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Chapter 3

Diagram as a Productive Instrument in Contemporary Architecture

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Introduction

Diagrams are beneficial tools that can be used at every stage of a design action, from the emergence of first ideas to the representation of the final version of the design. They can be defined as visual tools, schematic images which are used in many different disciplines. In architecture, they act as bridges in transferring non-architectural knowledge to the field and producing information within architecture. With the acceleration of the search for a new architecture whose boundaries are blurred and which is becoming more experiential, the importance given to the diagram has also increased. The diagram is as old as architecture itself, but especially since the late 1990s, the research and discourse on this subject has increased. In order to better interpret the current, complex paradigm of architecture, it is important to understand where and how the diagram is positioned in this paradigm. Accordingly, this study tries to examine two main questions: "How is the diagram instrumentalized in contemporary architecture?" and "How are diagrammatic approaches used by contemporary architects in discourse and practice?" Findings of this study aims to contribute to the field and draw attention to the potentials of the diagram by identifying the different aspects and roles of it and determining what roles it plays in design and whether its prominent features in discourse are reflected in practices.

This study does not seek a single and definitive answer; by adopting a post-positivist perspective, it tries to examine different aspects and reveal the potentials of richness in today's complex embracing world of architecture. Both this study and the diagram itself are process-oriented, not just results-oriented. The methodology is based on discourse and content analyses carried out on the productions of the architects included in the study. This study consists of four main sections. It starts with a literature review, the latter analyses the diagram through discourse and practices. The third and fourth sections present the findings of analyzes and discuss the results. The research design is based on developing holistic, flexible and sensitive perspectives by prioritizing the researcher's interpretation.

Findings showed that architects frequently use diagrams as production tools when determining the program, form or meaning. They are versatile tools that cannot be defined by a single definition. Diagrams could play important roles in reducing complexities and making them easily understandable, unifying conceptual approaches into project, redefining boundaries, and integrating information existing within architecture or from other disciplines into design. Although internationally known architects were discussed within the scope of the study, the diagram is an important guide for every designer, and this study aims to increase the promotion of the use of the diagram both in the architectural production areas and in educational environments.

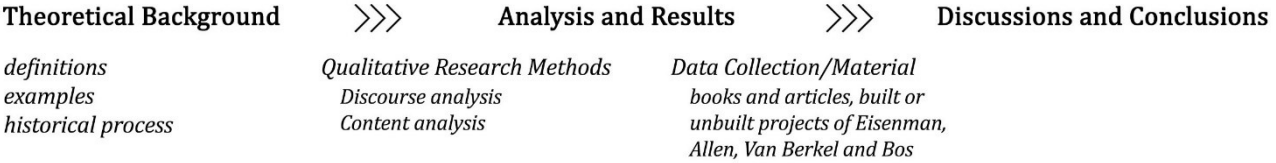

Figure 1. Structure of the Study (Developed by Authors)

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Theoretical Background

In its most general definition, a diagram is a graphical representation of a phenomenon consisting of lines, structures, forms. According to Corbellini (2006), as long as they can be perceived and used within a certain structure and play a role in reading, interpreting and planning reality; buildings, formulas, musical pieces, movie sequences, daily use objects and many other things can play the role of diagrams.

The diagram is a conceptual tool that produces new by conceptualizing information. Deleuze and Guattari (2005) defined the diagram as an “abstract machine”; a machine that builds what has not happened yet. Although it works as an element that explains functions and shows relationships between time and space, its primary role is to be an abstract tool that allows thinking about spatial organization and to build the new that is being formed. It has the power to produce something new and unpredictable (Cano-Ciborro, 2023).

Diagrams, which Knoespel (2002, p. 11-12) described as "vehicles of invention and extension," can visually present and strengthen an idea, as well as find a way to see something that has never been seen before. They make it easier to ask what is missing. The diagrammatic continuum shows itself in the fields of architectural theory and practice with its aspects that both improve design in an heuristic sense and explain how to construct design in a technical sense (Knoespel, 2002, p. 32). By associating concept and form, the diagram assumes a central role in the production and expression of architecture, enriching traditional representation systems with multiple contents (Amore, 2023). It helps to balance freedom and control in design (Fedorchenko, 2008).

In his book called “Content” which is a magazine-like, a diagram-like book, Koolhaas (2004) demonstrated that architecture, when freed from the obligation to build, becomes a way of thinking about everything, a diagram of everything. Aureli (2005), in his article "After Diagrams", claimed that reality, through diagrams, has turned into a nihilistic tool that can be produced and destroyed at any time. This creative and nihilistic thought, which reducts things to changeable icons and signs, and therefore to nothingness, can rebuild the representation of the world.

