Collaborative design in a multidisciplinary architectural design approach

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Abstract

The architectural profession is multidisciplinary. Only few weeks in an architecture studio is enough to be convinced of it. From the identification of a need, to the construction of a building, the architect seeks the cooperation of a lot of experts from various disciplines, from the jurist to the mason via the engineer, to conceive and make build. It is not so much the multidisciplinary character of the profession of architect that is to challenge, but the consideration by the architect of the constraints/potentialities generated by this multidisciplinarity in the early phases of design process, and the conditions of possibility integration. In this paper the subject of teaching the Conceptual Design in the School of Architecture of the Politecnico di Milano and Université catholique de Louvain is dealt with.

Keywords: Design Strategy, Education, Multidisciplinarity.

1 Introduction

The design is a highly non-linear creative and strongly multidisciplinary activity [1]. Some of the disciplines which intervene in the design of a building are: architectural composition, structural engineering, architectural technology and energy engineering. Depending on the strategy of designing, one or more disciplines can have priority over others. Let us call the way in which various disciplines are examined in detail, within the design activity, “design path” and we will give, in this section, a possible abstract visualization.

In defining the space of the design, Arielli [2] introduces three levels of abstraction which can be identified with three Cartesian axes in a three-dimensional space: completeness, concreteness, and variants.

2 Design Strategies

The Top-Down approach is a classic approach, examined in detail and applied by many authors [3]. From the didactic point of view, it is the approach used in many multidisciplinary design studios. In these courses, although there are different disciplines, the organization of the laboratories is determined so that the technical disciplines intervene only in the moment in which the architectural design has reached an elevated degree of completeness.

Since technical requests are often different form the architectural ones, the introduction of engineering themes (structural and energy) can leads great changes into the original architectural idea. The result is often the failure of the design idea and the need to pass to a variant of the design (see Figure 1).

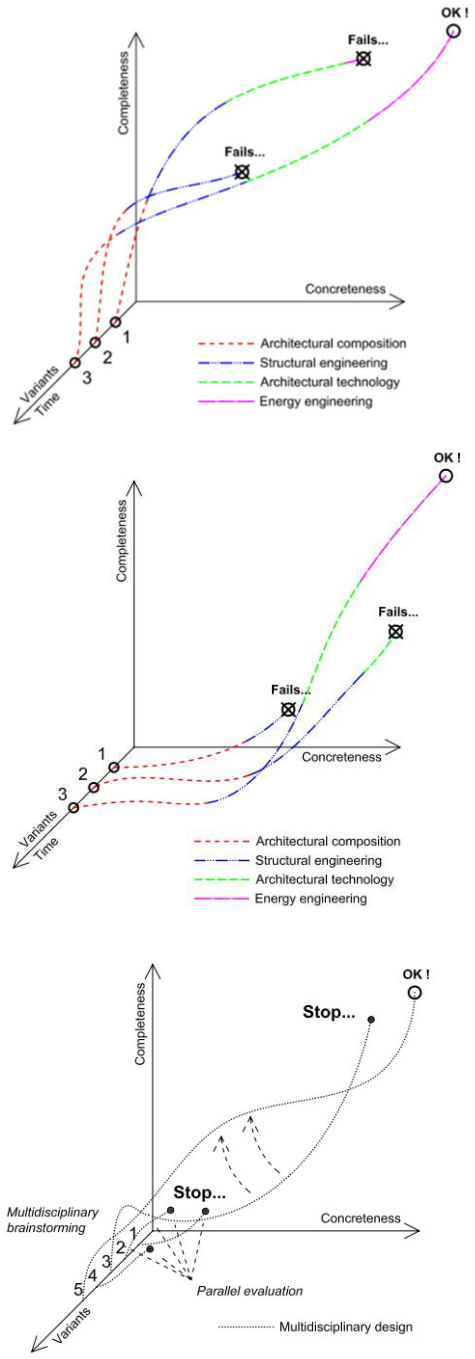

Figure 1. Representation of Top-Down, Botton-Up and Collaborative design strategies.

An approach with a completely opposed philosophy is the Bottom-Up. Even this one is an approach examined in-depth by many authors [4]. From the didactic point of view it is the approach used in the traditional design studios with monothematic theme (interior design studio, structural design studio, etc.). A structural design studio, not having at its inside the skills to develop a valid architectural design and having to focus on structural design, it will choose a simple and clear structure around which to develop the building. It should be noted that also this way of proceeding validates the idea of a serial design, where the single discipline intervenes only when the task of the previous ones is exhausted. A design modification, carried out within a discipline, leads, as in the top-down design, to non-linear cycles in the design path.

In the abstract design space the Bottom-Up approach is substantially the opposite of the Top-Down approach (Figure 1), in which at first technical problems are solved (concreteness) and then the architectural composition of the design is created (completeness).

Nowadays, architectural and engineering design are creative and multidisciplinary activities. In modern architecture, buildings are often designed to the limit of the design knowledge of the various disciplines which intervene during the design phase. This often makes serial approaches inadequate to the realization of a good design.

The multidisciplinary aspect of the design must enter into the brainstorming stage so that different designers can discuss different design solutions (collaborative design) in a phase in which completeness and concreteness of the design are still not at an advanced level. The most effective proposals must be examined in detail and put in competition with one another until the definitive design solution is reached (Figure 1).

3 References

[1] Blockley D. (1980). *The Nature of Structural Design and Safety*, Ellis Horwood, Chichester, UK.

[2] Arielli E. (2003). (In Italian). *Pensiero e Progettazione*. Milano: Bruno Mondadori.

[3] Chen, X., Gao, S., Yang, Y. and Zhang S. (2012). "Multi-level assembly model for top-down design of mechanical products", *Computer-Aided Design*, **44**, 1033-1048.

[4] Meller, R.D., Kirkizoglu, Z. and Chen, W. (2010). "A new optimization model to support a bottom-up approach to facility design", *Computers & Operations Research*, **37**(1), 42-49.