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Human-Centered Design in the Age of AI

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Yapay Zekâ Çağında İnsan Odaklı Tasarım

Editörden

Hızlı teknolojik ilerleme ve Yapay Zekâ'nın (YZ) yaygınlaştığı çağımızda mimarlık ve tasarım, insan merkezli inovasyonda yepyeni bir döneme girmektedir. Yapay Zekâ'nın tasarım konularında artan rolü ve insan odaklı tasarımı geliştirme potansiyeli her zamankinden daha görünür hale gelmektedir. JCoDe'un 5. Cilt 1. Sayısı'nın teması, Yapay Zekâ teknolojilerinin tasarım pratiklerini nasıl etkilediğini araştırmayı ve insan ihtiyaçlarını, konforunu ve refahını ön planda tutan çalışmaları vurgulamayı amaçlamaktadır. Bu bağlamda insan merkezli tasarım yaklaşımına odaklanarak yapay zekâ ve tasarımın kesişimini araştıran araştırmaları, makaleleri, derinlemesine araştırmaları ve iç görüleri teşvik eder.

Çağımız, tasarım alanında yeni bir sayfa açan, insan yaratıcılığı ile teknolojik gücün dinamik bir yakınlaşmasına işaret etmektedir. Bu fikre paralel olarak mevcut tema, bireylerin refahının ve deneyimlerinin merkezde yer aldığı yapay zekanın tasarım pratikleri üzerindeki çok yönlü etkisini keşfetmeyi hedeflemektedir. Özünde, "Yapay Zekâ Çağında İnsan Odaklı Tasarım", tasarım ve mimarinin geleceğine bir yolculuğu, yapay zekanın yaratıcı potansiyelinin tasarım eylemiyle birleştiği bir yeni arayışı temsil etmektedir. Bu tema, insanın düşünce, arzu ve ihtiyaçları ile teknolojik inovasyon arasında gelişen etkileşimin bir kanıtıdır ve yapay zekanın temelde insanlığın farklı ihtiyaçlarından kaynaklanan tasarım araç, ortam, destek ve önerileri oluşturma kapasitesini göstermektedir.

Bu bağlamda JCoDe'nin onuncu sayısı, İnsan Odaklı Tasarım İlkeleri, Yapay Zekâ ile Geliştirilmiş Kullanıcı Deneyimi (ArchUX), Kapsayıcı Tasarım ve Erişilebilirlik, Akıllı Evler ve Nesnelerin İnterneti (IoT) Entegrasyonu, Yapay Zekâ ile Desteklenen Yaratıcılık, Mimarlık ve Tasarım Pedagojilerinde Yapay Zekâ, İnsan Odaklı Yapay Zekâ Etiği, Vaka ve Uygulama Örnekleri vb. tartışmaları içermektedi.

Tasarım eğitim ve pedagojileri ağırlıklı ilk bölümde, Emine ZEYTİN, Kamile ÖZTÜRK KÖSENCİĞ ve Dilan ÖNER, gelecekte daha da yaygınlaşacağı düşünülen üretken tasarım asistanlarının (GDA) mimari tasarım sürecine entegrasyonunu araştırmaktadır. Araştırma, üçüncü ve dördüncü sınıf mimarlık öğrencilerine odaklanarak, bu araçların tasarım sürecine nasıl entegre edildiklerini ArchiGAN ve HouseGAN araçları üzerinden incelemektedir. Mehmet Uğur KAHRAMAN, Yaren ŞEKERCİ, Müge DEVELİER ve Ferhat KOYUNCU, GAN (Generative Adversarial Networks) tabanlı üretken tasarım asistanlarının İç Mimarlık Eğitimi'ne konsept geliştirme hususunda entegrasyonunu tartışmaya açmaktadır. Çalışma, iç mimarlık eğitimine YZ (Yapay Zeka)'nın entegrasyonunu önererek öğrencilere temel 21. yüzyıl becerilerini kazandırma ihtiyacını vurgularken gelecekteki araştırmaların hibrit YZ metodolojilerini ve YZ'nın meslekteki evrilen rolünü keşfetmesi gerektiğini öne sürmektedir.

İkinci bölüm, dijital teknolojiler ve YZ çağında dönüşen mimarlık düşün ve pratiklerine odaklanmaktadır. Kaan KARABAĞLI ve İpek KURAN, dijital çağda mimari olanakları yeniden tanımlamak için sibernetik ilkelerle XR teknolojilerinin yakınsamasını incelemektedir. Çalışma dönüştürücü olasılıklara dair iç görüler sunar ve sibernetik ilkeler, XR teknolojileri ve mimari tasarım arasındaki simbiyotik ilişkiyi, hem kuramsal, hem de mimarlık öğrencileri ile yürütülen atölye çalışmaları üzerinden inceler. Dijital çağda mimariyi yeniden tanımlamaya ve yaratıcılığın sınırlarının sorgulandığı ve yapılı çevrenin insan hayal gücünün dinamik bir ifadesi haline geldiği insan merkezli olmayan yeni bir mimari çağı tartışmaya açar. Burak DELİKANLI, afet sonrası senaryolara dönük önerdiği dijital fabrikasyon kolektifi modeli ile, dijital üretim araçları ve yapay zekanın öz-örgütlenmeyle entegrasyonunun afet müdahale stratejilerinde yaratabileceği toplumsal refleks ve dayanıklılığı tartışmaya açmaktadır.

Üçüncü ve son bölümde Tuba ŞEKERLİ ve Çetin TÜKER, özellikle grafik tasarım alanında yapay zekâ uygulamalarının geleceği, olumlu ve olumsuz yönleri, istem oluşturma pratiğinin elde edilen görsel sonuca etkisi, Dall-e kapsamında oluşturulan görsellerin yeterliliği, gelişen bu teknolojinin gelecekte tasarımcıların rolünü nasıl değiştirebileceği, tasarımcıların yaratıcılık ve özgünlük algıları, tasarımcıların teknik beklentileri ve yapay zekâ kullanımı sırasında karşılaştıkları zorluklar ve olanaklar üzerinde durmaktadır. Esra Nur GÜNDÜZ ve Ozan Önder ÖZENER, Sürrealizm ile mimarlık arasındaki ilişkileri ve bu ilişkilerin mekansal potansiyellerini, oyuncuların deneyimleri aracılığıyla keşfetmeyi hedeflemektedir. Deneyimi rüyalar, özgür düşünme ve çoklu fırsatlar alegorilerine dönüştüren bulmaca oyunu Superliminal'de (2019) dijital uzam deneyiminin sürrealist mekansallık potansiyeli araştırılmaktadır. Çalışmanın ön sonuçları "regression tree" metodu ile görselleştirilmiştir

Human-Centered Design in the Age of AI

Editorial

In the current age of rapid technological advancement and Artificial Intelligence (AI) proliferation, architecture and design have entered a new era of human-centered innovation. The growing role of AI in design issues and its potential to enhance human-centric design become more visible than ever. This theme investigates how AI Technologies influence design practices, strongly emphasizing designs prioritizing human needs, comfort, and well-being. It encourages research, articles, in-depth exploration, and insights that explore the intersection of AI and design, focusing on the human-centered design approach.

This era signifies a dynamic convergence of human ingenuity and technological prowess, ushering in a new chapter in the realm of design. Parallel with this idea, the current theme is dedicated to exploring the multifaceted impact of AI on design, where the welfare and experiences of individuals take center stage. In essence, "Human-Centered Design in the Age of AI" represents a journey into the future of design and architecture, a journey where the creative potential of AI converges with the act of design. This theme is a testament to the evolving interplay between human aspiration and technological innovation, demonstrating the capacity of AI to craft architectural environments that are fundamentally rooted in the diverse needs of humanity.

In this context, the tenth issue of JCoDe includes discussions concerning Human-Centered Design Principles, AI-Enhanced User Experience (ArchUX), Inclusive Design and Accessibility, Smart Homes and Internet of Things (IoT) Integration, AI-Infused Creativity, AI in Architecture and Design Pedagogies, Human-Centered AI Ethics, Case Studies and Best Practices

In the first part, which focuses on design pedagogies, Emine ZEYTİN, Kamile ÖZTÜRK KÖSENCİĞ, and Dilan ÖNER explore the integration of Generative Design Assistants (GDAs), precisely machine learning-based tools, in the architectural design process. The research focuses on third and fourth-year architecture students, examining how they adapt to and integrate these advanced AI tools into their design workflows. Mehmet Uğur KAHRAMAN, Yaren ŞEKERCİ, Müge DEVELİER, and Ferhat KOYUNCU discuss the integration of GAN (Generative Adversarial Networks) based generative design assistants in concept development in Interior Architecture Education. The research suggests the integration of AI into interior design education to equip students with essential 21st-century skills while emphasizing the need for future research to explore hybrid AI methodologies and the evolving role of AI in the profession.

The second part focuses on architectural ideas and practices transformed in the age of digital technologies and AI. Kaan KARABAĞLI and İpek KURAN examine the convergence of cybernetic principles and XR technologies to redefine architectural possibilities in the digital age. The study offers insights into transformative options and explores the symbiotic relationship between cybernetic principles, XR technologies, and architectural design, both theoretically and through workshops conducted with architecture students. It redefines architecture in the digital age and opens up a new, non-human-centered architectural era where the limits of creativity are questioned. The built environment becomes a dynamic expression of human imagination. With the digital fabrication collective model he proposes for post-disaster scenarios, Burak DELİKANLI discusses the social reflexes and resilience that integrating digital production tools and artificial intelligence with self-organization can create in disaster response strategies.

In the third and last chapter, Tuba ŞEKERLİ and Çetin TÜKER question the future of artificial intelligence applications, especially in the field of graphic design, their positive and negative aspects, the effect of the prompt creation practice on the visual result obtained, the adequacy of the visuals created within the scope of Dall-e, how this developing technology can change the role of designers in the future, The research focuses on designers' perceptions of creativity and originality, designers' technical expectations, and the difficulties and opportunities they encounter during the use of artificial intelligence. Esra Nur GÜNDÜZ and Ozan Önder ÖZENER aim to explore the relations between Surrealism and architecture and the spatial potentials of these relations through the experiences of the actors. The surrealist spatiality potential of digital space experience is explored in Superliminal's puzzle game (2019), which transforms the experience into allegories of dreams, free-thinking, and multiple opportunities. Preliminary results of the study were visualized with the "regression tree" method

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The Role of AI Design Assistance on the Architectural Design Process: An Empirical Research with Novice Designers

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This study explores the integration of Generative Design Assistants (GDAs), specifically machine learning based tools, in the architectural design process. It investigates how these tools, once confined to experimental realms, are now influencing mainstream architectural practice, particularly among novice architects. The research focuses on third and fourth-year architecture students, examining how they adapt to and integrate these advanced AI tools into their design workflows. Through an empirical online workshop, the study collected data of design process recordings, design output success scores of students by an independent jury, and post-experiment surveys. This approach provided insights into the timing, frequency, and sequence of GDA usage, as well as the influence of specific GDA features on design success. The research reveals that three primary strategies emerged in students' GDA usage: continuous use throughout the design process, selective problem-solving use, and initial ideation use followed by traditional methods. However, an over-reliance on GDAs was noted to potentially limit the designer's interpretive and developmental input. The survey shows that different GDAs have distinct strengths and impacts on the design process. In terms of selected GDAs for the experiment, ArchiGAN aids in discovery and ideation, while HouseGAN excels in reframing design problems. In conclusion, the study underscores the transformative potential and challenges of GDAs in architectural design and highlights the need for balanced GDA integration. The research outputs show that future research should focus on the long-term implications of GDAs in architectural education. This research aims to guide the effective integration of AI in architecture, enhancing the human designer's role rather than overshadowing it.

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Keywords: Artificial Intelligence, Generative Design, Design Assistant, Architectural Design Pedagogy, Design Cognition.

Tasarım Sürecinde Üretken Yapay Zeka Asistanlarının Rolü: Mimarlık Öğrencileriyle Ampirik Bir Araştırma

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Uzun süre yalnızca akademik çalışmalar ile sınırlı kalmış olan üretken tasarım asistanları, makine öğrenmesi tabanlı yapay zeka teknikleri sayesinde ana akım mimari pratik için de erişilebilir olmuştur. Bu çalışma, gelecekte daha da yaygınlaşacağı düşünülen bu üretken tasarım asistanlarının (GDA) mimari tasarım sürecine entegrasyonunu araştırmaktadır. Araştırma, üçüncü ve dördüncü sınıf mimarlık öğrencilerine odaklanarak, bu araçların tasarım sürecine nasıl entegre edildiklerini ArchiGAN ve HouseGAN araçları üzerinden incelemektedir. Araştırma kapsamında gerçekleştirilen çevrimiçi atölye çalışmasında, 12 katılımcının tasarım süreci kayıtları, tasarım çıktılarının bağımsız bir jüri tarafından değerlendirilmesi ile elde edile başarı puanları, ve son olarak atölye sonrası öğrenci anketleri ile toplanan geri bildirimler çalışmanın nicel ve nitel verilerini oluşturmaktadır. Araştırma, öğrencilerin GDA kullanımlarında üç ana stratejinin ortaya çıktığını göstermiştir: (1) tasarım süreci boyunca sürekli kullanım, (2) seçici problem çözme kullanımı ve (3)başlangıçta fikir oluşturma kullanımı ardından geleneksel yöntemlere geçiş. Araştırmada, GDA'lara aşırı bağımlılığın, tasarımcının yorumlayıcı ve geliştirici katkısını potansiyel olarak sınırlayabileceği gözlenmiştir. Anket çalışması ise, farklı GDA'ların tasarım sürecine farklı aşamalarda katkı sağladığını göstermektedir. ArchiGAN, keşif ve fikir oluşturma aşamasında yardımcı olurken, HouseGAN tasarım problemlerini yeniden tanımlama ve tasarım iterasyonu konusunda destekleyici gözükmektedir. Sonuç olarak, çalışma, mimari tasarım sürecinde GDAların dönüştürücü potansiyelini ve sürece entegrasyonlarında karşılaşılabilecek zorlukları göstermektedir. Araştırma, dengeli bir GDA entegrasyonunun gerekliliğini ortaya koymakta ve gelecekteki araştırmalar için, mimarlık eğitiminde GDAların uzun

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1. INTRODUCTION

In the historical landscape of architectural design, AI assistants have long been envisioned as augmentative tools. Initial endeavors, such as expert systems and rule-based generative models, signaled an innovative shift, yet their assimilation into mainstream architectural practice remained marginal. These pioneering technologies, while groundbreaking, often stayed confined to experimental realms, lacking widespread adoption in the field of architecture.

The landscape underwent a transformative shift with the advent of probabilistic methods like neural networks, heralding the emergence of more sophisticated and diverse AI tools. The inception of Generative Adversarial Networks (Goodfellow et al., 2014) marked a significant milestone in this evolution, which has since been propelled further by advances in technologies like diffusion models (Sohl-Dickstein et al., 2015).

Presently, the architectural domain witnesses a burgeoning array of AI tools, each designed to augment distinct phases and facets of the architectural design process. This expansion not only paves the way for heightened creativity and efficiency but also presents a complex challenge to architects: the integration of these technologies, which function not merely as tools but as independent design agents endowed with their own knowledge memory and synthesis capabilities. This integration transcends mere utilization; it necessitates the harmonization of their intrinsic design intelligence with traditional design methodologies.

This research is grounded in the historical evolution of AI tools in architecture and seeks to bridge a critical gap: comprehending how architects are assimilating technologies, particularly GANs, into conventional design paradigms. It delves into the emerging strategies architects employ to integrate these intelligent tools – which transcend the role of simple aids to become central agents of design. The study aims to uncover insights into how these tools are redefining creativity and efficiency in architectural practices, signifying a departure from traditional methods towards a more integrated, AI-augmented approach.

Focusing on the incorporation of AI tools, specifically GAN-based generative design assistants (GDAs) like ArchiGAN and HouseGAN, this study examines their utilization in the design workflows of novice architects. It centers on third and fourth-year architecture students, who, while acquainted with conventional drawing-based design techniques, are not as deeply entrenched in these practices as their more seasoned counterparts. This positions them uniquely as more adaptable and receptive to incorporating novel AI tools into their design repertoire. The selection of GAN-based plan generators as the principal investigative tool stems from their widespread accessibility and their aptitude for addressing plan configuration challenges, offering a concrete metric to gauge AI's impact on design outcomes.

1.1 Evaluation of Generative AI Tools

In architectural design, artificial intelligence (AI) can be broadly categorized into two approaches: rule-based and probabilistic machine learning-based (Carpo, 2023). These approaches have deep roots in the field, with significant contributions from pioneers such as Marvin Minsky and Nicholas Negroponte. Minsky, a proponent of the probabilistic approach, and Negroponte, who favored rule-based systems, laid the groundwork for the diverse range of AI applications we see in architecture today.

Rule-based AI systems employ a range of mathematical models and algorithms (Singh & Gu, 2012), such as cellular automata (Wolfram, 1983), genetic algorithms (Holland, 1992), shape grammars (Stiny & Gips, 1971), L-systems (Lindenmayer, 1968), and swarm intelligence (Anderson, 2001) with multi-agent societies. These systems operate on predefined rules to generate designs that adhere to specific user-defined goals and constraints. Examples of rule-based AI in architecture can be seen in the work of the Architectural Machine group at the MIT Media Lab, which was founded by Negroponte.

Conversely, the probabilistic machine learning-based approach, as exemplified by neural networks, represents a more dynamic and adaptive method of design generation. Neural networks, as described by Kasabov (1996), are biologically inspired computational models comprised of processing elements (neurons) and their connections. These networks store mathematical information from image-based data, analyze the probabilistic logic within the dataset, and generate

new images accordingly. Building on the capabilities of neural networks, Generative Adversarial Networks (GANs) further extend the boundaries of what is architecturally possible. GANs, comprising a generator and a discriminator, collaborate not to directly create high-quality designs, but to facilitate the generation of diverse design possibilities and variations, thereby assisting designers in enhancing the overall quality of their work. These networks learn from extensive datasets and employ a collaborative process where the generator produces images and the discriminator evaluates them, resulting in images that closely resemble the training data, thus offering new insights into architectural design possibilities.

The advent of probabilistic generative algorithms has spurred a new wave of AI tools capable of creating diverse design outputs (Chaillou, 2022). These advanced tools are now being employed to generate urban forms, as illustrated by the work of M. del Campo et al. (2019). Similarly, they are used for crafting road diagrams, an approach detailed by Chu et al (2019).

In architectural planning, such AI assists in developing plan layouts, different techniques described by Nauata et al. (2021) and Chaillou (2019). Newton (2019) explores GANs for generating and analyzing architectural plans, even with small datasets, illustrating AI's capability to contribute to architectural plan development and analysis. Rodrigues et al. (2024) apply AI to space allocation in housing, showcasing AI's role in creating efficient mass-customized layouts. Complementing these insights, Özman and Selçuk's study on GANs in mass housing plan generation in Turkey enriches the narrative, illustrating the possible practical applications of AI in addressing real-world architectural challenges (2023).

The design of facades has also been revolutionized, with systems offering facade suggestions highlighted in work of Kelly et al (2018). Moreover, these algorithms enhance the creation of views and perspectives, a concept explored in the GAN model of Kyle Steinfeld (2019) They extend to the engineering domain as well, aiding in the design of structures as noted in R. Danhaive and C.T. Mueller’s paper (2021), and have notable applications in simulation analysis for performance optimization, as discussed by Quintana et al.(2020). And finally Eroğlu and Gül (2022) demonstrate StyleGAN's potential in

architectural form generation, offering a new dimension to design inspiration.

These examples mark a significant milestone in the application of AI within the design discipline, showcasing the versatility and depth of probabilistic methods.

1.2 Co-Designer or Design Assistance?

In the architectural landscape of the 1970s, Nicholas Negroponte emerged as a forerunner, advocating for an interactive synergy with intelligent machines. At the MIT Media Lab's Architecture Machine Group, his pioneering work culminated in the development of Urban 2 and 5, early forays into Computer-Aided Design (CAD) systems. These systems were tailored to aid architects in crafting floor plans and optimizing room layouts for various factors such as adjacencies, lighting conditions, and modular grid integration. Urban 5, in particular, delved into the synergistic relationship between architects and intelligent agents, balancing tasks through a blend of machine-implemented implicit rules and architect-specified explicit parameters (Negroponte, 1969;1970). This endeavor underscored an evolving paradigm in computer-aided design processes, wherein these systems transcended mere drafting tools, actively suggesting layouts and identifying potential design conflicts.

Concurrently, Cedric Price in the UK was exploring the autonomous capabilities of AI in architecture. His 1976 project, the Generator, envisioned a self-adapting building. This concept hinged on a computer system capable of reconfiguring partition layouts either in response to user behavior or spontaneously, aiming to foster novel environmental conditions. Price's work presciently recognized the potential for machines to act as autonomous design agents (Furtado, 2008), foreshadowing the expanding role of AI in architectural software.

The foundational experiments by Negroponte and Price laid the groundwork for contemporary discussions on the role of AI in architecture. Their pioneering insights have only gained in pertinence as AI technology has become more accessible and affordable, transitioning from niche research to a staple in mainstream architectural practice. However, it is important to acknowledge that these early rule-based AI approaches underwent a period of dormancy

during the so-called AI winter, as they grappled with the challenge of moving from theoretical research to practical application. The resurgence and evolution of neural networks and probabilistic methods have reignited interest in AI as a design assistant, reinstating these technologies at the forefront of architectural innovation.

Carta (2021) critically challenges the oversimplified and fundamentally erroneous belief that computers will replace human designers. The study underlines a pivotal concern in the use of algorithmic design tools: while there is an abundance of data that is easily accessible and interpretable, insufficient attention is paid to the architectural merit of the training plans used. Current applications of these technologies predominantly serve as design assistants rather than replacements for human creativity and expertise. Consequently, the discussion shifts focus from the unrealistic expectation of generating flawless designs to a more pragmatic exploration of how these computational tools can meaningfully contribute to architectural practice. This shift brings to the forefront crucial questions about decision-making processes in design: How extensively will we rely on these tools, and what benefits can they bring? Moreover, it probes the potential of these technologies to enhance the design quality of architectural products, underscoring their value as augmentative tools rather than replacements for human designers (As & Basu, 2021).

1.3 AI and Design Pedagogy: Emerging Perspectives

The emergence of new AI tools has significantly triggered their application in design education, offering fresh perspectives and methodologies.

