

# Rethinking the concept of Order from a Systemic and Expanded vision of Architecture. Foundations and strategies for a new framework

Repensando el concepto de Orden desde una visión Sistémica y Ampliada de la Arquitectura. Fundamentos y estrategias para un nuevo marco de acción

**Jon Arteta Grisaleña**

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**Jon Arteta Grisaleña**

Investigador independiente

jonarteta@hotmail.com

Doctor Arquitecto por la Universidad de Alcalá, Máster en Proyecto Avanzado de Arquitectura y Ciudad (Univ. de Alcalá) y titulado por la Universidad del País Vasco.

Sus investigaciones se centran en las metodologías de diseño arquitectónico y urbano y su conexión con el contexto científico, tecnológico y social.

En la actualidad combina la investigación de manera independiente con el ejercicio profesional, colaborando con oficinas de Chile y España.

## Abstract

This article proposes a new way of understanding the concept of architectural order, expanding its traditional scope to adapt it to the systemic and hybrid nature of contemporary architecture.

Is it possible to think of an architectural order that goes beyond mere geometric-formal considerations? Could we conceive a more systemic and integrating concept of order that also incorporates the environmental, social and/or virtual/digital dimension of architecture? What resources and design strategies can be relevant in the construction of this new order?

The text addresses these issues through a theoretical-practical approach that integrates different positions, trends and examples in a coherent and synthetic discourse that reconnects the concept of order with the experiences and challenges of contemporary architectural design.

*Key words: order, systemic architecture, hybrid architecture, design strategies, digital design.*

## Resumen

El presente artículo propone una nueva manera de entender el concepto orden arquitectónico, ampliando su alcance tradicional para adaptarlo al carácter sistémico e híbrido de la arquitectura contemporánea.

¿Es posible pensar en un orden arquitectónico que vaya más allá de las meras consideraciones geométrico-formales? ¿Un concepto de orden más sistémico e integrador que incorpore también la dimensión ambiental, social y/o virtual/digital de la arquitectura? ¿Qué recursos y estrategias de diseño pueden resultar relevantes en la construcción de este nuevo orden?

El presente texto aborda estas cuestiones mediante una aproximación teórico-práctica que integra diferentes posicionamientos, tendencias y ejemplos en un discurso coherente y sintético que reconecta el concepto de orden con las experiencias y los retos del diseño arquitectónico contemporáneo.

*Palabras clave: orden, arquitectura sistémica, arquitectura híbrida, estrategias proyectuales, diseño digital.*

## Introduction

This article proposes a new way of understanding the concept of architectural order, in order to update it and making it a useful instrument to interrogate and analyze the challenges of contemporary architectural design. To do this, we will start by explaining the influence of systemic/complex thinking and physical-digital hybridization in the current architectural context, describing a new scenario that invites us to question the traditional notion of architectural order. Hereinafter, an alternative definition is proposed, based on the concepts of organization and articulation. Thanks to this new conceptual framework, we will be able to analyze some of the main resources and design strategies of contemporary architectural design.

## Towards a Systemic and Expanded vision of Architecture and Architectural Order

For more than six decades, science and philosophy have been building a new way of understanding order in the world, leaving behind the cartesian and deterministic vision of traditional science to embrace a more open and dynamic conception, based on the concept of system. This transformation has had a direct influence on most disciplines, architecture among them.

Theories associated with systemics and complexity describe a world in which all entities and phenomena are interconnected with each other, forming a great "system of systems". The important thing is no longer the objects, but the relations between them. In the field of architecture, Montaner talks about the "*crisis of the object*"<sup>1</sup>, referring to this transition to a systemic worldview, highlighting relational aspects and the strong connection between architecture and its context. Stan Allen reinforces this idea mentioning a shift of focus "*from object to field*", that is, replacing traditional "figure on background" with "field-to-field" relations, in which everything is part of the same network of relationships<sup>2</sup>.

In contrast to these visions, the traditional definition of architectural order refers to the "*arrangement and proportion of the main bodies that make up a building*"<sup>3</sup>, focusing its attention on the formal aspects of architecture, understood from an object-oriented and autonomous logic. Does it make sense to continue limiting the architectural order to the physical and formal dimension? Is it possible to imagine a more open and systemic order?

