be further articulated – the Detailed design phase (n. 3 in the Design morphology) is further subdivided in: (Broadbent, p. 254, D)

To many architects, though keenly interested in scientific method for design, soon became clear that a design process is not a design sequence going "straight through from analysis to synthesis to evaluation", because there are so many variables in it, that one always have to go round the cycle many times, producing subsequent modified syntheses.

M. Asimow, *Introduction to Design*, 1962

J.C. Jones, "A Method of Systematic Design", 1963; *Design Methods*, 1970

S.A. Gregory, *The Design Method*, 1964

L.B. Archer, *Systematic Method for Designers*, 1965

"Rational design" theories

In those days many other authors worked along this line of thought. These are a few of the many works that deeply influenced the design culture of those days, which can be put under the headline of Rational design theories

"The method is primarily a means of resolving a conflict that exists between logical analysis and creative thought.

(…)

So systematic design is primarily a means of keeping logic and imagination separate by external rather than internal means."

J. C. Jones, 1963

In the words of one of them, J.C. Jones, The method is primarily a means of resolving a conflict that exists between logical analysis and creative thought. (Broadbent, p. 257, E)

So, in his method Jones suggests that the designer should separate imaginative ideas and designs from logical statements of information and requirements during the design process, trying to put them together again at some ponit "along the way".

This cartoon by louis Hellman belongs to those days and well illustrates the difficult task for the architect to "tame" both horses: the art and the science

Three stages of information recording according to J.C Jones:

1. **Analysis – all requirement listed and reduced to a set of performance specifications;**

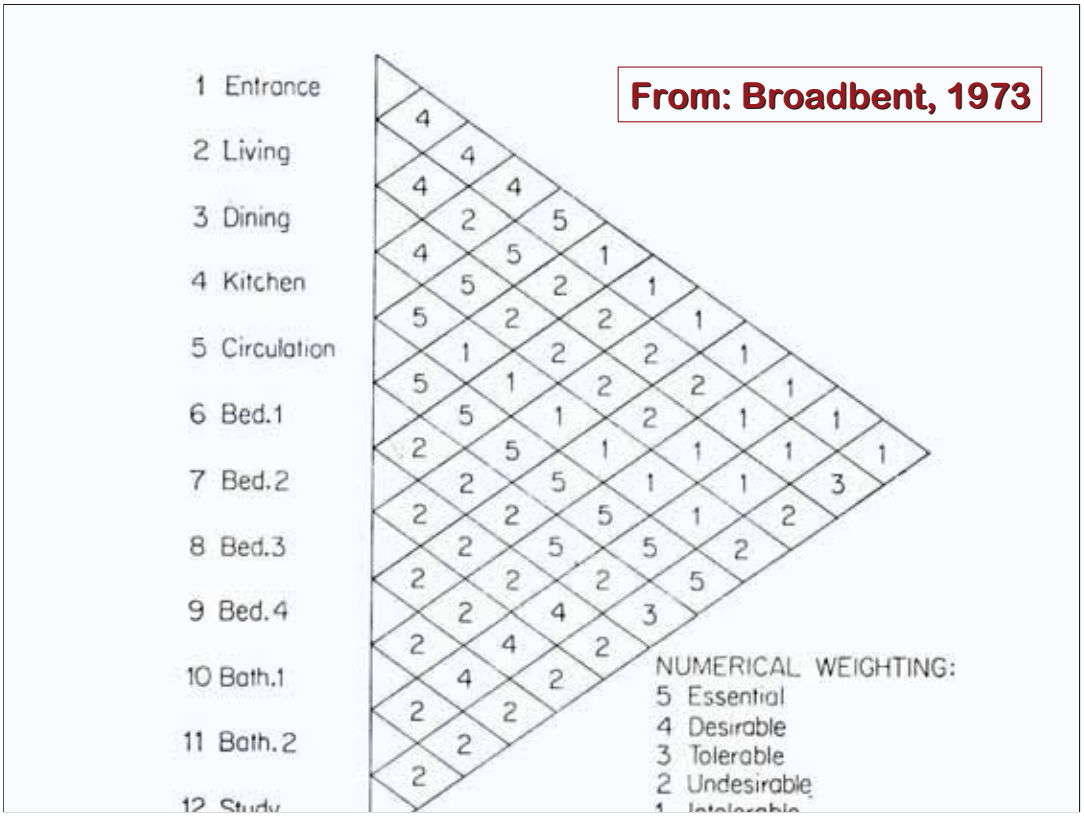
1. **Synthesis – stated solution for each individual performance specification and built up to form complete designs;**