Recent studies, including Basarir (2022), advocate for AI-centric courses in architectural curricula, enriching design education with new exploratory pathways. Sadek and Mohamed (2023) exemplify this by using AI to convert stories into visual designs, aiding conceptual development. Similarly, Cudzik et al. (2024) and Edirne and Öztürk (2023) explore AI's role in generating inspirational imagery and textual concepts, respectively, enhancing creativity in design studios. Bank et al. (2023) further this innovation by employing GANs to impart spatial understanding through architectural models, advancing students' design comprehension. These studies collectively suggest that AI technologies can significantly enhance the conceptual design phase,

acting as potent tools for design assistance and creativity enhancement. For instance, Tong et al. (2023) envisioned AI as "a new mode of sketching," though they cautioned against its uncritical use, highlighting the importance of maintaining creativity. Ceylan (2021) further contextualized AI's role in design, advocating for its use as a supportive, rather than dominant, component in the creative process.

While numerous studies started to investigate various AI tools in architectural design education, our research focuses on the impact of these tools' features and the strategies students employ during the design process.

2. METHODOLOGY

The methodology of this study involved an empirical online workshop with 12 architecture students to investigate the impact of GAN-based Generative Design Assistants (GDAs) on the architectural design process. Participants, drawn from third and fourth-year architecture students, were split into two groups, each using a different GDA—ArchiGAN or HouseGAN—to create housing layouts. The study collected data through design process recordings, design output scores, and student surveys.

This mixed-method approach provided insights into how the timing, frequency, and sequence of GDA usage, as well as the specific features of the selected GDAs, influenced the design success of novice architects.

2.1 Design Experiment Set up

In this experimental setup, a specific design constraint of a 12 X 12-meter footprint was established. Participants, tasked with designing a single-story housing layout suitable for a family with two children, were presented with this challenge. To effectively leverage the capabilities of the Generative Adversarial Networks (GANs), a highly restrictive site, akin to a narrow and elongated parcel, was chosen. This constraint was intended to maximize the utility of both the GANs and traditional design methods.

The participants were bound by three primary rules during the design process:

*Verbalizing Thoughts: Participants were required to articulate their thoughts aloud throughout the design process, providing insights into their decision-making and creative approach.

*Utilization of GDA Interface: They were encouraged to use the GDA interface extensively, saving the layouts generated or inspired by the GDA tool. This rule aimed to foster a deeper interaction between the designers and the AI tool, encouraging exploration of AI-generated solutions.

*Adherence to Standard Drawing Practices: The use of a predefined layer system and furnishings in their AutoCAD drawings was mandated to ensure uniformity in drawing standards across all designs.

Crucially, the experiment integrated the use of both AutoCAD and the GAN-based Generative Design Assistant (GDA), allowing participants to combine the conventional design process with the AI assistant. This integration aimed to explore how traditional design methods and AI tools can synergize, enhancing the design process by combining the precision and familiarity of AutoCAD with the innovative, AI-driven capabilities of GDA. The dual-use of these tools offered a unique perspective on the blending of established architectural practices with cutting-edge AI technologies.

After the experiment completed, the results were evaluated with three jury members with different expertise and experience. One is an associate professor, another is a research assistant, and the last is a professional architect. They evaluate the final results according to functionality, structural performance, adaptivity, interior/exterior relationship, sequential perception, sophistication and creativity between 1-10.

2.2 Selected Design Assistant Tools

Accurately estimating the shape and dimensions of large buildings is a critical task for architects, developers, and urban planners. This process necessitates a comprehensive consideration of the spatial

arrangement, including room configurations, and the adjacencies and connections between major spaces. Despite a clear understanding of the process, it remains a notably time-intensive task. The domain of automatic floor plan generation, a research area since the 1970s, represents a pivotal approach to addressing these challenges. In recent times, studies focusing on enhancing architectural design production through Generative Adversarial Networks (GAN) have gained prominence.

Various housing layout design assistant approaches and GAN-based applications, such as DCGAN (Uzun et al., 2020), ActFloor-GAN (Wang et al., 2023), ArchiGAN (Chaillou, 2020), and HouseGAN (Nauata et al., 2020), exist in the field. However, a notable limitation of these tools is the absence of user interfaces to facilitate experimental application. For the purpose of this research, HouseGAN and ArchiGAN were selected due to their specific features and relevance.

ArchiGAN, developed by Chaillou, emphasizes plan organization and style transfer. It features a sophisticated three-step deep network stack for generating floor plans, including the creation of RGB representations of building footprints, room layouts, and furniture arrangements. Users can modify inputs at each stage by altering images, though it lacks high-level control features, such as specifying room dimensions and specifications.

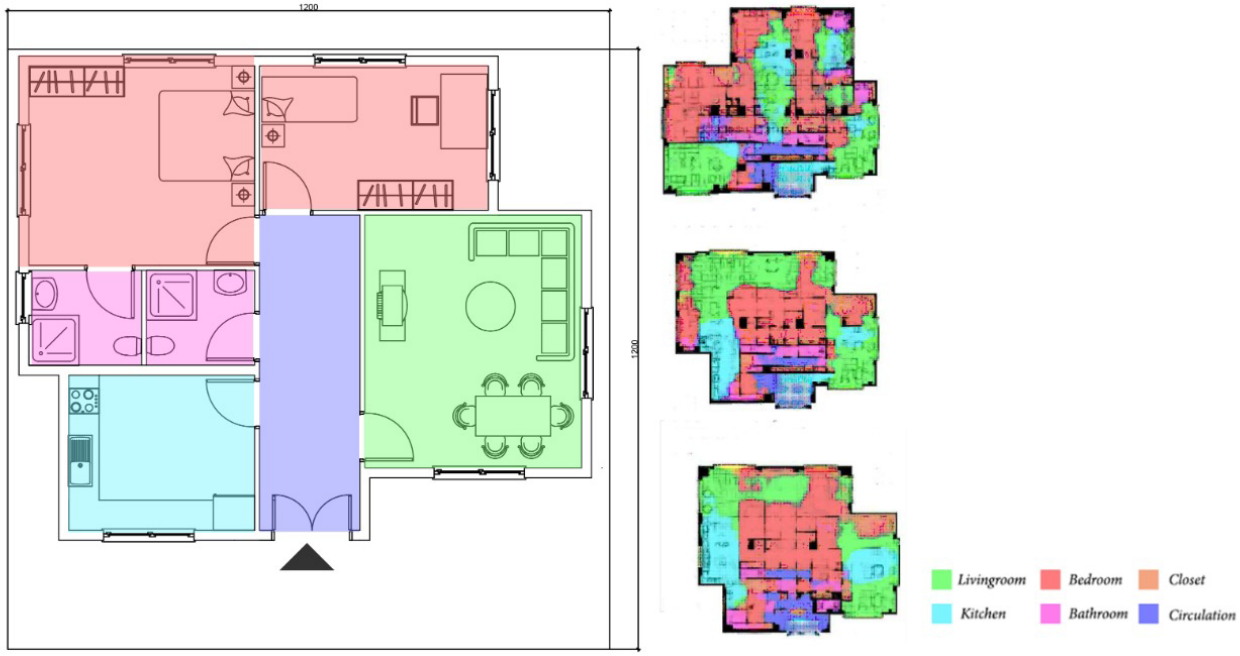
Figure 1: ArchiGAN interface used in the experiment (created by authors).

HouseGAN, on the other hand, introduces a novel approach with its relational generative adversarial network. It addresses house layout generation as a problem, proposing a graph-constrained solution. The architecture of this innovative network is based on relational design principles. It embeds constraints directly into the graph structure of its relational networks. The network aims to generate a set of axis-aligned bounding boxes for rooms, adhering to architectural constraints represented as graphs. The generated house plans are evaluated based on realism, variety, and compliance with input graph constraints. In HouseGAN, a bubble diagram is graphically represented, where nodes encode room categories and edges denote spatial adjacencies.

Figure 2: HouseGAN interface used in the experiment (created by authors).

These Generative Design Assistant (GDA) interfaces enable designers to leverage both collective and individual expertise as a design aid. Moreover, they allow designers to make comparative analyses between iterative design solutions generated under the same functional relationship criteria. However, these tools, created with different data sets and possessing varied design control capabilities based on their generative logic, are compared to understand their potential and limitations, alongside designers' strategies.

Figure 3: Integration of GAN Tool in Student's Design Workflow (created by authors).



2.3 Participant Survey

Following the design experiment, an extensive participant survey was conducted to gather in-depth feedback from the students. This survey was meticulously structured to include a diverse array of question types, including multiple-choice questions, open-ended inquiries, and Likert scale assessments, providing a comprehensive evaluation of the students' experiences with the Generative Design Assistants (GDAs).

The survey incorporated Likert scale questions to quantitatively gauge the students' perceptions of the GDAs' impact. These questions were designed to measure both the positive and negative influences of the GDA on their design process and speed, the effect on their decision-making process, and the degree to which they attributed authorship of the final design to themselves. These questions required responses on a scale from 1 to 10, with 1 being the least impactful and 10 being the most.

In addition to these structured quantitative questions, the survey also featured open-ended questions. These queries aimed to delve deeper into the students' subjective experiences with the GDAs. Questions included inquiries about the perceived usefulness or redundancy of specific program interface features, the impact of the program on the

manageability of the design process, preferences for this method of design, suggestions for AI's role during the design phase, desired additions to the GDA, and a comparative analysis of the advantages and disadvantages of using different GDAs.

Furthermore, the survey included multiple-choice questions to identify specific aspects of the design process where AI support was most frequently utilized and to understand which facets of their designs were most influenced by the GDA alternatives.

This multifaceted approach to the survey was crucial in providing a holistic understanding of the students' experiences, preferences, and suggestions regarding the integration of AI tools in the architectural design process. The diversity of question types ensured that both quantitative data and qualitative insights were gathered, allowing for a nuanced analysis of the GDAs' impact on novice designers in the field of architecture.

3. RESULTS AND FINDINGS

3.1 Design Process Diagrams

Utilizing the comprehensive design process records, a specialized diagram was created for each student (S), encapsulating the time allocation between AutoCAD and the Generative Design Assistant (GDA). This diagram meticulously quantified the duration spent in both AutoCAD for traditional drawing and the GDA for AI-assisted design. Additionally, it highlighted 'Decision Making Moments'—key instances where crucial design decisions were made, marking a shift in the use of design tools.

In the diagram, each unit, represented by a box, corresponded to a half-minute timeframe within the design process. The color coding within these boxes differentiated between periods spent using AutoCAD and the GDA, providing a visual guide to the tool usage pattern. Notably, the areas marked 'D' pinpointed the 'Decision Making Moments.' These moments were critical junctures where designers integrated their insights with the outputs from the AI assistant, influencing the direction and evolution of their design concepts.

This analytical approach through the use of the diagrams, enriched with the jury scores reflecting how each student's work was evaluated overall by the jury according to predefined criteria. This scoring provided an additional layer of assessment, offering insights into the effectiveness and impact of the design choices made by the students

To analyze the designers' strategies, the diagram employed a duration-scaled approach. This method was instrumental in revealing:

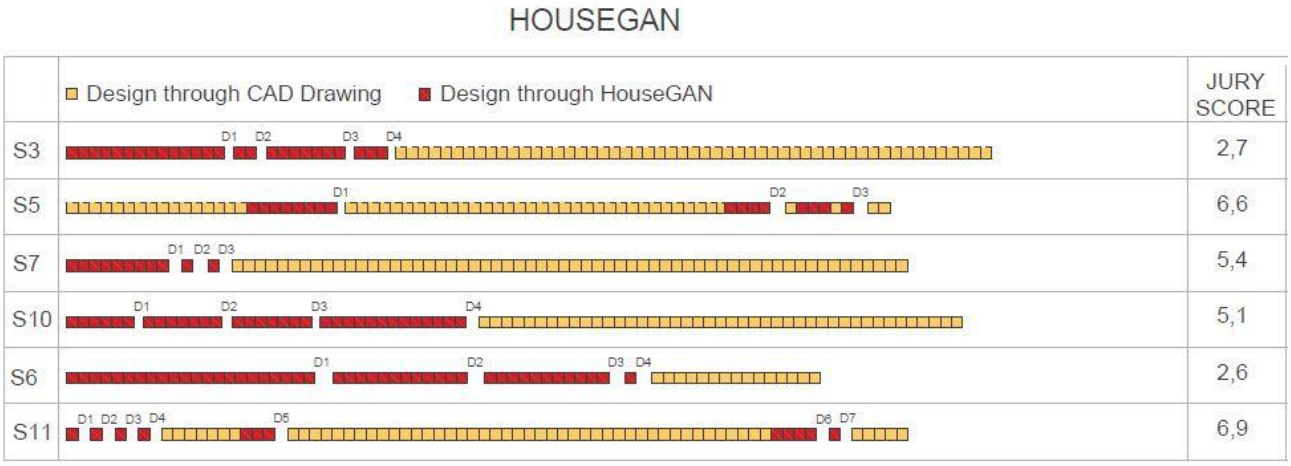
*The specific points in the design process where the GDA was incorporated,

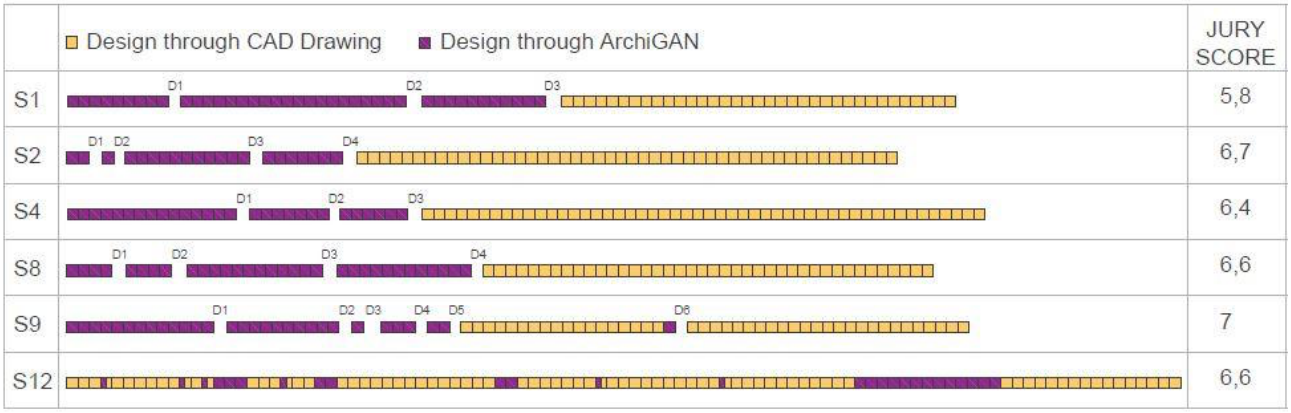
*The sequence and order in which the tools were used,

*The frequency of transitioning between AutoCAD and GDA,

*The length of time each tool was engaged.

Figure 4: Students' design process diagrams with jury success scores (created by authors).





3.2 Metrics From Survey

The design process in architecture is a multifaceted path, one that encompasses the generation of initial concepts to the final decision-making stages that solidify a project's direction. The integration of Generative Design Assistants (GDAs) into this journey has the potential to significantly influence each phase. In this section, we present the findings from the survey that explored how students evaluated the impact of two specific GDAs, ArchiGAN and HouseGAN, across different stages of their design processes (Table 1).

Table 1: Metrics of design assistant usage for different aims according to the survey (created by authors).

	ArchiGAN	HouseGAN
Discovery	0.5	0.17
Identifying Design Criteria	0.5	0.17
Regenerating Prob. And Design Criteria	0.17	0.5
Generating Alternative Solutions	0.5	0.67
Research	0	0.33
Defining Design Problem	0	0.33
Generating Solution	0.17	0.33
Reasoning	0.17	0
Evaluating	0.33	0.17
Comparison	0.17	0.33
Decide	0.17	0.33

3.2.1. Discovery and Ideation

ArchiGAN emerged as the more effective tool during the discovery phase and in identifying design criteria, with scores indicating that its interface or algorithmic approach may facilitate the initial exploration and conceptualization stages more efficiently. This suggests that ArchiGAN could be particularly useful for architects in the early, creative phases of design, where a wide range of ideas and inspirations are considered.

3.2.2. Problem-Solving and Iteration

HouseGAN was favored for its capacity to regenerate problems and iterate on design criteria, a feature that is crucial for refining design solutions and responding to evolving project needs. Its higher score in this area implies a robust capability for managing design alterations, making it a potential asset for stages requiring adaptability and reevaluation of initial design assumptions.

3.2.3. Alternative Solutions and Analysis

Both GDAs demonstrated significant utility in generating alternative solutions, with HouseGAN slightly outperforming ArchiGAN. This indicates that while ArchiGAN provides substantial support in diversifying design options, HouseGAN might offer a more expansive set of alternatives or a user interface that better supports this exploration.

3.2.4. Research and Definition

HouseGAN's higher effectiveness in supporting research and defining the design problem suggests that it may be better equipped to assist designers in the analytical aspects of the process, such as understanding context, setting objectives, and conceptualizing the overarching design approach.

3.2.5. Evaluation and Reasoning

ArchiGAN was perceived to be more helpful in the evaluation of design options, which is pivotal for assessing potential solutions against project criteria. However, both GDAs scored lower in aiding reasoning,

indicating a potential area for development in enhancing how these tools support the understanding and justification of design decisions.

3.2.5. Comparison and Decision Making

In the latter stages of the design process, where comparison and decision making are key, HouseGAN was again favored. Its higher scores suggest that it may provide more effective mechanisms for contrasting different design solutions and facilitating informed decision-making.

4. DISCUSSION

4.1 Design Strategies: Navigating GDA Integration

The examination of the design process diagrams reveals that the strategies employed by designers can be categorized into three distinct groups. An intriguing pattern emerges when we juxtapose these strategic groupings with the jury evaluations: certain strategies appear to correlate with higher jury scores (Figure 5).

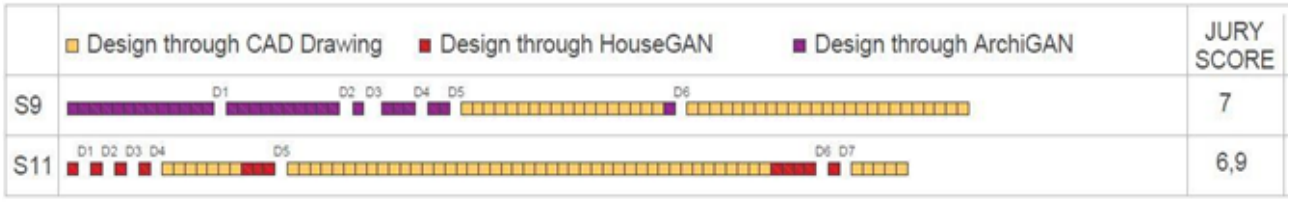


Figure 5: Design process diagrams and success scores of students who used Strategy 1 (created by authors).

Strategy 1: GDA as an Integral Tool Across Stages

A noteworthy observation is that a particular approach, employed by two students referred to as S9 and S11, correlated with the highest jury scores within their respective groups. These students, one using ArchiGAN and the other HouseGAN, initiated their design process with the GDA not merely for early ideation but also returned to it at various stages. This recurrent engagement indicates a more integrated use of artificial intelligence, suggesting its role as a continuous consultative presence throughout the design workflow.

These designers took advantage of the GDAs to generate a multitude of design alternatives and went on to synthesize elements from several different plans. This synthesis was directly used without additional

modifications to suit the context, demonstrating a reliance on the solutions provided by the GDAs. Interestingly, despite the GDA occupying only a small portion of their overall design time, its influence was significant. The GDA here acted not just as a generator of design options but also as a stimulant for creative thinking, influencing the overall design strategy.

This approach underscores a refined utilization of GDAs where the tools are not merely used for singular tasks but are revisited as an integral part of the design development. The favorable reception by the jury suggests that the integration of AI at various stages could potentially enhance the final design outcomes. Moreover, this strategy raises pivotal questions about the evolving role of AI in design pedagogy and professional practice, hinting at a future where AI is seen less as an auxiliary tool and more as a constant collaborator in the creative process (Figure 6).

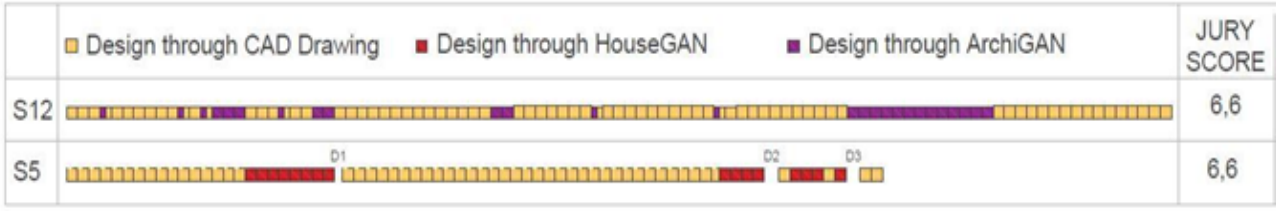


Figure 6: Design process diagrams and success scores of students who used Strategy 2 (created by authors).

Strategy 2: Integrating GDA Problem-Solving into AutoCAD Drafting

Continuing with the analysis of design strategies, Strategy 2 was employed by two other students, labeled as S12 and S5, who attained scores that were above the group average in their respective categories—ArchiGAN and HouseGAN. The utilization of this strategy is depicted in Figure X.

