Dia-grammatics: a cartography of complexity for design

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Urban discourses are complex products of different actors' desires, from political to social and architectural ones. In fact the role of architectural design today is also to provide this culturalized frame within which the complex political and economic transformation are embedded. As these elements come together, eventually they pick up speed and display as emergent property the capacity to empower and actualise specific -local, urban-solutions.

In order to study the complexity of reality in design, we propose a two-fold approach:

First we propose a methodological framework: an exploratory analysis, using diagrams as a model for complexity . The diagram has the ability to form spatial attributes from discourses by representing their contents and functions but not in a specific way. It incorporates the different desires and results in a cartographic grammar that shapes place, local character and experiences.

Secondly, we use as entry points for urban regulations processes 50 cases of planning competitions in Switzerland. This empirical background of planning competitions assembles all the different fields and actors' desires for architectural and urban design praxis. But more important from their role of platforms of communication between different fields, competitions, shaped by these different actors, produce design possibilities, which are realised in urban forms. They are powerful processes that from political questions formulate apolitical design problems that produce in their turn political urban events.

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Introduction

In this paper we discuss complexity and the urban conditions using as an entry point diagrams. We argue that diagrams possess the ability to encompass different traces of reality and thus they are an important tools (conceptual and empirical) for the study of the urban environment. The city and its architecture define a complex manifold where different spaces, images, structures and networks evolve, emerge and change through time. All these "geographies of architecture" are not a coherent 'given' but rather spaces of becoming, potential futures and thus need alternative research approaches. We propose that the diagram is an adequate model for studying these "geographies of architecture", the relational spaces from which the urban environment emerge.

Diagrams encompass any type of abstract pictorial representation and range from maps, line graphs and bar charts to engineering blueprints and architects' sketches. However, we believe that diagrams are more than visual representations or symbols: they hibernate between the different kinds of abstract pictorial representations (icons, maps etc) and discourses but also they provide bridges between theory, conceptual and philosophical issues of representation, and between methods or tools, dealing with the everyday life.

We argue that diagrams must be reconsidered in design against the new developments in technical and social sciences: diagrams are valuable conceptual and empirical tools for understanding complexity in design, not only as network-like images or graphic maps but as bridges between urban discourses, procedures and solutions; common platforms of empirical studies and general concepts.

As a laboratory to test our concepts we are going to use architectural competitions. Architectural competitions provide from a multitude of projects the "best solution", thus they act as a selection mechanism for the urban environment, related with issues of design, actualisation but also organisation and decision-making.

Diagrammatics : towards a model for complexity of reality

Complexity as an understanding of reality

Complexity cannot be given a simple definition. Complexity is a way of looking at things. Using and accepting complexity thinking is helpful because it enables the acknowledgement of:

"the unmanageability of the contemporary world whilst also holding open the possibility that novel forms of organisation or structuring might emerge spontaneously out of a sea of dense and disorderly interaction."(Clark 2005)

Having in mind that complexity thinking is a decision of looking at reality, complexity thinking is able to conceptualise our spontaneous - disorderly environment and its uncertainties, as possibilities and potential futures.

"… complexity entails that in a system there are more possibilities that can be actualized." (Luhman 1985)

Following these concepts of emergence and possibilities, we approach complexity focusing on two main problems:

In a first place the relation between quantification-qualification: the intrinsic magnitude of complexity asks for both quantitative and qualitative methods combined.

To illustrate this difference with an example we can think about the difference between measuring something and defining its measure:

Measuring something gives a quantitative result, a solution, a magnitude, or an index number that can be used for comparing one situation with another.

On the contrary defining the measure provides an assessment (evaluation or estimation of the nature, quality, or ability) of the situation.

This lead us to the second problem in approaching complexity:

In order to approach and study it is necessary to achieve an understanding of it. Thus we are looking for "techniques of understanding", methods of problem structuring and models that do not simplify but rather provide ways for the mind to grasp and work with quantitative and qualitative aspects of complexity.

We are proposing as models of complexity the use of diagrammatic models: diagrams, as we discuss in detail later, are processes or a grammar through which the quantitative and qualitative data can be organised by producing an organisational map.