1. **Evaluation – alternative designs tested against performance specifications.**

Jones separates the recording of information, that must be developed in three stages:

BROADBENT 258, F

Interactions between different categories of information can be plotted by means of interaction nets and topological diagrams

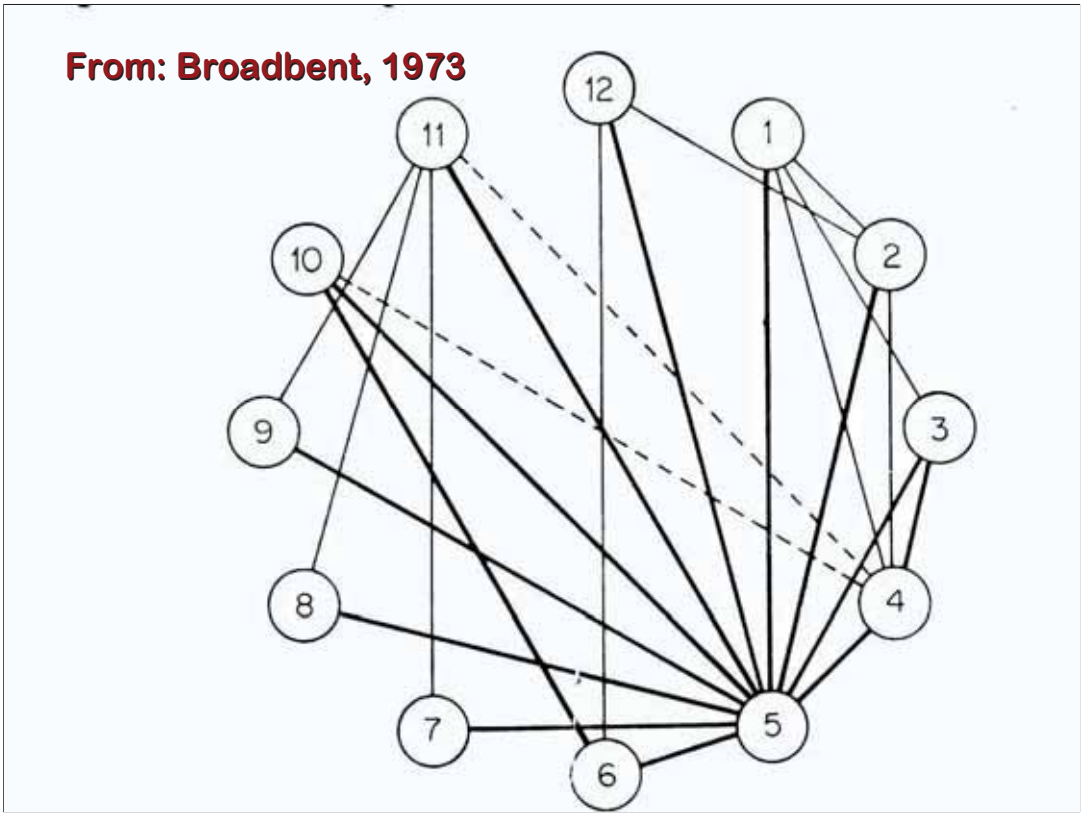


Performance specifications express requirements in terms of performance only, without any reference to material, shape, design etc.

Design proceeding from systematic performance analysis allows to look for more partial solutions to each performance specification, while design proceeding from a sketch only goes on to refine a single solution.

Jones describes several graphic techniques for analysis, such as the interaction chart and the connexion diagram, that have developed since, and used in many different contexts.

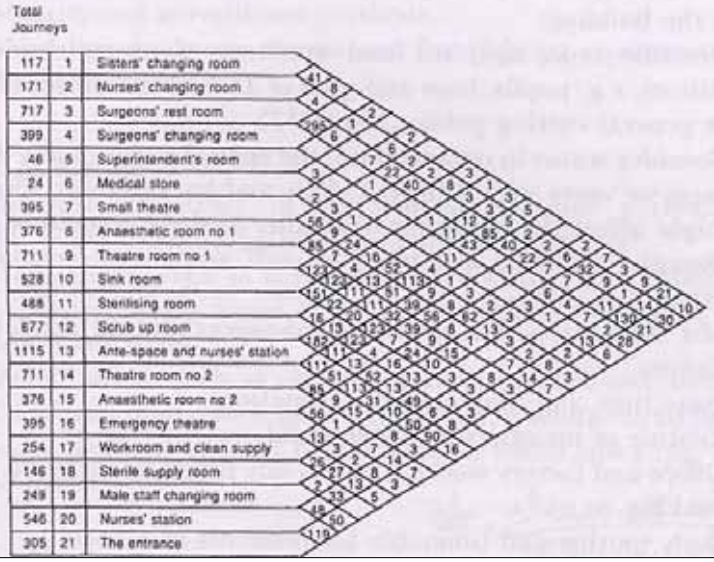
In this fig. : simple interaction chart showing connections between rooms. In this case the connections are intended as clarfying and ease movement between rooms according to the functional logic referred to the activities performed in each room. The numerical weighting and coding given to each interaction is suitable for computer analysis