This particular approach is characterized by an initial engagement with AutoCAD, where students formed their preliminary design concepts. Unlike those employing Strategy 1, these students interspersed their design process with frequent transitions between AutoCAD and the GDA. This pattern suggests that the GDA was not the primary source for initial design generation but was rather utilized as a tool for addressing specific challenges within the designs that were initially conceived through traditional drawing methods. Similar to the first

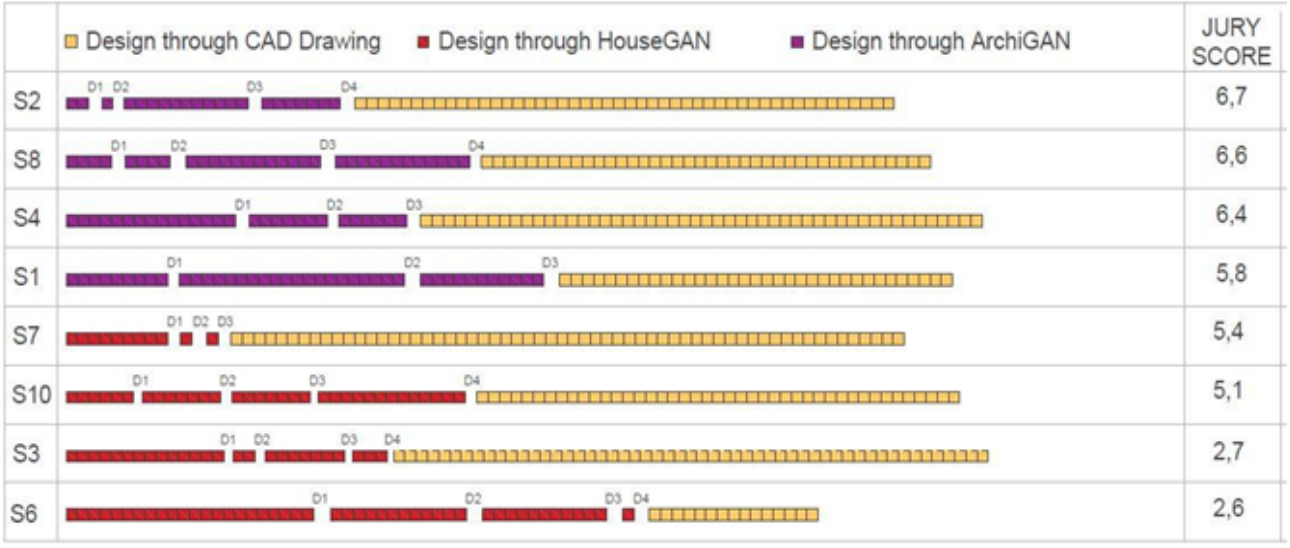
strategy, these students also returned to the GDA during the later stages, which demonstrates a thoughtful integration of artificial intelligence at various points in their workflow.

In this case, the students leveraged the GDA for the generation of different design alternatives, ultimately selecting a specific plan layout. Notably, they proceeded to refine and evolve this chosen plan, making contextual adjustments to better fit the design requirements.

Moreover, similar to Strategy 1, the overall time devoted to the GDA was a minor component of the total design process. This suggests that the students viewed the GDA not as the central tool of design but as a means to resolve particular issues that arose during their design development in AutoCAD. The GDA, in this context, served as an ancillary resource, aiding in problem-solving and enriching the design process rather than dominating it (Figure 7).

Figure 7: Design process diagrams and success scores of students who used Strategy 3 (created by authors).

Strategy 3: Initial GDA Use with Limited Follow-Through



The examination of the design process strategies revealed that the majority of students—S2, S8, S4, S1, S7, S10, S3, and S6—adopted what has been categorized as Strategy 3. Interestingly, within this group, students utilizing ArchiGAN (S2, S8, S4, S1) received higher jury scores compared to their HouseGAN counterparts (S7, S10, S3, S6), suggesting

that the choice of GDA tool might play a role in the perceived success of the design outcomes. The specifics of how each selected GDA influences success are explored further in the subsequent section.

In this widespread strategy, students initiated their design process with the GDA to generate an array of design alternatives, much like Strategy 1. However, this is where the similarity ends. Unlike their peers who revisited the GDA at different stages, these students restricted the use of GDA exclusively to the initial phase, eschewing its benefits in later stages. They selected one particular design alternative but did not further adapt or develop it in context.

Furthermore, when considering the time invested in the GDA in relation to the entire design process, a pattern emerged: those who spent a greater proportion of time engaged with the GDA tended to have lower jury scores within their groups. This was exemplified by students S1 and S6, who dedicated 53% and 75% of their design time to the GDA, respectively. This trend suggests a potential pitfall of becoming too reliant on the GDA for producing variations, to the detriment of engaging in the interpretive and developmental aspects of design. Such a reliance points to a diminished interpretative control by the designer, which is critical for translating GDA-generated options into refined, contextually appropriate design solutions.

This strategy underscores the necessity of a balanced approach to the use of GDAs in the design process. It reflects the importance of the designer's interpretive role and suggests that while GDAs are valuable for initial ideation, the human element is crucial in the subsequent design development for achieving successful outcomes.

4.2 Feature Dynamics: ArchiGAN vs. HouseGAN

The survey results provide insightful revelations about the usage and effectiveness of the two Generative Design Assistants (GDA) interfaces, ArchiGAN and HouseGAN, in the architectural design process. These findings underscore the distinct functionalities and impacts of each GDA, shaping how participants approach and execute their design strategies.

ArchiGAN is noted for its deductive approach in generating iterative solutions. It initiates the design process with decisions about the building's footprint and the relationships between exterior and interior spaces. This approach steers the GDA to later adapt and meet the functional needs of the layout. This methodology is particularly conducive to facilitating discoveries and identifying design criteria, as ArchiGAN tends to generate more ambiguous design solutions compared to HouseGAN. The ambiguous nature of these solutions fosters a space for exploration and innovation. Furthermore, ArchiGAN's capability to create detailed furniture layouts offers substantial feedback for spatial usage, prompting higher evaluation metrics from the participants.

In contrast, HouseGAN adopts an inductive method, where designers first determine the functional relationships, which then inform the creation of the layout footprint. This process makes HouseGAN a more suitable tool for regenerating design problems and design criteria based on user decisions. Consequently, it becomes a preferred option for generating alternative solutions to a given design problem and is used more frequently than ArchiGAN for comparative purposes. The survey indicates that this ability to compare different design options is instrumental in aiding decision-making processes (Table 2).

Feature	Design through ArchiGAN	Design through HouseGAN	Design through drawing
Mass design	X		X
Void design	X		X
Function types (livingroom, kitchen etc.)		X	X
Number of rooms		X	X
Functional relationships		X	X
Relationship with exterior (windows)	X		X
Relationship with exterior (doors)	X	X	X
Room size			X
Deduction	X		X
Induction		X	X
Feedback of spatial usage	X		X
Structural feedback			
Topologic relationships (3d)			
Iterative solutions	X	X	
Comparison		X	X
Collective expertise	X	X	
Individual expertise	X	X	X

Table 2: GAN-based design tools and CAD-based drawing comparison.

5.CONCLUSION

The conclusion of this research draws together insights on the role and impact of Generative Design Assistants (GDAs) in architectural design, with a specific focus on ArchiGAN and HouseGAN. This study, which involved third and fourth-year architecture students, delves into how these emerging AI tools are integrated into traditional design processes and their effect on design outcomes.

The research findings highlight that both ArchiGAN and HouseGAN offer unique advantages in the design process. ArchiGAN is particularly effective in the discovery and ideation phases, facilitating exploration and the generation of diverse design concepts through its deductive approach. HouseGAN, on the other hand, excels in regenerating design problems and iterating on design criteria, proving invaluable in the later stages of design development with its inductive methodology.

The study identifies three primary strategies adopted by the students in integrating GDAs: continuous use throughout the design process, selective use for specific challenges, and initial use for ideation followed by traditional methods. These varied approaches underscore the flexibility and adaptiveness of GDAs in architectural design. However, an over-reliance on GDAs was observed to potentially limit the designer's interpretive and developmental contributions, suggesting the need for a more balanced integration of these tools.

Considering the educational implications of our study, it's clear that introducing Generative Design Assistants (GDAs) into architectural education invites a thoughtful reconsideration of teaching methods in design. Because, incorporating Generative Design Assistants (GDAs) into architectural education introduces a multifaceted challenge: how to blend traditional design principles with emerging AI technologies. Our findings with ArchiGAN and HouseGAN illuminate this complexity, suggesting that while GDAs can broaden the design horizon for students, they also necessitate a deeper pedagogical strategy. This strategy should not only facilitate technical proficiency but also

encourage a critical examination of how AI influences design choices and outcomes.

Moreover, the transition towards integrating GDAs in education requires rethinking assessment criteria and learning outcomes. It prompts a discussion on developing new frameworks that evaluate both the creative process and the ability to critically apply AI tools. By addressing these aspects, educators can foster an environment that not only values innovation but also cultivates a reflective design practice, preparing students for a rapidly evolving professional landscape.

Adding to this complexity is the observed tendency towards over-dependence on AI tools among some students. Our study identified diverse strategic approaches to GDA usage, ranging from continuous integration throughout the design process to selective application for specific challenges, and initial ideation followed by traditional methods. These varied strategies underscore the importance of guiding students towards a balanced use of technology—where GDAs serve as aids that enhance creativity and problem-solving rather than as crutches that limit personal initiative and critical thinking. Educators face the challenge of instilling in students the discernment to leverage these powerful tools judiciously, ensuring that the reliance on AI does not overshadow the development of their design intuition and capabilities. Encouraging a varied approach to GDA use can help students navigate the potential pitfalls of over-reliance, fostering a generation of architects who are both technologically adept and deeply engaged in the creative process.

In conclusion, this research establishes a foundation for understanding the integration of AI tools in architectural design, revealing both their transformative potential and the challenges they pose. Looking ahead, further studies are essential to explore the long-term implications of GDAs in professional practice, their impact on design quality, and the evolution of architectural education to include these advanced technologies. Such future research will be crucial in guiding the effective integration of AI in architecture, ensuring that these tools augment rather than overshadow the essential role of the human designer.

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Conflict of Interest Statement

The authors of the study declare that there is no financial or other substantive conflict of interest that could influence the results or interpretations of this work.

Author Contribution

The authors declare that they have contributed equally to the manuscript.

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Integrating Artificial Intelligence in Interior Design Education: Concept Development

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This article aims to explore the integration of artificial intelligence (AI) as a design tool in interior design education. The research examines the students' interior design studio project outcomes over the usage of AI in creating conceptual images, and the implementation of the AI-created concept to the overall space. In the research, students' projects are divided into two groups of 5 according to sufficient or insufficient prompts for the "AI generated" conceptual images. Barnard's (1992) CAIDC (Consensual Assessment of Interior Design Creativity) scale was used for the assessment. Mann-Whitney U Test was conducted for the results. We understand that there is no significant difference between writing sufficient or insufficient prompts in the concept development phase of interior design projects according to the Barnard (1992)'s design merits. It has been confirmed that the main factor that influences this regard is the need for an appropriate "concept analysis" to adapt the concept generated with AI to the specified project spaces. The study concludes that AI tools, particularly in generating spatial concept images based on prompts, serve as aids rather than replacements for interior designers, highlighting the importance of designer interpretation and adaptation skills. Furthermore, it suggests the integration of AI into interior design education to equip students with essential 21st-century skills while emphasizing the need for future research to explore hybrid AI methodologies and the evolving role of AI in the profession.

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Yapay Zekayı İç Mimarlık Eğitimine Entegre Etmek: Konsept Geliştirme

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Bu makale, iç mimarlık eğitiminde bir tasarım aracı olarak yapay zekanın (AI) entegrasyonunu keşfetmeyi amaçlamaktadır. Araştırma, öğrencilerin mekan tasarım stüdyosu proje çıktılarını, kavramsal görüntülerin oluşturulmasında yapay zeka kullanımı ve yapay zeka tarafından oluşturulan konseptin genel alana uygulanması üzerinden incelemektedir. Araştırmada, öğrencilerin projeleri "Yapay Zeka tarafından oluşturulan" kavramsal görseller için yeterli veya yetersiz istemlere göre beşer kişilik iki gruba ayrılmıştır. Değerlendirme için Barnard'ın (1992) CAIDC (Consensual Assessment of Interior Design Creativity) ölçeği kullanıldı. Sonuçlar için Mann-Whitney U Testi yapılmıştır. Barnard'ın (1992) tasarım değerlerine göre, iç mimari projelerinin konsept geliştirme aşamasında yeterli veya yetersiz bilgi istemi yazmak arasında önemli bir fark olmadığını anlıyoruz. Bu konuda etkili olan ana faktörün, yapay zeka ile oluşturulan konsepti belirlenen proje alanlarına uyarlamak için uygun bir "kavram analizi" ihtiyacı olduğu teyit edilmiştir. Çalışma, özellikle belirli ipuçlarına dayalı mekansal kavram resimleri oluşturmada AI araçlarının iç mimarların yerine geçmek yerine yardımcılar olarak hizmet ettiğini, tasarımcı yorumlama ve uyarlama becerilerinin önemini vurgulayarak sonuçlanmıştır. Ayrıca, iç mimarlık eğitimine AI'nin entegrasyonunu önererek öğrencilere temel 21. yüzyıl becerilerini kazandırma ihtiyacını vurgularken, gelecekteki araştırmaların hibrit AI metodolojilerini ve AI'nin meslekteki evrilen rolünü keşfetmesi gerektiğini öne sürmektedir.

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1. INTRODUCTION

The development of artificial intelligence (AI) technologies was accompanied by the emergence of some technological myths between the 1950s and the early 1970s. These myths centered on the idea of developing a machine that could think and be perfectly precise in its replication of human cognition. The potential of AI was the subject of a cultural narrative that led to high hopes and ambitions for the field (Natale & Ballatore, 2017). To identify decision-making patterns and minimize human intervention, AI can analyze big data using scientific methods, particularly machine learning. AI, machine learning, and deep learning were becoming increasingly important in this regard (Aggarwal et al., 2022). As of the beginning of 2022, new large-scale AI models have been released every month, marking the beginning of the deployment phase of AI (Maslej et al., 2023). AI software or systems were utilized by 24% of enterprises for ICT security, 23% for business administration processes, and the least, 9% for human resources management or recruiting (Eurostat, 2021).

The rapid rise of artificial intelligence (AI) raises questions about the future of jobs and whether current professions will become obsolete. The issue of which occupations will disappear and how AI will take over the jobs of professionals has become an important issue. Studies on the fear of autonomous robots and artificial intelligence (FARAI) have emerged to explore individuals' sense of losing their jobs due to autonomous robots and AI (Li & Huang, 2020; Golin & Christopher, 2022; Nilsson, 1984; Morikawa, 2017; Coupe, 2019; Prokopowicz, 2022; Chymis, 2020; Liang & Lee, 2017; Vu & Lim, 2021). These studies indicate that AI tools in various professional fields create a fear of job loss among employees. Additionally, Mirbabaie et al. (2022) examined the impact of AI on changes to work, loss of status position, and AI identity threats in the workplace.

Along with the increasing fear of job loss in various professional groups, the field of design also experiences a rapid rise in AI. However, there is a lack of studies investigating whether AI will eliminate the profession of interior design or if AI is merely a design and communication tool. Xu & Yu (2022) mainly studied the visual performance of psychological factors in interior design under the background of artificial intelligence. Zheng (2022) discussed the issue of interior design marketing and an

inevitable trend in the future development of interior space design solutions. Huang et al. (2022) focused on the evaluation method of interior design programs based on artificial intelligence processing technology. Wu & Han (2023) studied how to analyze and design an interactive interior decoration design system based on AI and VR technology. Wu (2022) discussed how to better integrate traditional elements into contemporary furniture under the background of contemporary technologies such as wireless communication and artificial intelligence decision-making.

Under these circumstances, an experiment is being carried out using student-created works in interior design to determine whether artificial intelligence can take the place of an interior designer in the field of interior design by choosing just one of the artificial intelligence methods currently used in the field.

2. LITERATURE REVIEW

2.1. 21st Century Skills, Necessary Abilities in Interior Design, and Communication

Education is critical in preparing people to solve real-world problems. It must constantly adapt to new technological advancements, sociological changes, and necessary skills in both professional and everyday lives (Howells, 2018). Real-world problems change as time passes. In the 21st century, there is a new world order. The important topics of the new order are different. We have to improve our skills. The skills required for education and employment in today's economy have been labeled '21st Century Skills (Laar et al., 2020). These skills are defined by different organizations. According to Howells (2018), 21st Century Skills are 'cognitive and meta-cognitive skills' (e.g. critical thinking, creative thinking, learning to learn, and self-regulation); 'social and emotional skills' (e.g. empathy, self-efficacy, and collaboration); and 'practical and physical skills' (e.g. using new information and communication technology devices).

Greenhill defines 21st Century Skills in their report published in 2010 as 'Learning and Innovation Skills' (Critical Thinking and Problem Solving, Communication, Collaboration, and Creativity and Innovation), 'Information, Media, and Technology Skills' (Information Literacy, Media Literacy, ICT Literacy (Information, Communications, and

Technology Literacy), 'Life and Career Skills' (Flexibility and Adaptability, Initiative and Self-Direction, Social and Cross-Cultural Skills, Productivity and Accountability, Leadership, and Responsibility). As we understand from 21st Century Skills, communication skills are important. They are essential in the expanding service sector. They concern the ability to transmit information while ensuring that meanings are effectively expressed. To successfully navigate the current social world, one must be able to effectively regulate one's needs and goals with those of the larger society. Employers require people with communication skills because our global economy is so interconnected (Van Laar et al., 2020). On the other hand, technology skills are also important and should be integrated into the curriculum. Effective communication is indeed a crucial skill for interior designers. It enables them to effectively convey their ideas, collaborate with clients and colleagues, and ultimately bring their design visions to life. Recognizing the significance of communication skills, the Council of Interior Design Accreditation (CIDA) has identified communication as one of the most important professional standards that interior design students need to meet.

CIDA sets learning expectations for students, requiring them to demonstrate an 'Apply/Ability/Able' level of learning for the 'Communication' standard. This implies that students should not only possess knowledge about communication principles but also can apply those principles effectively in real-world design scenarios. As the field of interior design continues to evolve, it becomes increasingly important for interior design programs to expose students to emerging communication technologies that can enhance their skills and competencies.

2.2. Artificial Intelligence (AI)

As Homo sapiens, we have given ourselves the title 'man the wise,' emphasizing the high value we place on our intelligence. Throughout history, we have strived to comprehend the workings of our minds - how we, with a limited amount of matter, can understand, analyze, predict, and shape a world far vaster and more intricate than ourselves (Russell & Norvig, 2014).

Alan Turing (1950) designed 'The Turing Test' to define intelligence. According to the test, a computer passes if it answers questions like a

human. People cannot tell if it's a human or a computer answering (Russell & Norvig, 2014). This aligns with John McCarthy's definition of AI in 1956. It describes machines executing tasks that humans can do (Zicari, 2018). To pass 'The Turing Test', a computer must have the following abilities:

- Natural language processing
- Knowledge representation
- Automated reasoning
- Machine learning

These abilities are now considered types of AI. However, AI goes beyond mimicking human intelligence. It seeks to develop intelligent entities (Hussell & Norvig, 2014).

AI and human intelligence share functional components. They both play essential roles in various areas. Computers rely on short-term memory and random processing units. The brain uses digital and analog systems. Despite these differences, both systems process information accurately and reliably. Computers and the human brain differ in electrical signal transmission, flexibility, and memory. Computers are currently the most efficient and rapid method of information processing available (Mansur, 2018).

AI has made significant contributions to various industries, including architecture, engineering, and construction. The concept of digital buildings has emerged as a key area of focus for AI development, aiming to use new technologies to enhance building safety and efficiency (McCarthy, 2007; Borglund, 2022). The interdisciplinary nature of AI draws upon concepts and methods from multiple disciplines, including mathematics, linguistics, psychology, neuroscience, mechanical engineering, statistics, economics, cybernetics, and philosophy, among others (Tecuci, 2011). This article focuses on the effects of AI in the interior design discipline. Even though there are different types of AI, the scope of this article is limited to machine learning.

Since we are in the era of big data, where an immense amount of information exists. As one type of AI, machine learning is one of the most popular concepts in the AI world. For example, there are one trillion web pages, and one hour of video is uploaded to YouTube every second, resulting in 10 years' worth of material each day. With the vast

amount of data available, machine learning is necessary for automated data analysis. This involves the use of techniques that can automatically recognize patterns within data, which can then be used to anticipate forthcoming data or make decisions under conditions of uncertainty. (Murphy, 2012). Even though there are different types of machine learning, we only focus on supervised learning.

Supervised learning involves using labeled training examples to capture the relationship between input and output data, allowing for the prediction of the output variable for new data (Ertel, 2017). It's commonly used for tasks such as image and speech recognition, spam filtering, and predictive modeling across various industries (Haykin, 1998; Kotsiantis, 2007). Supervised learning uses labeled data, while active learning improves performance by obtaining user feedback for labels. Nonetheless, supervised learning can be limited by high costs for collecting labeled data and ambiguity during monitoring or labeling (Liu & Wu, 2012).

In the interior design discipline, AI would be used as a tool in adding objects in renders, creating the concept, working on lighting, color-texture choosing, and combination, combining different images, etc. In this article, we focus on creating concept images via supervised learning tools such as DALL-E and Midjourney. All of these tools generate images from input text using multimodal generatives, but can reinforce biases from training data (Mishkin et al., 2022; Marcus, Davis and Aaronson, 2022; King, 2022).

2.3. Design Process

Design acts as a mediator between mental and social activity. It must be original and functional. It must add value to the existing world of design. The design process includes asking, imagining, planning, creating, and improving design ideas (Christiaans, 2002; Yu Shan et al., 2018). In the early 1960s, the realization that ‘design’ as a process was common to various fields—the various specialisms within engineering, industrial design, architecture, planning, and so forth—generated a fruitful new approach to design methodology (Darke, 1979).

The design process is a rational and creative activity, requiring design education that encompasses both technical knowledge and the development of creative thinking in the field of design (Kahvecioğlu, 2007; Öztürk & Türkkan, 2006). Throughout history, the concepts of

creativity, human intelligence, and knowledge creation have been highly regarded. They have held significant places in various academic disciplines. These concepts are as important as any other subject of study and have been addressed with curiosity and admiration throughout human history (Kahvecioğlu, 2007).

Indicators that distinguish creativity from other aesthetic standards include a design's typicality and how much it deviates from the viewer's mental image. Additionally, the definitions of creativity in both general and specific contexts were aided by a comparative analysis of pairs of designs. The ability to create novel and emotionally impactful designs, incorporate inventive forms, and functions, integrate shape, function, emotions, material, texture, and color, and show a willingness to experiment with different approaches and take calculated risks are all characteristics of creativity. Creativity is a special quality that designers and viewers can appreciate it works, even though it is difficult to quantify objectively (Christiaans, 2002).