They illustrate the relation in a mathematical way by using a connecting structure, a line between at least two points, sentences or assumptions. Which of the infinitely many possible routes between them is selected? The relation between the two points is singular and determined: it is a directed arrow, a vector, between the decisive points that stands in front of the space of immense possibilities. Points and vectors result to the diagram, the general model with which possibilities may be "play".

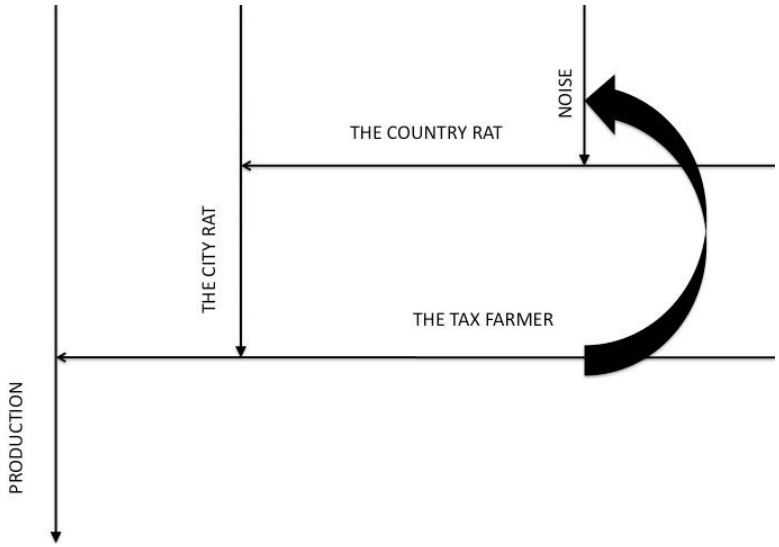

Fig. 1 Diagram of the "the city and the country rat" from M.Serres' Parasite

Models of a complex urban reality

When we are dealing with urban complexity, we are talking about components of our urban environment but also about a whole series of circulating networks of command and control. Because the urban environment is complex components or networks do not just add up as layers to any definitive layer of panoptic order able to make the city mapped, open and transparent. As we illustrate in the following examples the diagrams provide an adequate model for urban complexity since they allow both, an understanding of our environment and a cartography of potential futures where quantitative and qualitative information are present.

The diagram in the example Panopticon from M.Foucault is both, specific in that precisely maps the space of individual and universal in that it refers to an entire social regime.

Furthermore this diagram contributes to a final stage of theoretical understanding: an end point-goal. The attention is directed less towards material objects and more towards relations as points and the vectors of complex relational structure. The diagram here is the general outline of events (G.Deleuze) and relations between events, their quantitative information without the qualitative part, not because they are absent but because they are all possible.

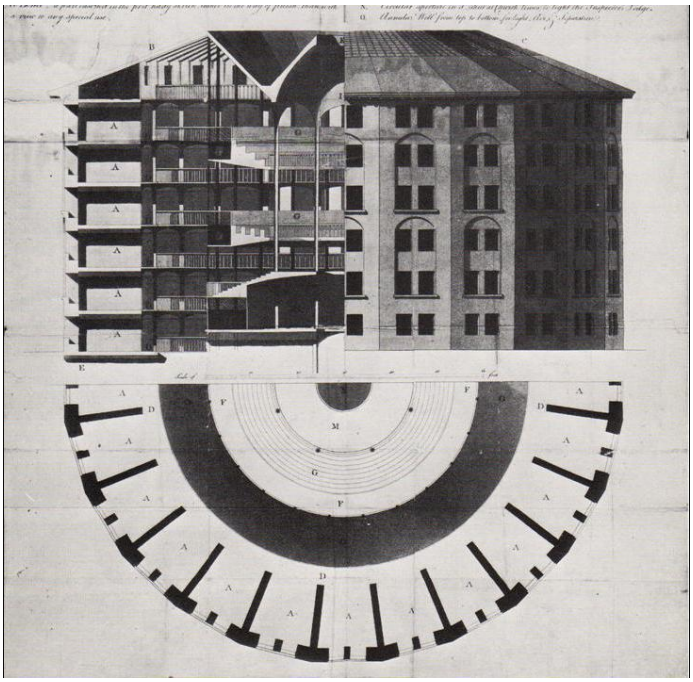

Fig. 2 Panopticon (retrieved from http://wongturn.files.wordpress.com/2009/09/panopticon.jpg)

