colaboração
como estratégia sistêmica
collaboration as a systemic
strategy

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INVITED ARTICLE

Abstract

The commented content of the following article was produced in the context of the systematized text: "*The Boat, the Sea and the Steersman: Design Processes and Cybernetics in Digital Culture*" (Pratschke, 2018), presented as part of the requirements for obtaining the title of Associate Professor at the Institute of Architecture and Urbanism, University of São Paulo, in September 2018. The text contextualized eight articles published by me or in co-authorship over the last 18 years, dealing with the development of the organization of information and communication, linked to digital culture, in architectural design processes.

Keywords: Collaboration, System, Design process, Nomads.usp

1 Visualization, organization and integration of information and its forms of communication

The first section contextualizes the transition to the digital culture, that implies profound social and organizational changes, highlighting an increasing need for collaboration between disciplines to respond to contemporary challenges.

To the questions of the 1990s on the need to solve computationally the visualization, organization and integration of information and its forms of communication, today, are added new questions about the benefit of such computational facilities for humanity as a whole. The question of consciousness, which Roy Ascott (2003) relates to computational development, is not only about the self, but about the continuity and expansion of the nodes. It is also a question of survival and responsibility that implies in what we produce in physical spaces and environments, and in what way we do it. It includes, finally, the need for greater interaction and collaboration among areas of knowledge, traditionally in

our case, with little or no connection with Architecture, such as Biology and Ecology, among others (Pratschke, 2018, p.13).

Architectural production, according to Gordon Pask (1969), is systemic in its organizational structure, demanding a collaborative stance in the process.

> The introduction of scientific methods from the 1960s on, derived from the interest and collaboration of scientists, such as the cyberneticist Gordon Pask, in Architecture courses - for example, the Architectural Association or the Ulm School - resulted in the formation of a group of professionals who have systematically used Cybernetic, Systems and Complexity theories in their design processes and in the definition of interaction with users. Cedric Price, the Archigram group, Metabolists, Frei Otto, Christopher Alexander, Yona Friedman, Gui Bonsiepe, and Ranulph Glanville are some architects, designers, and urban planners who have built little but contributed greatly to the methodological formulations of design processes and their relation to information and communication. Their thoughts and works should, therefore, be recovered within the current context of theoretical-methodological and architectural design production, since they enunciated and explored concepts such as architecture as a network, defined by actions and activities. Their ideas dialogue with notions such as uncertainty and impermanence, inviting us to view architecture as a set of actions (Pratschke, 2018, p.33).

The development of computing, information and communication technologies of the twentieth century invites us to revise the design process.

> It can be noticed that the methods of organization of information and communication, such as Cybernetics, evolve *pari passu* with computational and informatics development, shifting the focus from the object - *object oriented*, in our case, architectural, to "on the system" - *system oriented* (Burnham, 1968 cited in Pratschke, 2018, p.55).

2   Technological and methodological development

The collaboration in Architecture is constantly reviewed, with the increase of the number of actors in the process and the functional and ecological revaluation of the products. The development of digital platforms for the organization of information and communication, such as BIM (Building Information Modeling) for example, allow transparency and access to the registered information. In this scenario, the actors involved can modify and supplement the project from the start, and at any time during its life-cycle.

> In addition to obtaining important products, the introduction of digital media in the processes of *in loco* knowledge building stimulated and made possible the interlocution between [professionals and] researchers, allowing, in a much more effective way, to verify the limits and potential of the use of these means in this type of project. Despite the still limited possibilities of collaboration through computational platforms, I was able to perceive, on the one hand, clear relationships between structured work, in part, according to computational logic and, on the other hand, to glimpse the need - and the wealth - of thinking and designing platforms for collaborative construction of digital models of diverse natures (Pratschke, 2018, pp.44-45).

The transparency of the management and the individual contribution to the collective has been introduced in society in general, for example, in the context of education, work and creative production.

> The resolution of the problems of connectivity between users and the emergence of new computational paradigms allow us today to understand the digital environment as a *locus* of organization of information and communication. A good example of this is what has been happening at the University of São Paulo since 2017, when the Presidency signed a cooperation agreement with the multinational company Google LLC. Through this agreement, dispersed organizational systems - from the university - migrated to a central system - of Google's - that hosts and makes available free organizational services to all academic activities, for all USP faculty members, students and technical staff. Among the various services offered, citing only a few, are an email manager, individual cloud drive with unlimited storage capacity and various associated services, integrated calendars, access to

various support systems, forming a unique system with the existing systems at USP. The individual availability of this environment depends on a request from each user, who is ultimately required to join it if they want access to their own information (Pratschke, 2018, p.53).