In a literature study on a diagram-themed international conference series, International Conference on the Theory and Application of Diagrams, Purchase (2013) defined diagrams under two main headings: concrete and abstract. While concrete diagrams are schematic and geometric forms that generally represent objects, abstract diagrams are charts that explain networks, relationships, and data and can be reinforced with visuals. Concrete diagrams are the closest representations to reality. Since what is described in abstract diagrams is a network of relationships, the diagram can take on different identities depending on the information the designer wants to highlight.

In his book “Space is the Machine” Hillier (2007, p. 11-12) indicated that “The word ‘architecture’ seems to mean both a thing and an activity… Product and process are not, it seems, independent”. Additionally, Tenbrink et al. (2019) stated that, as an extension of architecture being both a thing and an activity, architectural diagram is both an activity called 'diagramming' and something open to change, representing a building that has not yet been physically realized.

Although most diagrams are generally individual and specific, there are diagrams that transcend time, scale and geographies and inspire other designs and diagrams. The Panopticon, based on the ideal prison planning produced by Jeremy Bentham in 1785, was reinterpreted as a disciplinary mechanism diagram by Foucault and then Deleuze (Corbellini, 2006). While Le Corbusier's Dom-ino was initially produced as an answer to the problems of the day, it has become one of the most important diagrams of modern architecture over time. Modulor, an another design from Le Corbusier, based on the measurements of the human body and the Golden Ratio, appears as a diagram that facilitates standardization and plays a productive role by describing measurements and sizes, even if it is not visible in the design (Eisenman, 1998). 'Party diagrams', which were first used in the Beaux-Arts school and reflected the main idea of design, and 'bubble diagrams' made by graduate students at Harvard in the 1950s, developed new ideas on space and movement and became the pioneers of many architectural diagrams produced today. Rudolf Wittkower's Nine Square Grid diagrams are a type of diagram that allows obtaining multiple formal configurations as a frequently used architectural archetype. Geometric diagrams such as “Möbius strip” and “Klein bottle” could work as generators in obtaining an architectural formation. The "Evolutionary Tree" diagram, published by Charles Jencks in 1971, covering the 20th century and including predictions for the next thirty years, is a timeline showing years and thematic variables. This is a data diagram that visualizes existing information and allows the production of new information. In brief, architectural diagram based on such examples is gradually expanding its field of activity in the world of contemporary architecture.

Current reflections of this power possessed by the diagram can be observed in the definition of "diagram architecture" used by Toyo Ito (1996, p.18-24) when describing Kazuyo Sejima's architecture, where the diagram now takes precedence over architecture and becomes the producer of architecture. In this regard, it is important to analyze and interpret the features and functions that make the diagram so powerful.

Aureli (2005) stated that the development of awareness on urban space in the 17th and 18th centuries and the emergence of cartography formed the basis of the diagram. Urban designs such as Ebenezer Howard's Garden City or Le Corbusier's Villa Radieuse are diagram-based propositions and have been a guide for many modernist urban designs that developed after them. Bauhaus, one of the important institutions in the founding of the Modern movement in Europe, adopted some concepts that were new to architecture under the conditions of that day, such as "simplicity, abstraction, unity, organization" (Amen, 2017). Gropius, the founder of Bauhaus, explained the

education given in line with these concepts through a curriculum diagram which shows the relationship between theoretical and practical courses in a wheel-shaped diagram schema. In the same period, interior-oriented designs such as Christine Frederick's "The new housekeeping: Efficiency studies in home management" and Bruno Taut's "Die neue wohnung" were realized, which construct spatial organization and circulation through diagrams.

As architecture goes through different trials, the use of diagram for different purposes has become widespread. Since the 1990s, the idea of the "diagram" has been pushed as a cutting-edge approach to design and design thinking (Sadler, 2012). Because diagram can provide new perspectives on social relations, it can offer insights that are becoming more and more independent of discursive relations (Buckley and Waring, 2013). With the millennium age, it is seen that the city, which is a living organism, is in a rapid change and architectural movements need to keep up with this change physically and socially (Valipour et al., 2017). Hence, the diagram, which is a tool that constantly erases and renews itself and provide new perspectives, keeps up with this change.