Fig. 3 two prisons of the panopticon: in Arnhem , the Netherlands (retrieved from http://www.flickr.com/photos/35110249@N05/3471151686/) and in Statesville in the USA (retrieved from http://alumni.media.mit.edu/~carsonr/phd_thesis/figures/real-panopticon.jpg)

The complexity of urban environment produces the oligopticon, series of partial orders, of observatories. In the diagrammatic work of Constant "New Babylon" the tension between the larger fixed structures and the smaller scale flexible and labyrinthine interior structures is not fully worked out.

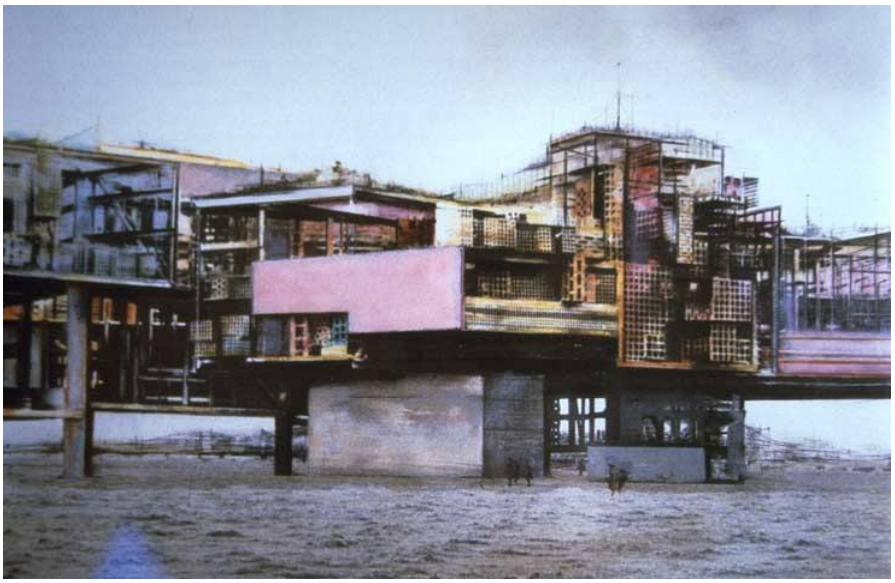

Fig. 4 New Babylon

However these are not contradictions states are more placed in a flux of interdependence rather than opposition. New Babylon does not produce a definitive panoptic order but depicts a series of partial orders, random glances to complexity from an observer who might be able to give it some seeming meaning, an understanding.