The contribution on the platforms depends on the knowledge and expertise of the actors and needs be stimulated through professional training.

Similarly, regarding design processes, we have been using the collaborative platforms built according to the BIM (Building Information Modeling) concept for some years now. Software developers themselves allow the use of such platforms free of charge for educational purposes, enabling the future architects to explore and familiarize themselves with them early in the undergraduate course. In the first classes under my responsibility, at the IAU-USP, we began a few years ago to use the Revit Architecture program. The paradigms of this platform presupposes quite different design processes from the usual ones, since already from the beginning of the process, in the first operations with the program, the system requests several informations, relatively precise, so that it is possible to model the project. The use of this platform in design disciplines, in the following years, contributed to deepen the knowledge about the specificities of the system, allowing the organization of the information and its communication in a collective way. The collective contribution in the project process demands, in turn, a methodological structuring that values the role of the observer, aiming to guarantee quality, viability and performance of the elaborated system, as well as making the best use of the specific knowledge of each of the contributing actors to power the system (Pratschke, 2018, p.54).

The process includes different actors, specialists, that collaborate horizontally and transversally in the platform. Two forms of interaction are highlighted, identified by Cybernetics as First and Second order.

First Order Observation, as defined by Cybernetics, refers to the relationship between an observer and his object, making it clear that the result of the observation depends on the characteristics of the observer. The Second Order Observation, also called Observation of Observation, considers the increase in the number of observers since the beginning of the process, which allows multiple glances on the observed object or system, whose result depends on the different characteristics of those who participate in the process (Pratschke, 2018, p.4).

In this sense, the Cybernetics, among other theories with its collaborative routines, can assist in the selection of best proposals. Decision-making, structuring and mediation techniques are necessary to break with conventional hierarchies, leaving space for emergencies.

In the context of a project process, this collaborative mode confirms a greater need to integrate disciplines, preferably in a transdisciinary way, so that many variables are available to help select the best solutions. Swiss-American linguist Marie-Laure Ryan (2005) reminds us that digital media must be integrated as "[...] an art of compromise between the possibilities of the system and the demands of narrative meaning" (Pratschke, 2018, p.55).

3   Teaching and training in digital culture

The use of digital media in education and professional training presupposes a greater integration of the areas of knowledge through continuous education and training of teachers and students.

Architecture Computing is still, in many institutions, introduced through a specific discipline. The duration and the workload of a discipline in a course grade, however large, are insufficient for students to be fully qualified. Knowing digital technologies, but also understanding their impacts on the design process, is, today, critical for architects. This vast and complex knowledge, which presupposes the construction of critical visions, approaching new ways of learning, designing and organizing information, and includes the understanding of new productive arrangements, must be introduced from the beginning of the formation and included as a cultural principle in all disciplines. This is because modern, analogical design methods by virtue of the time when they were formulated are usually taught in computer science disciplines - via *CAD* programs - and in design

> workshops, but also extensively discussed and approached in disciplines of history, representation, and technology. Digital and collaborative processes, however, lack teachers who help construct their critique, contextualize culturally their emergence and contribute to the insertion of future professionals in the new productive arrangements in architecture. In architecture courses of our time, interdisciplinarity and collaboration need to be stimulated, trained, experienced in the use of the various platforms, if one wants to form propositional architects and innovate in the academic environment (Pratschke, 2018, pp.58-59).

Digital thinking as an information and communication organizing background requires a broader revision of didactic formats, even though some isolated examples of exploratory possibilities were already registered.

> However, for many university professors, there has been a search for differentiated didactic forms, which include digital thinking in the academic environment, signifying approximations between research groups and institutions, and even creating new interdisciplinary or specialized undergraduate courses. This tendency helps to explain the interest that the Pinhal Digital extension course aroused in the past, as well as its subsequent reverberations, which revealed to us the enormous didactic potential of transdisciplinary observation. Exercises in the context of a discipline, which stimulate the collaboration and understanding of the potential of a platform like BIM, should be used for the architecture course as a whole, because they affect several understandings, useful for the whole of the training. From my point of view, the efforts of the University of São Paulo in the introduction, defense and dissemination of a transdisciplinary culture in all their careers are still timid, although remarkable. When there is a slowdown in the transition from analog to digital, the responsibility is not, in my view, of the technology or the infrastructure: it is human, and cultural (Pratschke, 2018, p.60).

