

Postdigital augmented spaces: A conceptual framework

Espacios postdigitales aumentados: Un marco conceptual

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Received 2024-03-27

Accepted 2024-10-01



To cite this article: Başarır, Sıla Burcu and Yüksel Demir. "Postdigital augmented spaces: A conceptual framework." *VLC Arquitectura* 11, no. 2 (October 2024): 173-189. ISSN: 2341-3050. <https://doi.org/10.4995/vlc.2024.21425>



Abstract: Contemporary augmented spaces are situated in-between digital-analog, material-immaterial, online-offline, and real-virtual binaries. Relatedly, postdigital as a concept suggests that digital technologies are now integrated with all aspects of the individual and social atmosphere. Therefore, we should engage digitality through a critical approach, focusing on its intermingled situation. Reading augmented spaces with a postdigital perspective is essential to understanding and evaluating digital technologies in the context of the current line of vision. This paper aims to provide a better understanding of contemporary debates on digital technologies in the context of design. The article reviews the definition of augmented space, and later postdigital as a concept is discussed with its fundamental characteristics. In what follows selected projects amongst the 2023 Media Architecture Biennale finalists are studied concerning the postdigital augmented spaces. As an outcome of this research, we suggest a postdigital augmented space conceptual framework that can be effective for the theory and practice of postdigital augmented spaces.

Keywords: augmented space; postdigital; digital; media architecture; augmented reality.

Resumen: Los espacios aumentados contemporáneos se sitúan entre lo digital-analógico, lo material-inmaterial, lo *online-offline* y lo real-virtual. En este contexto, el concepto de *postdigital* sugiere que las tecnologías digitales se han integrado completamente en todos los aspectos de la vida individual y social. Por lo tanto, es crucial abordar la digitalización desde una perspectiva crítica, poniendo énfasis en su naturaleza entrelazada. La lectura de los espacios aumentados desde una perspectiva *postdigital* es fundamental para comprender y evaluar las tecnologías digitales en el marco de la visión contemporánea. Este artículo tiene como objetivo profundizar en los debates actuales sobre las tecnologías digitales en el ámbito del diseño. En primer lugar, se revisa la definición de espacio aumentado, y luego se aborda el concepto de *postdigital*, destacando sus características clave. Posteriormente, se analizan los proyectos seleccionados entre los finalistas de la *Media Architecture Biennale 2023*, examinándolos en relación con los espacios aumentados postdigitales. Como resultado de esta investigación, proponemos un marco conceptual de espacio aumentado *postdigital* que puede ser útil tanto para la teoría como para la práctica de estos espacios.

Palabras clave: espacio aumentado; postdigital; digital; arquitectura de medios; realidad aumentada.

INTRODUCTION

Digital technologies are the most fundamental aspect of contemporary living in different contexts, as they are now intrinsic to the always-on-the-move human of the 21st century. Mobile devices have profoundly changed individual and societal interactions, and the cultural, political, and economic atmosphere, compared to the initial stage of digitalization. Today, digital technologies present habitual tools and mediums such as wireless connections, smart devices, and environments, similar to the proliferation and availability of the electrical infrastructure. Digital tools and mediums are adopted by digital natives intuitively, and nowadays many sociological, cultural, environmental, and biological phenomena are interwoven with technology, all being in constant interaction.

This complex interconnection of technology, environment, and culture is also an issue that is being scrutinized in architecture and design theory and practice. Computational design and construction methods, parametric design strategies, building information modelling (BIM), and intelligent building applications exemplify a portion of the effects of digitalization in architecture during the last 20 years. Concurrently, the experiential effects of digital technologies such as adding dynamic, virtual information layers, surveillance systems and their influences, and novel interaction possibilities in physical spaces have also been addressed by different concepts and applications, such as Manovich's "augmented space."¹

Recently, the sociocultural and environmental effects of digital technologies have become the focus of the intersections of digital media and architecture. New ways of merging real and virtual experiences, encouraging socialization, and creating awareness for cultural and environmental issues are considered fundamental objectives instead of technological advancements themselves, which can be observed in events such as the Media Architecture Biennale (MAB).² Relatedly, the purpose of this study is to investigate the contemporary augmented space examples that question

the experiential effects of digital technologies on physical spaces and propose a new, up-to-date conceptual framework concerning these practices.