Rey-Barreau & Whiteside (1983) defines the design process in 7 steps which are programming/research, schematic design/concept formation, preliminary design/concept development, design development/idea representation, construction documents/working drawings, construction documents/specifications, and implementation. According to Pile (1995), interior design projects require a structured approach, with the steps varying based on project size and client-designer relationship. Below are the steps identified by Pile (1995):

- Establish Contact with the Client - Define the project scope, set a budget and timeline, and decide on the need for other professionals.
- Obtain a Survey of Spaces - Determine the specific requirements of the project through interviews and data collection.
- Develop Preliminary Design - Find aesthetically pleasing solutions to the problems defined through programming.
- Develop Detailed Design - Create detailed drawings, plans, elevations, sections, and perspectives, and select materials, colors, and finishes.

- Prepare Constructions Documents - Create working drawings and specifications, establish a construction schedule, and select contractors.
- Supervise Construction - Ensure quality workmanship and adherence to specifications.
- Make Adjustments and Evaluations - Address issues promptly and conduct follow-up evaluations of completed projects.

Interior designers must balance creativity with effective project management to ensure successful projects. Excellent design and good project management are both necessary for success. Clients are more likely to be satisfied with poor design and good management than with excellent design and poor management. The 7 design phases are crucial for sufficient planning and decision-making in the design process, which minimizes errors and revisions. Formal training for designers typically only covers 10 to 25% of the design process, and the rest is learned on the job. Students in design school only experience a small part of the design process. They focus mainly on the presentation and response stages, without learning about project execution. As a result, graduating students have only a general understanding of the full design process (Pile, 1995).

2.4. Interior Design Education

Design education takes place in a physical and mental space called the design studio, which is considered a cultural phenomenon. Donald Schön (1983) characterizes design as 'reflection in action', while Johnson (2000) believes that a studio is a pedagogic tool used to teach the culturally rooted and individually creative process of design. The studio is a combination of place, people, and a structured process led by a mentor.

According to Schön (1983), studio education is about learning by doing. Students work on design challenges with the guidance of a mentor, which allows for the practice of good design. This process helps students understand spatial organization, composition, and articulation to create meaningful and beautiful spaces. Each design explores how space and its contents are expressed and related to each other (Öztürk & Türkkan, 2006).

According to Teixeira (2005), a design studio is a place where design-related information is created and consumed. The creation of this information involves transforming collected data and drawing from architectural and design cultures, as well as personal experiences. Teixeira believed that the main objective of a design studio is to identify the central concept underlying a design idea. The creative process begins with generating ideas, developing them into a concept, and finally refining them into a theme. To develop an interior design project in a studio, students should follow several phases from an initial idea to a completed project (Hasırcı et al., 2022).

While Pile (1995) identifies seven steps to facilitate the process of design, Botti-Salitsky (2005) has modified the process into 5 phases to fit within an academic curriculum:

- research and problem statement creation
- schematic design
- design development
- construction documentation
- final critique

Students are given a project with specific requirements and a concept or theme to integrate into their designs (Allen et al., 2004; Neilson & Taylor, 2002; Tate, 1987). They use various tools, such as bubble diagrams, perspectives, elevations, and CAD software, to develop their designs, select materials, and equipment (Botti-Salitsky, 2005; Tate, 1987; Gül, 2016; Weisberg, 1988; Yurtgün & Çınar, 2023). During each phase, students make decisions related to space allocation, color schemes, materials, furnishings, and lighting (Botti-Salitsky, 2005; Allen et al., 2004; Mitton, 2004; Pile, 1995). Sufficient documentation during the design phase, including various types of drawings, specifications, and schedules, is crucial for the final studio project critique (Allen et al., 2004; Neilson & Taylor, 2002; Botti-Salitsky, 2005). The final stage is the critique, where students receive feedback on their work from instructors. The goal is to produce a final design that fulfills the requirements of an imaginary client and meets the criteria set by the instructors (Anthony, 1991; Dozois, 2001; Dutton, 1991; Botti-Salitsky, 2005).

Concept development is the process of expanding and refining an idea or a concept. It often involves exploring different perspectives,

researching ideas, and considering the implications and potential outcomes of the concept, done by students. To communicate design concepts easily with visuals generated by AI, machine learning can be used to describe an image with words (Amritkar & Jabade, 2018). This helps clients or collaborators communicate design concepts with interior designers.

2.5. Artificial Intelligence and Concept Development

Developing a concept via AI requires similar stages. The process of concept development in an interior design studio typically begins with research and exploration of different design styles, materials, colors, and textures. An interior designer also needs to consider the function of the space, the needs of the client, and any existing architectural features. They may create sketches or mood boards to visualizing different design options. Machine learning can be used to describe design concepts in a way that is easy to understand and visually appealing. For example, a caption for an image of a cozy living room might read 'Warm colors, plush textiles, and a glowing fireplace create a comfortable and inviting atmosphere for relaxing and entertaining.' By using descriptive communication, the designer can convey the mood and aesthetic of the space to the client (Johnson, 1994). Just as with the phrase 'a picture is worth a thousand words', it is believed that using visual or graphic aids can facilitate better comprehension of novel ideas (Finke, 1996).

Written or verbal communication is the primary way of exchanging information between people and revealing the concept in design studios as a result of the concept of creativity. Furthermore, AI can assist with the selection and sourcing of materials and furnishings. This can save time and reduce errors, allowing designers to focus on the creative aspects of their work. However, it is important to remember that AI should not replace the critical thinking and problem-solving skills of the designer. Rather, it should be used as a tool to enhance the design process and bring new ideas to the table. Related to this, in the studies of Kahraman, Şekerci & Develier (2023), Yıldırım & Demirarslan (2020), Eskicioğlu & Öztürk (2020) and Çelik & Sağlam (2023), they experienced artificial intelligence and space designs with the text to image visual creation tool of artificial intelligence in the design process and reveals new ideas. Among these studies, the study by Kahraman, Şekerci & Develier (2023) emphasizes that the designer's critical

thinking and problem-solving skills surpass the database of today's artificial intelligence.

Interior architecture education and especially design studio courses are like a test of the professional profession. For this reason, the course contents should be kept up-to-date for students to adapt to the changes in the current situation with the changing and developing technology in their professional lives. The course contents, in which these current technologies are included, enable students to closely follow the developments in the profession.

3. MATERIAL AND METHOD

3.1. Design Project

In this course, we expected students to design a fair stand by creating the concept via AI. The students were asked to create and write 'prompts' by themselves. Prompt means a descriptive text for AI Large Language Model (LLM) which are text to image generators like Midjourney and DALL-E to create images accordingly. We write a text, and AI creates the image. In this context, first, we made a lecture about how to write a proper prompt. We advised students to imagine the conceptual fair stand design first and think about the colors, materials, style, spaces-subspaces, space organization, circulation, etc. After that, we asked them to try to explain what they imagine via words like writing a descriptive text. That's going to be the prompt of that project. If the imagining and writing of what they imagine part is not sufficiently well, the prompts will not be sufficient, either.

The fair stand would be located in a space designated for large exhibitions, especially those of a commercial nature where products are exhibited to promote trade or space for large conventions. The students were tasked with designing a fair stand for a brand, which they were to create along with its brand identity in the ANFAŞ Commercial Center in Antalya/Turkey, with every detail designed and a cost analysis conducted. To ensure the necessary functions for the brand identity are met, students are requested to design a project that appeals to different users, attracts people to the location, and provides an enjoyable experience where people can not only make purchases but also spend quality time in the area. Designing an exhibition stand was the task assigned to the students. that spans approximately 1200

square meters (ground floor: 800 square meters, mezzanine floor: max. 400 square meters). This project allowed them to freely conceptualize their design and provided a moderately larger-sized project for assessment purposes.

We expected students to create a brand and brand identity in the categories listed below under these conditions.

- Technology - Information Technologies
- Construction
- Sport - Healthy Nutrition
- Clothing – Accessories
- Cosmetics

We also shared a list of required functions.

- Relaxing area
- Info desks (optional, depends on brand identity & scenario)
- Catering area (café, bar & bistro)
- Experience rooms (3 rooms)
- General Office Space for min. for 3 people
- Administrative Office
- Meeting Room (For Employees)
- Presentation Room Based on The Brand Identity (for customers/visitors)
- VIP Room (for customers/ visitors)
- Cashier, Selling/shopping area (optional, depends on brand identity & scenario)
- Multipurpose/Performance Hall including subspaces (depends on brand identity & scenario)
- Additional Function Based on the Brand Identity (Exhibition Etc.)
- Storage

This course continues in 14 weeks including 1 week for midterm jury. After 14 weeks, the final jury was held. During 14 weeks, the steps listed in Figure 1 were followed.

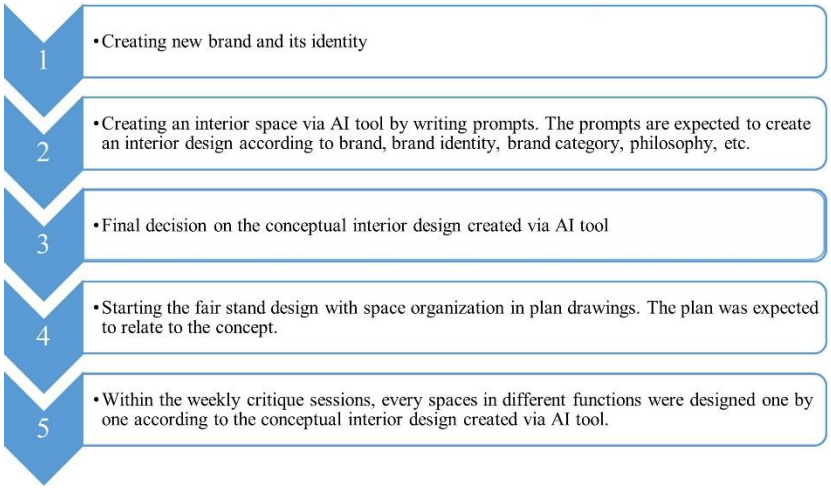


Figure 1: Fair stand design steps in the course.

One of the finalized projects is shown in one sample student project in **Table 1** and **Table 2**. The sample project is chosen since lighter colors are pre ferred in the design and since there is limited space for project renders and drawings, it would help with understanding. The student created a brand labeled 'Way' is specializing in snowboard equipment. Since she wanted to create a fair stand based on the idea of a ski slope in the snowy mountains, she wrote a prompt accordingly. Even though it is a weak prompt, she could able to get some conceptual images created via AI (**Table 1**). She completed the project with renders and total technical drawings from 1/50 to 1/1 in necessary detail after working on it for the entire semester. Some of the drawings and renders are shown in **Table 2**.

Prompt	Conceptual Images Created via AI
Snow and Sky, Triangular Shapes, Blue and White	

Table 1: Sample Project's Conceptual Images Created via AI and the Prompt.

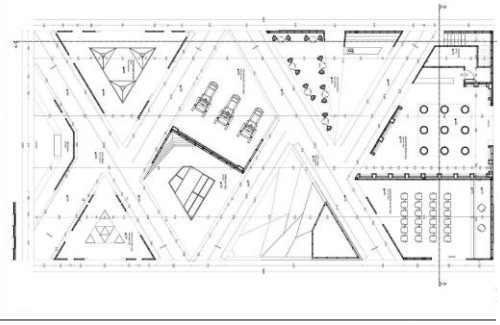
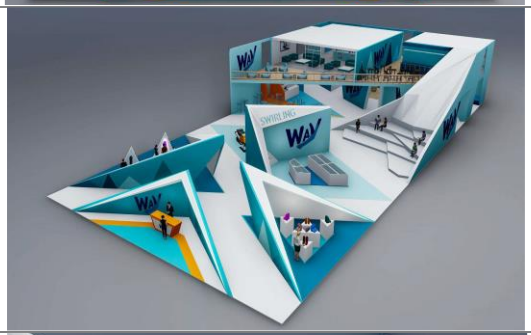
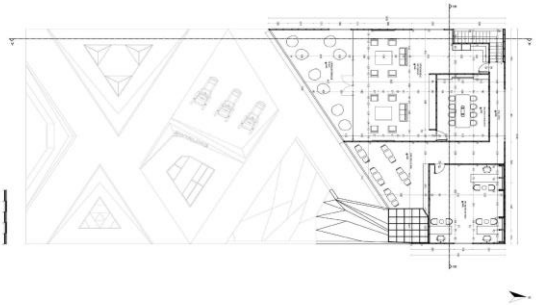
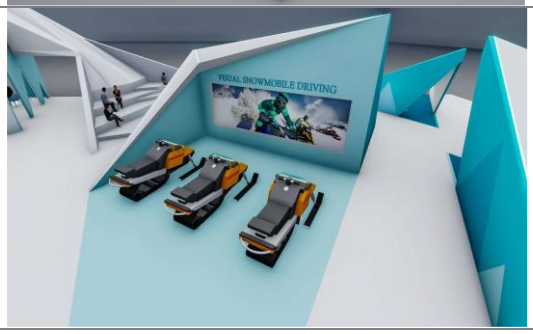
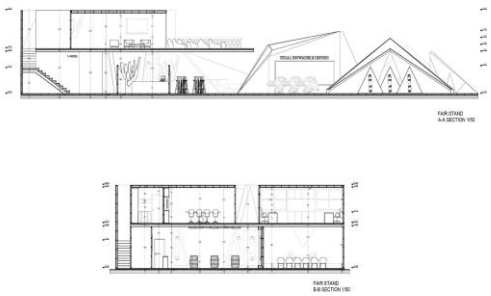
Renders	Some of the Technical Drawings
	
	
	

Table 2: Sample Project's Renders and Some of the Technical Drawings.

3.2. Evaluation Methodology & Criteria

For this study, Barnard's (1992) CAIDC (Consensual Assessment of Interior Design Creativity) rating scale, which evaluates aspects of the design merit of interior design solutions, was chosen. Barnard has identified different design aspects for evaluating interior design solutions, drawing inspiration from creative expressions in other fields. However, the term 'creativity' is often used without sufficient definition. Barnard aimed to develop an assessment tool, the Consensual Assessment of Interior Design Creativity (CAIDC), based on Amabile's assessment (1982, 1983) which is the Consensual Technique for Creativity Assessment, to evaluate interior design projects for their creativity and other design merits. The CAIDC provides a reliable way of rating the creativity and design merits of interior design projects.

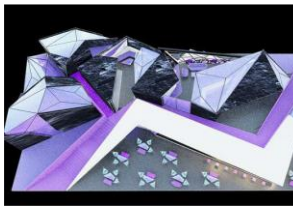
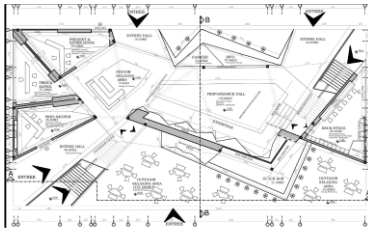
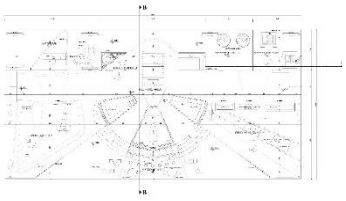
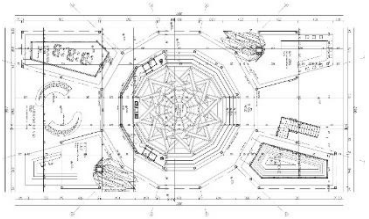
Barnard identified 12 design merit aspects (Barnard, 1992) which are aesthetic appeal, appropriateness, artistic merit, complexity, creativity, functionality, liking, novelty, originality, technical merit, thematic expression, and craftsmanship. From those 12 merits, only craftsmanship is eliminated since the craftsmanship skills shown in the presentation were not addressed in the study.

Barnard (1992) describes how we should understand any of the design merits to avoid misunderstanding. According to the descriptions, the course's 4 instructors evaluated and graded the projects based on the 11 merits by rating each project in both groups from 1 (lowest) to 9 (highest). The average of the grades given by the 4 instructors was calculated for each merit and project. This average grade was accepted as the project's score for that merit.

3.3. Subjects

This study focuses on 10 subjects, consisting of senior-level students (n=10) enrolled in an interior design studio course at Antalya Bilim University in Antalya/Turkey. The subjects were required to complete a fair stand design project, utilizing AI tools in the conceptual phase. There were 10 students in the course. While 5 students were able to write clear, detailed, and sufficient prompts, the rest of the 5 students wrote inadequate and shorter prompts. The detailing level determines whether a prompt is sufficient or insufficient. Superficial, not-detailed, general, and nonspecific prompts were considered insufficient prompts. Insufficient prompts result in artificial intelligence producing and presenting images in a somewhat random manner, with less designer influence.

Students who wrote sufficient prompts will be labeled as Group A, while those who did not write sufficient prompts will be labeled as Group B. The prompts, concept image created via AI, students' 3d model, and one of the technical drawings of the projects for Group A shown in Table 3, and for Group B are shown in Table 4.

Std No	Prompts	Conceptual Image Created via AI	Students' Interior Design Digital Model Developed According to the Conceptual Image	Students' Interior Designs' Technical Drawings
1	Geode Crystals, Reflection, Prismatic Forms, Crystal Cavity, Geological Structure and Formation, Crystal Ggrowth Patterns			
2	people. exploring showroom, cyberpunk,cubes, grid, lines, virtual reality, screens, interior, neon lights, metaverse, --ar 16:9			
3	Psytrance Neon light Ancient alien Highly detailed Perspective Dark place Techno music Stage Modern materials, Radial Symmetry			

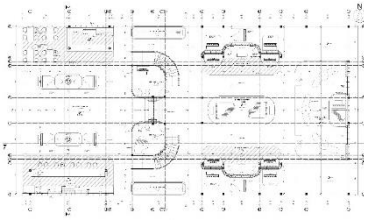
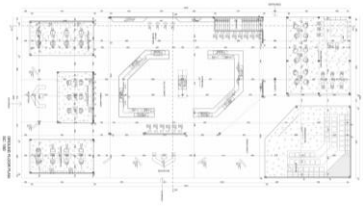
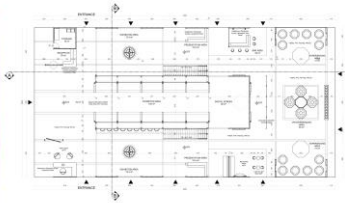
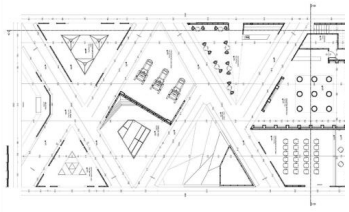
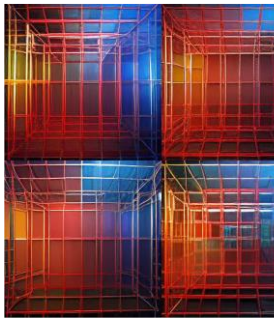
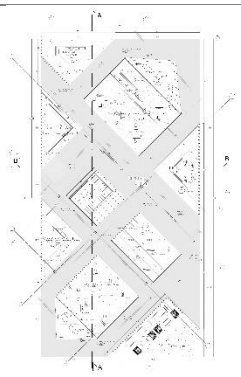
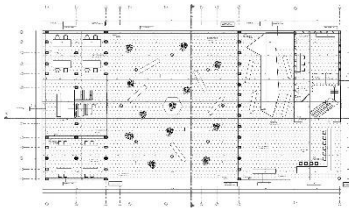
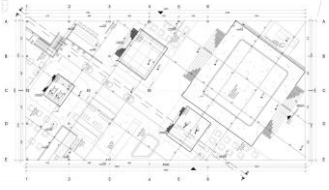
4	Modern, Opera, Dramatic Atmosphere, Elegant, Luxury, Glamorous, Sophisticate, Theatrical, Opulent and Chic Design			
5	Soft Pink, Soft Orange, Gold Details, Venesia, Showrooms, Platform, Jewelry, Display, Elegant, Luxury, Ancient, Gilded Accents, Exhibition			

Table 3: Group A Students' Conceptual Images Created via AI, Interior Design and Their Models and Technical Drawings.

Std No	Prompt	Conceptual Image Created via AI	Students' Interior Design Digital Model Developed According to the Conceptual Image	Students' Interior Designs' Technical Drawings
1	Gateway, Planets, Technology, Galaxy			
2	Snow and Sky, Triangular Shapes, Blue and White			
3	3D Grid System, Matrix Grid Plan, Color Psychology		 	
4	Costume, Fashion, Exhibition, Geometry, Fabric		 	
5	Dynamic Display, Purple, 360 Screen Coverage			

3.4. Hypotheses

In this study, the main question is whether artificial intelligence can take the place of an interior designer in the field of interior design. The limitation of the study is one type of AI tools which is from text to image ones. Additionally, AI will only be utilized during the conceptual stage of the design. According to the main problem and the limitations, twelve null hypotheses were tested:

H1. There is a significant difference between interior design projects created via sufficient, detailed, and insufficient prompts in the conceptualizing phase of the design.

H2: There is a significant difference in the merit ratings of design solutions conceptually created by AI by writing sufficient or insufficient prompts.

- Aesthetic appeal
- Appropriateness
- Artistic merit
- Complexity
- Creativity
- Functionality
- Liking
- Novelty
- Originality
- Technical merit
- Thematic expression

Table 4: Group B Students' Conceptual Images Created via AI, Interior Design and Their Models and Technical Drawings.

4. RESULTS AND FINDINGS

This study aims to compare the success levels of projects of students who have been able to write a sufficient prompt or not in the use of artificial intelligence tools during the conceptual phase in interior design. To conduct this comparison, due to the low number of subjects in the two groups, the Mann-Whitney U test, which is one of the nonparametric methods, was used.

Data analysis and data entries were provided to the SPSS 24 package program. No incorrect or incomplete data was found. The results of the Mann-Whitney U Test, which was conducted to examine whether the evaluation criteria used in the study differ statistically according to whether or not to write a good prompt or not, are given in Table 5.

	Situation	N	Order Average	Order Total	U	p
Aesthetic appeal	Group A	5	6,90	34,50	5,500	,151
	Group B	5	4,10	20,50		
	Total	10				
Appropriateness	Group A	5	5,10	25,50	10,500	,690
	Group B	5	5,90	29,50		
	Total	10				
Artistic merit	Group A	5	6,00	30,00	10,000	,690
	Group B	5	5,00	25,00		
	Total	10				
Complexity	Group A	5	5,70	28,50	11,500	,841
	Group B	5	5,30	26,50		
	Total	10				
Creativity	Group A	5	6,40	32,00	8,000	,421
	Group B	5	4,60	23,00		
	Total	10				
Functionality	Group A	5	5,30	26,50	11,500	,841
	Group B	5	5,70	28,50		
	Total	10				
Liking	Group A	5	6,00	30,00	10,000	,690
	Group B	5	5,00	25,00		
	Total	10				
Novelty	Group A	5	5,50	27,50	12,500	1,000
	Group B	5	5,50	27,50		
	Total	10				
Originality	Group A	5	4,80	24,00	9,000	,548
	Group B	5	6,20	31,00		
	Total	10				
Technical merit	Group A	5	5,30	26,50	11,500	,841
	Group B	5	5,70	28,50		
	Total	10				
Thematic expression	Group A	5	5,50	27,50	12,500	1,000
	Group B	5	5,50	27,50		
	Total	10				

Table 5: Mann-Whitney U Test Results.