4   Collaboration, revised

When learning to read and write, technical mastery is not enough! To get out of functional illiteracy, one must know how to understand, analyze, synthesize. We agree that free access and free use of the Internet promotes exchanges between actors, without, therefore, guaranteeing collaboration. The development of organizational structures and the preparation of the individual in the use of available technologies and scripts are fundamental.

> Central to the architect's work, collaboration is also one of the key concepts of digital culture. The organization of information flows and forms of communication in the digital environment, through multiple platforms, make it possible to connect physically distant people and record activities, in real time or not. In the case of Internet communication, the development of mobile devices and of information and communication technologies has allowed the expansion and complexzation of modes of connection between people, in a "glocal" way, or in the formulation of Tramontano and Santos (2013), by constituting hybrid territories of communication and exchanges (Pratschke, 2018, p.114).

With the evidence of possibilities of manipulation and abuse of unprepared individuals, the challenge is from now on to deepen contextual and content knowledge. In the case of Architecture, it is possible to observe a connection between platform and simulation subsystems of the various design and execution aspects, allowing to have a view of the proposal through simulation data.

> In recent years, I have noticed that the issue of collaboration has become a central element in the digital production in Architecture, with the diffusion of Building Information Modeling (BIM) and the communication and integration of the production process to the design decisions, through manufacturing. Unlike many architects and even researchers at BIM, my approach to BIM was not through CAD but through organization methods of information and communication. The organization structure of related data, viewed and accessible in a single file, allowing the project to be developed and modified by the various authorized actors, also in real time through a conversion platform, is undeniably cybernetic. This allows - and encourages - that other methods and theories are associated with the use of BIM, in the definition of scripts and in the coordination of collaborations (Pratschke, 2018, p.144).

5   Platforms for the design process

The change in the design process, using collaborative platforms allows the approximation of design with technology.

> The BIM concept [...] drastically changes the way the design process is organized. A multidisciplinary team can work together on the same digital model and on the metadata feed, mirroring the characteristics of a system. But perhaps the most expressive and innovative differential of BIM is that its products are also information systems, usable and updatable not only during the design and construction phases, but throughout the life cycle of the building, and among these there are also the technical drawings referring to the architectural object. [...] The programs in BIM request information on materials and technical solutions because, without such precision, it is not possible to begin the modeling of the elements of the building. This relationship with technical issues transforms the design process as a approximation between the areas of Design and Technology, presupposing close collaborations that may be of great interest for the didactic-pedagogical aspects of the training of architects (Pratschke, 2018, p.116).

Collaboration is not only understood between individuals, but also between systems, subsystems, using Artificial Intelligence and new studies in Cognition. Design processes and their products fit into what is called nowadays a Cyber-Physical System, unifying the different layers of collaboration.

> Finally, [...] it admits the use of applications and programs for varied analysis, facilitating the systemic relation with information about the environment in which the building will be inserted. Through these complementary programs one can simulate and rectify behaviors, aiming to improve the performance of the construction in relation to the context. Current research in Nomads.usp has sought to broaden the notion of the environment in these processes by investigating the possibility of using historical, behavioral and flow aspects as parameters to which numerical values can be assigned and inserted into programming (Pratschke, 2018, p.116).

6 Final considerations

Collaboration in the contemporary architectural production process, has many advantages and enrich the results, but the progress of the process and the results depend on the structure of the employees, their specialties, their quality of training and ability to interact. Participants need to be aware of contemporary developments and challenges as a collective motivating element. To move from a participant to a collaborator, the stance must be proactive and the understanding of the goals and connections with the other actors systematically reviewed. The process is systemic and involves recursion, feedback, and permissive corrections. The person has to be able to accept criticisms and modifications that happen during the process. It still needs a decentralized management structure as can be seen for example in the feasible system model, proposed by Stafford Beer (1972). Initially, the process is more time consuming, because of feedbacks and revisions. Evaluating the pros and cons, it can be concluded that: Collaboration enriches the result; Collaboration allows you to perceive mistakes already in the initial stages; Collaboration familiarizes the expert with other methodologies used by other specialists; Collaboration is fundamental in complex projects; Collaboration makes us more tolerant, Collaboration promotes emergency and innovation, Collaboration transdisciplinary challenges complex projects [to be continued]

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