Contemporary architecture no longer responds to rigid and predefined formal schemes, as classic buildings did, but to increasingly complex, diverse and dynamic functional requirements related to social, energetic and environmental aspects. Likewise, these factors have a decisive influence on our way of perceiving architecture: people presence or absence in certain areas, patterns of light and shadow, environmental conditions of the space, or even notifications of our mobile phone, may notably vary the perception and sense of spatial order.

For this reason, it is proposed to replace the concept of architecture with that of "architectural system", encompassing both physical entities and dynamic phenomena linked to a certain region of space.

- 1 Montaner, *Sistemas Arquitectónicos Contemporáneos*, 10.
- 2 Allen, "From Object to Field", 24-31.
- 3 RAE, "Orden", definition no. 9, related to architecture. [www.rae.es](http://www.rae.es)

As indicated by architect Manuel Gausa, contemporary architecture:

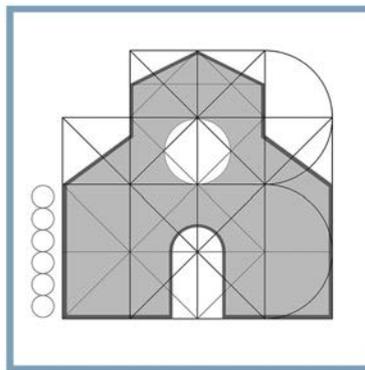
*pay special attention to the development of (complex) systems rather than to the design of (refined) objects, and such systems—or processes— evolutionary, plural, changing, irregular, would manifest the transfer of a still static and figural conception of space to a definitely dynamic and relational, evolutionary and definitely interactive.<sup>4</sup>*

**4 Gausa, OPEN. *Espacio, tiempo, información*, 8.**

This in turn entails a reinterpretation of the architectural discipline itself, renouncing disciplinary autonomy and self-imposed limits to promote a hybrid architecture, contaminated/enriched by different agents, phenomena and technological devices. As Andrés Jaque states, architects do not design buildings, but “*architectural devices*”<sup>5</sup>, that include construction technologies, but also a wider range of resources, such as protocols, online environments, etc. This brings us to the idea of an “*expanded architecture*”, freed from the traditional limits of the discipline to adopt a more open, operational and unbiased attitude. This approach will also extend to the concept of “*authorship*”, understanding that architectural systems tend to transcend the traditional figure of the unique designer, involving an increasing number of agents (specialists, citizens, community) with the capacity to contribute to the development of architectural projects.

**5 Andrés Jaque, interview.**

In summary, the systemic and expanded vision of architecture invites us to question the traditional notion of order, suggesting the need for a broader and more operative term that helps to understand the real complexity of current architectural design.



**Figure 1: Classic order- disciplinary autonomy Vs Systemic Order- expanded architecture. Source: own elaboration**

### **Rethinking the concept of Order. Foundations for a new framework**

In order to incorporate this systemic and expanded vision, it will be necessary to redefine the concept of order in architecture, freeing it from previous limitations and connotations (object-oriented vision of architecture and protagonism of the geometric-formal dimension). The idea is to adopt an alternative definition that reformulates the foundations and objectives of the architectural order, generating a new conceptual framework.

**6 Schumacher, *The Autopoiesis of Architecture*, vol II, 42.**

To do so, we will adopt the definition proposed by Patrik Schumacher in the book “*The Autopoiesis of Architecture*”, in which architectural order is defined as the conjunction of two complementary factors: organization and articulation<sup>6</sup>.

“Organization” refers to the existence of objective links or connections between the elements of an architectural system. For order to exist, it is first necessary that these links are present, giving rise to “organization”. The second factor, “articulation”, consists in the ability to perceive this organization by users and agents linked to the architectural system. Articulation allows buildings and architectural systems to be legible and understandable by people.

Architectural order, therefore, is the result of the conjunction of both factors: organization (links must exist) and articulation (links/connections must be perceptible / understandable).