To interpret the contemporary implications of the diagram, its presence on some important examples from contemporary architects can be questioned. For example, the project for a master plan competition held for the Japanese city of Yokohama proposed by OMA in 1991 consists of two diagrams which carry verbal and visual information (Figure 2). Starting from the discourse of creating a continuous and formless "programmatic lava", OMA designs a range of events that provide a 24-hour 'peak' in order to use the place and infrastructure at the highest level of efficiency around some basic public programs. The first diagram shows programmatic components isolated from each other as spontaneous events over time, while the second one is an assemblage of the same programmatic components, all superimposed on the timeline. At first glance both diagrams depict the same information. The first diagram shows the data at hand; the second diagram, created with the "programmatic lava" metaphor, turns the information into an organizational element that can be used in the design process (Garritzmann and Deen, 1998, p.86-88). In another project of OMA, the Seattle Central Library, there can be seen two architectural approaches; one highly organized and the other flexible. Charles Jencks described it as an iconic building produced by a generative section through the “Big Mac sandwich diagram”. There is enough space “between the sandwich slices” for the two approaches to work together and derive alternatives (Jencks and Koolhaas, 2011). In these projects, diagrams act as boundary elements, giving flexibility to the programme and the organisation of the interior space.

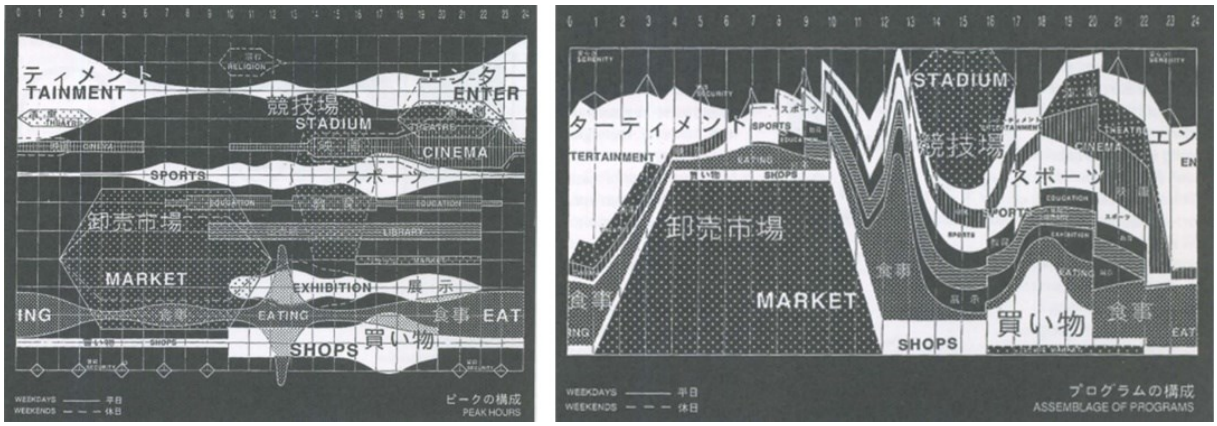

Figure 2. OMA's generative program diagrams for the Yokohama Master Plan (Garitzmann and Deen, 1998, p.87)

The diagram cannot be defined by a single definition or a single role. To illustrate, the use of diagram in MVRDV's Metacity/Datatown project can be examined as it has a different approach than OMA's project examples given above. Datatown is a city based solely on data, a city that is intended to be described with information; it has no topography, no ideology, no context. This concept design, in which different information is visualised with a city abstraction, is based on the expression of certain information such as population and waste in the world. The city exists with a diagram, it is a diagram-city.

As the examples given explain, the diagram is a bridge that brings information and architecture together and makes them useful. Diagrammatic thinking acts as a bridge between ideas and implementation; It could be a representation tool, where it is something post-produced or a thinking and designing tool, in which the diagram itself is something that produces. Questioning the interventions revealed by the diagram activity will be important in terms of questioning the new identities that the architecture of the future can acquire.

Material and Methods

The research design, in the light of the information obtained from the literature, consists of discourse and content analyses, which are qualitative research methods, and synthesis of these analyses. A post-positivist perspective was adopted while performing these analyses. This study is limited to the works of Peter Eisenman, Stan Allen, Ben van Berkel and Caroline Bos, and the scope can be expanded by analysing other names in other studies.

Discourse analysis and content analysis were conducted on selected publications and buildings in order to observe how the productive power of the diagram has taken a place in architectural discourse and practice in the

last decades. Discourse analysis is based on the examination of written or oral language documents and texts (Hodges et al., 2008). Content analysis allows making systematic inferences from materials in different formats such as texts, audio recordings, images and films (Drisko and Maschi, 2016). In line with these analysis methods, it is questioned whether the concepts that architects use to define the diagram in their discourse are used in the production of the architectural product, and how the diagram is/can be instrumentalised in this context.