Manovich's definition of augmented space is parallel to the scope of the previously mentioned events³ however, this argument made in 2006 could be considered as a prelude to investigating the digitalization of physical spaces and its effects are currently being argued with the concept of postdigital in different academic spheres: scrutinized in music,⁴ art,⁵ and humanities.⁶ Postdigital reveals that while technologies influence our perception of reality and our practices, we also shape them with our purposes and collective engagements. Contemporary augmented spaces, such as MAB examples are highly related to the postdigital paradigm, and therefore a deeper investigation is needed in this context. As such, a more complementary and explanatory concept of augmented space is required to understand and integrate postdigital phenomena.

The paper aims to provide a review that outlines augmented space and postdigital concepts to combine them through a study of practical examples and proffer a conceptual framework for postdigital augmented spaces. Thus, the concept of augmented space has been investigated by reviewing its origin. In what follows fundamentals of the postdigital have been discussed. The research combines these discussions with projects selected from MAB23 award nominees and winners to develop a conceptual framework. To explore an understudied phenomenon, it needs to be grounded with a conceptual framework, to create an impetus for systematic assessment of future research and practice,⁷ and our work aims to answer such necessity. The conceptual framework provides a lens for designers to critically inform projects that integrate digital technologies into physical spaces. By framing contemporary practices through the postdigital paradigm, this research offers a valuable critical perspective for understanding, designing, and realizing our increasingly digitalized built environment. In addition, it is an attempt to offer an agenda for

architectural discourse that focuses on the usage of digital technologies with a postdigital approach, which is a gap in research on digitalization in architecture.

AUGMENTED SPACE

Information layers in the built environment can be observed earlier than digital interventions, such as texts, images, or signs.⁸ From an archaeological media perspective, architecture, urban design, media, and technologies were incorporated in previous periods. The 19th century was especially important for large-scale advertisements which combined with electric light effects, allowed animated displays that have changed the urban experience and this can be seen as precedents of merging media and architecture.⁹ Particularly, *son et lumière* spectacles can be appreciated as early experiments of exercising modern audiovisual media technologies on the experience of architecture and space,¹⁰ such as Paul Robert-Houdin's *Château de Chambord* design from the 1950s, an early example that is being linked with contemporary projection mapping applications.¹¹ Combining technology and space for artistic expression has been influenced by the techno-optimism of the 1960s, and Billy Klüver and Robert Rauschenberg's initiatives for artist-engineer collaborations through performances, and the organization "Experiments in Art and Technology (E.A.T.)," which are considered important precedents, along with the exhibition "Cybernetic Serendipity" in 1968.¹²

With the expansion of digital technologies and the internet in the 1990s, the opportunities brought by digitalization have been an important topic of exploration in many fields, including art, design, and architecture. Blending digitalization into the physical environment has been scrutinized since the early experiments of digital technologies on space and architecture, which are gathered under different terms such as hybrid spaces,¹³ responsive environment,¹⁴ media architecture,¹⁵ interactive architecture,¹⁶ urban machines,¹⁷ mediatecture,¹⁸ and augmented space.¹⁹ Manovich's "augmented space" is preferred for this study albeit its apparent has-been situation relative to

other terms. The reason for this choice is that he identifies it with three characteristics that address similar aspects of all other previous terms: Firstly, the physical space and its experience are the main subjects of interest, secondly, there is an information layer changing dynamically in space, and lastly, there is a localized interaction with users, environment, or both.²⁰

In his seminal work, Manovich developed the concept by modifying the already established term "augmented reality (AR)",²¹ which became a well-known concept with *Google Glass* in 2013, and the worldwide mobile game, *Pokemon Go*.²² While he theorizes the change of experience in physical spaces intervened with digital media, he recognises the effects of the technological development on our change of perception of augmented spaces. Hence, he compiles technologies interchanging data with physical space, composing the "data-space".²³ Still, Manovich's intent is "to focus on the experience of the human subject in augmented space as opposed to particular electronic, computer, and network technologies through which the augmentation is achieved."²⁴ Aesthetically, as architecture engages with its spatial aspects as well as its visual appeal, augmented space is also a concept of more than surfaces turning into information screens. Similarly, Fox and Kemp's definition of interactive architecture requires a focus on the physical and tangible experience, with a reciprocal interaction with the space, hence people becoming participants of architecture instead of being users²⁵ which can be interpreted as mutual aspects with augmented spaces. Bullivant also emphasizes the sensual communication and phenomenological experience of similar practices²⁶ that incorporate electronic/digital media into space and architecture, which can be considered hybrid spaces that act as mediating devices and environments. Relatedly, Manovich invites architects to "consider the 'invisible' space of electronic data flows as *substance* rather than just as void - something that needs a structure, a politics, and a poetics."²⁷As a consequence, augmented spaces need diverse expertise intrinsically, such as