Table 5 shows that there is no statistically significant difference in the mean criterion scores of students in terms of whether they wrote a good prompt or not for aesthetic appeal (U=5.500, p>0.05), appropriateness (U=10.500, p>0.05), artistic merit (U=10.000, p>0.05), complexity (U=11.500, p>0.05), Creativity (U=8.000, p>0.05), functionality (U=11.500, p>0.05), liking (U=10.000, p>0.05), novelty

(U=12.500, p>0.05), originality (U=9.000, p>0.05), technical merit (U=11.500, p>0.05), and thematic expression (U=12.500, p>0.05).

5. CONCLUSION

With this study, we understand that there is no significant difference between writing sufficient or insufficient prompts in the concept development phase of the interior design projects according to the Barnard (1992)'s design merits. This means that whether or not a sufficient prompt is written has no impact on any of the chosen criteria for this study in an interior design project. Because AI is just a tool. The important thing, as in this study, is how the professional interior architect or interior architecture student interprets this image and offers technical solutions and suggestions. Additionally, when the AI image generator is used as a design tool for interior design concept creation, we observed that the sufficient or insufficient prompts created by the students which directly affect are not factors in the adaptation of the created concept to the overall space.

We understood that the main factor that makes an impact in this regard is the 'concept analysis' required to adapt the concept produced with AI to the given project spaces. It can also be stated that the important thing is to understand the design style, which includes design principles, elements, color & material combination, lighting, general ambiance, and so on that are shown in conceptual images created using AI, as well as the ability to capture the same design style independently for different function and size spaces that are not shown in the conceptual image.

According to the findings of this study, AI tools are understood to be new tools that help in communication in interior design and do not have a significant impact on the creativity and design merits of the design. When we look at the history of interior design, we can see that the first interior designers could only draw by hand and digital tools were not available as a tool. As time passes, new digital tools are developed, and almost all interior designers now communicate using computer-aided drawing and modeling tools. Today, we live in the AI era and it appears that AI will be a useful tool for interior designers, but it will not have a significant impact on design. What matters is that the designer/AI user

STAGES OF THE PROCESS	1-PROGRAMMING / RESEARCH	2-SCHEMATIC DESIGN/ CONCEPT FORMATION	3-PRELIMINARY DESIGN/ CONCEPT DEVELOPMENT	4-DESIGN DEVELOPMENT / IDEA PRESENTATION
PURPOSE:	To identify the problem	to generate ideas by synthesizing previously determined project information	to analyze, develop and refine previously generated ideas	To present refined problem solutions to the client in order to obtain approval for further development
	To identify known facts			
	To outline project requirements			
PRIMARY COMMUNICATION METHODS:	**Graphic, written and verbal: Techniques used to identify, define and seek information:**	**Informal graphics and verbal:**	**Informal graphics and verbal communication:**	**Formal and/or informal graphics, and verbal communication:**
	Correspondence	Bubble diagrams	Orthographic drawings	Orthographic drawings
	Client interviews	Freehand sketches	Plans	Axonometric drawings
	Photographs	Loose orthographic drawings	Sections	Perspective drawings
	Existing project drawings	Brainstorming	Elevations	Rendering
	Analytical illustrations	Tracing	Detail drawings	Tonal value
	Techniques used to convert, evaluate and break down information:		Axonometric (paraline) drawings	Shade and shadow
	Bubble diagrams		Isometric	Color
	Flowcharts		Plan oblique	Verbal descriptions
	Matrix		Elevation oblique	
	Bargraphs		**Perspective drawings:**	
	Analytical photo-sketches		One-point	
			Two-point	
PRIMARY COMMUNICATION ORIGINATED BY:	Client and Designer	Designer	Designer and Other Professionals	Designer
DIRECTED TO:	Designer and Client	Himself	Client	Client

understands the created images and applies them to the interior design.

Rey-Barreau & Whiteside (1983) defines different types of stages of communication in interior design. In Table 6, we only show the stages where the AI tool focused on this study can be implemented.

Table 6: The Stages of the Interior Design Project Process which the AI Tools Focused on in this Study can be Implemented (Ray-Barreau & Whiteside, 1983)

The results also show the role of AI as a tool in aiding verbal description and translation of concept spaces into visual representations. By incorporating AI into the interior design curriculum, students can acquire essential 21st Century Skills and improve their communication abilities.

To sum up, the main problem of the study is whether artificial intelligence can take the place of an interior designer in the field of interior design. In this study, we only focus on text to image AI tools and only used in the conceptual phase in design. We understood that AI can only be a tool like Autocad, Photoshop, 3ds Max, or any other digital tool which helps the designer in drawing or visualizing. It appears that there won't be a suitable interior design project without the designers' comprehension of the style of the space from the conceptual image generated via AI. We should integrate AI into the curriculum in the same way that we integrate digital modeling and drawing tools to give students the 21st Century Skills they need to succeed.

This study aimed to create a spatial concept image that is created by prompts via AI tools. Since this method does not always produce satisfactory results for the users, hybrid methodologies in AI should also be compared for further studies like the ‘imagine’ tool which is writing a prompt, ‘blend’ tool which give the AI some images to blend them or the mixed usage of these tools.

Furthermore, AI tools are rapidly evolving. When this study is repeated with the same methodology in the future, the results will be different. Last but not least, in this study, we only focus on verbal communication to create image-based AI tools. AI tools of various types may have a significant impact on the interior design profession. As a result, it is critical to research them as well.

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The article complies with national and international research and publication ethics. Ethics Committee approval was not required for the study.

Conflict of Interest Statement

The authors of the study declare that there is no financial or other substantive conflict of interest that could influence the results or interpretations of this work.

Author Contribution

The authors stated that M.U.K contributed 40%, Y.Ş., M.D. and F.K. each contributed 20% to the article.

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Redefining Architecture Through Posthuman Principles: Bridging Cybernetic Concepts and XR Technologies

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The integration of cybernetic principles into architectural discourse has led to a profound transformation in the conceptualization of architectural entities. Cybernetics redefines architecture as a dynamic and responsive entity, capable of communication, interaction, and adaptation. This paradigm shift is exemplified by the Fun Palace project, which envisioned architecture as a living organism dynamically responding to its environment. Marcos Novak's concept of liquid architecture further elucidates this transformative paradigm, emphasizing architecture's fluid adaptability in digital realms.

Realizing these transformative qualities requires architecture's integration into digital space. Extended Reality (XR) technologies serve as a conduit for this integration, enabling architects to transcend traditional limitations and reshape spatial environments. Through a rigorous inquiry into the convergence of cybernetic principles and XR technologies, this research redefines architecture in the digital age. Two workshops serve as case studies, demonstrating the transformative potential of this symbiotic relationship.

In conclusion, this research sheds light on the symbiotic relationship between cybernetic principles, XR technologies, and architectural design, offering insights into transformative possibilities. By redefining architecture in the digital age, this study paves the way for a new era of architectural innovation, where creativity transcends boundaries, and the built environment becomes a dynamic expression of human imagination.

Keywords: Post-Human Architecture, Cybernetic Principles, Extended Reality Technologies, Architectural Ecosystems, Symbiotic Harmony

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Posthuman İlkeleri ile Mimarlığı Yeniden Tanımlamak: Sibernetik ile XR Teknolojilerinin Entegrasyonu

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Sibernetiğin mekân üretim pratiklerine entegrasyonu, mimarlığın kavramsallaştırılmasında derin bir dönüşüme yol açmıştır. Sibernetik, mimariyi iletişim kurabilen ve adaptasyon becerisi yüksek, dinamik ve etkileşimli bir yapı olarak yeniden tanımlamamızı sağlar. Bu paradigma değişimi, mekânı çevreye dinamik olarak tepki veren canlı bir organizma olarak ele alan Fun Palace projesi ile görünür hale gelir. Marcos Novak'ın akışkan mimari kavramı, mimarinin dijital alanlardaki akışkan uyarlanabilirliğini vurgulayarak bu dönüştürücü paradigmayı güçlendirmektedir.

Bu dönüştürücü nitelikleri ortaya koyabilmek, mekânın dijital ortamda varolmasıyla mümkün olabilir. Genişletilmiş Gerçeklik (XR) teknolojileri bu entegrasyon için bir kanal görevi görerek mimarların geleneksel sınırlamaları aşmasına ve mekansal ortamları yeniden şekillendirmesine olanak tanımaktadır. Sibernetik ilkeler ile XR teknolojilerinin yakınsamasına ilişkin olan bu araştırma, dijital çağda mimariyi yeniden tanımlar. İki çalıştay, bu simbiyotik ilişkinin dönüştürücü potansiyelini gösteren örnek olay çalışmaları olarak hizmet ermektedir.

Sonuç olarak bu araştırma, sibernetik ilkeler, XR teknolojileri ve mimari tasarım arasındaki simbiyotik ilişkiye ışık tutarak dönüştürücü olasılıklara dair içgörüler sunmaktadır. Bu çalışma, mimariyi dijital çağda yeniden tanımlayarak, yaratıcılığın sınırları aştığı ve yapılı çevrenin insan hayal gücünün dinamik bir ifadesi haline geldiği yeni bir mimarlık tanımı getirmektedir.

Anahtar Kelimeler: Posthuman Mimari, Sibernetik İlkeler, Genişletilmiş Gerçeklik Teknolojileri, Mimari Ekosistemler, Simbiotik Harmoni

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1. INTRODUCTION:

Within the realm of architectural discourse, the integration of cybernetic principles marks a profound transformation in the conceptualization of architectural entities. Cybernetics, as a transdisciplinary field concerned with systems' control and communication, engenders a fundamental shift in perceiving architecture as a dynamic and responsive entity. Central to this paradigm shift is the reconceptualization of architecture as a non-human entity with its own agency and intelligence, capable of communication, interaction, and adaptation (Price, 1966).

The Fun Palace project exemplifies this paradigm shift. Originating in the mid-20th century, the Fun Palace sought to establish an architectural space characterized by continual evolution and dynamism. The project envisioned architecture as a living organism, capable of responding dynamically to its environment and occupants' needs (Wiener, 1948). This approach challenged prevailing architectural norms, transcending the traditional notion of architecture as static and immutable. Liquid architecture, as conceptualized in the seminal work "Liquid Architectures in Cyberspace" by Marcos Novak emerges as a compass and further illuminates this transformative paradigm (Novak, 1995). Novak posits that architecture in digital realms possesses intrinsic liquidity, capable of fluidly adapting and reshaping in response to dynamic stimuli. This notion underscores the dynamic nature of architectural expression within both physical and digital environments, highlighting the interplay between cybernetic principles and architectural design.

The realization of these transformative qualities within architecture is contingent upon its integration into digital space. While cybernetic principles imbue architecture with the capacity for dynamic interaction and communication, physical limitations constrain the full manifestation of these qualities within traditional architectural mediums. As indicated in Figure 1, architecture necessitates integration into digital realms to fully realize its potential as a dynamic and responsive entity.

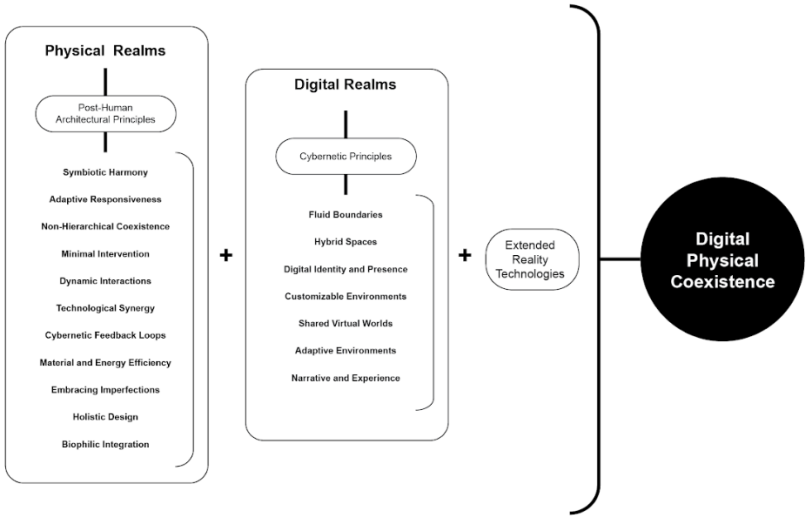

Figure 1: Diagram showcasing the relationships of Digital and Physical Coexistence (Author,2024).

The seamlessly overlaying of digital layers onto the physical environments through XR provides the actualization of the transformative and interactive qualities. The integration of digital elements into physical space opens up new avenues for architectural expression, blurring the boundaries between the real and the virtual. Thus, architects transcend the constraints of traditional architectural mediums, enabling architecture to communicate, interact, and respond to occupants' needs and preferences in unprecedented ways. The fusion of physical and digital realms not only enhances architectural expression but also reshapes the dynamic interplay between individuals and their built environment.

Drawing insights from cybernetic theories and the integration of Extended Reality (XR) technologies mark a significant departure from conventional design paradigms, heralding a paradigm shift in how architects conceive and manifest spatial environments. Thus, XR technologies emerge as pivotal catalysts for architectural evolution, bridging the chasm between conceptualization and realization and inaugurating an epoch of boundless spatial exploration and expression. This fusion of physical and digital realms fosters a symbiotic relationship between architecture and technology, enabling architects to realize visionary concepts such as the Fun Palace in ways previously unimaginable and redefine architecture in a post-anthropocentric era (Figure 2).

In light of these transformative developments, this research endeavors to elucidate the symbiotic relationship between cybernetic principles, XR technologies, and architectural design, with two workshops serving as our case studies. Through a rigorous inquiry into the innovative possibilities arising from their convergence, this study seeks to redefine architecture in the digital age, where creativity transcends conventional boundaries, and the built environment becomes a canvas for boundless imagination.

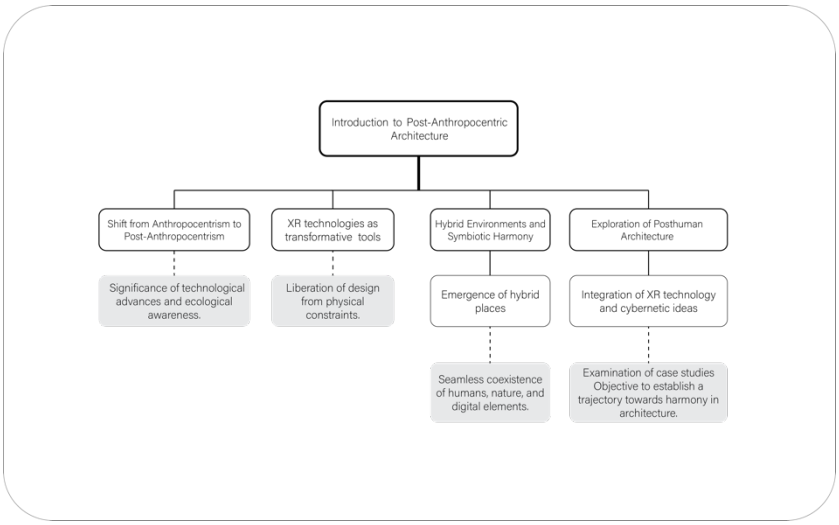

Figure 2: Transformative qualities within Post-Anthropocentric Architecture (Author,2024).

2. EVOLVING ARCHITECTURAL AGENCY: A Post-Anthropocentric Perspective

Departing from conventional paradigms, our discourse delves into the profound implications of embracing non-human agency within the built environment. This contribution aims to deepen our understanding of the nexus between cybernetic concepts, XR technologies, and architectural design.

Donna Haraway's work "Simians, Cyborgs, and Women: The Reinvention of Nature" (Harraway, 1991) challenges traditional boundaries between the human and the non-human, aligning with the paradigm shift in architectural discourse towards transcending its static

nature and actively engaging with its occupants. She invites us to reconceptualize architecture as a dynamic and responsive entity.

Juhani Pallasmaa's insights in "The Eyes of the Skin: Architecture and the Senses" (Pallasmaa, 2005) offer reimagining of architectural agency. Pallasmaa's emphasis on sensory experience prompts a shift from a purely visual understanding of architecture to one that acknowledges the multisensory nature of human perception. In doing so, he invites us to reconsider architecture as a sentient entity capable of evoking emotional responses and a dynamic and responsive extension of human experience.

Marcos Novak's concept of "liquid architecture" illuminates a fluid and dynamic understanding of architectural expression within digital realms. Novak's vision transcends conventional notions of architectural form and materiality, proposing instead an architecture that possesses an intrinsic liquidity, capable of fluidly adapting and reshaping in response to dynamic stimuli (Bolter & Grusin, 1996). This concept challenges the traditional constraints of physical architecture, envisioning a fluid and responsive built environment that seamlessly integrates with the digital realm.

In conjunction with Novak's liquid architecture, Donna Haraway's exploration encourages a critical reevaluation of the human-environment relationship. Haraway's conceptualization of the cyborg blurs the boundaries between the human and the non-human, aligning with the fluidity envisioned in Novak's architectural paradigm. This alignment suggests a paradigm shift in architectural discourse, where static boundaries give way to dynamic interactions and engagements between occupants and their environment.

Furthermore, Juhani Pallasmaa provides a tactile dimension to this discourse. Pallasmaa's emphasis on sensory perception invites us to engage with architecture not just visually but holistically, through all our senses. In doing so, he reinforces the idea of architecture as a living, breathing entity, responsive to the nuances of human experience. This resonance with Novak's fluid architecture and Haraway's cyborg blurs the distinction between the built environment and its inhabitants, fostering a symbiotic relationship where both adapt and evolve in tandem, echoing Novak's vision of a fluid architectural realm in cyberspace.

In synthesis, the evolution of architecture through a post-anthropocentric lens challenges conventional boundaries, inviting a reimagining of our relationship with the built environment. By embracing non-human agency, architecture becomes a dynamic, responsive entity that reflects the entanglement of human and non-human worlds. Thus, by integrating cybernetic concepts into architectural discourse, we lay the groundwork for a post-anthropocentric architecture characterized by responsiveness, adaptability, and symbiosis with the broader ecosystem

3. INTEGRATION OF CYBERNETIC PRINCIPLES

Cybernetics, as a transdisciplinary field concerned with control and communication in complex systems, provides a theoretical framework for understanding the feedback loops and emergent properties inherent in urban environments. In the context of architecture, cybernetic principles inform the design of responsive structures that adapt to changing environmental conditions and human behaviors. Concepts such as feedback, self-regulation, and emergence are central to the cybernetic approach to architectural design, facilitating the creation of buildings and spaces that actively engage with their occupants and surroundings.

In the pursuit of creating post-anthropocentric spaces that seamlessly blend with XR technologies, architects acquire inspiration from the fundamental concepts of cybernetics. Ranulph Glanville, a former student of Gordon Pask and a prominent figure in cybernetics, provides a vivid depiction of a world where conversation theory has shaped the environment:

> *"The architect and cybernetician Ranulph Glanville, a former student of Pask's, has poetically described what an environment conditioned by Conversation Theory might be like:*
>
> *Imagine you go out at night in the depths of the countryside.*
>
> *There is a clear dark sky, no light spillage from civilization, it is a cold damp night, and as your eyes become accustomed to the darkness you gradually see little points of light - the stars. These*

points of light shimmer (because of the dampness and coldness in the air)

If you listen carefully, you can imagine them singing to each other, forming little choirs that sing together.

You, of course, are another of these stars, and you also sing. As you move, the other stars come into focus and form constellations: there are clusters that cohere for the moment, and that then dissolve as you move on. The songs continue, you hear choirs of the constellations. The feeling is of overwhelming joy, beauty, wonder, oneness" (Pask, 1969).

This depiction encompasses a vision that resonates with the goals and ideals of a post-anthropocentric perspective. As architecture navigates the unexplored landscape of the post-anthropocentric era, it discovers guidance in the intricate principles of cybernetics—an interdisciplinary framework that clarifies the dynamic interconnections among systems, information, and control. This chapter explores the significant impact of cybernetic theories on the development of architecture and enables the creation of post-anthropocentric architectural settings that incorporate XR technologies.

3.1 The Fun Palace Project as a Case Study:

To properly comprehend the significance of the architectural evolution described in this paper, it is necessary to examine the underlying cybernetic ideas that inform it. Cybernetics is a field of science that focuses on systems, information, and control. Cybernetics, which was once restricted to engineering and technology, is now experiencing an acceleration and serving an essential role in the design of the post-anthropocentric future. This revival is a result of Cedric Price and Gordon Pask's creative partnership, particularly on the Fun Palace project (Figure 3). Pask, a pioneer in cybernetics with training in psychology, exposed Price to systems thinking and self-regulating systems. Together, they envisioned the Fun Palace as an open, flexible space supported by a cybernetic control system that would encourage interaction among users and ensure flexibility (Pask, 1969).

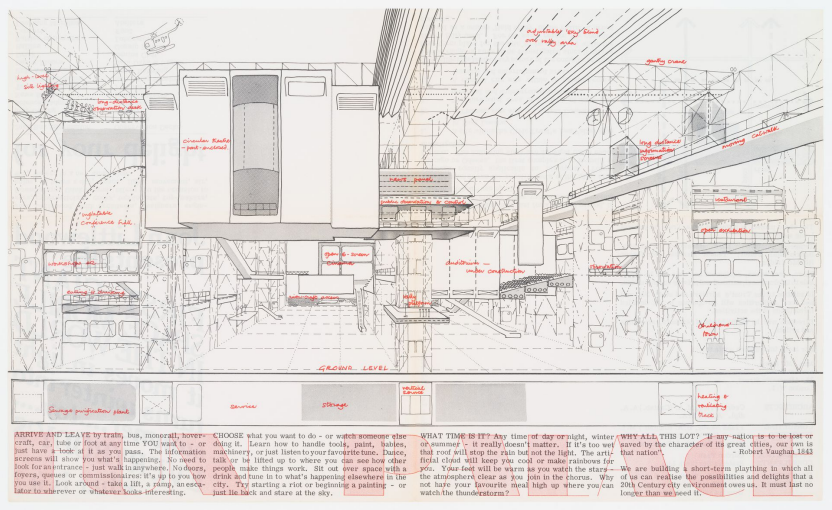

Figure 3: Fun Palace image (image from the archival of Canadian Center for Architecture, CCA).