Hereunder, we will see how the concepts of organization and articulation<sup>7</sup> can help to give meaning and coherence to many of the resources and searches present in current architectural design, integrating them within a common search horizon. The idea is to reconnect the concept of order with the trends and challenges of contemporary architectural design, promoting a systemic (maximization of architecture-environment connections) and expanded (hybridization) vision of architecture.

**7 Our approach proposes a free and expanded interpretation of the concepts originally set by Patrik Schumacher.**

## **Constructing/designing Architectural Order through Organization and Articulation. Connecting with the resources and strategies of contemporary architectural design**

### **Organizational Strategies in Architectural Design**

The systemic vision of the world invites us to investigate and learn more deeply about the organization of the systems that surround us, identifying their components and relational logics. Scientific and technological developments of the last decades have allowed us to advance remarkably in this field, expanding our capacity to understand and design increasingly complex and sophisticated organizational patterns. Architecture will directly benefit from this context, increasing its organizational capacities.

### **Understanding and Analyzing Organizational Patterns**

The success of any architectural system will depend on its ability to connect with the organizational dynamics and logics of the systems that surround it (urban, ecological, social, etc.). Many of these logics are not evident, and in many cases, they are still elusive to us, given their enormous complexity. However, scientific-technological advances have provided us with very useful tools to advance in this field, such as complex algorithms/formalisms, Big Data or Artificial Intelligence, all of them understood as resources that allow us to expand our natural intuition, broadening the designer’s field of understanding.

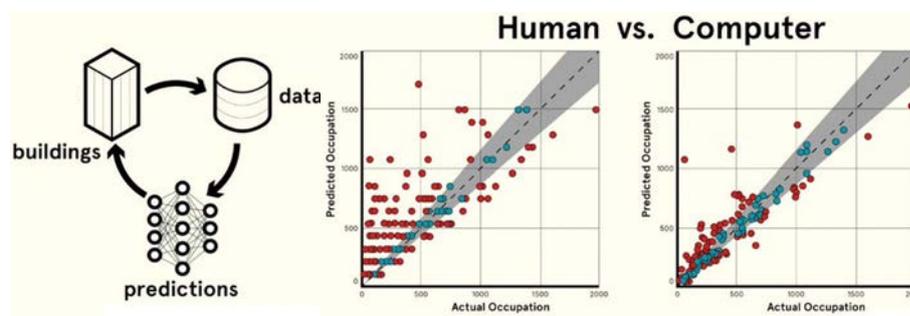
In the book “Análisis y diseño de la Ciudad Compleja”, the anthropologist Carlos Reynoso collects some of the main (complex) formalisms associated with the study of urban phenomena and dynamics, highlighting tools such as agent-based simulations or space syntax, among much others. But, without a doubt, the most booming resource in our days is Big Data, generated from the massive record of our daily actions, both in the physical and digital world. Aside from the necessary debate on how to collect and manage such information, the truth is that we are facing an expanding phenomenon that can be of great help to broaden the understanding of systems linked to architectural and urban environment.

Currently, there are many research centers and teams working on this, from leading institutions such as “MIT Senseable City Lab” to smaller companies or local governments that are beginning to explore the possibilities that big data can offer to improve the development and management of their respective communities. Most of these teams work on the urban scale, although there are researchers who are applying it also on the architectural scale, through data obtained from post-occupancy studies. One of the outstanding authors in this field is the architect Daniel Davis, who, together with Wework research team, has carried out several studies on occupancy patterns in cowork spaces. Davis collects data from different Wework Company buildings, crossing them through artificial intelligence applications (machine learning) that

“begin to recognize patterns that human designers can’t see in the data”.<sup>8</sup> (Fig. 2)

These investigations will allow to detect use patterns and predictions based on empirical evidence, generating objective data that can be used to inform and optimize future designs.

Figure 2: Study on the use of shared meeting rooms in Wework buildings. Comparison between designers’ (intuitive) predictions and predictions derived from data collection and computational processing through machine learning. Source: Davis, “Applying machine learning to building design”.