design and engineering from the beginning of conceptual development to the actual application, therefore they also involve approaches from various disciplines. This trait is similar to artistic interaction design that is interdisciplinary in essence as “obtaining input, articulating output, manufacturing and fabrication, and social, psychological, cultural, and even political issues are all areas that interactive artists must engage.”²⁸

POSTDIGITAL

Historically, the proliferation of computers in personal and societal life is a phase of the digital revolution, which spans from the early 1980s to the early 2000s.²⁹ Lupton addresses this period as the “cyber” era: when cyberspace indicates a non-physical and distinct world that is experienced by computer technology.³⁰ There have been such divisions between real and virtual worlds e.g., digital-analog or online-offline. Negropte stated that there has been “a perceived polarity (however artificial) between technology and the humanities, between science and art, between right brain and left,”³¹ which is related to the dualistic perspective. This sorting of digital and non-digital rules out the possibilities of intermediary situations, however, cultures and practices that appear to be outside of cyberspace are deeply influential to the virtual world.³² In addition, “just as the ideas of ‘online’ or ‘being online’ have become anachronistic as a result of our always-on smartphones and tablets and widespread wireless networking technologies, so too the term ‘digital’ perhaps assumes a world of the past.”³³ This shift has been pointed out by Cascone,³⁴ and Pepperell and Punt³⁵ with their common concept of “postdigital.”

In 2000, postdigital was defined as an aesthetic in music.³⁶ Recently it has been discussed as an artistic expression or approach,³⁷ often linked with the “New Aesthetic” practices³⁸ and new media arts.³⁹ Also, it has been studied in the context of humanities,⁴⁰ educational research⁴¹ and cultural studies⁴² along with computational/integrated design.⁴³ Thus, postdigital has been scrutinized from different points of view and is challenging to define and work with.

Moreover, postdigital is arguably an ambiguous term considering the meaning of the “post-” prefix being “after”, and excessive usage of this notorious prefix and its indication of temporality is already raising concerns.⁴⁴ It has different inclinations, such as a departure from a period of digital being perceived as technical progress or moving towards “a much more nuanced and critical view of human-technology relations”⁴⁵ Additionally, digital is often used as a synonym of binary systems, therefore “post-” prefix may indicate a deviation from this binary understanding.⁴⁶ We acknowledge this historical inclination of the postdigital age and discussions in this context.⁴⁷ Nonetheless, our opinion is parallel with Cramer’s: it encourages us to focus on its practical aspects while being aware of its imperfections.⁴⁸ “The post-digital captures the embeddedness of the digital in the objects, images, and structures we encounter on a daily basis, and the way we understand ourselves in relation to them.”⁴⁹ These structures involve manifold contexts as “postdigital mashup of material and immaterial production reaches well beyond the economic sphere to directly address the cultural, the social and the political.”⁵⁰ Therefore, it offers an explanatory conception of the multifaceted, complex situation of our contemporary condition.

In practice, digital is commonly defined as non-analog, virtual experiences, and analog-digital dichotomy is often read parallel with physical-virtual duality. Analog is considered to be tangible and available to bodily perception, while digital is cognitive, immaterial, and thus intangible. Practical examples in the postdigital age reveal the blurriness of such categorical divisions between analog-digital, old-new media, online-offline communication, real-virtual, natural-artificial, etc. Postdigital aesthetics have the following attributes:⁵¹

- computation becomes experiential, spatial, and/or materialized
- computation is embedded or embodied within the environment

- digital infrastructures/processes are being aestheticized
- a hybridized approach towards the digital and non-digital is embraced

The postdigital approach is defined as a convergence of multidisciplinary, interdisciplinary, transdisciplinary, and even antidisciplinary methods between scientific areas.⁵² We claim that postdigital practices involve post-disciplinary approaches between artistic and scientific domains. Post-disciplinary design practice implicates “actively negotiating and forging new boundaries between designers, users, and other experts rather than simply abandoning boundaries or working ‘across’ boundaries,”⁵³ which is evident in postdigital practices that holistically incorporate diverse expertise.