Pask's theoretical framework, known as "conversation theory," as indicated in **Figure 4**, had a pivotal role in underlining the importance of continuous dialogue and interaction within the cybernetic system of the Fun Palace. Grounded in the principles of cybernetics, conversation theory provided a structured approach to fostering communication and feedback loops among the various components of the architectural environment. By emphasizing the dynamic exchange of information and ideas, Pask's framework facilitated self-organization within the Fun Palace, allowing it to evolve and adapt in response to user inputs and environmental stimuli.

At the heart of conversation theory lies the recognition of the inherent complexity and unpredictability of human interactions. By treating the Fun Palace as a cybernetic system characterized by ongoing conversations between its occupants and the built environment, Pask's framework enabled the emergence of novel spatial configurations that were not predetermined by traditional architectural design processes. Instead, the architecture of the Fun Palace was continually shaped and refined through the collective interactions and experiences of its users.

Central to Pask's vision was the idea of co-creation, where users actively participated in the design and evolution of the architectural space. Through their engagement with interactive installations and immersive experiences, occupants of the Fun Palace became co-creators of their environment, contributing to its ongoing transformation and

adaptation. This participatory approach to architecture challenged conventional notions of authorship and control, emphasizing the collaborative nature of design and the democratization of spatial production.

By embracing conversation theory, the Fun Palace transcended the confines of traditional architectural practice, becoming a dynamic and responsive entity that reflected the collective intelligence and creativity of its users. Through continuous dialogue and interaction, the Fun Palace evolved organically, giving rise to spatial configurations that were as diverse and unpredictable as the conversations that shaped them. In this way, Pask's theoretical framework not only enriched the architectural discourse but also paved the way for a new era of interactive and adaptive design.

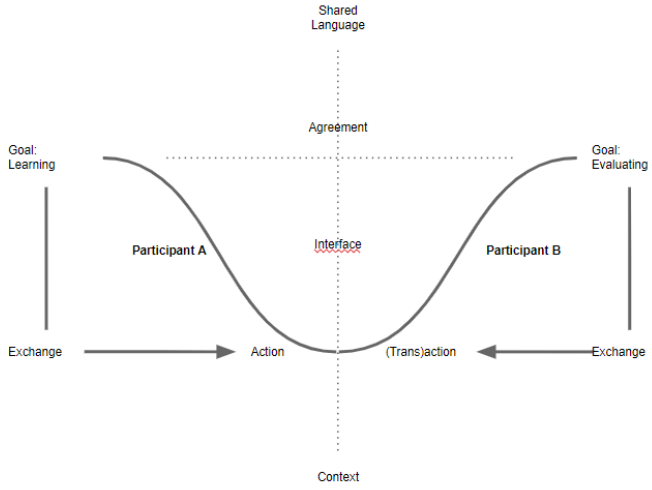

Figure 4: Diagram showcasing the integral relationships of Conversation theory by Gordon Pask within the Cybernetics context. (Author, 2024)

The incorporation of cybernetic principles into the field of architecture signifies a significant period of change, wherein architecture assumes a dynamic role in altering both the physical realm and the social aspects of global community (Herdt, 2021). Pask's significant contribution to architecture came in 1969 when he proposed "architectural cybernetics" as a unifying theory for the field. He argued that traditional architectural practices relied on rigid rules and failed to address emerging challenges. In contrast, he saw architectural cybernetics as adaptable to environmental and behavioral changes, envisioning architecture as an interactive environment for inhabitants (Temizel, 2020).

The field of cybernetics provides architecture with the capacity to engage in self-regulation, adaptability, and intelligence. Feedback loops, which have resemblance to natural processes, emerge as a fundamental design principle that allows architecture to dynamically adapt and react to evolving inputs. These feedback loops give rise to an architectural structure that undergoes learning, evolution, and transformation in conjunction with its inhabitants and surroundings.

The architecture of the post-anthropocentric era embodies a self-sustaining existence, reflecting the intricate and harmonious dynamics observed in the natural world. When contemplating this prospective architectural landscape, our objective extends beyond the creation of physical structures. Instead, we aim to develop an ideology that transcends the boundaries of the physical, the current, and the subjective. We are now experiencing the beginning of a period in which architecture, in both its virtual and physical forms, aligns with the fundamental cycles of the ecosystem. The architect who adopts a post-anthropocentric perspective, utilizing XR technology and adhering to cybernetic principles, assumes the role of a transformative agent, serving as a bridge between the physical realm and the realm beyond.

"Our architecture will enable
Our architecture will play
Our architecture will sense
Our architecture will self-structure
Our architecture will learn
Our architecture will be self-aware
Our architecture will stimulate
Our architecture will get bored
Our architecture will anticipate
Our architecture will interact

Our architecture will be emotive" Emotive City by Minimaforms (Minimaforms, 2016).

Drawing upon cybernetic theory, the manifesto of the Emotive City Project embodies a dynamic vision of urban design that prioritizes feedback loops, self-regulation, and emergent behaviours (Minimaforms, 2016). Rooted in the belief that cities should be responsive to the needs of their inhabitants, the manifesto articulates

a set of principles and goals informed by cybernetic principles (Price, 1966). By integrating concepts such as sensory engagement, inclusivity, and iterative design, the manifesto establishes a framework for creating urban environments that evolve in response to the feedback of their users.

The Emotive City **(Figure 5)** advocates for an iterative design process that embraces experimentation and continuous improvement, reflecting the cybernetic principle of emergence (Schön, 1983). By iteratively testing and refining design concepts based on user feedback, architects can uncover emergent properties that enhance the emotional resonance and functionality of urban environments. This iterative approach enables cities to evolve organically over time, adapting to changing social dynamics, technological advancements, and environmental conditions while remaining responsive to the needs of their inhabitants.

Figure 5: Emotive City by Minimaforms (Minimaforms, 2016).

In the context of hybrid environments, where architecture converges with digital technologies, the utilization of feedback systems imparts a dynamic quality to architectural design. This dynamic quality enables architecture to function as an intelligent entity, capable of adapting to the preferences and needs of its inhabitants. This concept resonates deeply with the ethos of the Emotive City project by Minimaforms (Minimaforms, 2016). By harnessing feedback dynamics, architectural environments become more than static structures; they evolve into

interactive systems that establish a symbiotic relationship with the surrounding ecosystem. Just as the Emotive City project envisions urban spaces that dynamically respond to human emotions and behaviors, the architectural designs discussed within this framework exemplify a similar responsiveness, mirroring the self-regulatory mechanisms inherent in natural systems. Thus, through the integration of feedback systems inspired by cybernetic principles, architecture evolves into a dynamic and adaptive entity, embodying the concept of architectural autopoiesis within the context of non-anthropocentric architecture.

4. XR TECHNOLOGIES AS ARCHITECTURAL TOOLS

4.1 Redefining Space: Spatial Redefinitions within XR Technologies:

The integration of Extended Reality (XR) technologies within architectural practice represents a seminal advancement in spatial design, ushering in a paradigm shift that transcends conventional limitations and offers novel opportunities for spatial innovation. XR technologies serve as potent catalysts for architectural creativity, enabling architects to seamlessly amalgamate physical and digital realms, thus fundamentally redefining spatial experiences. This integration is particularly salient within architectural discourse, where scholars delve into the intricate interplay between human-computer interactions and spatial contexts.

The pursuit of realism in XR experiences motivates architectural endeavours to construct immersive metaverses; however, the exploration of mixed realities extends beyond realism to encompass sensory augmentation and the synthesis of virtual and physical worlds. Notably, Fuller and Weizman's aesthetic theory underscores the importance of sensory atonement and narrative exploration in mixed realities, elucidating the multifaceted nature of architectural expression within XR (Young & Dawkins, 2023).

Moreover, this transformative shift transcends mere creation of physical structures, engendering dynamic, adaptable environments that responsively cater to human needs. By integrating historical

narratives into architectural designs, architects imbue spaces with continuity, thereby forging connections between the past and the present. Furthermore, narrative incorporation transcends mere functionality, offering occupants immersive experiences that evoke emotions and foster meaningful engagements.

4.2 Architecture as an Interactive System:

XR technologies serve as transformative tools within this paradigm, facilitating dynamic interactions between users and their built environment, thereby fostering symbiotic relationships that evolve over time. Architects conceptualize XR environments as living organisms engaged in continuous dialogues with their occupants, drawing inspiration from concepts such as feedback loops, self-regulation, and emergence. For instance, projects like "Hyper-Reality project **(Figure 6)** challenges conventional spatial perceptions by envisioning a future where digital overlays saturate physical environments, thereby highlighting XR technologies' potential to redefine spatial experiences profoundly (Matsuda, 2016).

Figure 6: Hyper-Reality project (Matsuda, 2016).

4.3 Augmentation and Visualization:

XR technologies offer architects unprecedented tools for spatial redefinition, interactive design, and sensory augmentation, backed by empirical studies showcasing their efficacy. The integration of XR technologies enables architects to craft immersive environments

seamlessly blending virtual and physical worlds. By harmonizing digital elements with physical landscapes, architects create encounters blurring boundaries between physical and digital realms, ensuring seamless integration of virtual experiences with tangible environments.

At the core of XR-infused architecture lies the integration of cybernetic principles, wherein architectural spaces evolve into dynamic systems capable of adapting and responding to user interactions and environmental stimuli. Drawing inspiration from cybernetic theories, architects conceive XR environments as living organisms that engage in continuous dialogue with their occupants. Concepts such as feedback loops, self-regulation, and emergence inform the design process, enabling architectural spaces to dynamically adapt and evolve over time. For instance, the "Hyper-Reality" project prompts critical reflection on the role of technology in shaping human experiences within architectural environments (Matsuda, 2016). By presenting a speculative vision of augmented reality's implications, the "Hyper-Reality" project invites viewers to contemplate the complex interplay between technology, architecture, and human perception. Such engagements with XR technologies not only challenge traditional notions of architectural design but also underscore the potential for architecture to become a responsive and adaptive entity in its own right.

As XR systems permeate diverse domains, architects are poised to navigate the expanding terrain of XR, ensuring the seamless integration of virtual experiences with tangible environments. Embracing the interdisciplinary nature of XR, architects are positioned to lead the way in crafting dynamic, adaptive spaces that respond to the evolving needs and preferences of users.

5. CASE STUDIES AND PRACTICAL APPLICATIONS

5.1 Speculative Design Workshop with XR Technologies:

In this workshop, participants engaged in speculative design exercises inspired by cybernetic principles. They began by speculating on posthuman architectural concepts using ChatGPT, generating prompts for further exploration. These prompts served as the basis for modeling

virtual architectural spaces using Maya, a 3D modeling. **Figure 7** illustrates the process of this workflow.

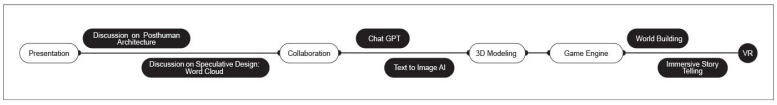

Figure 7: Diagram showcasing the flow for "Speculations on Posthuman Architecture: Virtual Ecologies and Non-Human Presence" workshop (Author, 2023).

Once the architectural models were created, participants transferred them to Unreal Engine, a real-time 3D creation platform **(Figure 8)**, to visualize and experience the virtual environments. Unreal Engine allowed for immersive exploration of the speculative designs, enabling participants to interact with and navigate through the virtual spaces in real-time. By combining speculative design with XR technologies, participants explored the transformative potential of cybernetic-inspired architecture in creating dynamic and responsive spatial experiences.

Figure 8: Design by workshop participant Lakshmi Srinath, showcasing the digital layer to be integrated in the AR platform for the physical realm. (Author, 2023)

5.2 Post-Anthropocentric Design Workshop with AI Tools:

In this workshop, participants delved into discussions on the future of university campuses and post-anthropocentric design principles. Drawing inspiration from cybernetics and posthumanism, participants explored the intersection of human and non-human elements in architectural design.

Using AI tools for image manipulation and interpolation, participants transformed original campus photographs into speculative architectural visions. These AI-generated images served as visual narratives of post-anthropocentric design concepts, challenging traditional notions of human-centric architecture.

Additionally, participants utilized AI tools to create an interpolation video that showcased the manipulation and transformation of architectural imagery over time. By visualizing the evolution of architectural concepts through AI-generated imagery **(Figure 9)**, participants explored the dynamic nature of post-anthropocentric design and its implications for the future of architectural practice.

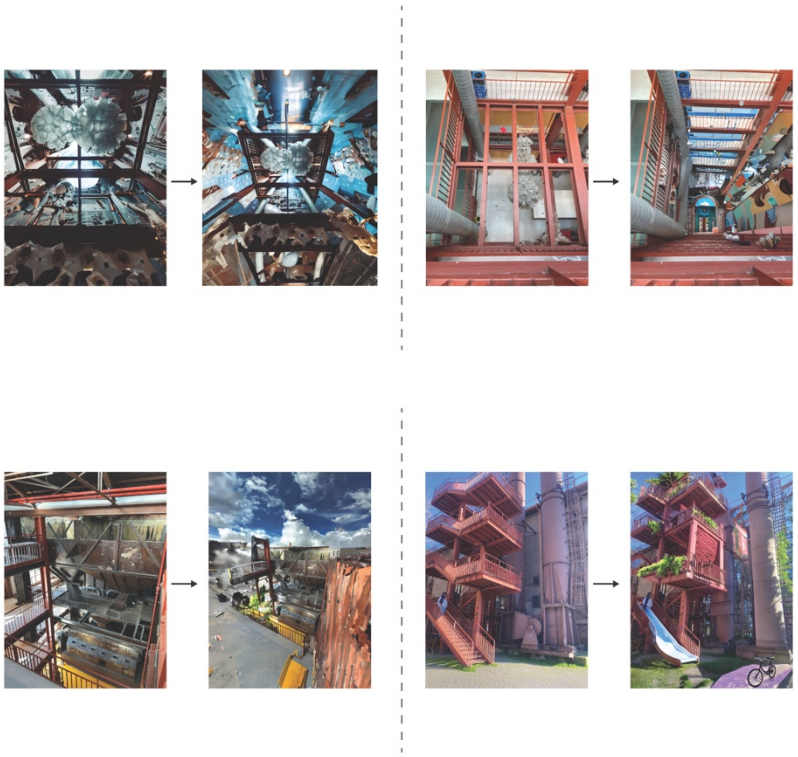

Figure 9: Diagram showcasing the outputs of the AI collaborations. (Author, 2024)

5.3 Analysis:

The integration of cybernetic principles and speculative design methodologies in both workshops represents a significant advancement in architectural exploration. By drawing inspiration from Glanville's cybernetic theories, the first workshop demonstrated a keen understanding of architecture as a dynamic system capable of self-organization and adaptation. Utilizing Maya and Unreal Engine, participants were able to materialize speculative architectural spaces, leveraging technology to visualize environments that respond dynamically to their inhabitants and surroundings. This approach represented within the diagram **Figure 10** that showcases the outputs of the AI collaborations, not only challenged traditional architectural boundaries but also provided a platform for envisioning transformative spatial experiences that go beyond static design concepts.

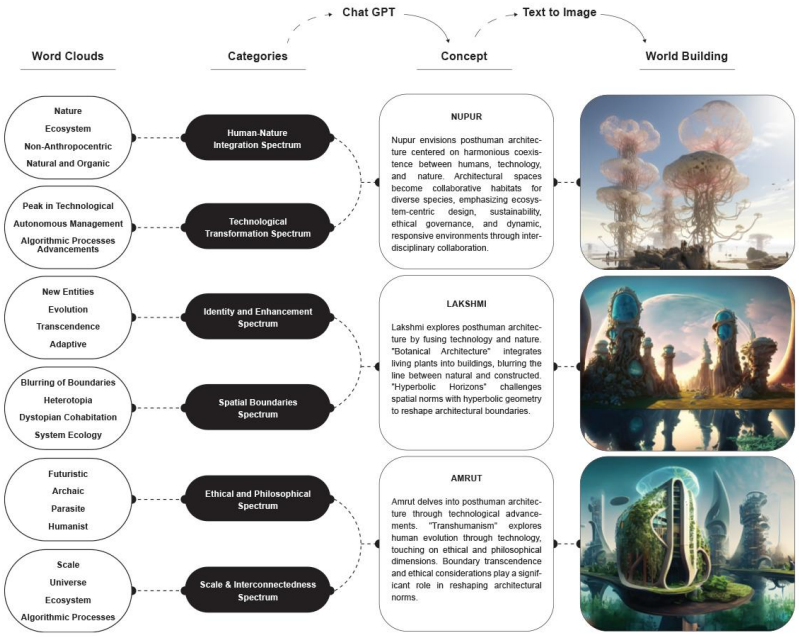

Figure 10: Diagram showcasing the outputs of the AI collaborations explored within the "Speculations on Posthuman Architecture: Virtual Ecologies and Non-Human Presence" workshop. (Author, 2023)

Similarly, the second workshop, driven by the discourse on post-anthropocentric design, embraced AI tools for image manipulation and transformation to further push the boundaries of architectural exploration. By reimagining the role of humans in shaping the built environment, participants engaged in speculative design exercises that explored the dynamic interplay between human and non-human elements. This exploration aligns closely with cybernetic principles, which emphasize the interconnectedness and feedback loops inherent in complex systems. Through the use of AI tools, participants were able to visualize and articulate alternative architectural narratives that challenge traditional notions of human-centric design.

Moreover, both workshops facilitated an iterative and collaborative design process, fostering interdisciplinary dialogue and creative experimentation. Participants iteratively refined their speculative architectural designs, drawing inspiration from Glanville's cybernetic theories in the first workshop, and collaboratively explored the transformative potential of AI tools for architectural visualization in the second workshop. This iterative and collaborative approach not only enriched the discourse on posthuman architectural concepts but also paved the way for innovative and inclusive architectural practices that prioritize dynamic interaction and adaptation.

Overall, the convergence of cybernetic principles and speculative design methodologies in these workshops signifies a paradigm shift in architectural discourse. By embracing non-anthropocentric perspectives and leveraging advanced technologies, architects are poised to redefine the boundaries of architectural practice and create environments that are responsive, adaptable, and inclusive. These workshops serve as catalysts for continued exploration and innovation in the field of architecture, inspiring new approaches and methodologies that prioritize the dynamic relationship between humans, technology, and the built environment.

6. CONCLUSION

The convergence of XR technologies, cybernetic principles, and post-anthropocentric design ideologies represents a pivotal moment in architectural discourse, heralding a paradigm shift that transcends

traditional boundaries and redefines the role of architecture in shaping human experiences within the built environment. This interdisciplinary exploration, drawing from diverse fields including philosophy, architecture theory, sociology, and cybernetics, has unveiled the profound transformative potential of embracing non-human agency in architectural practice.

Throughout this paper, we have navigated the intricate interplay between human and non-human elements, challenging entrenched constructs and inviting a critical reevaluation of the human-environment relationship. By synthesizing insights from seminal works by theorists such as Donna Haraway, Juhani Pallasmaa, Niklas Luhmann, and Karen Barad, we have laid the groundwork for a new understanding of architecture—one that is dynamic, responsive, and deeply attuned to the complexities of our contemporary world.

XR technologies emerge as powerful tools for spatial redefinition, enabling architects to transcend conventional boundaries and craft immersive environments that resonate on visceral and emotional levels. Whether through virtual reality (VR), augmented reality (AR), or mixed reality (MR), these technologies afford architects the means to create experiences that foster deeper connections between occupants and the built environment, enriching the human experience in unprecedented ways.

Furthermore, the integration of cybernetic principles imbues architecture with qualities reminiscent of living systems, transforming static structures into adaptive, self-regulating organisms. By embracing feedback dynamics and iterative design processes, architects cultivate environments that evolve in response to changing stimuli, mirroring the dynamic equilibrium observed in natural ecosystems.

Simultaneously, the adoption of post-anthropocentric design ideologies prompts a fundamental reevaluation of architectural agency and the relationship between humans and their surroundings. Advocating for a more inclusive, holistic approach to design—one that prioritizes sustainability, well-being, and harmony between humans, nature, and technology—architects are poised to usher in a new era of architectural practice that transcends anthropocentric constraints.

As we venture into a future where architecture seamlessly integrates with XR technologies and embodies cybernetic principles, architects assume a transformative role as mediators between the physical and the digital, the human and the non-human. Through collaborative exploration and iterative experimentation, we chart a course towards a

more harmonious coexistence—one where architecture serves as a catalyst for social, cultural, and ecological transformation.

In conclusion, the evolution of architecture through a post-anthropocentric lens underscores the imperative of interdisciplinary collaboration and technological innovation in shaping the built environment of tomorrow. By embracing XR technologies, cybernetic principles, and post-anthropocentric ideologies, we embark on a journey towards a more sustainable, inclusive, and harmonious architectural practice—one that enriches the human experience and fosters meaningful engagement with our surroundings.

Conflict Of Interest Statement

The authors of the study declare that there is no financial or other substantive conflict of interest that could influence the results or interpretations of this work.

Author Contribution

The authors declare that they have contributed equally to the manuscript.

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Emergency Swarm:
A Digital Fabrication Collective for Post-disaster Scenarios

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Earthquakes in Turkey serve as unfortunate reminders etched in collective memory. Despite years of preparation by governmental and civil organizations for the devastating impacts of earthquakes, organizational challenges persist in the post-disaster. Disasters like the Kahramanmaraş and Hatay Earthquakes on February 6, for which we directed all available resources post-disaster, often exceed the capacity of existing preparations. To address such limitations in the future, the integration of digital fabrication tools and artificial intelligence supported organization of civil collectives emerges as a potential game-changer in disaster management. Additionally, the self-organization of disaster-affected individuals and volunteers has proven to be a critical component of effective disaster recovery planning. These technologies offer innovative solutions to enhance the organization of civil collectives and improve post-disaster response. Within this framework, the paper examines the possible contributions of digital fabrication tools and open-source architectural approaches in disaster recovery planning and explores their applications in emergency scenarios. The culmination of this research proposes the formation of a collective named *Emergency Swarm*, managed by artificial intelligence bots through the *Discord* network. The paper outlines how data would flow within this network and how stakeholders would interact. In conclusion, this research suggests that integrating digital fabrication tools, AI, and self-organization can revolutionize disaster response strategies and enhance community resilience. The potential of the Emergency Swarm network to transform disaster management practices is significant, offering a glimpse into the future of disaster response.

