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Architects who keep up with the new designs demanded by the building industry will remain at the
forefront of the design process in our information-technology based world. Being familiar with the
tools available for simulations and early phase models will enable architects to lead the process.

We can get "back to command".

The other message of our slogan is "Back to command".

In the expanding world of IT applications there is a need for the ready change of preliminary models by
using parameters and scripts. These approaches retrieve the feeling of command-oriented systems,
CAADence in architecture

Back to command

Edited by Mihály Szoboszlai
CAADence in Architecture
Back to command

Proceedings of the International Conference on Computer Aided Architectural Design

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Budapest, Hungary
Faculty of Architecture
Budapest University of Technology and Economics

Edited by
Mihály Szoboszlai
Theme

CAADence in Architecture
Back to command

The aim of these workshops and conference is to help transfer and spread newly appearing design technologies, educational methods and digital modelling supported by information technology in architecture. By organizing a workshop with a conference, we would like to close the distance between practice and theory. Architects who keep up with the new design demanded by the building industry will remain at the forefront of the design process in our IT-based world. Being familiar with the tools available for simulations and early phase models will enable architects to lead the process. We can get “back to command”.

Our slogan “Back to Command” contains another message. In the expanding world of IT applications, one must be able to change preliminary models readily by using different parameters and scripts. These approaches bring back the feeling of command-oriented systems, although with much greater effectiveness.

Why CAADence in architecture?
“The cadence is perhaps one of the most unusual elements of classical music, an indispensable addition to an orchestra-accompanied concerto that, though ubiquitous, can take a wide variety of forms. By definition, a cadence is a solo that precedes a closing formula, in which the soloist plays a series of personally selected or invented musical phrases, interspersed with previously played themes – in short, a free ground for virtuosic improvisation.”

Nowadays sophisticated CAAD (Computer Aided Architectural Design) applications might operate in the hand of architects like instruments in the hand of musicians. We have used the word association cadence/caadence as a sort of word play to make this event even more memorable.

Mihály Szoboszlai
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Members of our local organizing team have supported this event with their special contribution – namely, their hard work in preparing and managing this conference.

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Enhancing Housing Flexibility Through Collaboration

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Abstract: Flexibility is a solution employed in housing from the twentieth century, in which allows space adaptation to its residents. In addition to creativity, various materials assisted this transformation over the years, improving construction quality and better response for inhabitants demands. During this process, the multidisciplinary association between some areas, such as Computer Science and Electrical Engineering, were essential for built environment, highlighting the project complexity. This study aims to explore the importance of collaborative design for deepening the relationship between living and dwelling flexibility, showing how different professional fields can be used to qualify the space adaptation. Methodologically will be investigated some prototypes and products emphasizing computerized technology and multidisciplinary.

Keywords: Collaborative Design, Flexibility, Technology

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INTRODUCTION

A building project should integrate multidisciplinary professionals, so all design and construction steps are correctly detailed. Initially, these interactions occurred as discussions during face-to-face reunions, in which several drawings were continuously reviewed. Internet and CAD/BIM technologies have been changing this context since the computer insertion [1].

The support to multiple design participants progressed with Information Technology (IT), utilizing constant communication, virtual studios, and collaboration. It enabled access to databases, computational resources and messaging data/exchange [2]. Computer Supported Collaborative Design (CSCD), a field from Computer Supported Collaborative Work (CSCW), incorporated these aspects integrating members separated in time and space to develop individual tasks in a common project [3].

Collaborative Design explores how the information, interface, and design can be technically manipulated by more than one person [1]. Is a resource to construction complexity and dynamics, in which involves relationships, organizations, and processes [4].

As collaboration can be used in different contexts of the building project, this study aims to explore the importance of Collaborative Design for dwelling flexibility. The subject was chosen to explore it from a new perspective, applying technology to approach user accommodation into living environment.

Methodologically will be investigated some prototypes and products emphasizing computerized technology and multidisciplinary. The selected cases have been chosen according to their innovation and transformation capacity. Only examples with qualified information were considered.
INNOVATION IN SPATIAL FLEXIBILITY

Flexibility is the competence to offer varied choices and customizations [5]. A space with general purpose, where furniture and movable partitions create a malleability [6]. Furthermore a polyvalent form, in which distinct uses occur without a change in itself [7]. An aptitude to create a margin, implementing different interpretations and tasks [8].

To achieve these results, strategies employed are modular and prefabricated elements, sliding/folding/retractable partitions, light partitions, functionless spaces, and multipurpose furniture [9]. Modular and prefabricated elements facilitate assembly and disassembly as Gypsum, Drywall, and ceramic Cobogós.

Partitions are a simple environment divisor or a ambience aggregator/divider. Functionless spaces change one use in another (sometimes excluding kitchen and bathrooms). Furniture employs transformation, such as beds and tables into built-in cabinets [10].

Besides these strategies, prefabrication and independent structure were fundamental in the nineteenth and twentieth centuries. Currently, computerized technology innovates revolutionizing the old practices and materials, replacing the manual function by the automation [11].

