Architectural Reprogramming

Subjects: Architecture And Design
Contributor: Aleksandra Milovanović

Architectural reprogramming is recognized as a growing, analytical and problem-based approach in the design process in which the subject of design/redesign is an entity of urban or architectural heritage. The "RE" nature of architectural programming encourage its new rehabilitation from a strictly developmental perspective to one that deals with creating a new functional order within the existing inherited spatial framework with the aim to provide a sustainable configuration of activities, spaces and relationships.

Keywords: architectural programming ; heritage ; value-based matrix ; reprogramming ; design methods

1. Introduction

The current city transformation development trends indicate that, in addition to the unprecedented growth in the global building sector, nearly two-thirds of the building area that exists today will still exist in 2050 [1]. That is why the continuous re-examination of current research approaches concerning evaluation, (re)planning and (re)designing of the inherited space represents a necessary and challenging task for researchers, educators, policymakers and practitioners in the field of architecture and urbanism. This is confirmed by a series of affirmative and research-stimulating declarations, policy positions and strategies aimed at the practical arena of architecture. The EU Council Work Plan for Culture 2019–2022 [2] denotes architecture as a cross-cutting field and “as a discipline that encompasses the right balance between cultural, social, economic, environmental and technical aspects for the common good”. Additionally, according to the First EU Policy outline on Architecture, this disciplinary framework is flagged as “the heritage of tomorrow” [3]. In line with this notion, the identification of urban patterns whose values have not yet been recognized and which have a capacity to become heritage of the future requires innovation in approaches and methodologies for their decoding such as methodological framework of architectural programming. Through rendering the programming methodology from its origin (functionally oriented and problem-based) towards its rehabilitation from modernist doctrine (hybrid oriented and process-based approach), today, when cities experience limited capacity, one of the central design issues is focused on reprogramming existing typologies.

2. Methodology of Architectural Programming

Herein, the architectural programming methodology was created with the aspiration to (a) develop new spatial patterns and typologies in an effective, critical and argumentatively based way and to (b) provide the high performance and functionality of the space. In rendering the programming methodology from its origin (problem-based approach) [4] towards the rehabilitation from the modernist doctrine (hybrid-oriented approach) [5], today, when cities experience a limited capacity state, one of the central design issues is focused on reprogramming existing typologies of inherited spaces. Some studies have already shown the potential of applying architectural programming in the context of architectural heritage, revealing a new “RE” nature of programming directed towards providing a sustainable configuration of activities, spaces and relationships [6].

The origins of the methodological framework of programming in architectural design discourse were established by Pena and Caudill, who in 1959 published a study entitled “Architectural Analysis—Prelude for Good Design” [7], guided by the belief that the design can be significantly improved by “asking the right questions at the right time” [7]. Building the argument on their own design practice, the authors open a critical discussion on the status of the architectural program emphasizing the need to affirm the process nature of the program and establish its methodological orientation-programming as “architectural diagnostics” [7]—the process of establishing specific a set of design criteria through a participatory process that necessarily precedes the beginning of design.

The transposition of aspects from social and behavioral sciences into architectural design contributes to developing specific methodological approaches in programming and design. More specifically, behavioral theories have had a significant impact on the domain of architectural programming in the 1970s, primarily by strengthening designers’

argumentative frameworks to describe architectural solutions, understand different phenomena in controlled environments and develop appropriate solutions for specific programming requirements according to identified design problems. The growing interest in the social sciences [8][9][10] and domains such as environmental psychology, environmental sociology and social ecology has also influenced the growing concern of the academic and professional community that architectural structures and the built environment may have a detrimental impact on people and the environment. In such a context, the user's position in the design process becomes significantly more autonomous and focused on the interdisciplinary study of human needs and behaviors, an input parameter for the programming.