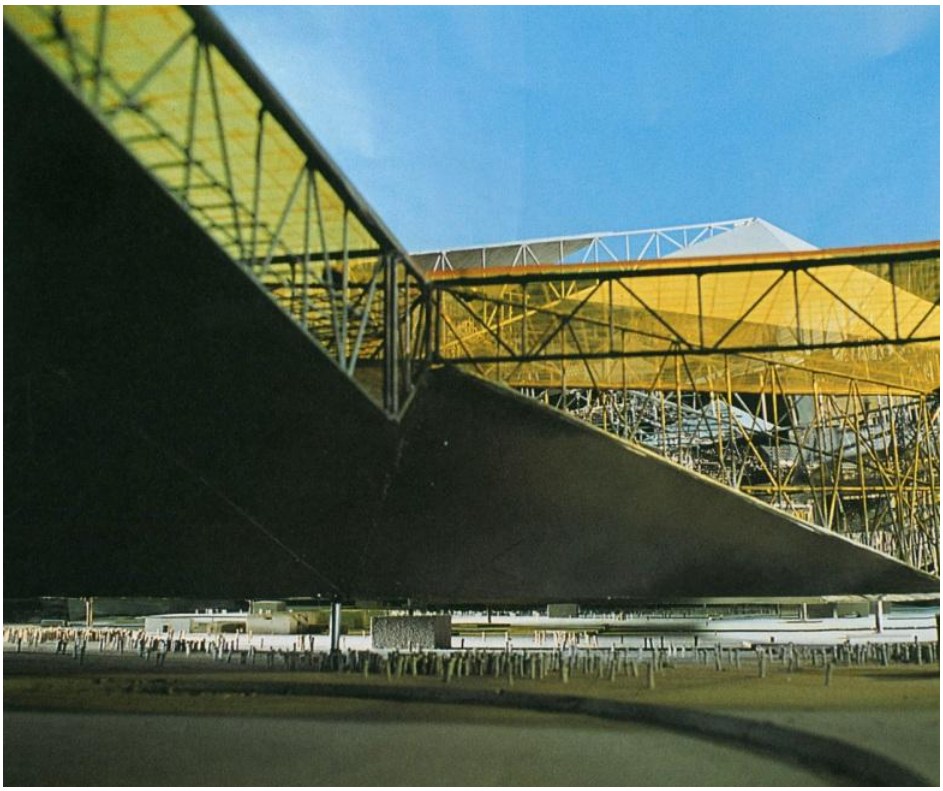

Fig. 5 New Babylon detail

Architectural competitions as a laboratory for dia-grammatics

Our aim in this paper is to study the urban complexity and how it affects processes and outcomes of architectural design.

We are going to work with architectural competitions as laboratories because we believe that competitions bring together both in space and time different knowledge and technical backgrounds form different fields related o architecture, design, construction etc. They are platforms of communication between these fields acting as selection machines of the "best" design outcome.

However all these characteristics compose a very complex decision making procedure, not always smooth and often frustrating, since competitions reflect the urban complexity and inherit its problems, conflicting agendas and backgrounds.

In our research we collect data for 50 Swiss competitions of 18th century from the French speaking part (Table 1), from technical journals of that period and historical databases (Table2).

Spatial frame	Switzerland , Federal State
Temporal frame	1800-1900 1974: Swiss Federal Constitution 1877: Federal principles for the rules architectural competitions

Table 1 Spatiotemporal frame of the study of Architectural competitions

Sources	Hypathie II (Archives de la construction Moderne EPFL) Schweizerische Bauzeitung Bulletin de la Société vaudoise des ingénieurs et des architectes Bulletin technique de la Suisse romande Die Eisenbahn / Le chemin de fer (www.seals.ch) Historisches Lexicon der Schweiz (http://www.hls-dhs-dss.ch/)

Table 2 Sources of the study of Architectural competitions

In order include complexity of reality in our data collection two rules, based the conceptual research, are formulated:

Rule 1. In accordance with the conceptual framework, the research of these populations is structured as a bottom up approach-study of their components, with no presupposed hierarchies or relations.

Rule 2. The research of these populations includes as much elements, detail, specificity as possible leading to a rich data collection.

In the following images, the starting point and milestones of the diagrammatic models produced during the study are presented.

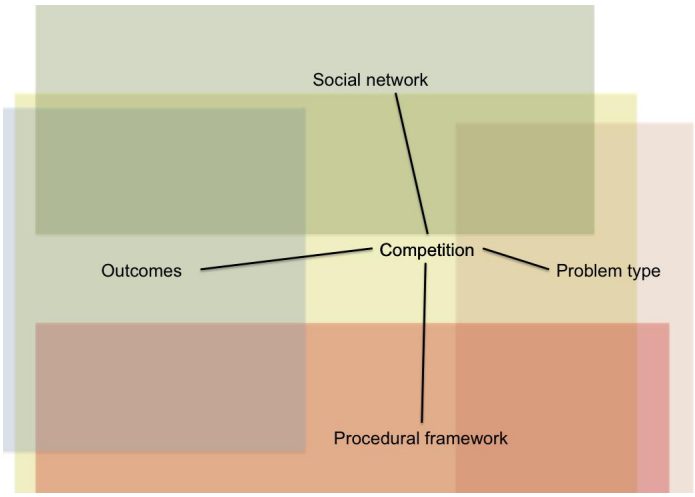

Fig. 6 Starting point: what we know about architectural competitions. An answer to a specific building problem where different social networks are involved, frameworks of procedures that produce design outcome(s). These are not used as predefined categories but components or entities for exploration.