### Designing the Organization of Architectural Systems

One of the main tasks of the architect will consist in designing the organization of architectural systems. This involves, on the one hand, determining which factors or “ingredients” are relevant to the architectural project, and, secondly, defining the connections and links that will occur between these ingredients. As we have just seen, we have tools to expand our understanding of architectural phenomena, being able to handle and manage an increasing number of factors or inputs.

This will allow an increasing degree of control and interaction over the mediums, although it is necessary to point out that this control can never be absolute, having to assume certain degrees of uncertainty and randomness. In fact, the conscious incorporation of indeterminacy can become a key resource to enrich the design and organization of architectural systems. Architecture, like other systems that surround it, doesn’t work in a deterministic and linear way; it will always be subject to certain degrees of variability and uncertainty that, far from diminishing the system, they can contribute to it’s diversity, adaptability and resilience. Below, we will analyze different tools and strategies orientated to the design of the organization in architectural projects, showing its ability to tackle different degrees of control and openness.

Diagrams are, without any doubt, one of the most popular and versatile tools, since they allow registering and integrating a wide range of factors, from technical, environmental and social aspects to artistic and conceptual intentions.

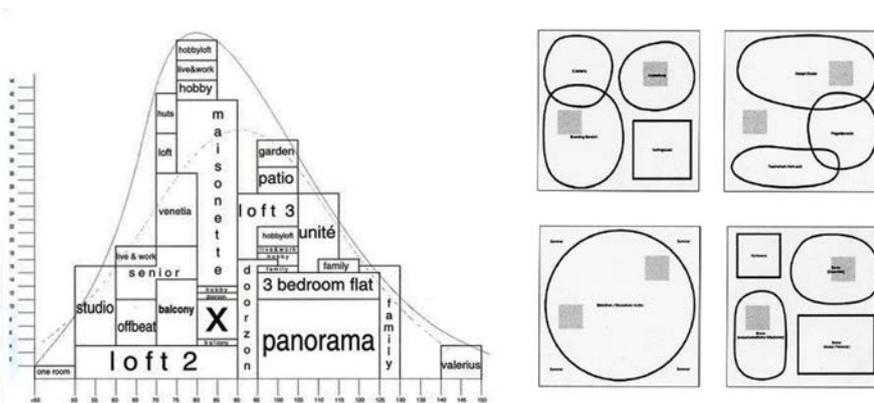
Not all architectural “ingredients” are easily quantifiable: metaphors, ironies, associations, perceptual and/or phenomenological intentions, etc. tend to transcend algorithmic/mathematical logic, requiring other tools for their formulation and incorporation into the design process. As Montaner suggests, we can consider diagrams as

*attempts to visualize flows, materials and phenomena of reality that do not have a precise shape or figure. (Diagram) is a geometric medium that serves to transfer the non-sayable with words, that is, what has no form or language, to what can be formulated, formalized and designed.*<sup>8</sup>

The purpose of the diagram is to contribute to the organization and structuring of the elements in the architectural system, laying the foundations for future development processes and progressive concreteness. However, these schemes can also provide, from the outset, spaces voluntarily open to uncertainty and spontaneity, as it happens in several projects developed by offices such as Sanaa or Moreau Kusunoki, among others.

## 8 Davis, “Applying machine learning to building design”.

**Figure 3: The diagram developed by MVRDV for the Silodam residential complex (left) reveals the desire to precisely control the programmatic and functional features of the project. In the diagram on the right, on the other hand, Sanaa proposes a much more relaxed and schematic distribution diagram for the Zollverein school, leaving room for lack of definition and the appearance of intermediate spaces. Sources, Left: MVRDV, Farmax. Right: Sanaa, in Montaner, “Arqueología de los diagramas”.**



In more advanced design stages, initial intentions and relationships will tend to be more precisely structured through the use of digital tools. This digitization process can be understood as a mere formality, or as an opportunity to move towards much more sophisticated and complex organizational schemes.

Resources such as BIM platforms or parametric design tools invite the designer to rigorously structure project information, explicitly expressing the mathematical relationships between different project components. This makes a difference with respect to tools such as diagrams or CAD plans, where the connections between elements can be more vague or implicit. Parametric/BIM tools promote the “explicitness” and the “systematization” of the information, making architecture’s organizational structures more visible and prominent.