Finally, postdigital is an attempt to “rehumanize” digital technologies. Alexenberg defines postdigital as artistic studies that involve digital technologies with cultural and biological systems, encouraging social and physical communication, and thus humanizing digital tools and media.⁵⁴ The humanization of digital processes is also related to imperfections, as being digital was considered to be “inhumanly” mistake-free. Similarly, the dehumanizing effect of digital technologies is connected with affiliations of the digital as being intangible. For example, Simbelis investigates ways to rehumanize digital mediums by hacking digital devices and converging digital processes with analog mediums; he aims for “a more critical stance towards the digital positivist-solutionist attitude in computational procedures and its quantitative methodologies.”⁵⁵

With these brief explanations of the conceptual proposition of the postdigital, it can be said that it has useful value in understanding and discussing the current complexity of human-technology-environment relations, which is also being addressed with design practices in media architecture. Augmented space as a concept reciprocates the technical and experiential aspects of contemporary examples, emphasizing the effects of digital technologies on the physical space. However, the postdigital approaches of specific augmented space practices are their distinctive, and

valuable qualities. Therefore, a novel conceptual explanation that combines postdigital and augmented space can be useful for both theoretical and practical research.

CASE PROJECTS

To further discuss postdigital augmented spaces, combining theory and practice is a necessity. The MAB defines media architecture as a term that “encompasses the integration of sensors and screens, sonic, visual, and tactile interfaces, materials, and displays, and data capture and display in the built environment” which also includes “the physical, social, political, and technical systems and infrastructure” that is used in the process and development.⁵⁶ It is a transdisciplinary event gathering projects engaging digital technologies critically in the context of public space, questioning digital rights, more-than-human approaches, and the “relentless techno-push,”⁵⁷ which is the reason for its selection as a case pool. MAB also has a scientific aspect with publications indexed in the Association for Computing Machinery digital library,⁵⁸ therefore it supports the main aim of this paper to combine theory with practice.

We excerpt 4 projects from 17 finalists in MAB23. The selection is made to demonstrate diverse approaches, contexts, and applications: involving deconstructive approaches on screens, inquiring concepts of surveillance and participation, digital placemaking, and questioning the dichotomy of nature and technology, represent the distinct postdigital approaches of merging digital and physical space among MAB23 finalists. As such, they are examined for postdigital approaches and augmented space characteristics by cross-reads of literature surveys and project statements. The data are gathered from project statements in the MAB23 project catalog, as well as online sources such as texts, images, and videos presented by designer teams or artists, and published articles explaining the projects. Our paper introduces these data briefly in the context of the research in this section. The findings



Figure 1. Digital Phyllotaxy by Jason Bruges Studio, Hankook Tire Headquarters, Seoul, South Korea, 2020.

of the study are processed to suggest 7 primary traits for postdigital augmented spaces, which constitute the postdigital augmented space conceptual framework.

Digital Phyllotaxy, South Korea, 2020

“Digital Phyllotaxy” aims to create an atmospheric experience during the vertical motion in the interior escalator of Hankook Tire’s headquarters building. The concept is to create a canopy that mimics the daylight and shadow effects of a tree by combining digital and physical design elements (Figure 1). The title of the project is derived from the *phyllotaxis*, meaning the alignment of leaves on a stem in botany. Being a site-specific design, Jason Bruges Studio “envisaged an artwork that brings a dynamic interplay of artificial and natural light deep into the heart of the building

generating visual connections across different floors to encourage staff interaction.”⁵⁹ The installation creates a natural-artificial synthesis using digital media: the “leaves” are comprised of edge-lit units and liquid crystal shutters, specifically located to generate a biophilic light and shadow game, while illumination and colors are determined with real-time data input from the movement of users and weather conditions. Hence, the design deconstructs the idea of a virtual “screen” into real interactive elements, composing these screens “to create an everchanging arboreal world.”⁶⁰ Diverse disciplinary actors were also involved during the design and production processes, such as media artists, architecture firms, lighting specialists, engineers, and mechanical consultants.



