On the ontological status of design objects

Nicola Guarino*, M.Rosaria Stufano Melone°

*ISTC-CNR , Via alla Cascata, 56/C , 38123 Trento , Italy
nicola.guarino@cnr.it

° Politecnico di Bari, via E.Orabona, 4, Bari, Italy
rossellaok@gmail.com

Abstract. In the design process, architects tend to choose and arrange together primitive geometrical elements according to their own cognitive environment (as reflected by culture and education), taking into account as well the broader social environment from which planning requests emerge.

Therefore, each of such elements plays a very specific role in the global system, resulting from a strong intentional choice. Design creativity emerges exactly from such strong intentional choices.

During their activities, architects tend to talk of these design elements using terms that reflect the role they have in the system, talking of them as "real entities" even if they don't exist (yet) in the real world, and are just on paper or even only in the architect's mind.

In this paper we shall discuss the ontological nature of design elements and related notions, distinguishing among: (i) design elements, (ii) design components, (iii) physical system components, (iv) conventional system components.

1   Introduction

Talking of architectural design is not a simple matter. This is because every design process has an artistic/creative component, which often introduces communication problems due to difficulties in understanding the architect's language [1]. During the design process, architects create images of entities that are supposed to become real, things that may never exist but, once conceived, they do exist in some way. But in which sense do such design objects exist? How can we analyze their ontological status?

Indeed, while talking of their projects, architects tend to ascribe a genuine ontological status to their 'creatures', even if they do not have a physical presence: they refer to special imaginary, conventional entities that are specifically dependent on a design specification. Such entities have three main modes of existence: they can exist just as mental prototypes in the architect's mind, they can be (partially) realized in the real

world by means of physical objects, or they can be "projected" features of physical objects, as in the case where a house is still in construction and the architect talks of the kitchen as if it existed already in the way it was designed. According to Guarino [2] these conventional design entities presuppose a non-standard ontological behavior. In particular, the same design element may undergo a complete replacement of the physical object that realizes it. In this paper we intend to elaborate on Guarino's analysis, focusing in particular on architectural design.

In the next Section we report some reflections about the architects' designing process, while in Section 3 we develop an ontological analysis of the different kinds of design entities. In Section 4 we draw some brief conclusions and discuss the follow ups of this research.

2   Design process and design objects

Probably no unified and unique definition of 'design' exists. Ralph and Wand [3] tried to give one. The noun 'design', for them, is a specification of an object, manifested by some agent, intended to accomplish goals, in a particular environment, using a set of primitive components, satisfying a set of requirements, subject to some constraints; the verb 'design', therefore, denotes the process of creating a design, in a particular environment (where the designer operates).

The aim of exploring design in a scientific way can be traced back to ideas in the 20th-Century modern movement of design [4]. What designers and architects know about especially is the 'artificial world' - the human-made world of artifacts. Their knowledge, skills and values lie especially in the techniques of the artificial [5].

Just as the other intellectual cultures in the sciences and in the arts concentrate on the underlying forms of knowledge peculiar to the scientist or the artist [4], designers' or architects', knowledge is inherent to the artifacts of the artificial world, gained through using and reflecting upon the use of those artifacts.

There is a lot of literature [6] [7] [4] that focuses on the knowledge lying behind design actions and in general on the design process; here we want focus on the *epistemic objects* this knowledge is about, i.e. on the nature of designers' *domain of discourse*.

Focusing on the designers' domain of discourse shifts the attention to the *language* used during the design process. Drawing and talking are actions occurring at the same time during the design process. Together, they constitute what Schon [8] defines a 'designing language' where verbal and non verbal dimensions are strictly connected. In one of Schon's observations the designer was designing and at the same time

talking to another designer. His speech was full of expressions that were intelligible only by observing his hands moving on the paper, and his arms around himself. The two architects were using a meta-language to discuss their own projectual intentions.

According to the results obtained from experiments and reported in the literature, during the design process we can recognize different phases: an approach phase, a definition phase, a redefinition phase, and a refinement phase, where details are expanded at a different scale [9]. In all these phases, architects deal with design objects that will be finally realized, objects that will be modified, objects that will not be chosen for the final design (and subsequent realization). Note that these objects are not drawings, but physical objects existing in the architects' mind, i.e., mental prototypes existing in a possible world. Drawings are just representations (possibly at different levels of details) of such mental prototypes.

We are interested in understanding the ontological status of these design objects, in order to analyze and make explicit –as much as possible– the main characteristics of ontological assumptions behind the design process. Indeed, although our focus here is on the universe of discourse underlying the design process, our ultimate goal is to understand the whole design process, and especially design creativity. In this perspective, Purini [10] focuses on the intentional actions that he labels 'techniques for invention'. During the implementation of all these 'intentional actions' the designer feels himself as being in a certain oneiric dimension where objects slide from reality into an 'unreal dimension' where every object can be read according to many different points of view.

In general, all cognitive processes that lead to a design, or to the creation of an 'architectural thing' implicitly use techniques for enhancing creativity [11], [12]. These techniques are based on procedures whose linguistic descriptions unavoidably have two refer to geometrical entities that acquire their own ontological status, being conceived/projected as objects on their own.

3 Artefactual systems and architectural design

The result of a design process is an artifact, or more in general an artifactual system (composed of several system components playing different roles). In a previous paper [2], it was argued that the way people deal with artifactual systems presupposes a non-standard ontological behavior, which allows for the mere virtual presence of components expected to be in a certain position, and for the complete replacement of their physical realization.