Another fundamental feature of the digital context is the possibility of expressing all kinds of phenomena based on a common language: binary code. This will allow entities and phenomena of various kinds (natural, social, architectural, digital, etc.) to connect and relate to each other, providing opportunities for more complex and systemic designs. One of the main examples are BIM platforms, which condense an ever-increasing amount of data regarding different design and construction factors, connected and linked to each other.

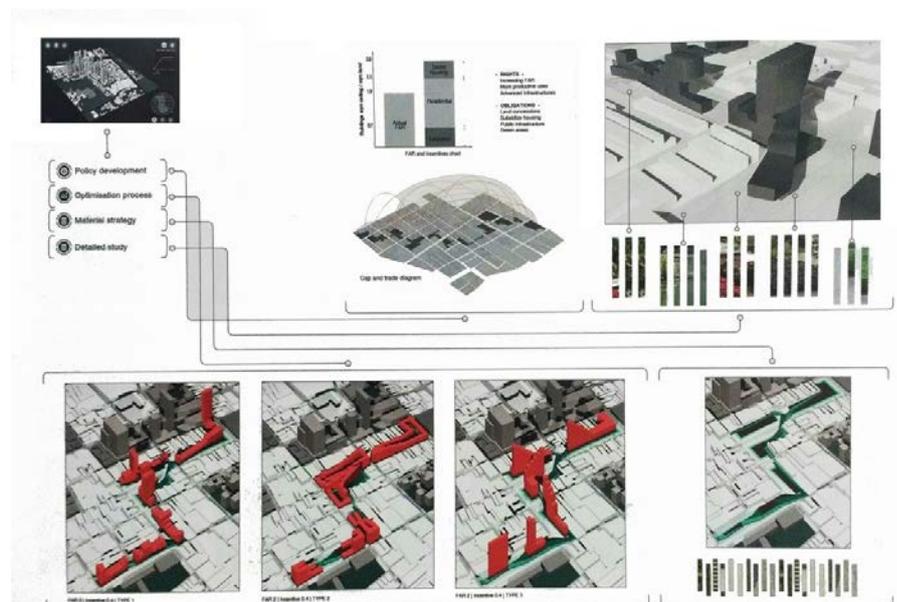
Parametric tools will offer even wider possibilities, being able to test all kinds of information crossings: geometry, environmental measurements, data related to social behavior, etc. It is even possible to incorporate time as an input, making some parameters vary their value based on the capture of real time data. This is the case of “interactive architectures”, in which the boundary between architecture and machine is blurred, introducing broader questions about the evolutionary capacity of architecture, the concept of architecture as a finished product, etc.

Parametric design strategies can also be compatible and/or coupled to citizen/multi-agent participation processes, helping to articulate the participatory process itself. The idea is to create models with variable parameters that can be used as a basis for collective debate, trying to reach consensus that allows calibrating and configuring these parameters in a specific architectural proposal. We can cite Llabres and Rico’s “Urban Relational Models”<sup>10</sup> as a featured example (Fig. 4), which was used to convene different agents and guide decision-making in the field of urban design. These types of experiences will foster a new way of understanding the role of the architect, a new kind of architect considered by Lluís Ortega as “postdigital”, since he uses digital tools not (only) to create sophisticated shapes and volumes, but to feed participation and public debate. In Ortega’s own words

**10 Llabres & Rico, “Relational Urban Models”, 84-91**

**11 Ortega, El diseñador total, 65.**

*The new architect is the one who establishes projects in an open but systemic way, the one who designs protocols that configure the relational systems that allow adjustments, the one who proposes forms of negotiation between generic personal subjectivity and updated collective subjectivity: a designer of parametric subjectivities.<sup>11</sup>*



**Figure 4. Parametric model developed by the office “Relational Urbanism” for a decision-making process in Santos district urban planning, Sao Paulo, 2014. Source: Llabres & Rico, “Relational Urban Models”.**

Finally, it will be necessary to refer to more diverse and multimodal design strategies, that is, to open design methods in which citizen participation and interaction become the true protagonists of the process. We are referring to strategies implemented by groups and authors such as Ecosistema Urbano or Doménico Di Siena, leaders in the field that is usually called “social urban design” or “civic design”, although their methods are also applicable on the architectural scale.