Figure 2. Chatty Bench Project and Festival by QUT Design Lab, Brisbane, Australia .2020-2021.

Chatty Bench Festival Community Media Visual Projections, Australia, 2020-2021

Chatty Bench Project (CBP) initially began as a physical intervention on public benches in Kelvin Grove (KGUV),⁶¹ painted orange to indicate that the bench is a spot for socialization, subsequently turned into a community collaboration aiming creative interactions between locals and physical space through digital storytelling, locative media and physical gatherings⁶² (Figure 2). The project was held online during the COVID-19 pandemic through workshops and digital tools such as Twine (an interactive fiction tool) and Mozilla Hub were used to create geolocative stories

of the residents that pass on their history, cultural backgrounds, and experiences of the urban village.⁶³ The workshops involved community stakeholders, researchers, designer specialists, and 16 participants.⁶⁴ These geolocative digital “artifacts” are exhibited in Mozilla Hub’s virtual environment. As one of the outcomes of the project, it is stated that “low-tech AR digital artefacts strengthened the participants’ connection to place, i.e. KGUV, and provided new meaning to it.”⁶⁵ In 2021, CBP continued with Community Media Visual Projections (CMVP), members created digital media via smartphones, telling their experiences about living, working, and studying in the village. These media are digitally

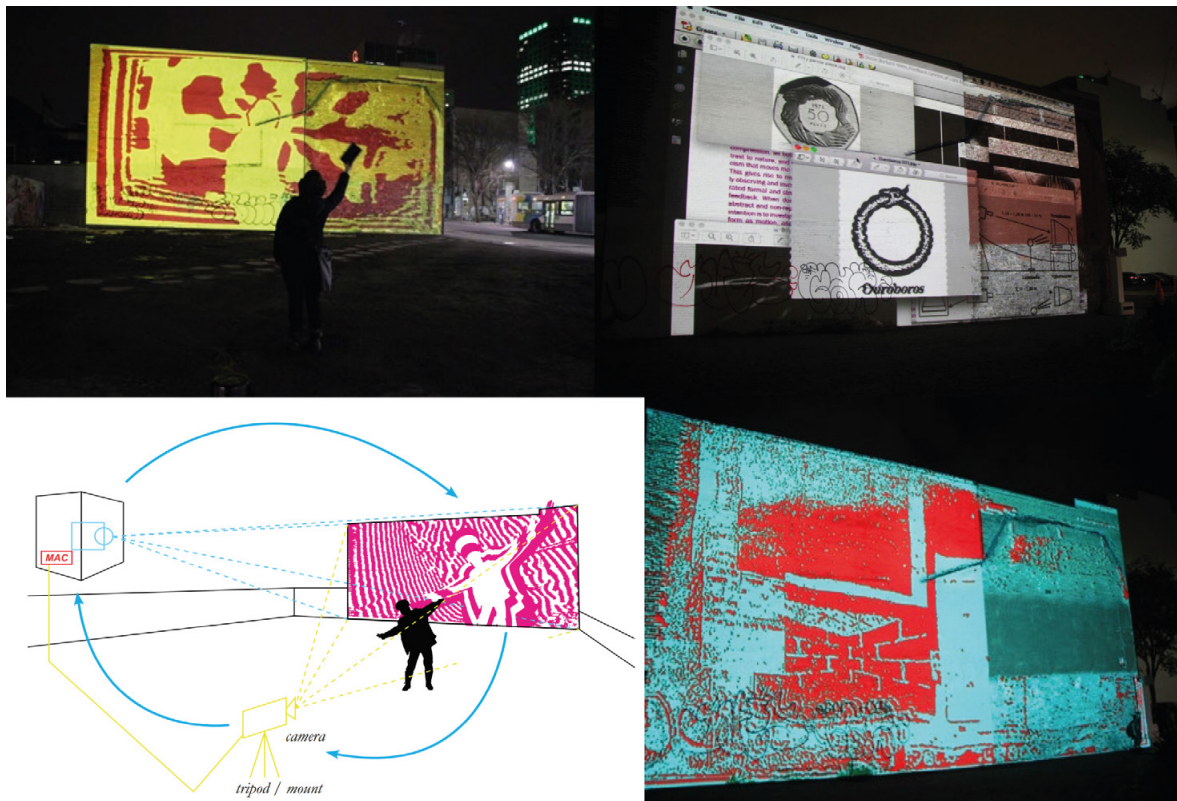


Figure 3. *Ecran de Veille* by Sam Meech, Montreal, Canada. 2022.

intervened by the members with creative coding, making patterns and distortions, and the outcomes are projected in a public space at the final gathering.