The original position of this view was established by Horowitz [11], pointing out the need to improve the methodological nature of programming through its empowerment with methods, techniques and tools developed by social scientists (such as systematic observation, controlled interviews, questionnaires and surveys and statistical analysis) and, for the purpose of extensive research, focused on gaining knowledge on the needs of different user groups. At the same time, environmental scientists recognized the potential of architectural programming for reformulating goals of functionality [12]. That would provide a critical context for exploring a possible solution to the then-growing controversy of sustainable environmental design. Studer and Stea [12] thus indicate that the functional origin of environmental problems is not in the domain of physical entities but in the "behavioral topographies" of human participants. Although, since the early establishment of the conceptual nature of the architectural program, there has been a focus on strengthening the social component and environmental sensitivity of the built environment and architecture through understanding the architectural program as a "fragment of social pattern" [13] or "lifestyle description" [14]. This component's practical application and articulation did not revive that social essence but rather had a strictly functionalist foundation closely linked to modernist architecture's precedents.

With the development of a methodological framework concerning design methods' paradigm shifts, specific programming approaches have also evolved. These approaches range from a participatory framework that engages future users' proactive involvement to carefully articulated research studies covering complementary typologies and users. In this range, there are three groups of approaches: (1) design-based, which is characterized by parallel implementation with the design process in which programming acts as an interface for translating an idea into a design solution; (2) knowledge-based, which has its original position in programming complex and organizationally specific typologies intended for specific user groups; (3) agreement-based [4][15], which is built on the organizational aspect of the design process, while value-based [16] is recognized as the most referenced approach in line with heritage construct.

The value-based architectural programming approach starts from the belief that in the design process, the primary responsibility in the process of architectural programming is the articulation of values that the architect should respond to. Values in this context mean those beliefs, philosophies, ideologies, understandings, purposes or other deeply rooted ideas, which are the reason for creating a design solution and which influence the designed architectural framework [16]. According to Avrami and Mason, values have long underpinned concepts of heritage and its conservation within the built environment [17]. The same authors pointed out that the last half-century bore witness to a critical period of political and social influence that shaped the field's institutional and professional development and has broadened the understanding of how multiple publics may ascribe different values to heritage [17]. In light of a review of published literature on heritage values, Fredheim states that value typologies for heritage conservation and management are often designed and implemented without understanding the implicit consequences of the inclusion and omission of 'values' [18]. He also suggests that these typologies often fail to prompt the necessary questions to develop satisfactorily detailed understandings of heritage significance, resulting in decisions based on implicit, rather than explicit, value assessments in practice. Thus, values in the context of heritage have numerous classifications, meanings and interpretations depending on user groups, context, purpose, etc. According to Hershberger [16], there is no finite set of values applicable to all architectural problems, but there may be sets of values that apply to certain types of architectural problems (see **Table 1**). In this sense, only specifically and contextually based values can serve as a valuable framework for generating an architectural program. Although many authors have tried to offer a conceptual framework of information matrix with values, in most cases, it did not prove to be a relative framework precisely because of the mentioned variability of values concerning the context and type of architectural problem solved through the design process.

Table 1. Programming value matrix according to Hershberger [16][19].

Values	Environmental	Human	Social	Systemic	Temporal	Economic	Aesthetic
Indicators	location climate urban context regional context	physical physiological psychological functional	cultural legal common	materials technologies processes	growth change constancy	building costs operationalization maintenance	form space style tradition

Based on the synergetic relationship of environment–behavior studies and architectural programming, the research thus starts from the belief that this methodological framework can provide a lens for the development of an information background oriented towards the closer connection of people and the environment. In this sense, programming will be activated as an analytical method for observing the social dimension of heritage in accordance with the capacity to perceive and dissect all layers of inherited space—through different spatial and social levels—but so that the environment–user–behavior relationship is established as transactional.

Contemporary Nature of the Architectural Program

The contemporary theoretical framework of studying the nature and state of the architectural program in design practice is considered on three relationships: (1) hybrid relations of program elements, (2) relation of program and form and (3) relations of functions (functional performance of space). Dynamic relationships are defined by combining activities and changing conditions—creating scenarios and modes of space use in accordance with the season, environmental conditions or climatic characteristics. Such a framework of architectural program consideration conditioned the research of complex spatial-program configurations that arise concerning users' specificity, relationships, behaviors and tendencies.