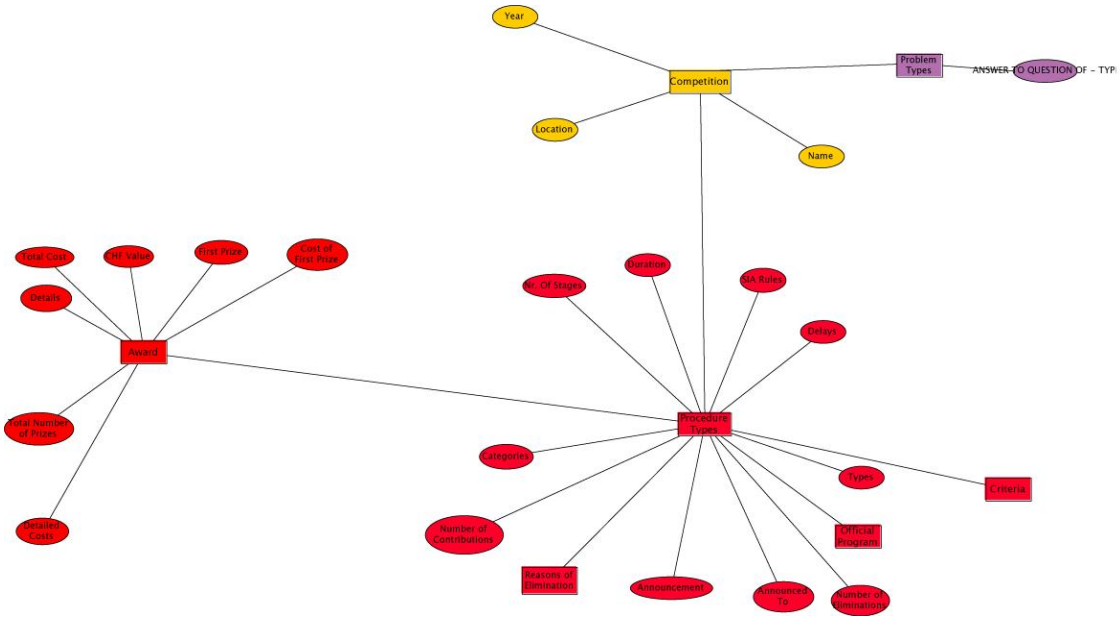

Fig. 7 First diagrammatic model (5 competitions): The data collected were mapped in the diagrammatic models with the aim to refine the starting components: What is the "procedure" in an architectural competition? A procedure is composed by the announcement (summary of the brief) that introduce information for who is eligible to take part in the competition, what are the awards, what kind of documents are handed and what kind of documents are asked for etc. Similarly the refinement of the other starting components is realised.