Unlike the parametric participatory processes, based on a type of cybernetic control in which participants just select or calibrate proposals pre-elaborated by the design team, in this case the design process will start directly from the opinions and suggestions of the community, without pre-fixed schemes. Each opinion constitutes one more piece of the puzzle, an ingredient that adds, alters and enriches the final proposal, giving rise to a process in constant evolution, a “generative” process in which the architect acts as a mere guide/channeler/catalyst of collective opinions and wishes. These kinds of design processes usually combine a wide range of methodologies, such as charrettes or community meetings, interaction through digital applications, building of models and full-scale prototypes, etc., in what would be considered an authentic manifestation of “expanded architecture”.

Through the examples aforementioned in this section we have been able to verify the existence of multiple methods and strategies to design the organizational structure of architectural systems. These organizational patterns are becoming increasingly complex and sophisticated, more dynamic and varied. This represents an important advance, but also a new challenge for the discipline:

How to articulate/communicate these complex organizations? How to elevate organization into architectural order?

### **Communication/Articulation in Architectural Systems. Formations and Informations**

As Schumacher states,

*Order requires that articulation is able to make the underlying organization perceptually palpable and legible.<sup>12</sup>*

The adoption of an expanded vision of architecture will imply the existence of multiple means to communicate and make architectural organization visible. This involves going beyond mere formal aspects, beyond the geometry and the arrangement of architecture’s physical components.

**12 Schumacher, *The Autopoiesis of Architecture*, vol. II, 87.**

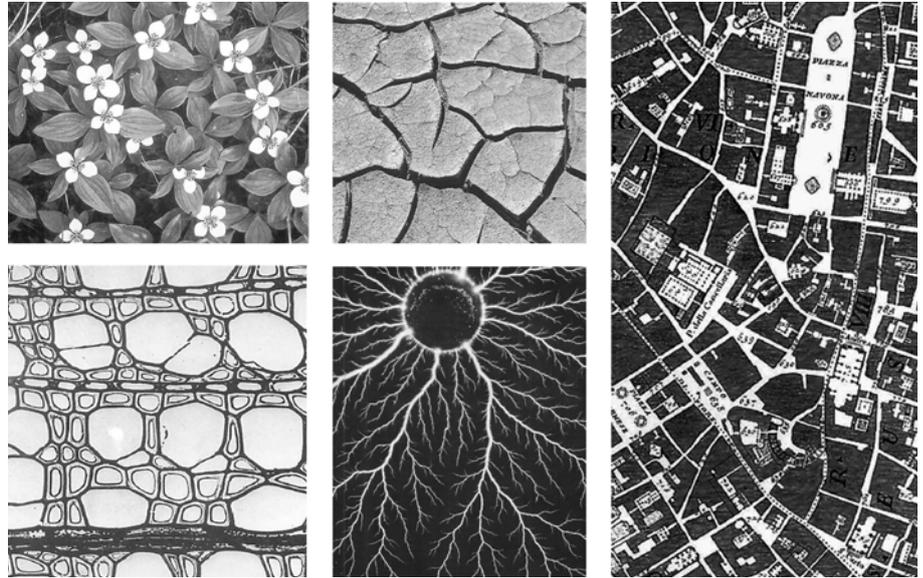
Architectural form is no longer the only way to communicate; it is one more component within a broader semiotic system. This does not mean ignoring formal dimension; instead, it should be studied together with new ways of expression/articulation. In this section we will analyze both physical/formal aspects of architecture and their informational extensions, developing an integrating and “expanded” conceptual framework.

### **Formations: Adaptive Patterns as a source for formal exploration**

In the previous section, we have alluded to the complexity of organizational structures in architectural design, incorporating an increasing number of factors or ingredients, as well as greater doses of variability and uncertainty. In this context, formal innovation should be focused on facilitating the legibility and understanding of these organizational patterns, making them visible through coherent geometric resources that enable the perception of order. Systems theories and complexity sciences will become a source of inspiration once again, providing useful concepts and references for new formal explorations.