Since different perspectives are discussed in this study, a mixed method consisting of qualitative research methods should be followed. Qualitative research approaches to its subject matter with an interpretive, naturalistic view. Thus, some empirical materials are collected and things are tried to be interpreted according to people's ways of making sense of them. Groat and Wang (2013) emphasized that qualitative research consists of a focus on interpretation and meaning and is based on an inductive logic. The study evolves around the researcher's interpretations of the data he/she collects, thereby the primary measuring device is the researcher. It tends to focus on contemporaneous phenomena and aims to outline a more comprehensive knowledge by evaluating multiple perspectives and many factors together with a holistic approach. Because it is not based on precise numerical measurements and statistics, analysis is usually represented by visual or verbal instruments.

There are different data sources for qualitative research. According to Groat and Wang's (2013) classification, interviews and open-ended response formats, observations, artifacts and sites, and archival documents are the main sources of information. In this study, data collection tactics can be included under "artifacts and sites" and "archival documents". These resources may consist of photographs, sketches, public documents, audio-visual materials. Accordingly, analysis will be made on the books and articles written by the selected architects and the built or unbuilt projects they designed.

Results

This section includes the discourse and content analysis through the selected architects. The terms used by architects to describe the diagram in their discourses are highlighted and how the diagram was instrumentalised in the projects was examined (Table 1, Table 2, Table 3).

Table 1. Analysis through Peter Eisenman.

Peter Eisenman
Analysed Publications: Diagram: An original scene of writing (1998), Diagram Diaries (1999)
Analysed Projects: House I (1968), House II (1970), House III (1971), House IV (1971), House VI (1975), House X (1975), House 11a (1978), Berlin Memorial to the Murdered Jews of Europe (2005), City of Culture of Galicia (2011)
-Diagram creates the new by acting with the information coming from a potential architectural object that does not yet exist. -A dual writing tool that interprets what comes from inside and outside of architecture -A graphical tool used to analyze relationships, a tool that plays an active role in the form construction -Representation of something that is not itself and does not resemble itself -Both a search for a process and an explanation of what is achieved -Not only an explanation but also an intermediary which generates time and space -Revealing the unseen in spatial organization -Two types of diagrams: Explanatory/analytical and generative -"A diagram implicit in the work is often never made explicit" (1999, p.27). The diagram that lies behind the visible produces the new by allowing stratification. -Through Deleuze's discourses, he expresses that the diagram is both form and substance, both visible and expressible. -Diagram is part of the processes that aim to open the discourse of architecture and the meanings behind it. -"Interiority of architecture": Architecture that has achieved its absolute autonomy and refers only to itself, its own discourse -The interiority of architecture contains accumulation of past architectures: "Anteriority of architecture" -In the past, certain forms in architecture have always been linked to certain functions and certain meanings. However, according to Eisenman, form, as a part of the interiority of architecture, can be liberated from such programmatic concerns. This process displaces the necessary relationship of form with function, meaning and aesthetics, without ignoring the necessary existence of all these. -A tool that finds and explains the relationship between the interiority of architecture and a real building -As his studies on diagrams progress, he produces the concept of "exteriority of architecture", arguing that the diagram is not only a tool explaining the relationship between the interiority of architecture and the building, but also assumes a productive function (1999). -One of his first designs, House I (1968) is actually a toy museum, not a house. Since there is no such type of museum, the first drawings of the design came from the search for a diagram. Eisenman defines this search for diagrams as producing rational techniques to get from A to B without resorting to traditional ways. One of the

diagrams shows the trace of a non existent column on the ground. This trace is not about function or aesthetics, it is a diagram that forces to think about the absence of a concrete entity in architecture.
-He develops the idea that the column and beam can serve as a sign if they do not carry a structural function by not supporting anything. In the example of House II (1970), both a grid of columns and a shear wall system are designed, one of which is sufficient for structural support (Figure 3). In this state of excess lies an architectural sign: The function of the excess is based on pointing out its own dysfunctionality, a reference to the interiority of architecture.
-In House III (1971), reading space and space elements hierarchically as primary and secondary is criticized; Equal attention is given to columns, walls and windows (Figure 3). The blurring of the hierarchy is also an expression of the interiority of architecture and the search for an architecture with blurred boundaries.
-In House IV (1971) diagrams, elements such as cubes, horizontal planes and nine grids are intervened with methods such as shifting, rotation, compression and extension. There are touches that go beyond functional requirements.
-House designs up to House VI (1975) consist of a linear transition from A to B, but in House VI this situation becomes simultaneous. The diagram takes on a productive role, denying the possibility of a predetermined outcome. Until House VI, the starting point of all designs was pure geometry, but with House VI, a new diagrammatic process idea emerged based on taking something that existed and making it visible by decomposing it. Design no longer has to originate from pure geometry but can involve a versatile state of unformed matter.
-The redundant structure fiction derived from the diagram supports the idea that form does not have to follow function.
-House X (1975) is based on an inquiry into situations that cannot be read hierarchically, emerging from pure geometry. Many houses have a spine that develops around a center but the center of House X is nothing. Although the house initially appears to be formed by the juxtaposition of four squares, this is merely a heuristic device used to approximate a more complex sign condition.
-House 11a (1978) contains the most "interior" space with its inaccessible void. This interior has no doors or windows, and therefore no entrance. Thus, the innermost part of the house is conceptually the most external part, because it cannot be entered. The house is conceptualized as a diagram which called Möbius strip, half of which will be placed underground and half above ground.
-Berlin Memorial to the Murdered Jews of Europe (2005), in which thousands of concrete blocks of different heights, as wide as a coffin, are placed on a sloping land on a grid that only one person can pass through, is another project he designed based on a grid diagram which carries the conceptual thought.
-He continues to benefit from the productive power of the diagram in his newer projects, especially when making decisions on the urban scale. Galician City of Culture (2011) is a multi-layered design derived from diagrams in which the historical street plan is superimposed and distorted by a modern grid. Spatial organization is achieved through the traces of this grid, from the upper scale to the interior.