This is a CONNEXION DIAGRAM derived from the previous interaction charts, in which all links of strength 3 (tolerable) are plotted with lines of appropriate thickness. Such a diagram may utilize information fron different interaction charts, in this examples, dotted lines show that certains rooms (4-10 and 4-11) are connected by the shared need for services (water and waste).

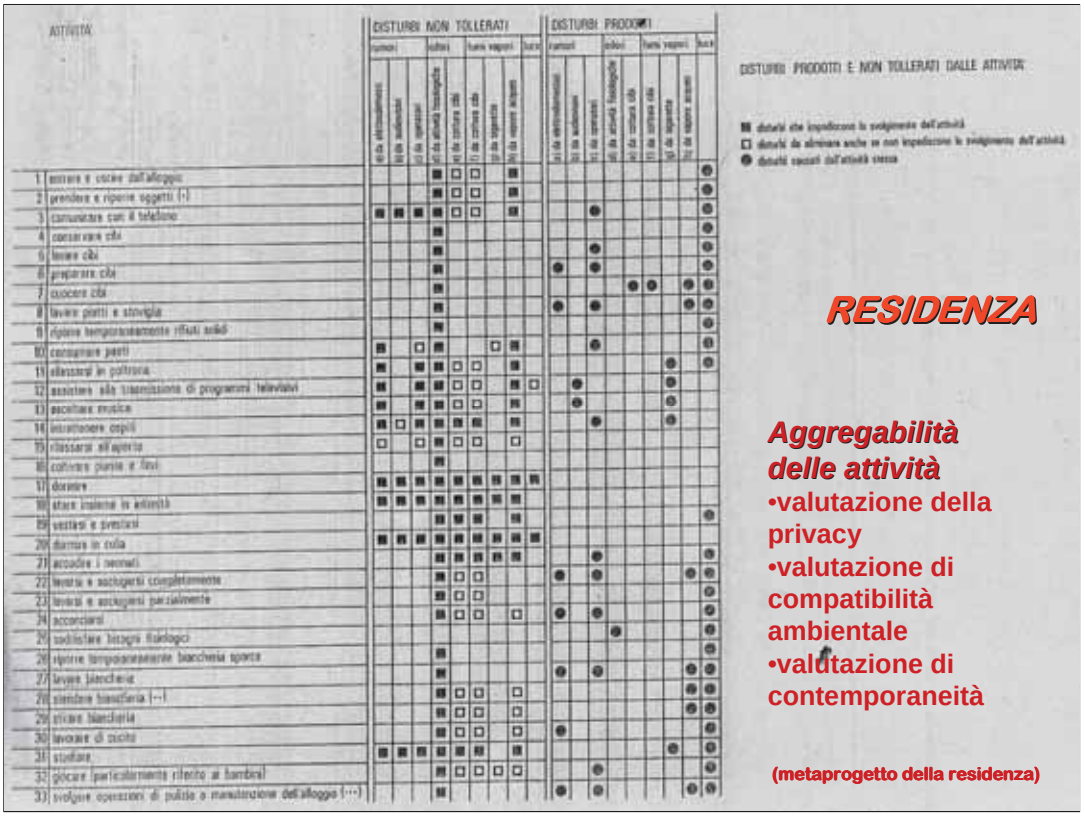
Fig 8.1

Matrix illustrating journeys between rooms by people working in a typical existing operating theatre suite. This can be used to decide what modifications are needed to reduce movement to a minimum and to combine the units in the most satisfactory way from all known points of view. (From *The Architects' Journal*, 17 June 1964, p. 1375.)