A significant step forward in establishing a new nature of the architectural program was made by Fenton [20] by considering the broader scope of hybrid construct in architecture and particularly hybrid relations in-between programs and forms. Based on the configuration and interaction of program elements, two types of hybrid programs have been identified: (1) thematic program—characterized by a dependence between parts and encouraging their interaction, emphasizing the fragmentation of a form and singleness of function between the various assembled elements; and (2) disparate program—characterized by the pursuit of economic benefits through often adding non-complementary functions to the existing architectural framework, which usually results in unexpected functional configurations.

Guided by the belief that the architectural program relies on repetition and habit and illuminating its prescriptive nature, Tschumi [21] identified that the program is never neutral and that the relationship between program and form can be one of reciprocity, indifference or conflict: (1) reciprocity means shaping the program so that it coincides with the form or shapes the form so that it reciprocates the configuration assigned to the program, (2) indifference implies that the form can accommodate any program, often resulting in a deterministic form and an indeterminate program, while (3) conflict implies that programs and forms intentionally collide to generate unexpected events in space.

To indicate the dynamic nature of the program, James and Yoos [22] single out two types of programs according to functional performance: (1) prescriptive (hard)—described as fixed spaces necessary for basic operation and services; and (2) spontaneous (soft)—described as physically porous spaces involving variable activities. In such a research framework, programming is established as an analytical process, and the program is defined as an instrument that contributes to spatial-program configurations that become the primary criterion for typological classification in response to environmental conditions and behavioral possibilities.

Previously singled out perspectives of the architectural program indicate this construct's strong capacity to improve the performance of space and create new configurations, which is especially important in the context of heritage reprogramming where the new order is most often sought. **Table 2** provides a recapitulation of the types of architectural programs, and this framework will be particularly important in the context of the design-based research methodology discussion.

Table 2. Types of Architectural program according to [20][21][22].

(1) Hybrid Relations of Program Elements		(2) Relations of Program and Form			(3) Functional Performance Relations	
thematic	disparate	reciprocity	indifference	conflict	prescriptive	spontaneous

3. Conclusions

The methodology of architectural programming is a complex process that can significantly improve the overall design process and its argumentative framework: (1) The value-based track has a significant role in identifying all determinants and contextual factors of architectural and urban heritage, (2) the multiscale track is an essential link between identified values and types of architectural program in the process of designing conceptual models, and (3) although types of the architectural program represent a general pattern of threefold relations (between program elements, between program and form and functional performance), they nevertheless provide insight into the initial strategy for creating conceptual models. Clustering the conceptual models according to the type of architectural program indicates a strong connection between spatial levels and the application of architectural programs. On the one hand, this clustering affirms the dependence between parts emphasizing the fragmentation of a form, while on the other side encourages functional performativity of physically porous spaces.

The central characteristic of architectural programming in the procedural sense is reflected in the organizational aspect of the design process and the strengthening of architecture as a team discipline. During the design process, special attention should be paid to the distribution of roles of all participants in the process, including architects, future users and researchers from social sciences but also the clients/investors and authorities. The participatory dimension of programming is based on the belief that the participation of all actors in the design process should be carefully developed —through the development of new relationships between users and service providers, as well as the development of common tools and languages as catalysts for individual and community development. This kind of development becomes especially significant in the context of social wellbeing. According to Taçon and Baker, “heritage is something that is essential for contemporary and future well-being, and that if we do not better care for heritage then human health will be negatively impacted” [23]. However, the ability to enjoy and take part in culture must not be taken for granted, as numerous barriers need to be overcome: “financial barriers to overcome, and probably geographical, social, and cultural barriers” [24]. Thus, inclusive policies are needed to enable all local and foreign people to access heritage activities and, therefore, higher levels of subjective well-being [24].

Although wellbeing represents a fundamental dimension to express the nature of sustainability and can be recognized as the ultimate goal of sustainable development [25], in our view, recognizing its importance in the context of heritage protection, promotion and reuse is still lacking. The promotion of wellbeing in this context (both for tourists and residents) must go beyond the economic values and should ensure social wellbeing aspects.

In the context of modernist doctrine in architecture, the primary connections between environment–behavior relations were established with a focus on the human functional programming value. Today, an unsustainable present and an uncertain future require the obvious and unquestionable necessity of introducing a wide range of programming values in the process of heritage reprogramming.