While ascribing an ontological status to what engineers and technicians have in mind when they speak of artifacts and their components in a technical discourse, we clearly

subscribe to the perspective of descriptive metaphysics [13], which 'is content to describe the actual structure of our thought about the world'. By its very nature, descriptive metaphysics takes a liberal view concerning the introduction of new ontological categories as long as they are motivated by cognitive distinctions, often reflected by the surface structure of natural language. The focus of our analysis is therefore not the world as such, but rather our way to look at it, i.e., some kind of 'Weltanschaung'. This term is sometimes used in social sciences to indicate a set of high-level beliefs through which an individual or group experiences and interprets the world. A precise definition of this concept seems however to be elusive [14], while the approach of descriptive metaphysics seems more useful to understand the hidden assumptions associated to the design process.

Let us now discuss the status of the various entities involved in the design process. As we have seen, this process includes a number of activities involving intentional selection of design elements from a mental repository, composition and arrangement of these components, physical realization, and so on. From the ontological point of view, this means we can distinguish the following cases:

a. *design element*: a certain object that can appear more than one time (with variations) in the same design or in different designs; an architectural element extrapolated out from its context and considered as independent (note that we are talking here of a genuine object in the designer's mind, not of a physical drawing).

b. *design component*: a design element that plays a specific role in a design, standing in a specific position

c. *physical system component*: a particular object, for instance a particular portico made with bricks posed according a peculiar texture.

d. *conventional system component*: what is expected to exist in a particular place, in the architect's mind.

Let's consider an example:

Suppose two architects are working on an urban garden. In its design, among other things, they include a portico. During the garden design process and the subsequent realization, different scenarios may open up:

(i) after they (painfully) agreed on a certain design solution for the portico, they discover later that this is infeasible due to technical constraints. They decide however to save this solution to reuse it in another project. Is that possible? What is the ontological status of that portico? What kind of mental mechanism makes this object

so real that it can pass from a project to another? Maybe it will undergo some modifications, but will it be the same portico?

According to the classification suggested above, this portico is a design element. Of course, suitable rules will be associated to it in order to regulate the admissible changes while reusing this element in different projects.

(ii) it happens that the realized portico falls down because of natural or anthropic actions, and a decision is made in order to rebuild it. While describing the site to someone never been there before, keeping the design drawings in his hand, the architect says: "And here there we have the portico". And he starts describing it. What is he talking about?

In this case the portico is a conventional system component, this because here the portico is something previously designed, then realized, then destroyed, and now it will be there again, although different bricks will be used, so a different physical component will be built (here we have a sort of conventional solution to the Theseus's paradox).

As discussed in [2], conventional system components are like phantasms, where for phantasms we intend combinations of mental imagery constructed by embodied, distributed and situated cognitive process [14] that can materialise and disappear.

4   Conclusion

In this paper we have made a first preliminary attempt to analyze the way architects refer to their own design process under an ontological perspective. We intend to further develop these ideas in order to contribute to a better understanding of the design process, and especially the relationship between knowledge-in-practice and its 'objects' [6], [7]. One of the expected practical results of this work will hopefully be a more effective way to share design knowledge among the different agents involved in a complex design process. We are also thinking of an experimental setting to elicit data (including neural evidence) about linguistic and drawing actions occurring at the same time in the design process, to be used to evaluate the cognitive adequacy of our approach.

References

1. Tafuri, M., 1986, Storia dell'architettura italiana 1944-1985, Torino: Einaudi, 1986
2. Guarino, N., 2014, Artefactual Systems, Missing Components and Replaceability, in M. Franssen et al. (eds.), Artefact Kinds: Ontology and the Human-Made World, Zurich, Springer International Publishing
3. Ralph, P.; Wand, Y., 2009, A Proposal for a Formal Definition of the Design Concept, Sauder School of Business University of British Columbia Canada
4. Cross, N., 2001, Designerly Ways of Knowing: Design Discipline versus Design Science, Design Issues, Vol. 17, No. 3, pp. 49-55, Boston: MIT Press Journals
5. Cross, N, Developments in Design Methodology, Wiley, Chichester (1984)
6. Ewenstein, B.;Whyte, J., 2009, Knowledge practices in design: The role of visual representations as 'epistemic objects'. Organization Studies, 30 (1). pp. 7-30. ISSN 01708406, University of Reading, CentAUR: Sage Publications
7. Wang, D.; Ilhan, A. O., 2009, Holding Creativity Together, Design Issues, Vol.25, No.1, Boston: MIT Press Journals
8. Schon, D.A.,1983, The Reflexive Practitioner, New York, Basic Books (trad.it. a cura di Angela Barbanente, 1993, Il professionista Riflessivo, Bari, Dedalo)
9. Quaroni, L., 1988, Progettare un edificio. Otto lezioni di Architettura, Roma, Gangemi
10. Purini, F., 2002, Le opere, gli scritti, la critica, Milano, ElectaElemond Editori Associati
11. J. S. Gero, 1996, Creativity, emergence and evolution in design, ELSEVIER Knowledge-Based Systems 9 435-448
12. Hatchuel, A; B. Weil, 2002, Lathéorie C-K: Fondements et usages d'une théorie unifiée de la conception, Colloque Sciences de la conception, Lyon
13. Strawson, P. F. (1959). Individuals: An essay in descriptive metaphysics. London: Routledge
14. Harrell, D. F.jr, 2013, Phantasmal Media, Cambridge, The Mit Press