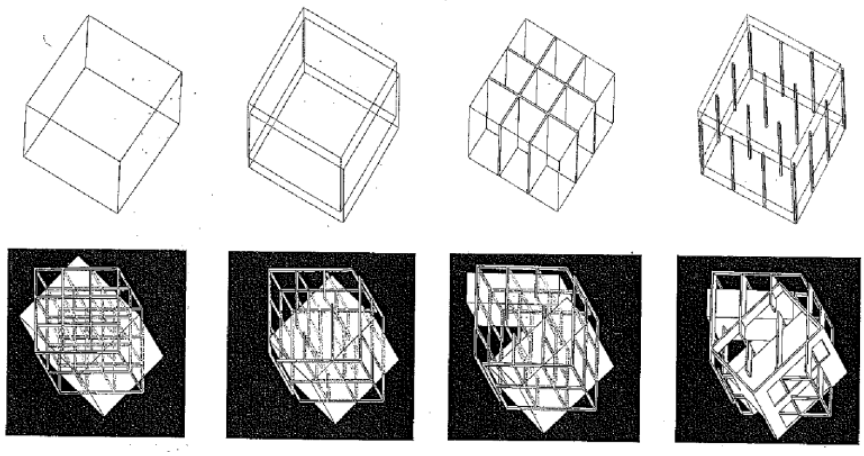

Figure 3. House II and House III diagrams (Eisenman, 1999, p.48)

Table 2. Analysis through Ben van Berkel and Caroline Bos.

Ben van Berkel and Caroline Bos
Analysed Publications: Diagram work (1998a), Diagrams: Interactive Instruments in Operation (1998b), UN Studio: Design Models – Architecture, Urbanism, Infrastructure (2006), Typological Instruments: Connecting Architecture and Urbanism (2011)
Analysed Projects: IFCCA competition project (1997), Möbius House (1998), Mercedes-Benz Museum (2006), Arnhem Center Master Plan (2015)