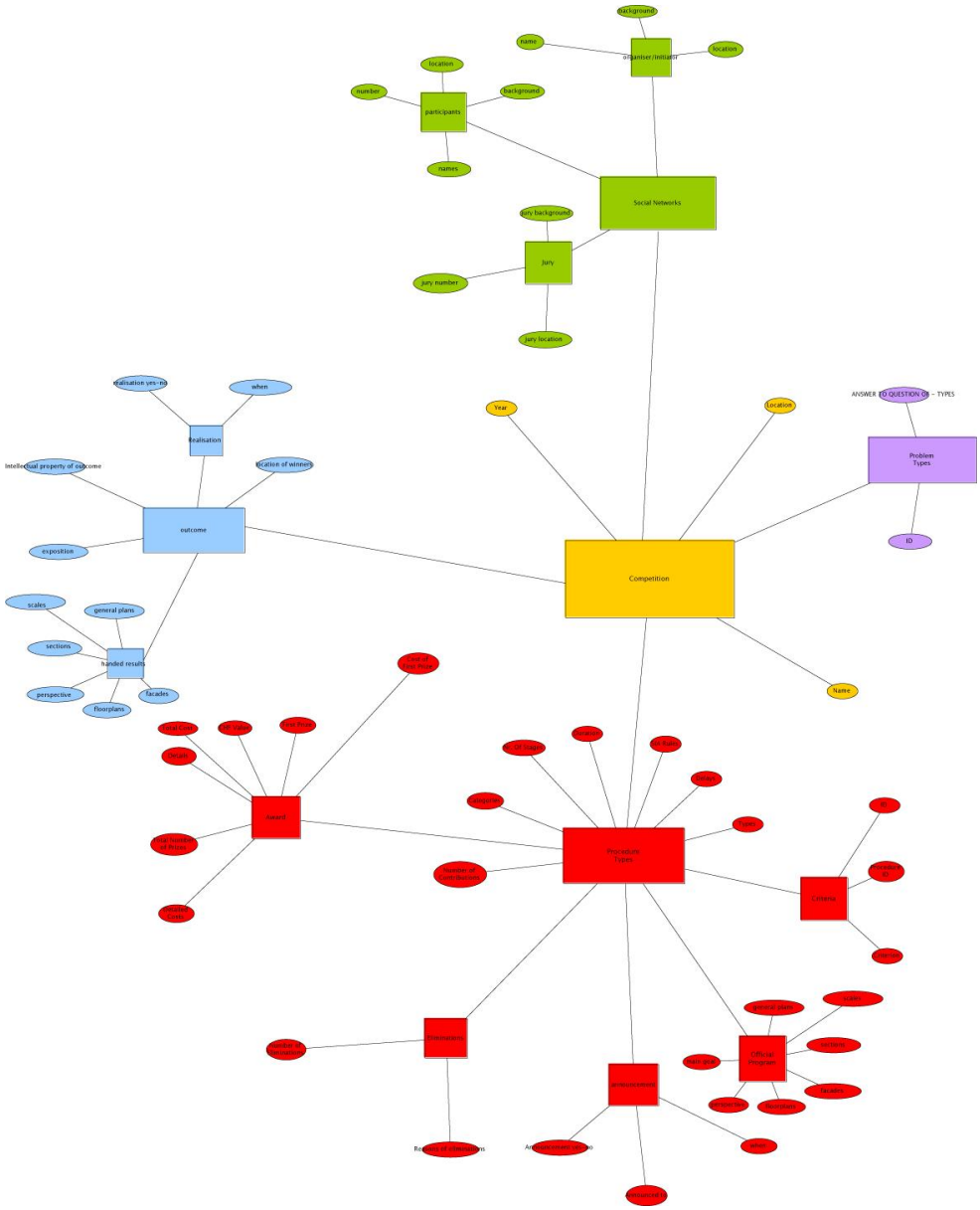

Fig. 8 Second diagrammatic model (20 competitions): Some first relations between the bigger data groups (the refined starting categories) are noticed, like the isomorphism between the asked and the handed documents.