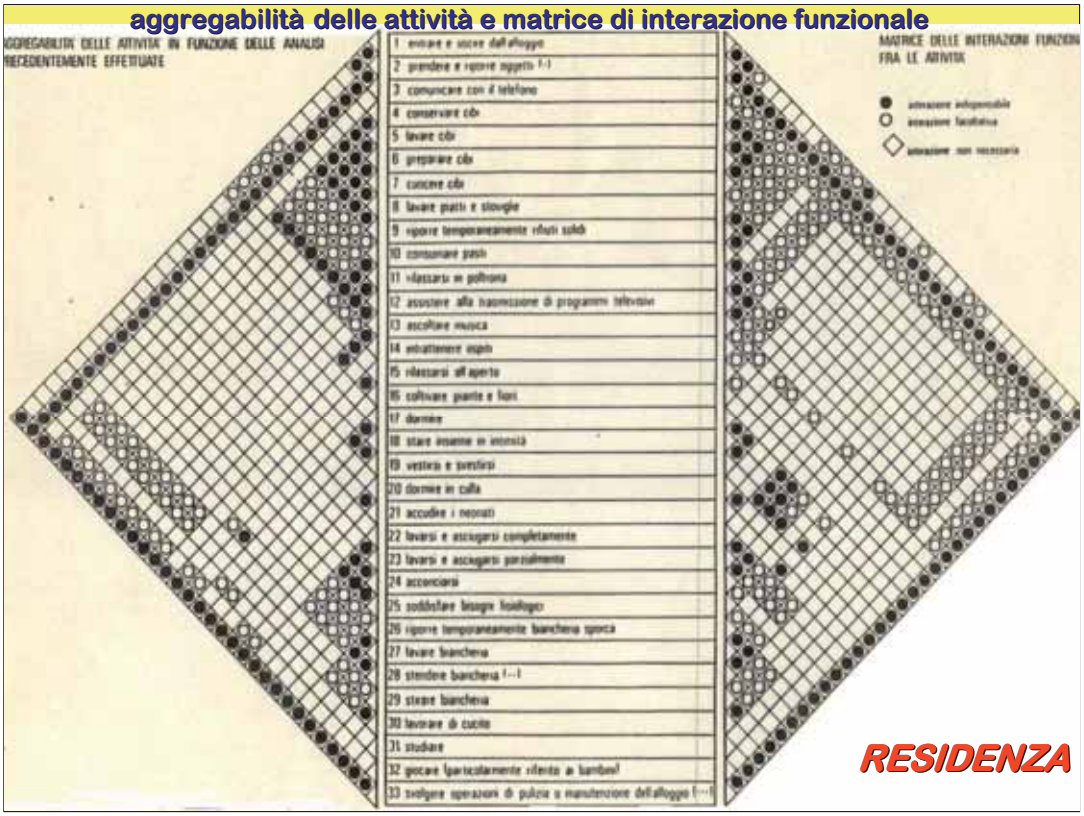


Total Journeys		
117	1	Sisters' changing room
171	2	Nurses' changing room
717	3	Surgeons' rest room
399	4	Surgeons' changing room
46	5	Superintendent's room
24	6	Medical store
395	7	Small theatre
376	8	Anaesthetic room no 1
711	9	Theatre room no 1
528	10	Sink room
488	11	Sterilising room
877	12	Scrub up room
1115	13	Ante-space and nurses' station
711	14	Theatre room no 2
376	15	Anaesthetic room no 2
395	16	Emergency theatre
254	17	Workroom and clean supply
146	18	Sterile supply room
249	19	Male staff changing room
546	20	Nurses' station
305	21	The entrance

From: Broadbent, 1973



To some of you these tables may look familiar: they come from the very extended study that Regione Liguria carried on and published in 1984 to develop the guidelines for social housing. The method was directly referred to the studies of those year and very near to the one proposed by Jones we've just seen



This is the interaction table of the same study.

Meta-design (in Italian *metaprogetto*)
Andries van Onck, Ulm, 1963

a design process is a way of structuring the order in which a *vast number of decisions* may be made

Decisions are interdependent

The stages of a design process cannot be equated with the phases of a decision sequence …

"a communication system which assumes that they can, will simply not work"

From these studies, and mainly deriving from Operational Research, stems the idea of METADESIGN.

As far as I know, the name (in italian: metaprogetto) was given by Andries van Onck, a Duch industrial designer who taught ar Ulm and At Milan, a s well, giving rise to a school of followers.