-Founders of the UnStudio (United Network Studio)
-Diagram, as one of the techniques used by designers when developing ideas, allows examining social discursivity from within the architectural practice itself.
-A statistical or schematic image, an assemblage of materialized situations and tactics, a set of design techniques that reproduce, produce and instrumentalize
-A black hole that radically changes the course of the project, transforms and liberates architecture
-A diagram is like a life jacket that grows to full size in an instant from a small package used to reduce and compress information.
-As it does not represent a construction with a scale, it is not a blueprint.
-Proliferators in a process of unfolding (2010, p.227)
-It differs from indexes, icons and symbols, its meaning is not fixed. “A diagram is a diagram because it is stronger than its interpretations” (1998b, p.21)
-Allowing information that would take days to be transferred to memory to be conveyed in the shortest time and in the most effective way
-In addition to reduction and compression, it pursues a clear instrumentalization that multiplies and produces architectural practices.
-Regulating technical and spatial organizations
-Producing new, instrumental meanings, renewing itself in the process, moving architecture away from typological fixation
-The unique aspects of the diagram prevent the design from becoming fixed and allow it to be open to the new.
-It continues to gain importance as a tool that offers broad, unpredictable and liberating avenues for architecture on a global scale.
-When Van Berkel and Bos could not find the appropriate pre-existing diagrams, they had to produce them themselves. They noticed some repetition in the way they applied and conceptualized the diagrams. They began to explore ways to use these repetitions in a meaningful and abstract way in design, realizing that some diagrams could be modified and applied in different ways.
-“Design models”: A prototype adaptable to different situations for design, through formal or conceptual guiding diagrams. They are further enriched with options and transformations and result in different projects.
-Through Design Models, they work on typology production in intensive and mixed-use projects and develop ideas about the use of the diagram in obtaining these typologies with its multiplier aspect.
-In 1997, in the design proposed for the IFCCA competition project, analytical diagrams containing different programmatic relationships are produced for a large reconstructed area in New York by considering 24 hours of the area. In these diagrams, the new situation is organized by visualizing information such as pedestrian and traffic density on program, time and location information.
-Möbius House (1998) consists of a "möbius strip" diagram, a figure that has no beginning or end and is created by two continuous lines creating a kind of spiral. The user family's 24-hour life and work cycle has an intertwined trajectory. Program, circulation and structure are integrated around it. Organization of time-space relationship and programmatic intersections, and the form of the building are achieved through diagrams.
-In Mercedes-Benz Museum (2006), the spatial organization consists of two spiral routes built around the large triangular atrium in the middle and the intersections of these routes. The building takes it’s form through the mathematical clover leaf image.
-In Arnhem Center Master Plan (2015), they focus on how the 'typology' approach can help in a mixed-use building that will be integrated into the urban context. This transfer center, which is seen as an important threshold for Arnheim, is planned to include residences, shops, offices and cinema programs in order to become a lively center. Passenger flow is provided from the central transfer section, and the twisting and interlocking structure of the ceiling, walls and floor blurs the inside-outside boundaries, and the fluid one-piece roof completes this flexible configuration with its structure that allows for a column-free interior. Based on the unity of time, movement, space and structure, some typologies/conceptual tools are adopted that have a transformative effect on topics such as usage times, schedule and access (2011). Instead of the traditional column system, 'V-walls' are designed to facilitate the collaboration of different programs and carry load. Using 'cuts', separate entrances to the vehicle and bicycle parks are defined from two separate parts of the project area. The carrier system, vertical connections and wayfinding tools are developed around the free-form sculptural 'twist'. The last conceptual tool is the 'Klein bottle', a mathematical diagram, which acts as a boundary tool connecting indoor and outdoor spaces such as the entrance and terrace.

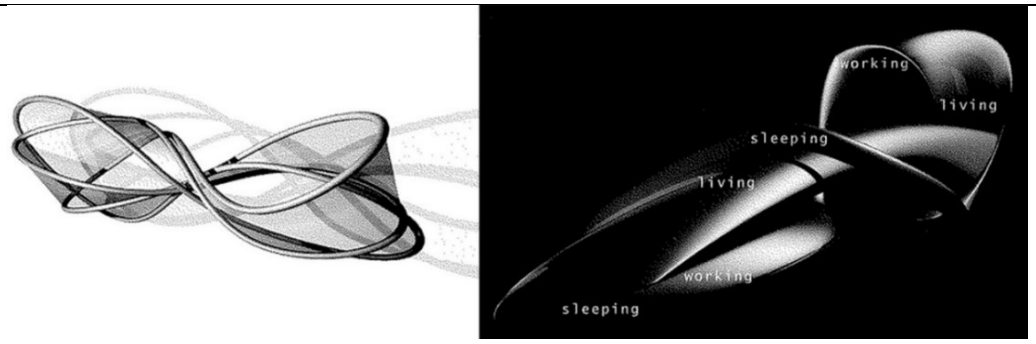

Figure 4. Möbius strip diagram for Möbius House (Garcia, 2010, p.225)

Table 3. Analysis through Stan Allen.