Écran de Veille, Canada, 2022

Écran de Veille is an artistic installation that questions the idea of screen and surveillance, by creating a loop between the projection and camera with an optical feedback system (Figure 3). The result is an interactive, playful interface on a façade. The camera captures both the projected images and happenings in immediate surroundings, then self-generatively incorporates them into the scene, creating “organic, visual echoes” in real-time.⁶⁶ The installation also involves a sound

design, which is affected by visuals on the projection and physical movements on the site. These interactive “screensaver” moments are interrupted by micro-documentaries showing a desktop of a computer of an unknown user searching through feedback loops, chaos theory or “ouroboros”, self-eating snakes, a live feed of the projection site, etc., aiming to evoke questions about surveillance systems by asking questions such as “does this person know we can see their screen? Or perhaps they can see us? Who is watching who?”⁶⁷



Figure 4. ZOE installation by Noor Stenfert Kroese in collaboration with Amir Bastan, Rotterdam, Netherlands, 2022.

ZOE, Netherlands, 2022

ZOE is a performative installation located in Ars Electronica Center that creates an environment with both natural processes and robotic systems, which becomes a “temporary co-existence.”⁶⁸ By using sensing technologies, the project consists of an experiential ecosystem involving *reishi* mushrooms and a robotic arm, both shaping each other’s behavior. Bringing the bias of paradox between nature and technology,⁶⁹

ZOE aims to experience the communication of mushrooms with visual and tactile data displayed simultaneously in the installation area. Mushrooms’ behavior defines the action of the robotic arm that provides light and humidity, and in turn, robot shapes the form of the light-sensitive reishi mushrooms. Inspired by Braidotti’s philosophy, “‘ZOE’ places everything, including us, in relation with the others as being part of it.”⁷⁰ Generated data from

Table 1. Postdigital augmented space traits and projects.

Traits	Digital Phyllotaxy	Chatty Bench	Écran de Veille	Zoe
Materiality	Physical materials and space combined with digital media	Real locations combined with digital “artifacts”	Users are using body movements to experience	An ecosystem of mushrooms and robotic arm, data materialized as carpets
Rehumanization	Biomimicry, generative	Socialization via physical and virtual space	Imperfections are favored, unpredictable, generative	Connection with nature, physical-tangible digital processes
Hybridization	Natural-artificial, material-immaterial	Online-offline, real-virtual, analog-digital	Old-new media, real-virtual	Natural-artificial, human-nonhuman
Interaction	Between installation, users, and climatic changes	Between users in the community and both physical and digital space	Interactive visuals and sounds with people and the immediate environment	Mushrooms, robotic arm, environmental conditions (air, light)
Critical approach	Deconstructing the “screen”, aestheticized digitalization	Low-tech tools, focusing on sociocultural aspects and practicality	Questioning surveillance, embracing accidents, unpredictability	Questioning nature-technology dichotomy, experimentality, tactility of data
Communication	Users, space, and environment	Local community, users, and space	Users, physical and virtual space	Mushrooms, robotic arm, and environment
Post-disciplinary approach	Engineer, artist, architect, specialists	Community stakeholders, participants, users, experience designers, researchers	-	Artists, engineers, robotics, and biology research institutions

nature-technology interaction is presented with real-time audiovisual representations and “tactile” data carpets (Figure 4).

From our literature review on the concepts of augmented space, and postdigital, with brief descriptions of case projects, we have identified their postdigital augmented space traits as *materiality*, *rehumanization*, *hybridization*, *interaction*, *critical approach*, *communication*, and *post-disciplinary approach* (Table 1). These traits constitute a synthesis of both postdigital and augmented space characteristics. Additionally, not all these traits need to be included in a project to be defined as a postdigital augmented space. However, combinations of the traits constitute essential topics in the creation and definition of postdigital augmented spaces that prioritize physical space while at the same time keeping a critical perspective towards digitalization.