Within the line of thought of Operational Research, META-DESIGN studies focused on the idea of feed-back, which carachterized BOTH the studies in systemics, information theory and cybernetics AND the critical voices coming from the architectural culture about the proper use of operational research in architectural design

1. The critics

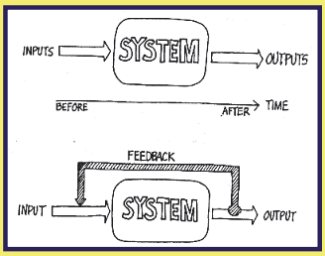
The main argument in these critics was that there is an essential difference between a design process and a decision sequence: a design process is a way of structuring the order in which a vast number of decision may be made, each one of them can be influeneced by a large number of variables.

One cannot espect to be able to equate the stages of a design process with the phases of a decision sequence.

… no design process can be completely linear: it must incorporate *feedback loops* so that new information acquired at any stage may be included in the further recycling of one of the decision sequences…

Tavistock Institute of Human Relations, London: *Interdependence and Uncertainty*, 1966

***feedback loop*: process where information about the output of an action by the system *returns to the system as an input* changing its next action (biology, information science)**



This very British and empirical statement vwas in fact British…

A research by the London Tavistock Institute of Human Relations (Interdependence and Uncertainty, 1966) pointed out that no design process can be completely linear: it must incorporate feedback loops so that new information acquired at any stage may be included in the further recycling of one of the decision sequences

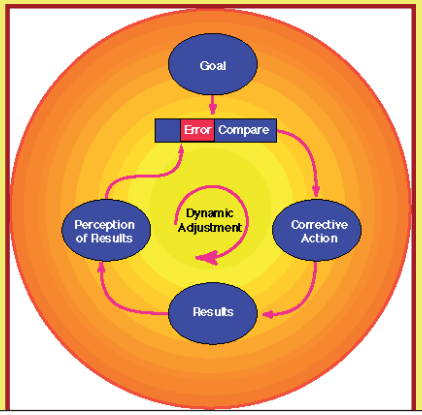
We already know what a feedback loop is: it is a process process where information about the output of an action by the system ***returns to the system as an input*** changing its next action

cybernetics (κυβερνητιχη = *the art of the pilot*)
is the interdisciplinary study of the structure of regulatory systems

"The science of control and communication in machines and animals"
(N. Wiener, *The Human Use of Human beings*, 1950)

Control theory
Systems theory
Input-output

feedback



The idea of feedback, coming from cybernethics, communication science and generally speaking from a systemic environment could be useful so improve the building process as well…

Cybernetics is the interdisciplinary study of the structure of regulatory systems. It is closely related to control theory and systems theory. Both in its origins and in its evolution in the second-half of the 20th century, cybernetics has provided powerful tools to study both informational and social system, both of them being based on language.

(that is, language-based) systems.

Basically, Cybernetics deals with the signal structure connecting a system with its environment.

An action by the system in an environment causes some change in the environment; and that change is communicated to the system via information, or feedback – that is, a flux of signals - , that causes the system to adapt to new conditions: the system changes its behavior.

Meta-design 1

"Design guidelines for controlling the various phases of sub-assembly of pre-fabricated building systems"
M. Oliveri, *Prefabbricazione e metaprogetto edilizio*, 1968

Meta-design 2

"An ordered set of operations to ensure consistency between premises and conclusions, by means of systematic processing, and to properly define the limits of design alternatives adequate to the problem"
G. Boaga, R. Giuffrè, *Metodo e progetto*, 1975

meta-design theories develop along two main lines:

the first one, is less complex, oriented to the technological material aspects of the building.

In Italy, they develop in the years of the industrialization of the construction industry, focusing mainly on the opportunity of developing Design guidelines for controlling the various phases of sub-assembly of pre-fabricated building systems.

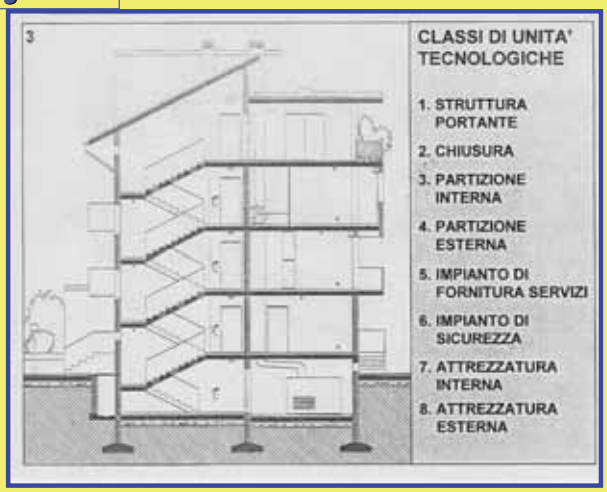
The second one, along the line of thought of Operational Research and a focus on feed-back processes, mantains its nature of theoretical development in design aimed at developing operational methodologies.