Stan Allen
Analysed Publications: Diagrams Matter (1998), Points+Lines. Diagrams and Projects For the City (1999), Practice: Architecture Technique + Representation (2009)
Analysed Projects: Logistical Activities Zone, Barcelona (1996), New Maribor Art Gallery (2010)
-Diagram is a collection of graphics that determines the relationships between function and form and organizes the structure and distribution of functions. -An intermediate layer that enables architecture and complex reality to come together and defines the spatial relationships between elements. -Not only an abstract model showing how spatial relationships work, but also an aid that shows the potential of how they can work -Elements that help create programmatic configurations by organizing variables such as time and space, distribution, density and tension. -A carrier of potential relationships between elements, a map of possible worlds -Digital tools for data collection and analysis -Focusing on the relationships between matter and information, it is an effective bridge for the flow of information between architecture and other disciplines, but one should not think that this flow of information will be smooth and simple as there will be constant external interventions. -Through the discourses of media theorist Friedrich Kittler, he opposes formalist approaches that consider the diagram only as a method of representation. According to Kittler's statement, "A medium is a medium is a medium, therefore it can not be translated", it is impossible for a translation to have universal validity, it will definitely contain some distortions, so it cannot be fully translated and will not be a translation (as cited in Allen, 1998). Against this arbitrary aspect of "translation", Kittler proposes a model based on the establishment of connections between elements, the flow of information through the gaps between parts, and shaped around the concept of "transposition". Relating Kittler's approach to the diagram, Allen argues that the diagram is a tool that provides transfer from the graphic to the material and spatial, rather than just a passive representation tool. -He discusses Toyo Ito's term "diagram architecture". In diagrammatic architecture, the architectural product does not have to be produced from a diagram. Diagram architecture is architecture that behaves like a diagram. It is architecture where function and form come together in flexible harmony, changing with the architectural shell but not restricted by it, and producing the most performative effect with the least architectural meaning. For Allen, SANAA, MVRDV, Rem Koolhaas, Bernard Tschumi are the producers of diagrammatic architecture. -Every notation/symbol is a diagram, but not every diagram is a notation. -Diagrams are the architect's most intense and powerful tools in an organizational sense. They are schematic and reductionist graphics (2009). -Logistical Activities Zone (1996) is an international competition opened for the renewal of the port area on the LLobregat River which became an opportunity for Allen and his team to examine the potential of infrastructure urbanism. The design is intended to create traces of an architectural infrastructure that flexibly directs future developments. In addition to traditional representation techniques, a "User's Manual" was created by making use of new representation strategies such as diagrams, maps and scripts while detailing the project. Area is divided to patches and corridors which superposition and form natural or built areas which is called mosaics. By proposing loose organizational typologies, it becomes easier to construct multiple program scenarios. The architectural form were completed by proposing a continuous roof supported by thin steel columns rising on a regular grid. -New Maribor Art Gallery (2010) is a project where the concept of part to whole is captured with diagrams. The configuration of similar forms is provided by multiple diagrams, and the complex whole formed by the combination of these simple modules defines different exhibition areas in the interior and provides a dynamic differentiation on the urban scale. One module alone defines an exhibition space, several modules combined

create large permanent spaces that allow temporary exhibitions. Diagrams were used in the search for both spatial organization and form.

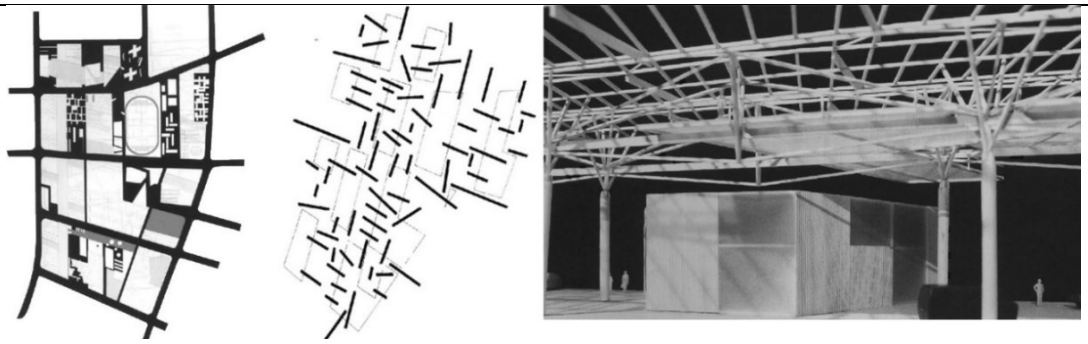

Figure 5. Diagrams from Logistical Activities Zone (Allen, 1999, p.72-89)

Discussions

Through the analysis of written sources on diagrams produced by Ben van Berkel, Caroline Bos, Stan Allen and Peter Eisenman in the late 1990s and early 2000s, some concepts used by architects when defining and explaining the diagram are extracted. Eisenman defines the diagram as a productive tool that transfers non-architectural information to architecture and also opens architecture to its own discourse. Van Berkel and Bos use some of the diagrams they produce as adaptable to different projects under the "design model" approach, and state that the diagram can play both the role of product and generator. Allen focuses on the aspect of the diagram that directs and enables different potentials as a producer.

According to the analysis, the roles of the diagram as a contemporary design tool can be classified as follows: Reproduction tool, abstraction tool, form tool, conceptualization tool, organization tool, interpretation tool and boundary tool (Table 4). These headings can go under each other or be used together in a design. Typology production is achieved through the proliferation of types, and abstraction is achieved through the reduction of complexities through diagram. It provides guidance in designing the architectural envelope and assumes the role of being the carrier of the conceptual idea behind the design. It channels information outside of architecture into architecture and ensures their organization by transforming information about form, function and program into usable data in design. It is a carrier of new interpretations in today's contemporary architecture. In addition, it constructs the relationships between inside and outside, public and private, by navigating the boundaries that are difficult to define in architecture. While performing these functions, architects use conceptual diagrams, data diagrams, relationship diagrams, form diagrams, circulation diagrams and programmatic organization diagrams.