Materiality in the forms of physical materials, locations, embodiments, natural processes, and spatial features such as climatic changes or air and light conditions and movements are present in these projects. Thus, materiality can be defined as combining or converting intangible, digital processes to tangible, physical, and spatial experiences. Materialization can involve humans with or without digital tools or interfaces, as well as natural, mechanical, and biological (non-human) systems integrated in physical space with digital processes through sensors, screens, robotics, etc.

Rehumanization of digitalization is achieved by merging digital technologies with physical installations, involving bodily interactions and sociocultural communications, and embracing imperfections. These approaches renegotiate postulations of digital technologies’ inhuman accurateness, or their

exemption from physical, analog, or natural systems. It is closely related to communication, interaction, materiality, hybridization, and critical approach traits of postdigital augmented spaces.

Interaction and communication are key traits of postdigital augmented spaces. The reason to consider interaction and communication separately is that not only do they imply individual attributions but also their correlation. Here, *interaction* means “the situation or occurrence in which two or more objects or events act upon one another to produce a new effect”⁷¹ such as the robotic arm affecting the mushrooms’ shape and growth, or users’ body movements’ effect on projected images through sensors. Yet, *communication* signifies a transaction, a “state of exchanging data or information between entities.”⁷² The interactivity of a postdigital augmented space may involve a communicative aspect, as in the Chatty Bench project, or it can be used to invoke a participative action such as in *Écran de Veille*’s user movements’ being used for feedback loops.

Hybridization of online-offline, natural-artificial, and analog-digital are evident in the case projects. The physical environment or objects and the non-physical information are interwoven through digital tools and interventions used in space in various ways such as the materiality of weather events and digital units in Digital Phyllotaxy, or “analog” benches and physical urban environment with digital storytelling in Chatty Bench project. These hybridizations create a merge of architectural space, media technologies, and other elements such as users or natural, non-human entities.

Using low-tech, imperfections, and unpredictability, aestheticizing digital processes with tangibility, or questioning surveillance and assumptions of dichotomic thinking such as the nature-technology paradox requires critical thinking towards digitalization. Postdigital augmented spaces utilize digital technologies to question their meaning, effects, and our experience and interpretation of them, which involves a philosophical inquiry. In doing so, they avoid conceptual binaries such as analog-digital,

real-virtual, material-immaterial, human-nonhuman, science-art, humanities-natural sciences, etc. while having a critical distance to the “new is always better” postulation that is generally accepted for digital technological developments.

Lastly, the post-disciplinary approach is a necessity for postdigital augmented space design process. Collaborations in computational sciences, arts, engineering, humanities, design, architecture, natural sciences, etc. through experimental, creative thinking in various design stages from conception to application are evident. Post-disciplinary practices challenge academic definitions of disciplinarity and do not seek definitive answers, evaluating the specifics of disciplines while breaching their limits by operating outside their borders.⁷³ Post-disciplinary knowledge is considered “situated knowledge”, that is “a multiplicity of interconnected viewpoints, perspectives, social relations, and cultural practices.”⁷⁴ Concurrently, the post-disciplinary approach involves nomadic creative practices that prioritize process over outcomes, and the boundaries between artist, designer, technician, producer, and consumer are being disintegrated through collaborative work.⁷⁵ The cases display outcomes of such post-disciplinary processes, with multiple specialties working together, creating a spatial experience that incorporates architectural design, media arts, humanities, science, etc.

FINDINGS AND CONCLUSION

For the findings of this research, we further elaborate on these traits to proffer a conceptual framework as in Figure 5. It should also be noted that this framework is an endeavor to provide a basis for postdigital augmented spaces, and thus can be elevated with further research.