References

1. Architecture 2030. Existing Building Actions. Available online: https://Architecture2030.Org/Existing-Building-Actions/ (accessed on 1 August 2021).
2. Council of the European Union. Council Conclusions on the Work Plan for Culture 2019–2022. Off. J. Eur. Union 2018. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018XG1221(01)/ (accessed on 5 June 2021).
3. Council of the European Union. Council Resolution of 12 February 2001 on Architectural Quality in Urban and Rural Environments. Off. J. Eur. Union 2001. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32001G0306(03) (accessed on 5 June 2021).
4. Pena, W.M.; Fock, J.W. Problem Seeking: New Directions in Architectural Programming; Caudill Rowlett Scott Houston: Houston, TX, USA, 1969.
5. Lawrence, A.R.; Schafer, A. Re: Programming_Journal of Writing + Building; Praxis: Columbus, OH, USA, 2006; pp. 4–5.
6. Pyburn, J. Architectural Programming and the Adaptation of Historic Modern Era Buildings for New Uses. J. Archit. Conserv. 2017, 23, 12–26.
7. Pena, W.; Caudill, W. Architectural Analysis—Prelude to Good Design. Archit. Rec. 1959, 125, 178–182.
8. Anderson, L.B. The Environmental Design Umbrella. J. Archit. Educ. 1967, 21, 4–6.

9. Milne, G. A Comparison of Paradigms in Research, Design and Education. J. Archit. Educ. 1971, 26, 8–15.
10. Zeisel, J. Sociology and Architectural Design; Russell Sage Foundation: New York, NY, USA, 1975.
11. Horowitz, H. The Architect’s Programme and the Behavioural Sciences. Archit. Sci. Rev. 1966, 9, 71–79.
12. Studer, R.G.; Stea, D. Architectural Programming, Environmental Design, and Human Behavior. J. Soc. Issues 1966, 22, 127–136.
13. Summerson, J. The Case for a Theory of Modern Architecture. R. Inst. Br. Archit. J. 1957, 307–310.
14. Hoppenfeld, M. Towards a Consensus of Approach to Urban Design. AIA J. 1962, 38, 37–42.
15. Peña, W.; Parshall, S. Problem Seeking: An Architectural Primer, 5th ed.; John Wiley & Sons: Hoboken, NJ, USA, 2012.
16. Hershberger, R. Architectural Programming and Predesign Manager; The McGraw-Hill Companies, Inc.: New York, NY, USA, 1999.
17. Values in Heritage Management: Emerging Approaches and Research Directions; Avrami, E.; McDonald, S.; Mason, R.; Myers, D. (Eds.) Getty Conservation Institute: Los Angeles, CA, USA, 2020.
18. Fredheim, L.H.; Khalaf, M. The Significance of Values: Heritage Value Typologies Re-Examined. Int. J. Herit. Stud. 2016, 22, 466–481.
19. Herschberger, R.G. Values: A theoretical framework for architectural programming. In Programming the Built Environment; Preiser, W.F.E., Ed.; Van Nostrand Reinhold: New York, NY, USA, 1985; pp. 7–12.
20. Fenton, J. Pamphlet Architecture 11: Hybrid Buildings; Princeton Architectural Press: New York, NY, USA, 1985.
21. Tschumi, B. Architecture and Disjunction; MIT Press: Cambridge, MA, USA, 1996.
22. James, V.; Yoos, J. Tempering Program_Journal of Writing + Building; Praxis: Columbus, OH, USA, 2006; pp. 30–35.
23. Taçon, P.S.C.; Baker, S. New and Emerging Challenges to Heritage and Well-Being: A Critical Review. Heritage 2019, 2, 84.
24. Ateca-Amestoy, V.; Villarroya, A.; Wiesand, A.J. Heritage Engagement and Subjective Well-Being in the European Union. Sustainability 2021, 13, 9623.
25. United Nations. The Future We Want: Final Document of the Rio +20 Conference. In Proceedings of the Rio20 United Nations Conference Sustainable Development, Rio de Janeiro, Brazil, 20–22 June 2012.