The building scale

A systemic description according to a functional criterion

The technological sub-system

A classification of building elements according to their function in the material constitution of the building



Analitical criteria - functional performances

According to the first line, the systemic analysis of a building derived at first from the artificial systems theory, referring mainly to functional criteria to describe its inside relationships

Its main objective is to give the different actors of the building sector a systematic tool to define the quality of a building and of its part , according to their specific function related to the whole building organism

How to define quality? Defining the characteristics that each element and space in the building must possess. And the quality of the relationship between all the elements.

How to express these qualities? In terms of functional performance, that is the operational answer to specified requirement derived from the analysis of the user's needs.

Subdividing the whole in order to analyse it, without destroying the whole itself

Dividing the whole according to its structural articulation, without cutting it into separate parts.

e.g. a door is not a mere quadrangular wooden board, but it must be seen as *a door of the building*.

(A. Angyal, Foundations for a Science of Personality, 1941)

What does each element do in the whole?

A BUILT ORGANISM

Each element finds its place and functional significance inside the order of the whole.

Each elements is described according to its function in the whole

A building breakdown structure helps us to logically descrive and classify the whole building organism

The spatial sub-system
A classification of space units related to activities which can be defined according to their space requirements (meta-design tools)

meta-design represents the *design of the environmental and spatial system, best suited to a system of activities*.
It is a regulatory procedure providing proper information about functional, formal and qualitative aspects to the design phase of the building process

More along the second line (research) are meta-design studies focused on

The spatial sub-system: a classification of space units related to activities which can be defined according to their space requirements

meta-design represents the *design of the environmental and spatial system, best suited to a system of activities*.

It is a regulatory procedure providing proper information about functional, formal and qualitative aspects to the design phase of the building process

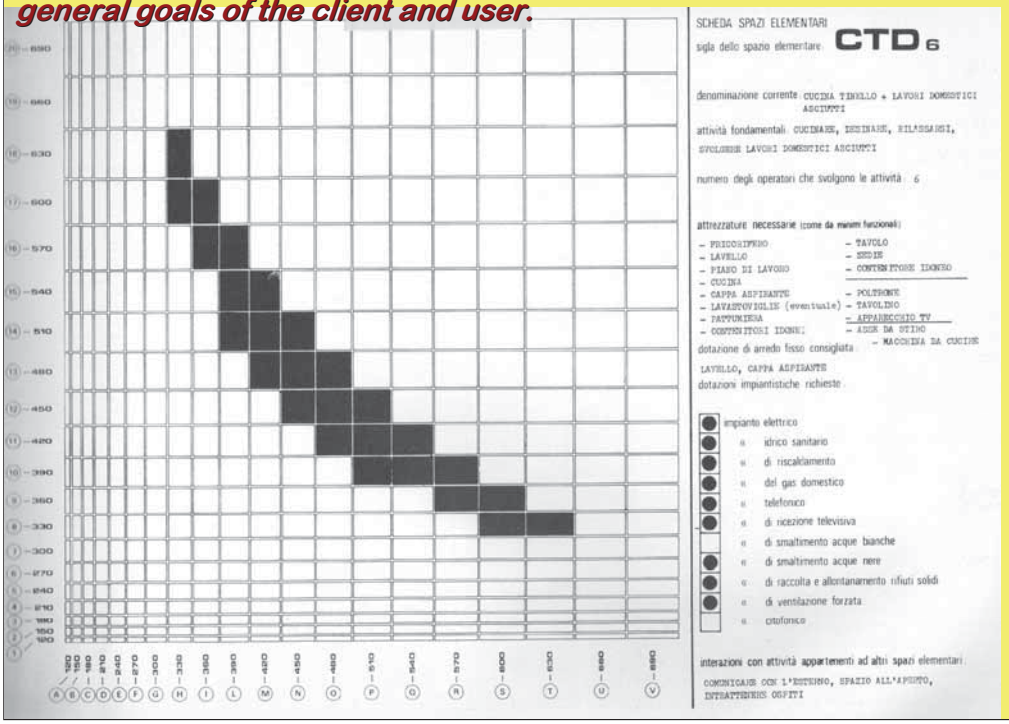
Meta-design requires the *systematic analysis of activities* in order to pre-defining the *requirements* and *formulate the answers in the form of performance* of the technological system , with the goal of building "the organization of a *system of spatial requirements* derived from *human activities*, both specific and adequate to their mutual relationship, which may result, by implementation and quantification of these requirements in relation to each specific context, in *a range of of design options* (either dimensional, typological, etc..) from which different solutions, all of them answering to the general goals of the client and user".