According to the conceptual framework, we define postdigital augmented spaces as,

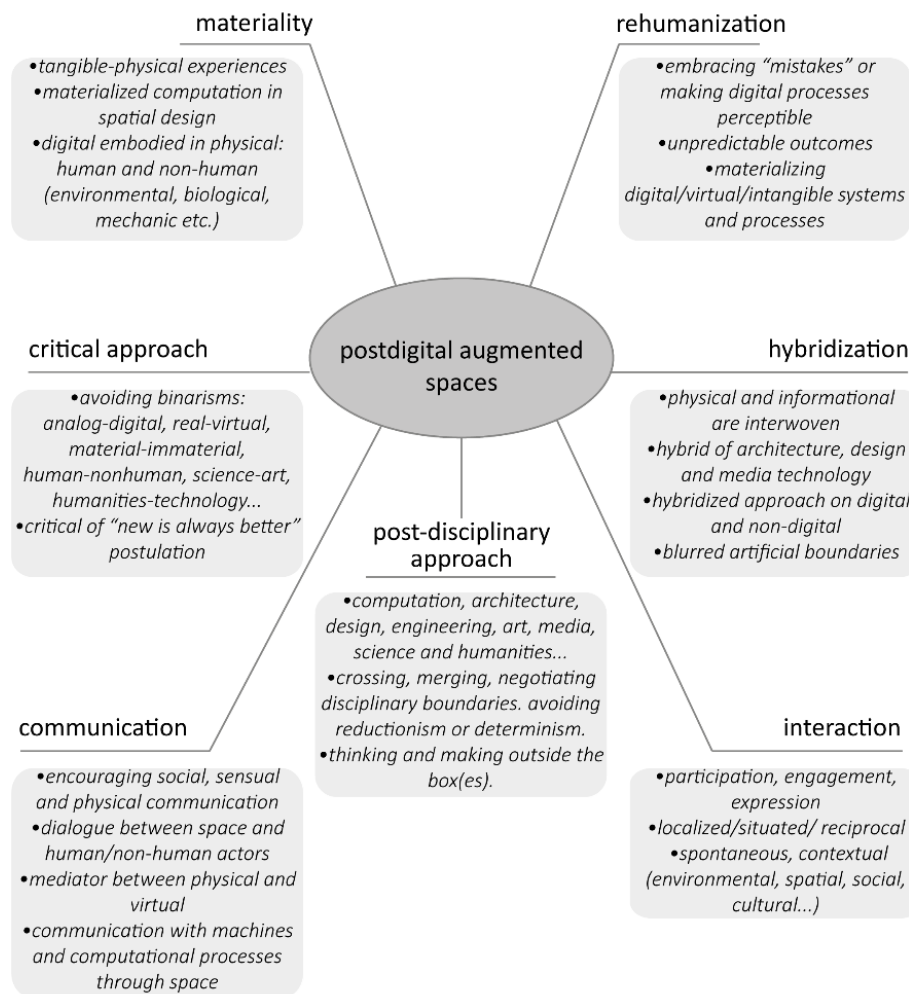


Figure 5. Postdigital augmented space conceptual framework.

- A merge of digital media and physical space, using technologies while assessing material, physical, contextual, social, etc. qualities of the physical space, and they engage our contemporary state of "in-betweenness" regarding dichotomies e.g., digital-analog, natural-artificial, material-immaterial, etc.
- Spaces that encourage creative usage of digital technologies in spatial design by critically evaluating digitalization, without the fixation on high-technology or high-resolution processes and outcomes.
- Spaces that critically focus on the experiential, sociopolitical, and sociocultural layers of interactions between technology, humans, and the environment, instead of interpreting technological developments themselves in an isolated perspective.

- Design and development of postdigital augmented spaces are mostly practices involving post-disciplinary collaborations between media design, art, architecture, engineering, and science and humanities, crossing, merging, and creatively negotiating the disciplinary boundaries.

While we argue that our approach to the subject is effective, examining the postdigital paradigm further through theoretical lenses like posthumanism and new materialism could provide additional valuable perspectives on the active role of technologies in reshaping our realities. Hayles' conception of posthumanism⁷⁶ highlights how technologies are changing understandings of materiality and embodiment connecting with notions of materiality and hybridity in postdigital spaces. Similarly, Bennett's vibrant matter⁷⁷ reveals how materiality emerges through non-human sociotechnical relationships. These can potentially expand the human-centered and material manifestations of the digital in the proposed framework.

ACKNOWLEDGMENTS

This paper is developed under an ongoing doctoral dissertation study in the Architectural Design Graduate program at the Graduate School of Istanbul Technical University, with Prof.Dr. Yüksel Demir as the thesis advisor and co-author of this paper. We also thank Prof.Dr. Ethem Gürer, Prof.Dr. Simge Esin Orhun and Prof.Dr. Burak Pak for their comments that greatly improved the manuscript.

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