Patrik Schumacher, Manuel Gausa, Charles Jencks or Nikos Salingaros are some of the prominent authors in this field, being responsible for different approaches and theoretical-practical proposals.

All these proposals converge in the use of “adaptive formal patterns”, i.e., geometries characterized by certain degrees of variability and adaptation. Complexity sciences have taught us to detect and understand these kinds of patterns, which manifest themselves in a wide range of structures and phenomena, both natural and artificial (Fig. 5).



**Figure 5: Adaptive patterns derived from different natural phenomena (plant growth, cracks, cellular tissue, electric shock) and artificial (urban development). Images collected and analyzed by Christopher Alexander in the book “The nature of order. Book 1”.**

As we can see in the images above, “adaptive patterns” share some common features: they are made up of basic formal operations or instructions, which are continuously repeated. This generates self-similar geometries at different scales, reproducing fractal geometries. Moreover, these geometries are not exactly repeated or standardized, on the contrary, each repetition experiences certain degrees of variation.

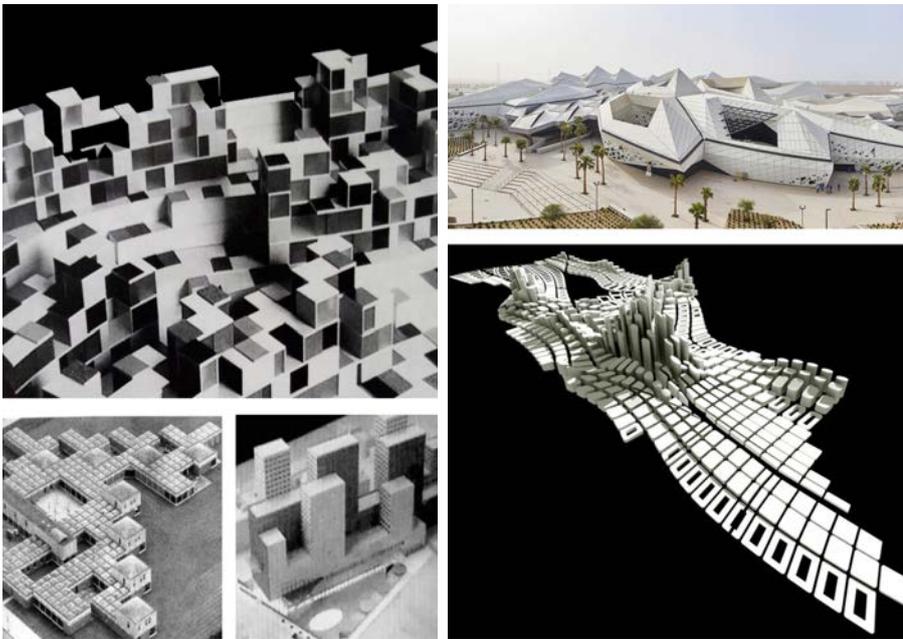
The use of adaptive patterns in architectural design leads to geometric systems that are coherent and systematic, as well as diverse and open to certain degrees of indeterminacy. These formal geometries can be interpreted, thus, as a suitable way to connect with architecture’s organizational systems, characterized by the same attributes.

Despite starting from the same formal concept, the aforementioned authors will conclude at highly diverse interpretations and aesthetic proposals, which demonstrates the versatility and productivity of this resource. Patrik Schumacher, for example, is characterized by the use of continuous and fluid surfaces, controlled by parametric/algorithmic software, which become increasingly complex by incorporating openings, folds, gradients and directional transformations that allow the design to be adapted to the needs and singularities of each project.

### **13 Gausa, OPEN. Espacio, tiempo, información.**

Manuel Gausa, on the other hand, proposes a broader set of patterns (twins, shoots, lattices, nodes, folds, etc.<sup>13</sup>) in order to achieve greater versatility and context integration. Gausa, like other authors such as the American critic Charles Jencks, uses his own and third-party works to explain this new formal universe, generating a wide-range sampling that accounts for the relevance of this phenomenon.