A. Magnaghi, *L'organizzazione del metaprogetto*, 1973

This definition by AlbeRto Magnaghi, one of the Italian scholars who developed good and sound research along this line, is quite clear.

ExactlY along these lines, the research by Regione liguria in the early 1980's was developed, and A RANGE OF DESIGN OPTION was derived

…a range of of design options (either dimensional, typological, etc..) from which different solutions, all of them answering to the general goals of the client and user.



From
Normativa tecnica regionale per l'edilizia residenziale della regione Liguria - CER, 1984

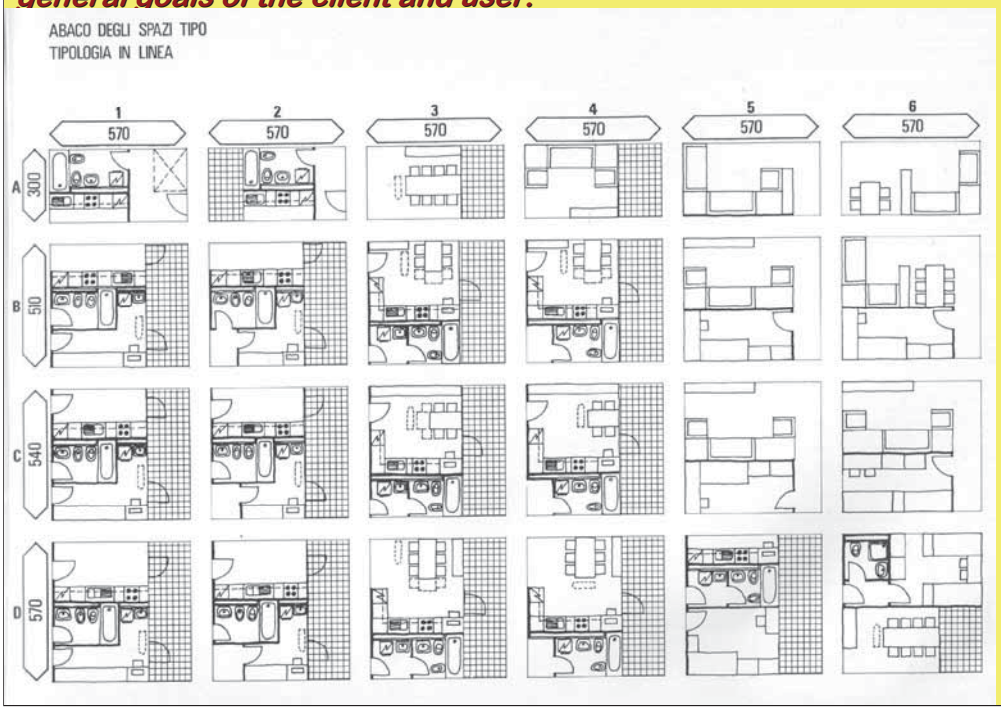
HERE WE SEE THE meta-design scheme of a RANGE OF DESIGN OPTIONS according to the different combination of width and length of a livingroom with kitchen which can contain 6 people, where the basic activities are cooking, eating meals, relaxing, cleaning up; there is a list of the fittings and of the equipment.

…a range of of design options (either dimensional, typological, etc..) from which different solutions, all of them answering to the general goals of the client and user.

From
Normativa tecnica regionale per l'edilizia residenziale della regione Liguria - CER, 1984

This is the meta-design layout for the same functions, for 4 people

…a range of of design options (either dimensional, typological, etc..) from which different solutions, all of them answering to the general goals of the client and user.



From
Normativa tecnica regionale per l'edilizia residenziale della regione Liguria - CER, 1984

These are the same schemesfurther developed from the layout to the construction phase: this is abacus of typical building unities according to a modular building system

A common feature: the *user* is a person
People are at the core of design

People are both the starting point and the final destination of the design process

Next time we will see how one of the main authors in this activity developed his design theory: from rational analysis to olistic approach