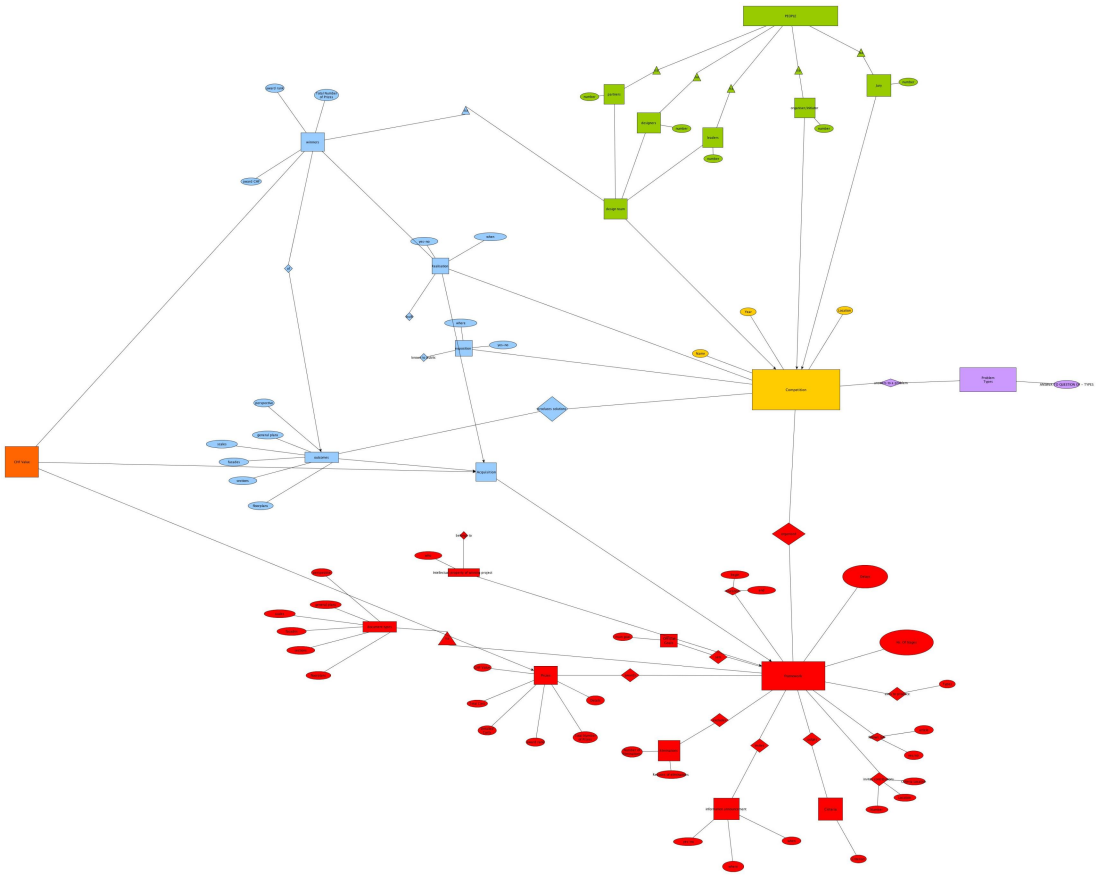

Fig. 9 Third diagrammatic model: generating relations. The relation between the component "realisation" and the component "people" involved is illustrated: in some competitions second or third prize winners realise the outcome of the competitions. Also new elements as the financial data and components as the "acquisition" are introduced and create new links between the components of outcomes and procedures.