Finally, it is worth mentioning the work of authors such as Christopher Alexander and Nikos Salingaros, whose research links adaptive patterns and fractal geometry to traditional architectures, incorporating them as a relevant part in the discussion about complex architecture and its formal manifestations.



**Figure 6.** Left: Use of adaptive patterns in designs belonging to various authors, analyzed by Manuel Gausa in the book "OPEN". Right: designs by Zaha Hadid Architects (directed by P.Schumacher) [www.zaha-hadid.com](http://www.zaha-hadid.com)

As can be seen, theories and concepts from systems/complexity sciences represent a recurring and productive source of inspiration. The result is not a clearly defined architectural style, but a constellation of heterogeneous proposals that conform a new field of action, a new constellation of possibilities that promotes the reformulation of both experimental geometries and forms inherited from the architectural tradition. All of this in order to achieve a greater capacity for articulation, improving architectur's communicational and expressive skills.

### **Informations: designing the "immaterial"**

Currently, there are many ways to communicate and express the organization of architectural systems, far beyond traditional formal resources, such as graphics, signs, protocols, digital apps/devices, etc. From an open and expansive perspective of the architectural discipline, it matters little whether these media fit or not within the classical canons and competences of our profession; the reality is that day by day all these resources combine and intermingle, affecting our way of perceiving and moving through architectural environments. In this sense, its study and analysis constitutes an inescapable task for contemporary architecture.

The "smart city" is perhaps the most radical manifestation of this new scenario, a city whose construction is radically immaterial. Its organizational structures have no physical translation, its protocols and relational laws modify the functioning of architecture and the city without altering the material substrate, beyond the eventual incorporation of tiny digital devices. Its consequences, however, do have an impact on the physical city, alternating circulation flows, patterns of co-presence, the way people interact, etc. These factors have a direct impact on the way of perceiving and inhabiting architectural and urban spaces, thus influencing our perception of order.

Manuel Gausa adds an additional consideration, highlighting the capacity of digital media to alter our spatio-temporal perception. The author speaks about

“an architecture where further could mean closer. Where proximity relationships no longer depend on (literal) distances but on degrees of (virtual) connection”.<sup>14</sup>

**14 Gausa, OPEN. *Espacio, tiempo, información*, 971.**

This statement certifies the definitive and inevitable fusion between physical and digital, both considered as parts of the same functional and perceptual system.

Interfaces, that is, devices that allow communication between the sender (designer) and receiver (user) through digital code, will play an essential role in this communication process. As Marcos Novak states, in this hybrid-digital context

“the painter must design the eyes of the viewer, the composer must compose the ears of the listener”.<sup>15</sup>

**15 Novak, “Liquid Architectures of Cyberspace”**

Designing and controlling interfaces and their interaction with the user is one of the key tasks of the new “extended” architecture.

Finally, it is necessary to indicate that digital environments, despite their apparent immateriality, are not free from aesthetic considerations. In this case we refer to the way of transmitting its content, i.e., to the graphic and visual composition of digital applications. The design of cyberspace is a key aspect to make the organizational structures of this new hybrid architecture functional and operational. We could even speak of a phenomenological dimension, reflected in the popularization and growing relevance of concepts such as “user experience”, referring to the legibility and experience of navigating these environments, as if it were a physical city. In any case, as J. Bermúdez states we must be conscious of the similarities between the physical world and virtual platforms, but also about their differences:

**16 Bermúdez, “Implicaciones Arquitectónicas de la Naturaleza del Hacer en Ambientes Digitales”, 142-145.**

*The greatest creative sin would be to make the virtual world a copy of the real, because this would demonstrate an unforgivable lack of imagination on our part.*<sup>16</sup>

## Conclusions

In this article we have seen how the concept of order -properly reinterpreted and freed from past limitations- can become a useful tool to question the architectural discipline and reveal its progresses, challenges and aspirations.

Organization and articulation become not only the ingredients of the architectural order, but explicit objectives for architectural and urban design. Throughout this article we have analyzed different resources and strategies to achieve these objectives, promoting a systemic and hybrid vision of architecture.

The result is a new framework for action, a theoretical-practical base that unites multiple avenues of work within a common search horizon, promoting the integration and development of new explorations in the field of architectural and urban design.

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