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Acil Durum Sürüsü:
Afet Sonrası Senaryolar için bir Dijital Fabrikasyon Kolektifi

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Türkiye'de yaşanan depremler, toplumsal hafızaya kazınmış hazin birer hatıra niteliğindedir. Geçmiş depremlerin sıklığı ve tazeliği toplumsal olarak ciddi bir eforun ve kaynağın bu afetlere hazırlanmaya harcanmasını gerektiriyor. Yine de, resmi ve sivil kuruluşların bu felaketlere hazırlanmak için devam eden çabalarına rağmen, afet sonrasında önemli organizasyonel sıkıntılar devam etmektedir. En son 6 Şubat'ta meydana gelen Kahramanmaraş ve Hatay Depremleri, müdahale çabalarının mevcut hazırlıkların sınırlarını zorladığı örneklerin en yakın hatırlatıcısı olarak karşımıza çıkmaktadır. Gelecekte bu zorlukların üstesinden gelmek için, dijital üretim araçlarının ve yapay zeka destekli uygulamaların afet yönetimine entegrasyonu potansiyel bir oyun değiştirici olarak ortaya çıkmaktadır. Ayrıca bu teknolojiler, sivil kolektiflerin organizasyonunu geliştirmek ve afet sonrası müdahaleyi iyileştirmek için de yenilikçi çözümler sunmaktadır. Afet anında potansiyel faydaların aranması ve gerekli hızlı tepkinin oluşturulabilmesi bu entegrasyonu araştırmaya yönlendiriyor. Afetten etkilenen bireylerin ve gönüllülerin öz-örgütlenmelerinin afet kurtarma planlamasında önemli aktörler olarak etkin katkı sağladığı vakalar mevcuttur. Bu gibi vakalardan edinilen dersler organizasyonel zorlukları aşmak için daha iyi öz-örgütlenme yeteneğine sahip olmaya yönlendirmektedir. Bu çerçevede makale, dijital üretim araçlarının ve açık kaynaklı mimari yaklaşımların afet kurtarma planlamasına nasıl katkıda bulunabileceğini ve acil durum senaryolarında nasıl uygulanabileceğini araştırmaktadır. Bu araştırma sonucunda ise, Discord ağı üzerinden yapay zeka botları tarafından yönetilen *Acil Durum Sürüsü* adlı kolektifin oluşturulmasını önermektedir. Makale, verilerin bu ağ içinde nasıl akacağını ve paydaşların nasıl etkileşime gireceğini detaylı olarak açıklamaktadır. Etkin bir öz-örgütlenme ağında görev paylaşımı dört grup katılımcı üzerinden yapılabilir. *Üretici, Tedarikçi, Dağıtıcı, Montajcı* olarak isimlendirilen bu roller yapay zeka destekli botlar tarafından koordine edilerek görev paylaşımı ve iş birliği içerisinde çalışabilirler. Sistem ilk olarak görev paylaşımını başlattıktan sonra üretici, tedarikçi ve dağıtıcı arasında iş birliği imkanı sunar. Sonrasında bir montajcı grubu kurarak ilk üç rol ile iş birliği sağlanır. Ayrık üretim yöntemine göre paylaştırılan görevler üretim döngülerini kapatma amacıyla nihayete ulaştırılır. Sistem üretim gerçekleşirken aynı zamanda bu verileri değerlendirerek döngüleri daha iyi versiyonlarına ulaştırma çabası içindedir. Böylelikle süreç içerisinde kendini geliştiren ayrık üretim döngüleri oluşturulur. Sonuç olarak, bu araştırma dijital üretim araçları ve yapay zekanın ve öz-örgütlenmeyle entegrasyonunun afet müdahale stratejilerinde devrim yaratabileceği ve öngörülemeyen zorluklara karşı toplumsal dayanıklılığı artırabileceği üzerinde durmaktadır. *Acil Durum Sürüsü* ağının afet yönetimi uygulamalarını dönüştürme potansiyeli önemlidir ve afet müdahalesinin geleceğine bir bakış sunmaktadır.

Anahtar Kelimeler: Afet, Deprem, Acil Durum Yönetimi, Afet Kurtarma Planlaması, Öz-örgütlenme, Dijital Fabrikasyon, Sürü Zekası, Türkiye

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1. INTRODUCTION

Turkey is located in a geographical landscape that faces high earthquake risk. The seismic events on February 6, 2023, centered in Kahramanmaraş and Hatay, stand out as a traumatic and recent reminder of this danger. Impacting a region inhabited by approximately 15 million people, these earthquakes have left enormous damage. Preliminary assessments indicate that over 500,000 homes were either completely destroyed or suffered severe damage, thrusting more than 2 million individuals into immediate housing challenges (Presidency of Strategy and Budget, 2023; Altunsu et al., 2024). Given the magnitude and intensity of these earthquakes, it is foreseeable that the existing construction sector may prove insufficient to manage the upcoming housing crisis. Immediate attention and strategic measures are necessary to counter and recover from the aftermath of such widespread and impactful earthquakes.

Based on data from the Turkish Statistical Institute (TUIK) in 2023, an average of 640,000 housing licenses were acquired over the past three years. In addition, the apparent surge in both nominal and real house prices in recent years has disrupted the economic equilibrium on the supply side of the housing market. To effectively address the housing problems in earthquake affected regions over the medium and long term, there is a necessity to shift the existing housing industry from other regions. Unfortunately, such a move could potentially disrupt the balance in the housing market.

Furthermore, the envisaged resource transfers, involving the transportation of substantial quantities of building materials, construction equipment, and labor, have the potential to create significant economic and logistical challenges. These challenges might persist for an extended period, causing enduring repercussions in both economic and operational costs. Careful planning and strategic measures are crucial to navigate this challenging scenario and minimize the negative impact on the housing market and the broader economy.

Addressing short, medium, and long-term shelter requirements after a disaster ranks among the most prominent issues (Zhao et al., 2017). Immediately after disasters, solutions like tents and containers, facilitating rapid settlement and installation, are often demanded

(Davis, 2011; Abulnour, 2014). While effective for short-term solutions, these options lack sufficiency over the medium and long term. Prefabricated buildings emerge as a viable alternative, capable of swiftly addressing shelter needs while offering sustainability in the medium and long term (Falza & Hariyadi, 2022). However, it is noteworthy that the current prefabricated building industry in Turkey may struggle to meet the surging demand (Amani & Niyazi, 2018).

In light of this challenge, digital fabrication presents a promising opportunity to balance the extraordinary growth in demand for prefabricated buildings (Gershenfeld, 2012). Embracing computer-aided manufacturing techniques, digital fabrication holds significant potential not only for the construction industry but also for sectors such as furniture, advertising, and vehicles. Notably, it has captured the interest of enthusiastic producers due to its simplified usage possibilities, offering a transformative solution to augment the existing prefabricated building industry's capacity to meet the increasing demand.

Furthermore, the Industry 4.0 concept presents strategies that can unleash the potential of small manufacturers by leveraging digital fabrication tools. A key concept is *Horizontal Networking*, encompassing the integration of manufacturing processes and establishing a robust communication and collaboration network among different stakeholders, businesses, and systems (Deloitte, 2015). This dynamic network facilitates seamless collaboration for small producers, enabling easier engagement with other businesses. Through direct communication and the exchange of data can establish more efficient and integrated supply chain management. Besides, it enables more adaptable production processes and customized products. In this network, when specific skills, production capacity, or resources are needed by other producers or customers, finding suitable resources becomes a streamlined process. Collaborating with other producers within such a network optimizes production in accordance with demand, leading to a more efficient utilization of resources. Therefore, it creates a dynamic environment for small manufacturers connected through digital fabrication tools, forming a production collective that amplifies collaboration, data sharing, demand and resource alignment, flexibility, and scalability – all crucial elements in post-disaster scenarios.

Collaboration among independent manufacturers, particularly those in industries like furniture, advertising, and transportation that have seamlessly incorporated digital fabrication tools into their production workflows, holds significant promise in addressing future post-disaster housing crises. The ability to make swift and independent decisions within a production network, activated during emergencies, provides a viable alternative to relying solely on authorized institutions and the conventional construction industry for meeting post-disaster needs. The utilization of digital fabrication tools in the production of modular houses offers a potential game-changer, especially in situations where the traditional construction sector struggles to meet the growing demand. These modular houses, crafted through advanced fabrication techniques, have the capacity to efficiently supplement the housing industry, offering a responsive and adaptable solution to the challenges posed by disasters. This collaborative approach, leveraging the agility of digital technologies, showcases a forward-thinking strategy to overcome housing crises and foster resilience in the face of unforeseen challenges.

Temel and Durst (2023) emphasized the importance of social media in the Kahramanmaraş and Hatay earthquakes, the significance of mobile communication and coordination applications in emergencies as an area that needs to be explored to minimize the impact of the earthquake and its active impact on disaster management. The lack of digital protocols in disaster management plans for post-disaster response and recovery in Turkey has been seen as a major problem after the recent earthquakes (Yılmaz, 2023). Digital fabrication experts can effectively contribute to disaster management if successfully integrated. Therefore, the paper initiated a preliminary investigation into modular designs achievable through digital fabrication capabilities. This exploration serves as an example of locally customized modular structures, designed in accordance with discrete manufacturing techniques and subsequently implemented by different manufacturers. Additionally, the paper delved into an inquiry concerning expert behaviors and collaborative initiatives in Turkey, particularly during significant events like the COVID-19 pandemic and the Hatay and Kahramanmaraş earthquakes on February 6. This research aims to examine the rapid decision-making process and the potential for post-disaster initiatives in Turkey.

Consequently, the study aims to examine the management processes of a disaster recovery plan on a smaller scale. *Discord* (2015) platform was chosen as the platform for facilitating *Horizontal Networking* among producers, suppliers, distributors, and assemblers. Through this platform, the study provides the production and logistics chains of volunteers, ensuring accurate guidance of their potential during emergencies. Also, this platform, when activated for emergency shelter needs, will be able to execute processes and autonomous activities by assigning tasks to predefined roles. Besides, the study will explore the integration of bots and third-party tools to carry out autonomous processes. The study concludes with an examination of data flow in a practical case study conducted through a Discord channel, leading to the development of organizational support scenarios. These scenarios aim to support the existing industry resilience during emergency scenarios through the disaster management strategy gathered from the research.

2. SELF-ORGANIZATION AND DIGITAL FABRICATION

The influence of advancements in ICT on architectural practice is steadily on the rise. These ongoing developments, fostering a more participatory approach for all actors, hold immense potential. Architects can now freely share projects that adhere to universal design principles on the web, empowering users to customize and locally construct their spaces. The utilization of digital tools in designing modular buildings not only reduces architectural costs but also enhances accessibility.

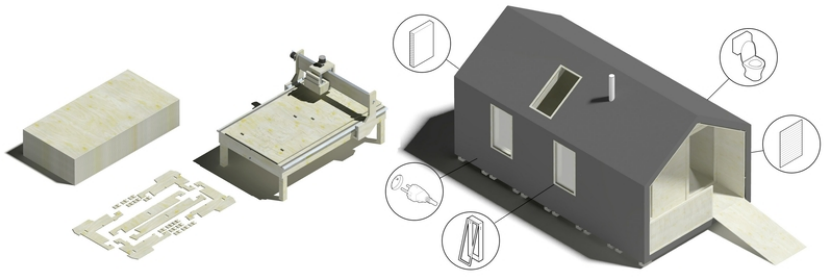
Furthermore, digital technologies can be leveraged for decentralization of disaster management in Turkey in terms of oversight systems, resource-allocation failure, and central-local collaboration (Hermansson, 2018). Jon and Purcell (2018) highlight the benefits of effective use of self-management in disaster recovery planning by examining cases in New Orleans, Indonesia, and Haiti. These cases demonstrate the power of social media and mobile technologies in emergencies. The transforming role of these technologies increases communication between actors and facilitates access to key resources such as materials, labor, and manufacturing opportunities.

Besides, mobile technologies can be deployed effectively to encourage self-organization in the first response to disasters (Nespeca et al., 2020). For example, the digital possibilities facilitating easy access to resources are reshaping the practice of architecture, making it more accessible, transparent, and participatory for a broader audience. The following analyzed cases delve into these potentials, particularly in the context of emergent scenarios.

2.1 Open-source Architecture: WikiHouse

Open-source refers to the intellectual property status of software where the source code is freely accessible, allowing users to view, modify, distribute, and share it according to specified license terms. In the 21st century, the concept of the free flow of information has also influenced the field of architecture. Developers can release architectural designs to users, enabling manufacturers and designers to access, modify, and distribute these designs. This promotes a collaborative, transparent, and participatory approach within the architectural ecosystem. Moreover, open-source projects, being freely available, reach a broad audience, allowing secondary developers to customize and enhance projects according to their specific needs, contributing to debugging and project improvement.

This notion advocates for increased accessibility in architecture, empowering individuals and communities to play an active role in designing and constructing their homes. It enables the democratization of architecture, emphasizing its affordability, sustainability, and adaptability compared to traditional approaches. In this context, *Open-source Architecture* emerges as an alternative to global housing challenges, capable of reaching base levels of society.



Şekil 1: WikiHouse Diagram (WikiHouse Diyagramı) (WikiHouse, 2011).

An exemplary illustration of open-source architecture is *WikiHouse* (2011), a building system empowering individuals to design and construct their homes using open-source projects and digital fabrication techniques like CNC cutting and 3D printing. Originating in 2011, WikiHouse aimed to provide an affordable, simple, and sustainable solution to the escalating global housing crisis. The WikiHouse initiative offers a platform featuring an online library of pre-designed building components, including walls, floors, and roofs. Users can easily customize and assemble these components to create a building design, complete with joint details (Figure 1). Technical details of the components are available for download, allowing for local production of materials and tools. This innovative approach to architecture shows the transformative potential of open-source principles in addressing housing challenges around the world.

2.2 An Emerging Organization in the Pandemic: 3-Dimentional Support

The 3-Dimensional Support (3-Boyutlu Destek) initiative is a collaborative network of volunteer makers spanning diverse locations, united to address specific needs within Turkey. Based on the strategy of the "maker" culture, this movement utilizes digital fabrication tools to address creative solutions for social challenges. Leveraging the power of collective production, a vast network of volunteer makers has been established to respond to needs across every province in Turkey. The initiative's open platform approach, avoiding a corporate identity, has facilitated the outreach to large masses.

During the initial months of the pandemic, the team swiftly organized, collated online data on the requirements of healthcare workers, and harnessed 3D printers to manufacture various materials, including visors and protective equipment, in a remarkably short timeframe. This collective effort showcased the potential of mass production, as manufacturers collaborated to fulfill needs while volunteer couriers efficiently delivered the produced equipment. Scaling rapidly to encompass all 81 provinces of Turkey, the initiative garnered support from over 3000 individuals and institutions. Between March 23 and May 13, 2020, utilizing over 4500 3D printers and mobilizing more than 300 volunteer motorcycle couriers, the initiative produced and distributed over 135,000 mask visors. This exemplifies the impactful

synergy achievable through the convergence of volunteerism, advanced technology, and collective effort in times of critical need (Kap, 2021).

2.3 An Emerging Network for Post-disaster: Earthquake Cooperation Group

The Earthquake Cooperation Group (Deprem Çalışma Grubu) emerged in response to the Kahramanmaraş and Hatay earthquakes, aiming to provide civil society support for earthquake preparedness and contribute to the country's recovery. In the post-disaster, the group directed its efforts towards the *National Housing Project (Ulusal Konut Projesi)*, a comprehensive initiative designed to address housing challenges in the aftermath of earthquakes. This visionary project proposes city-scale solutions to ensure housing for all citizens, envisioning 20 new cities with a focus on sustainability and local relevance at the urban scale. The initiative operates collaboratively with diverse stakeholders, including urban planners, economists, local communities, politicians, and municipalities, to bring the national housing project to life. Through this multi-faceted collaboration, the goal is to implement the project sustainably and in alignment with social needs.

Operating on the Discord (2015) platform, the earthquake working group serves as a dynamic hub for research, planning, and implementation processes integral to project development. It exemplifies the effective use of social media to address the urgent housing needs in the post-earthquake period and prepare for similar disasters in the future. Within the Discord platform, volunteers assume various roles, including architects, civil engineers, urban and regional planners, and academicians. Specialized channels and sub-working groups facilitate interdisciplinary interactions, allowing volunteers to exchange information and conduct research tailored to their areas of expertise. This collaborative and innovative approach highlights the transformative potential of digital platforms and collective expertise in addressing critical challenges in the aftermath of natural disasters (Elik, 2023).

3. EMERGENCY SWARM

The previous section demonstrates the impactful role of a manufacturing community seamlessly integrated with digital fabrication opportunities and social media platforms in fortifying measures against earthquake risks in Turkey. In this context, emergency shelter examples such as *WikiHouse*, where almost all parts can be produced with digital fabrication tools, can be included in disaster recovery planning. Modular designs, compatible with digital fabrication capabilities, present an appropriate manufacturing methodology convenient for discrete manufacturing. In the framework, all components required for a shelter unit can be organized as a task and assigned to different specialists. Each component can be fabricated in different manufacturing facilities, labeled appropriately, and transported disassembled to the construction site. In this scenario, a housing unit produced with digital fabrication tools can be transformed into an effective disaster recovery strategy through self-organization of specialists. Initiatives like the *3-Dimensional Support* team, which emerged during the global pandemic, and the *Earthquake Cooperation Group*, organized after the Kahramanmaraş and Hatay earthquakes, highlight the resilience of volunteer experts in Turkey to swiftly interact and collaborate.

In addressing the emergency shelter challenge, a unified platform encompassing manufacturing, procurement, distribution, and assembly, engaging volunteer manufacturers, logistics professionals, and a suitable workforce, can furnish rapid and organized solutions. Discord (2015) stands as a powerful network for collective organizations and provides a series of tools for collaboration, communication, and coordination with a substantial user base. Supporting both voice and text communication, it fulfills various needs like meetings, discussions, instant messaging, and information sharing. Its versatile features, including channels and roles, enable the creation of separate channels for different projects or tasks, with members assigned distinct roles. Integration with AI-supported bots and third-party tools further enriches its functionality. Customizable bots can execute tasks such as meeting reminders, voting systems, task tracking, and more.

Considering its extensive configuration options, Discord proves to be a platform that enhances organizational efficiency, promoting better

organization and more effective task sharing in collective efforts. Bots and various integrations automate workflows, thereby augmenting efficiency. In light of the preliminary research, Discord emerges as a highly suitable platform for a production network activated during emergencies, offering a versatile and efficient environment for collaborative efforts.

3.1 Framework of Roles: Producer, Supplier, Distributer and Assembler

Free-to-join networks must establish mechanisms for distinguishing between organic users and bots, a crucial step for ensuring channel security and sustained functionality. Identifying organic users also serves as an early security measure to prevent potential abuse and malicious interference. To streamline interactions within the organization and ensure mismatches based on tasks and qualifications, volunteers can be categorized into sub-groups based on their skills and abilities.

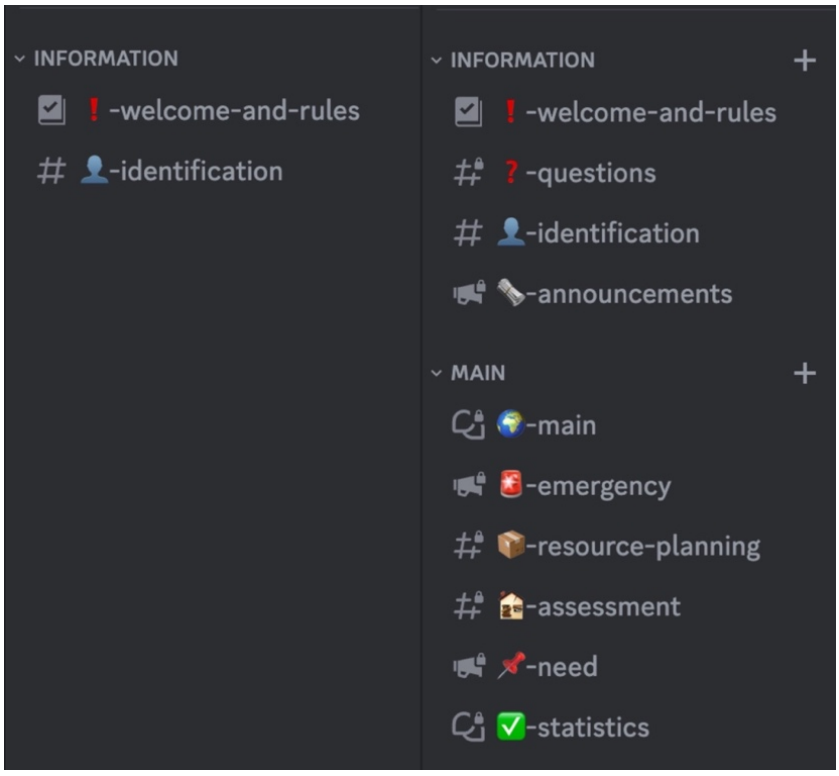


Figure 2: Forum, announcement, and text channels activated after volunteer roles are assigned (Gönüllü rolleri atandıktan sonra aktive olan forum, duyuru ve metin kanalları) (Discord, Emergency Swarm Community).