Table 4. Conceptualization of the diagram through analysis.

Peter Eisenman	dual writing tool, graphical tool, writing instrument, design tool, graphic shorthand, explanatory/analytical device, generative device, intermediary condition, trace, phantom, intermediate condition, the interpretation of the new, interstitial condition, interiority of architecture, anteriority of architecture, exteriority of architecture, blurring of the hierarchy, topology, grid, folding, distortion, superimposed maps, interpreting information, abstraction, spatial organization
Ben van Berkel and Caroline Bos	visual tool, statistical image, schematic image, black hole, a product and a generator, activator, reductive machine, proliferating machine, an actor in the interactive process, a foothold, maps of movements, maps of worlds yet to be constructed, Design Models, spatial organization, typology, reproduction, form search, conceptualization, Möbius Strip, Klein Bottle
Stan Allen	map of possible worlds, abstract model, instructions for action, rebus, graphic assemblage, graphically reductive, collection of graphics, intermediate layer, carrier of potential relationships, an effective bridge, diagram architecture, flexibility, transposition, spatial organization

Eisenman exhibits an approach that contradicts the traditional understanding of space and creates deconstructive designs through ‘folding’ idea that blur the boundaries. In this approach, he instrumentalizes the diagram in the search for an architecture that is autonomous and independent of external values. He uses grid diagrams to liberate the form and open architecture to its own discourse. In the designs of Van Berkel and Bos, geometric diagrams are used as tools that both give shape to the envelope and generate programmatic organization.

They also present their conceptual approaches and the 'Design Model' they have prepared to be developed and used in other projects through data diagrams. Allen creates typologies and road maps by using diagrams as sketches, linear diagrams and organizational schemes, which he sees as a channel between architecture and non-architectural information, and a transfer tool that establishes a relationship between matter and meaning.

	House Projects	Berlin Memorial	City of Culture of Galicia	IFCCA Competition	Möbius House	Mercedes-Benz Museum	Arnhem Center Master Plan
Reproduction tool	+	+					+
Abstraction tool	+		+	+	+	+	
Form tool	+		+		+	+	+
Conceptualization tool	+	+	+	+	+		+
Organization tool		+	+	+	+	+	+
Interpretation tool	+			+	+		
Boundary tool	+		+		+		+

Figure 5. Instrumentalization of the diagram on selected examples (Developed by Authors)

Although diagrams advance the project in different ways, the common point of them is that they develop thoughts and transform the existing information in mind into data that can be used in design. They are intensely active in an architectural environment that is experiential, dynamic, shifting from the understanding of "this or that" to "this and that". They provide freedom for architect and space, facilitate adaptation to multivariate situations with constructions compatible with different times and conditions. As the analysis shows, with the use of diagrams by contemporary architects and architectural offices, an architectural environment is designed where richer meanings and different experiences can be produced by transforming geometry into formlessness, homogeneity into heterogeneity, distinctions into blurring, stability into dynamism.

Conclusion

The diagram, as a design and representation tool, is an aid that the architect frequently uses during the design activity. Throughout history, architectural paradigms have constantly changed (Im and Han, 2015), and along with these paradigms, the diagram that guides it in terms of form, meaning and program has also undergone constant changes. In the 21st century, this strong influence of the diagram continues to increase, as it brings 'new' interpretations, regulates abstract and concrete relations, and defines the boundaries. It is not only responsible for representing the existing world, but also can play productive roles in the formation of new realities. In the contemporary architectural environment, diagrams play important roles in architecture's transformation from object-oriented to process-oriented and becoming influenced by the knowledge of many different disciplines. By allowing multiple productions, it opens new paths for the designer and leads to the discussion of some classical approaches. The diagram, which produces information according to the available data, changes as the information changes and is updated, bringing dynamism to architecture.

The search for an architecture that transcends boundaries and becomes liberated by not adhering to strict rules continues. In this quest, the place of the diagram should be discussed more, both in terms of the transformation of the architectural object itself and its instrumentalisation as a producer. In line with the discourse and content analyses, the aspect of the diagram, which develops through conceptual thinking and regulates basic constructs such as form and program by drawing strength from verbal and visual thinking forms, has attracted attention in contemporary discourses and practices. It is thought that the potential of these aspects will bring spatial enrichment both in architectural production and design education areas, especially in architectural studios. After all, as the title of Larkin and Simon's (1987) article puts it; "A diagram is (sometimes) worth ten thousand words."

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