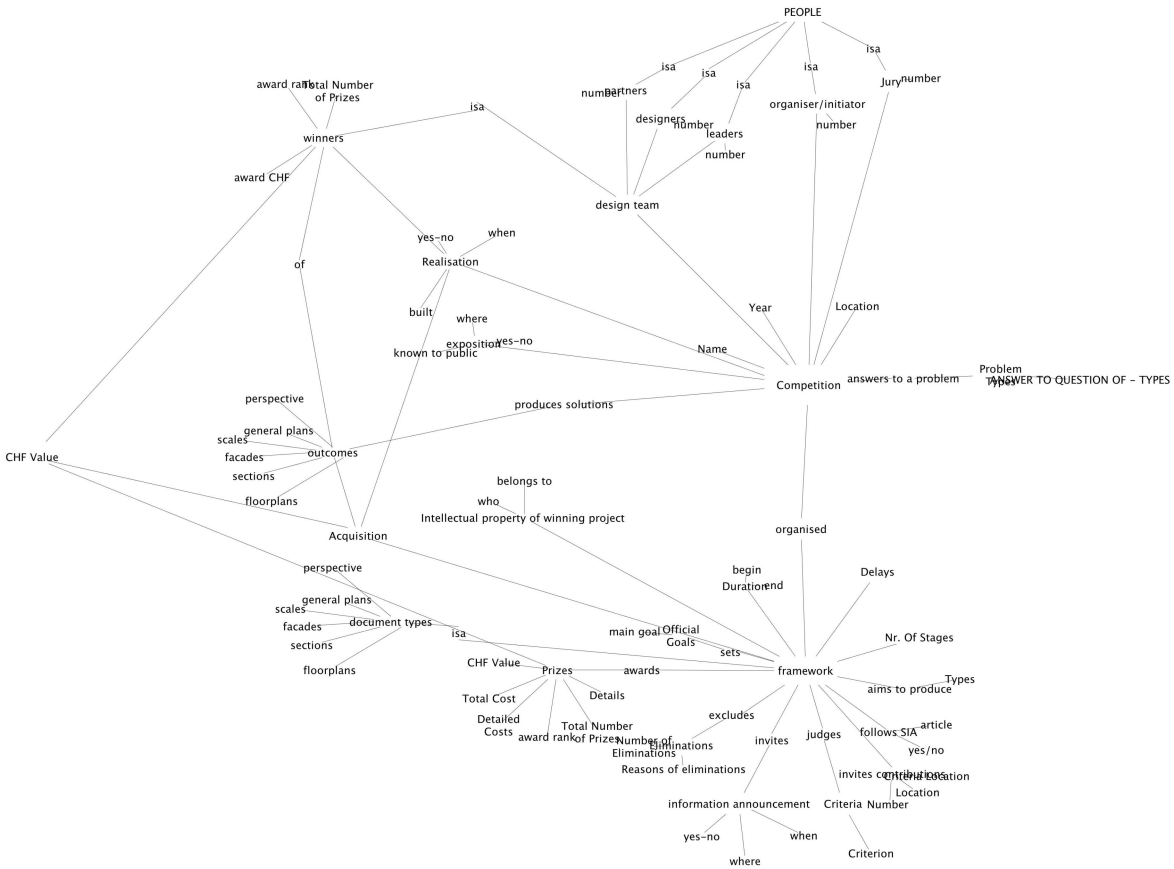

Fig. 12 Final diagrammatic model

Using diagrammatic models, we illustrate how our research is developed not only as a procedural understanding of architectural competitions but as a tracing of relations from singular cases. Starting from obvious knowledge about competitions, these knowings were refined, new components and details were introduced and new relations were traced. All 50 competitions together produced a general diagrammatic model (Figure 12), the cartography of relations, which entails all data retrieved from individual competition cases. In this final diagrammatic model most of the components are interrelated, some of the connections are expected but also some emerge unexpectedly from the data.

Diagrams enable the understanding of the complexity in competitions: the components and relations of each procedure, the evolution of each case, serves as a base and is transferred to the next competition case. Furthermore in the final diagrammatic model the design outcome of a competition is a part of an heterogeneous network of elements: description of design documents, people involved, materialisation of the design, reasons of failure, awards, acquisition etc.

Thus using diagrammatic models we trace the complexity of urban environment, as it is folded in the procedures of the competition, making them also complex, and as it is again folded in the design outcomes, making them part of a wider social, economical technical and political networks.

3. Dia-grammatics in design

Diagrams are valuable conceptual and empirical tools for understanding and mapping the complexity of our social, cultural and physical environment. They possess both qualities of the icon and written form: the iconicity and the arbitrariness of conventions. But diagram is neither icon neither linguistics. It is a " Zwieschenschrieben" that moves to a de-territorialised spatial zone, a space that is not real-actual but entails all the possibilities of the real, mapping out qualitative and quantitative information. In diagrams all the quantities, all the points are present and clearly defined. Also all the relations between these points are illustrated and they create an intertwined qualitative background of possibilities and potential futures.

This cartography of reality can be achieved by focusing on:
- random glances of partial understandings, the refinement of qualitative details of a general structure (oligotpicon)
- the materialised singular case and the transference of their qualitative and quantitative data to general diagram where all possibilities-qualities are present (panopticon)

In our diagrammatic models of architectural competitions both examples are used : focusing in the individual case we trace specific details, structures in order to refine our data, with a rich degree of complexity, possibilities and uncertainties of singular events. Then we transferred these to different cases in order to produce a general diagrammatic model.

By using dia-grammatics in design and design research we trace how a complex environment is folded in the procedures and in the design outcomes: we map the complexity of the design processes in competitions and

in this cartography we map the "position" of design outcomes as components of these complex networks. The diagrammatic models are tools that define the quantities, the details and characteristics of singular cases, by composing an evolving cartography that leads to a final "goal". In the same time they map the qualities as an evolving understanding of the singular cases and of the general, they are methods of understanding, of problem structuring.

Thus the diagrammatic models in design are not only a model introducing complexity in design but also a performative structure, which aligns the spaces of quantities and qualities, a common platform where problem structuring - understanding and problem solving-solutions are superimposed, worked out and evolve together.

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