For example, the concept of Smart Home seeks to incorporate control devices in the housing [12] or automate communication between them [13]. A smartphone or digital panel control remotely lighting, air conditioning, monitoring camera, and locks, ensuring comfort and practicality in daily activities [14].

Thus, how Collaborative Design can help to enhance flexibility at dwelling? Collaborative Design allows constant interaction among the participants, sharing databases, process, and design information. Furthermore, it strengthens creativity, stimulation of ideas, and cross-fertilization [15]. Together with IT helps in the design process and project planning, since it can be extended to materials and builders suppliers. Further, assists manufacture and installation, improving the quality and performance of entire project itself [16]. Some examples below will support these facts.

PRODUCTS AND PROTOTYPES

Prototype Wallbot (Figure 1) is a retractable partition from LAAB Collaborative Studio in Hong Kong. The partition opens and closes through sensors and mechanisms, powered by electronic and kinetic systems. It operates according to the user preset, being attached to each other [17]. Architectural, designer, mechanical engineering, civil engineering, and computer science probably were employed to achieve this result. It can be said the concept demands studies, simulations, and constant dialogue to build it in collaboration.

Figure 1: Wallbot. [17].

Another example is the Fritting™ panel (Figure 2) developed by the Adaptive Building Initiative. The product consists of fritted glass layers with dynamic graphic pattern controlling its transparency [18]. Presumably, experts have used contrasting knowledge to ensure the product.

Similarly dynamic technique is employed at “living” facades. Al Bahar Towers and Institut du Monde Arabe (Figure 3) have geometric facades altering according to the sun presence. The geometries have potential to be converted to internal devices, reshaping it as inhabitants context.
Walls or habitats could deform and adapt similarly as the prototype developed in the work Translated Geometries (Figure 4) from Institute for Advanced Architecture of Catalonia (IAAC). The prototype, made of Shape Memory Polymer (SMP), operates with microcontrollers, drones, and heat/cooling to change its appearance [21].

A partition could be mountable or inflatable such as the transformable material created at Harvard University (Figure 5). Inspired by snapology (a type of origami) it folds and unfolds through pneumatic actuators on the edge of the cells. Some parts are almost rigid and other has the freedom to deform [22].

The teamwork was composed of Chemical Biologist and other Applied Sciences professionals. Therefore, there are no limitations of fields that can be used in collaboration. From this background, it is possible evaluate the relevance of multidisciplinary at housing.

**DISCUSSION**

Although the great advantages of collaboration, some problems may interfere the process. Physical and temporal barriers can prevent the communication among the teamwork, requiring subsystems to avoid it [15]. Organizational, hier-
Architectural and relational conflicts can disturb the final product progress, since a dynamic network with no centralized controller and global behavior is not always available [23 & 15]. Specifications, concepts, and design demands alter over time hence, versatility in the collaboration is substantial to make reviews and adjustments in work [24]. Knowledge barriers can damage the integration of all participants, so softwares demand an equal peer instruction [15].

Computerized technologies, to find new ways of flexibility, also have advantages and disadvantages. Usually, manual and traditional systems have lower added value and are more popular. Handling and maintenance are more simple, because they are commonly used in commerce and the parts are accessible. However, manual systems have limited options, assigning only one or two functions.

Digital systems may comprise different functionalities. It can be programmed according to the needs of one or more users, ensuring comfort and convenience [25]. Even though technology has a higher added value, many are designed to generate a saving of resources over time [26]. Maintenance in such cases depends on each article. A programming repair may be cheap but the exchange of parts could be very specific, difficult, and expensive [27]. The biggest disadvantage of digital systems is energy and connection by Wi-Fi or Bluetooth.

**CONCLUSIONS**

The viewpoint presented demonstrate plausible applications to enhance flexibility via technology and collaboration, ratifying different opportunities to innovate ways of living. Multiple professionals allow enriching the design and answer the constant changes of society. Conflicts among the participants require attention, as it involves different concerns. A defined focus is important for the continuity of the work, assigning tasks to organize the design. Virtual connections bring opportunity to create therefore, lacks some assistance to avoid these problems. The principal key is balance all the aspects involved, either human or computer.

Computerized technology benefits show to be relevant, taking over more than one function and a practical manipulation. Disadvantages such as maintenance and price can be seen as transitional, because of the popularization and improvement around them.

Concluding, advantages of technology and Collaborative Design are bigger than disadvantages, making a favorable scenario to continue investigating the subject. As a future prospect is expected to reinforce the study and find a new way of reacting to the environment, improving man relationship with his living space and dwell needs through technology support.
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"The cadence is perhaps one of the most unusual elements of classical music, an indispensable addition to an orchestra-accompanied concerto that, though ubiquitous, can take a wide variety of forms. By definition, a cadence is a solo that precedes a closing formula, in which the soloist plays a series of personally selected or invented musical phrases, interspersed with previously played themes – in short, a free ground for virtuosic improvisation."