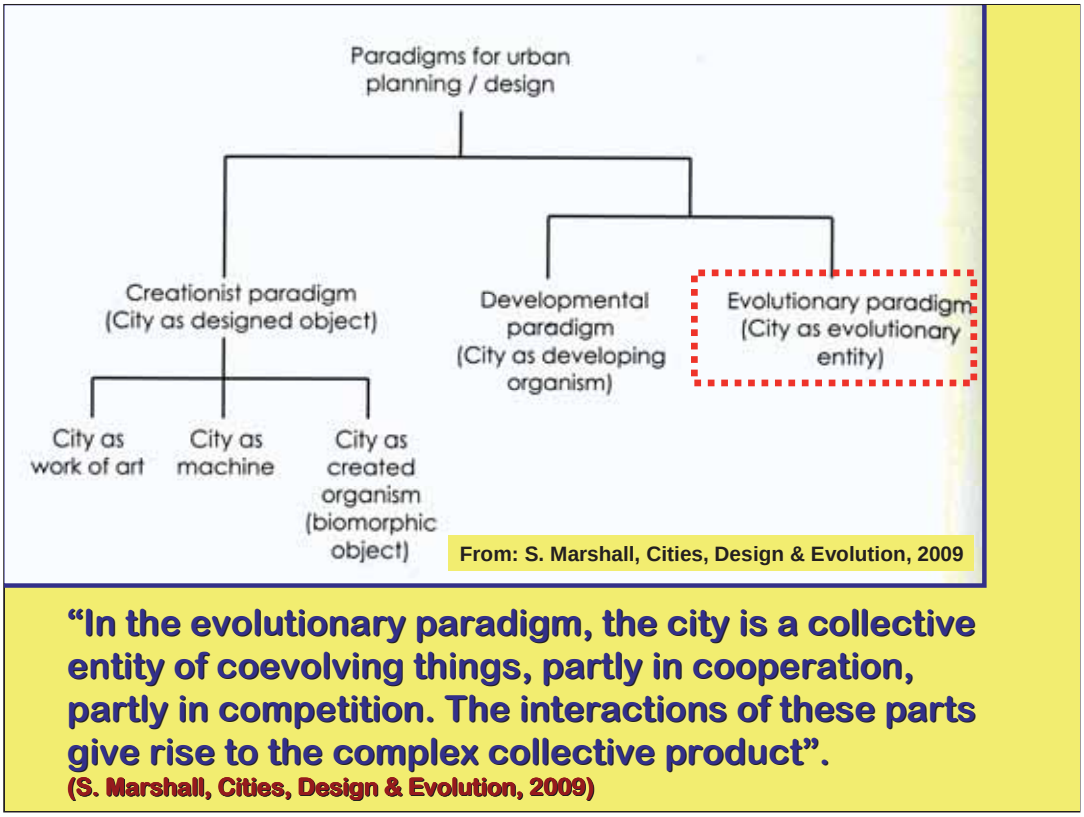
…
we cannot expect any longer the kinds of predictability that have dominated classical science.
…
cities are emergent and adaptive (…) we cannot expect them to exist in a state of equilibrium, as they are intrinsically unstable, *always in flux and thus far from equilibrium*."

(in: Batty, M., Marshall, S., From darwinism to planning – through Geddes and back, Town and Country Planning, november 2009)

And we must not forget our updated metaphor, the eco-syste.

This alco calls for a paradigm shift, a completely new approach to architecture and design.

Let's see what the most advanced urban theorists say – this comes from London University College and the director of advanced urban studies, Michael Batty.



Let me borrow a very useful concept from Stephen Marshall (the Bartlett Scool of Planning, University College London), who dedicated a recent book on the concept of evolution in design and planning. Marshall argues that, in order to understanding cities and the way to approach them, planners should resort to an evolutionary paradigm, rather than to the more traditional ones we see in the slide.

"In the evolutionary paradigm, the city is not a designed object (or a series of created objects); nor it is a developing organism composed of parts that are functionally interlinked, supporting and subordinate to the whole. Instead, the city is a collective entity like a forest or an eco-system, a population of coevolving things, partly in cooperation, partly in competition. It is the very interactions of the cooperating and competing parts that gives rise to to the complex collective product. In the evolutionary paradigm, above all, there is no optimal target form. It may be possible to identify potential improvements as immediate targets, but there is unlikely to be a single optimal target form and certainly no long-term knowable optimal form."

"

Further reading:

- G. Broadbent, *Design in Architecture – Architecture and the Human Sciences, 1973*
- J.Zeisel, *Inquiry by Design – Environment, Behavior, Neuroscience in Architecture, Interiors, Landscape, and Planning, 1981 – 2006*
- S. Johnson, *Emergence – the Connected Lives of Ants, Brains, Cities, and Software*, 2001
- S. Marshall, *Cities Design & Evolution*, 2009