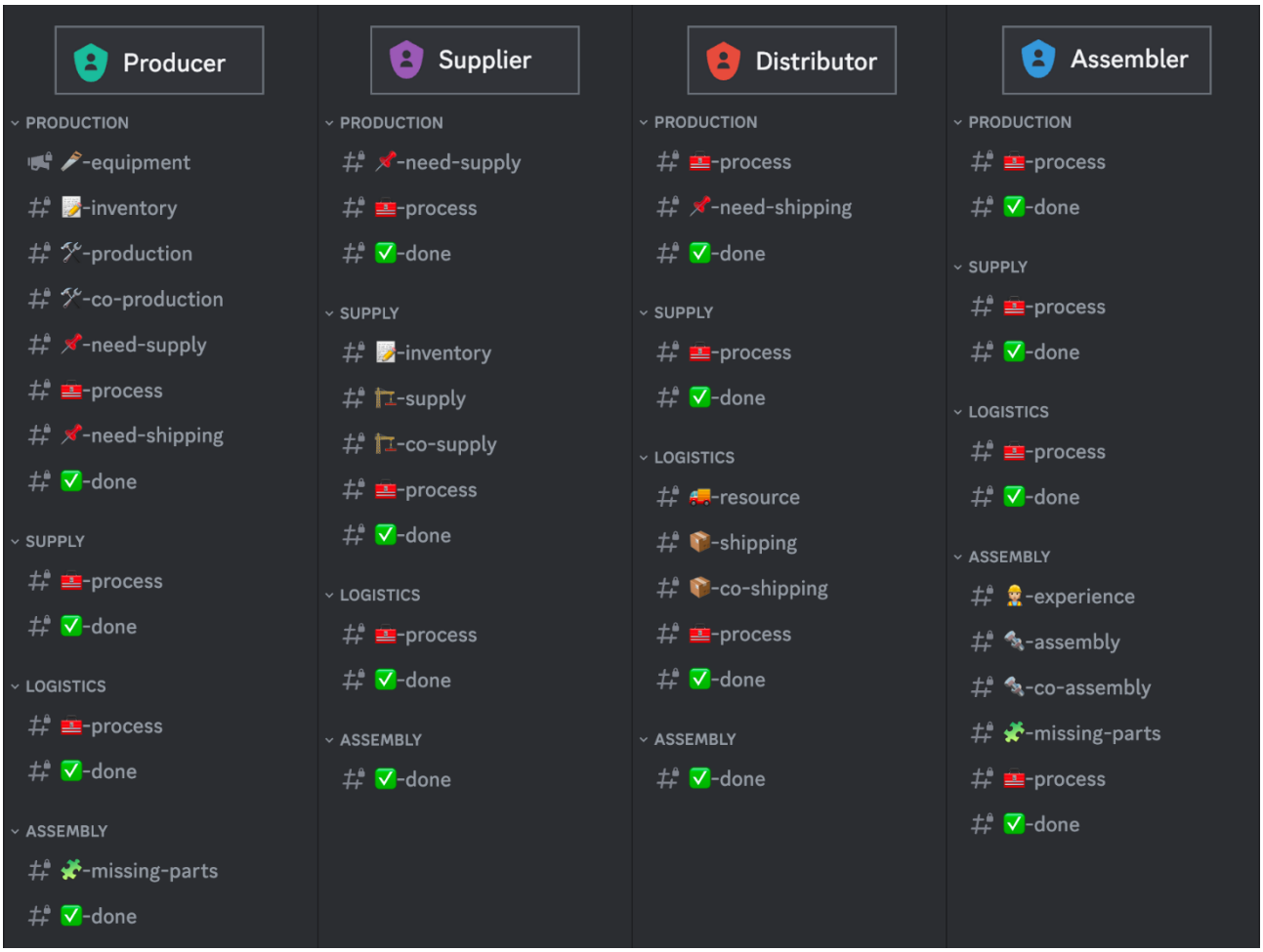


Figure 3: Sub-organizational channels involved according to volunteer roles (Gönüllü rolleri ne göre dahil olunan alt organizasyon kanalları) (Discord, Emergency Swarm Community).

After an external volunteer joins the channel, a questionnaire is administered to measure quantitative and qualitative characteristics. The questionnaire results determine the volunteer's role — *Manufacturer, Supplier, Distributor, or Assembler*. This role assignment allows for the creation of categories defining sub-organizations, ensuring that individuals can only access fulfillment channels corresponding to their voluntary roles.

The *INFORMATION* category (Figure 2) encompasses announcement channels, including welcome-and-rules, questions and answers, identification and participation surveys, and announcements. Besides, the *MAIN* category (Figure 2) includes forums, announcements, and text channels for introductions, general conversations, emergency messages, resource-planning, post-disaster needs assessment, shelter needs data, and completion statistics. Both categories are open to volunteers of all roles and can be accessed at any time. The public

channel serves as a forum, while the other channels in the category activate during emergencies, remaining open to receive messages. This structured approach ensures efficient communication, task alignment, and streamlined collaboration within the network.

A participant with the role of **Producer** engages with the announcement and text channels illustrated in **Figure 3**. *Equipment* and *Inventory* serve as announcement channels, displaying real-time data on equipment, labor, resources, and raw materials after *Resource-planning*. These channels, summarizing the overall status of the production sub-organization, aim to monitor capacity throughout the process and ensure the proper allocation of resources. The *Production* channel is designed to assign a single producer and facilitate the transfer of necessary documentation for production to volunteers. Processing equipment, inventory, and location information, offers are dispatched, starting with the most suitable candidates. In cases where a single producer cannot handle the task, it is subdivided and shared among multiple producers through the *Co-production* channel. Material support can be integrated into the process through the joint inventory *Need-supply* channel between the producer and supplier roles. The *Process* channel serves as an announcement channel where incomplete production statistics can be tracked by all volunteer roles. This enables individuals within the organization to access completion percentages of tasks, allowing them to schedule their tasks effectively based on the flowchart. When the anticipated completion time for the production process is determined, the appropriate distributor is matched with the product based on location and capacity using the shared *Need-Shipping* channel, common for both the producer and distributor volunteer roles. Following the delivery by the producer, they can receive new orders, and the data in the *Done* and *Statistics* channel is updated and accessible to all volunteers. This structured approach ensures transparency, efficiency, and seamless collaboration within the production network.

A participant taking the role of **Supplier** actively engages with the announcement and text channels outlined in **Figure 3**. After *Resource-planning*, the *Inventory* channel functions as an announcement platform, providing real-time data on current warehouse capacity and raw material availability. This channel enables suppliers to access occupancy rates in their warehouse network, facilitating informed

resource routing. After identifying the needed materials in the *Need-supply* channel, offers are extended to suitable individual suppliers, considering factors such as inventory levels, transportation, and location data. In cases where a single supplier cannot handle the task, it is segmented into sub-parts and shared among multiple suppliers through the *Co-supply* channel. The *Process* channel serves as an announcement platform where incomplete procurement statistics are visible to all volunteer roles. Once the supplier fulfills the order, they can receive a new request, and the data in the *Done* and *Statistics* channel is updated and accessible to all volunteers. This streamlined approach ensures transparency, efficiency, and collaborative success within the supply network.

A participant undertaking the volunteer role of Distributor engages with the announcement and text channels shown in Figure 3. After *Resource-planning*, the *Resource* channel operates as an announcement platform, providing real-time data on vehicle availability, driver information, and fleet status. Distributors utilize this channel to assess the current capacity of their logistics network, enabling strategic planning for resource transfer collaborations like shared distribution and driver-vehicle pairings. After identifying the need for shipping in the *Need-Shipping* channel, an offer is dispatched to the suitable individual distributors in the *Shipping* channel, considering resource and location data. Should a single distributor prove insufficient for the task, the responsibility is intelligently subdivided and shared among multiple distributors through the *Co-Shipping* channel. The *Process* channel serves as an announcement platform where incomplete supply statistics are accessible to all volunteer roles. Following the successful delivery by the distributor, they seamlessly receive a new order, and the data in the *Done* and *Statistics* channel is promptly updated and available for viewing by all volunteers. This systematic approach ensures transparency, operational efficiency, and collaborative success within the distribution network.

A participant assuming the Assembler role engages with the announcement and text channels outlined in Figure 3. Given that the Assembler role operates in the final stage of the entire process, participants with this role have access to all process channels, distinguishing them from other volunteers. The *Experience* channel

functions as an announcement platform, presenting current experience, equipment, and labor data post-resource planning. Within this channel, experienced and inexperienced teams can strategize collaborations and coordinate resource transfers. Assignments in the assembly and production channels are inherently interconnected. Essentially, the process commences after the manufacturer and assembler are matched. The channel processes information on experience, equipment, workforce, and location, sending offers starting with the most suitable candidates. In instances where a single assembly team cannot be assigned, teams of experienced and inexperienced volunteers are formed in the *Co-Production* channel, and the task is intelligently divided into sub-parts among multiple assemblers. If defective or missing parts are detected during the process, a new rapid procurement cycle is initiated in the *Missing-Parts* channel, involving both manufacturer and assembler roles. The *Process* channel, specific to the assembler role, can only be viewed by participants in this role. Given that the volunteer team at the end of the cycle is involved in this process, the channel is exclusive to the assembler role. Upon the assembly team's on-site delivery completion, they can undertake a new task, and the data in the *Done* and *Statistics* channel is promptly updated, accessible to all volunteers. This intricate yet systematic approach ensures transparency, operational efficiency, and collaborative success within the assembly process.

Additionally, volunteers within the network have the flexibility to assume multiple roles. For instance, individuals acting as both material suppliers and producers with extensive inventories may not require additional materials. In such cases, the system seamlessly integrates these cycles internally. Similarly, producers equipped with an assembly team have the capability to conduct the entire process in-house, leveraging the organizational chart and contributing solely to the statistical data. Within this network, volunteers can establish an initiative with the capacity to execute assigned tasks quickly and appropriately, enabling quick and effective decision-making. As a result, an emergency shelter designed in Plywood or OSB material can be manufactured through the collaboration of these four groups of volunteer, divided into sub-tasks. In this pre-planned process, seamless collaboration is more important than manufacturing techniques or architectural design. The division of the current task into as many sub-groups as possible emphasizes opportunities such as rapid response.

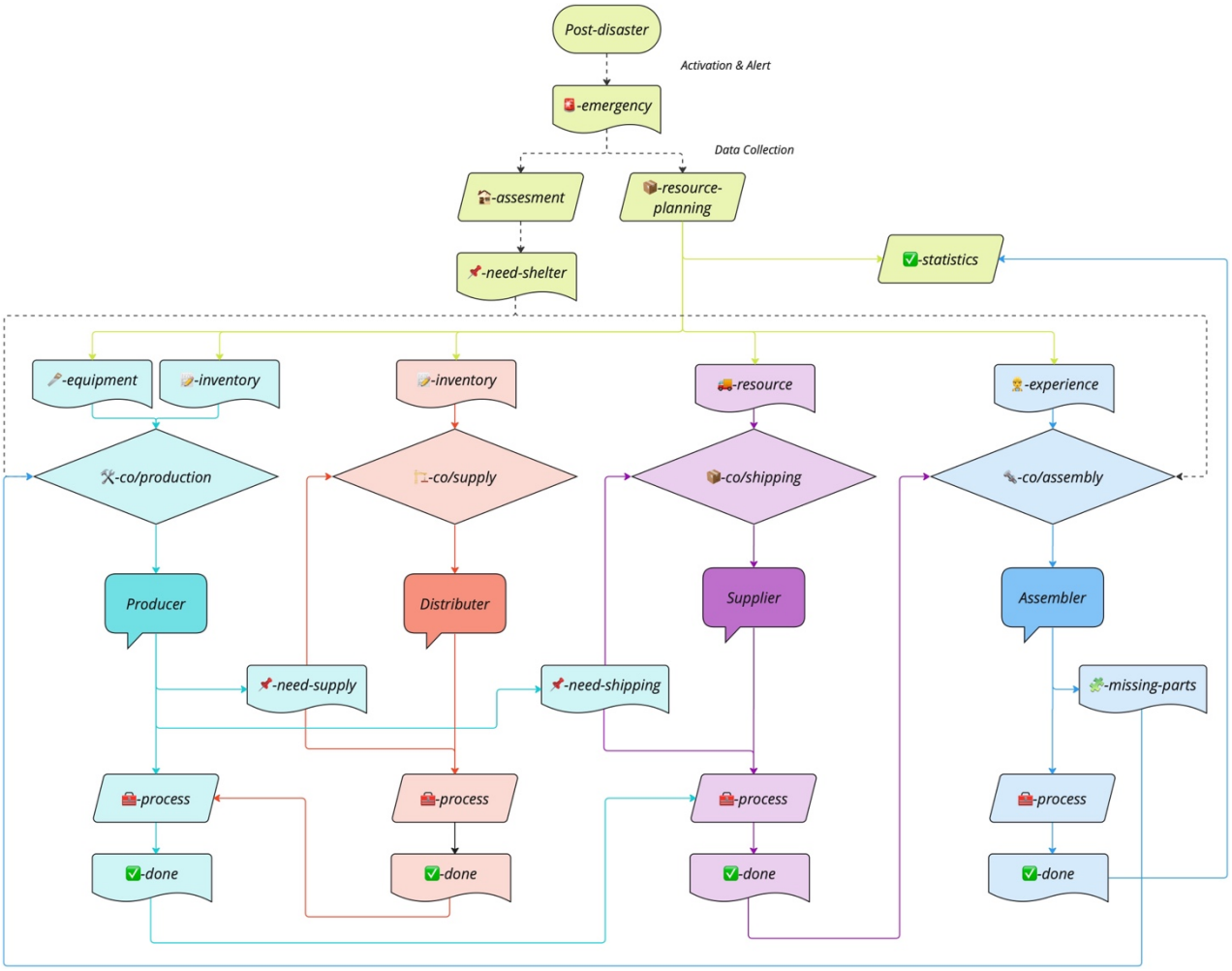


Figure 4: Data Flowchart (Veri Akış Şeması).

3.2 Data Flowchart: Production, Supply, Distribution and Assembly Network

Simplifying administrative systems necessitates exposing individuals to an optimal amount of data. Uncontrolled data flow can complicate tracking and reduce task adoption rates. Hence, it is crucial to tailor the data visibility for each user and distribute tasks with precision. This calls for a diligently planned data flow and task hierarchy, illustrated in **Figure 4** by the closed loop of channels triggering one another, as detailed in the preceding section.

The system is set in motion post-disaster through the activation of AI bots, which initiate an emergency state for users. Initially, these AI bots conduct an *Assessment* and *Resource-planning* to evaluate the current

situation. Subsequently, the average *Need-shelter* is determined, facilitating the matchmaking between the *Producer* and *Assembler* teams. Throughout the process, AI bots continuously gather equipment, inventory, resources, and experience data, leveraging statistical evaluation to make new matches within the loop. These efficiency-maximizing assessments are then shared with users via the *Done* and *Statistics* channel. This organized approach ensures a controlled and efficient flow of information, promoting better tracking and user engagement.

3.3 Self-organization with AI Bots

AI bots offer an avenue for self-organization, proving particularly invaluable in fostering collaboration during emergencies. Discord supports various types of AI bots designed for distinct purposes, including moderation, engagement, information, and emergency response bots. These bots, when employed collaboratively with humans, can elevate situational awareness, streamline data collection, enhance analysis and visualization, and facilitate communication in emergency scenarios. In Discord channels, these emergency response bots can contribute to triage and coordination, data collection and analysis, situational awareness, disaster response robots, as well as communication and information sharing. By managing and automating various tasks, AI bots empower users to concentrate on collaborative efforts and support emergencies (Midha, 2023; TopAI.tools, 2024).

While AI bots offer valuable contributions to emergency response, potential challenges must be acknowledged. One concern is the potential for AI systems to inherit biases from training data, potentially leading to inaccurate predictions. AI bots, in particular, may struggle to comprehend certain human responses, especially in crises, and may not fully replace human interaction. Another consideration is the risk that vulnerable users may overestimate the benefits of AI bots and encounter unforeseen risks, particularly during a crisis. Additionally, the inherent susceptibility of AI systems to errors raises concerns about potential liability issues. To address these challenges, it is crucial to implement rigorous safety measures, establish robust regulations, and promote collaborative standards to ensure the responsible and ethical use of AI technologies (Banafa, 2023).

4. DISCUSSION

One primary concern with this system revolves around its activation during a disaster and its ability to accurately detect the situation. This research did not have the opportunity to experiment with the *Emergency Swarm* platform with real actors. Nor has this paper been able to answer questions about its activation in the case of a real disaster. However, it presents an innovative scenario as an introductory phase of a large-scale research that could be examined as a scientific research project. Only a study of this scope can address the questions about this platform and answer whether collaboration with all experts can be established, whether AI bots can foster self-organization, and whether the architectural aspects of the product will be satisfactory.

Besides, questions regarding the activation and proper guidance of AI bots in the activation of this scenario also need to be investigated. While tracking Twitter data is one potential approach, historical instances, such as Microsoft's Tay chatbot in 2016, being miseducated as a Nazi supporter and racist, underscore the vulnerability of bots to deliberate manipulation (Schwartz, 2024). Despite advancements in AI technology since 2016, the risk of active data tracking being misdirected by harmful actors with artificial data remains, necessitating thorough testing and long-term development for bots serving as managers. Besides, there is a risk that these bots might unintentionally push volunteers beyond their capacity. Relying solely on completion data tracking might lead to the exhaustion of highly dedicated volunteers. To reduce this, precautionary mechanisms should be implemented, such as assigning easier tasks when a certain capacity threshold is exceeded.

In addition to equitable task distribution within the platform, measuring system sustainability requires the involvement of real actors. Implementing a rank system based on task completion and system finalization can offer statistical records and measure efficiency on a volunteer basis. Pairing more experienced individuals with less experienced ones can facilitate knowledge transfer within the system. Assigning relatively easier tasks to inexperienced volunteers serves both as an incentive and a training opportunity. Additionally, the system can be enriched with information on volunteers' production methods, capacities, supply chains, and transportation networks.

Furthermore, evolutionary approaches, such as observing volunteer behavior and training agents in experiments without using real actors, can further enhance the training of AI bots. Swarm intelligence, leveraging a reward and punishment mechanism, allows bots to strive for successful task completion despite incomplete knowledge. The methods applied by ant swarms to construct structures could be a subject of this research for AI bots to direct the experts. Also, optimization bots using genetic algorithms, for instance, can make precise matches between logistics and fabrication.

Looking ahead, a future projection involves developing a nationwide earthquake organization application, integrating a BIM system, and functioning as a comprehensive work management network. The inclusion of digital fabrication experts in disaster recovery planning is the unique value of this research. An effective future scenario needs to include this potential and explore the possibilities. Recent collective assistance events following the Kahramanmaraş and Hatay earthquakes demonstrate Turkey's suitability for implementing such a system. Meeting the urgent housing needs post-disaster requires transcending existing boundaries and dedicating efforts beyond current capacities.

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A Qualitative Study on the Effectiveness of Generative Artificial Intelligence in Graphic Design Practice

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Developments in artificial intelligence technology are not only changing our business processes and production methods, but also reshaping our understanding of creativity and design. For the graphic design field, this situation has initiated a new technological leap process. In the field of graphic design, artificial intelligence technology has been used in areas such as automatic image creation, design suggestions, colour and layout optimisation after the 2010s, especially with the advances in deep learning and machine learning technologies. In this study, it was aimed to examine the possible effects of artificial intelligence on graphic design processes, designers' adaptation process to artificial intelligence technology, their perspectives on this technology, the innovations and possible changes it brought to the field of graphic design. In this context, a case study has been conducted with the participation of seven expert and professional designers in order to examine the effectiveness of generative artificial intelligence in the field of graphic design. Three research questions were determined; (RQ1) What are the positive and negative effects of artificial intelligence-based applications, such as Dall-e a generative artificial intelligence tool, on design processes and designers' working dynamics? (RQ2) What are the effects of the designer's practice of generating prompts at the beginning of the design process on the quality of the resulting design? (RQ3) What are the difficulties faced by designers when using the Dall-e application, and what are the advantages and disadvantages of the application? In order to evaluate the overall effectiveness of the integration of the Dall-e AI application into different design disciplines, various fields such as logo design, food packaging design and poster design were selected. The reason for choosing the field of logo design is to examine how Dall-e brings together the symbolic and abstract elements of logo designs and to investigate its ability to produce original and meaningful symbols. The reason for choosing the packaging design field is to investigate how the packages created by Dall-e are associated with three-dimensional objects and how they convey the physical properties of the product. The field of poster design was chosen to evaluate Dall-e's illustrative abilities in visual production. The designers produced visual outputs with the prompts they wrote in line with the briefs given using Dall-e, and evaluated the visual outputs created during the study. The results of this study indicate that integrating the Dall-e AI tool into design processes can yield significant time savings for designers and enhance productivity due to its capacity for rapid production. It is important to create detailed and clear prompts in order to significantly affect the quality of visual outputs with the Dall-e. Additionally, these technologies can be used as a new specific preliminary research tool for designers can increase the productivity of designers and create more time for their creative processes.

Keywords: Artificial Intelligence, Computational Design, Graphic Design, GAN, Generative Design.

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Grafik Tasarım Pratiğinde Üretken Yapay Zekânın Etkinliği Üzerine Nitel Bir Araştırma

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Yapay zekâ teknolojisindeki gelişmeler, artık sadece iş süreçlerimizi ve üretim yöntemlerimizi değiştirmekle kalmıyor; aynı zamanda yaratıcılık ve tasarım anlayışımızın da yeniden şekillendirilmesine neden oluyor. Bu gelişmeler, grafik tasarım alanı için yeni bir teknolojik sıçrama sürecini başlatmıştır. Grafik tasarım alanında yapay zekâ teknolojisi, özellikle derin öğrenme ve makine öğrenmesi teknolojilerindeki ilerlemelerle birlikte 2010 yılından itibaren otomatik görüntü oluşturma, tasarım önerileri, renk ve düzen optimizasyonu gibi alanlarda kullanılmaya başlanmıştır. Bu kapsamda, yapay zekâ teknolojilerinin grafik tasarım alanıyla etkileşimini, bu alana entegrasyonunu ve tasarım süreçleri ile grafik tasarımcılar üzerindeki olası etkilerini incelemek amacıyla alanlarında uzman ve profesyonel 7 grafik tasarımcının katıldığı vaka çalışması gerçekleştirilmiştir. Yarı yapılandırılmış görüşmeler kapsamında tasarımcılar, bir üretken yapay zekâ aracı olan Dall-e'yi kullanarak verilen briefler doğrultusunda yazdıkları istemler (promptlar) ile görsel çıktılar üretmiş ve çalışma sırasında oluşturulan görsel çıktıları tasarım kriterlerine göre değerlendirmişlerdir. Çalışma sürecinde, grafik tasarım alanında yapay zekâ uygulamalarının geleceği, olumlu ve olumsuz yönleri, istem oluşturma pratiğinin elde edilen görsel sonuca etkisi, Dall-e kapsamında oluşturulan görsellerin yeterliliği, gelişen bu teknolojinin gelecekte tasarımcıların rolünü nasıl değiştirebileceği, tasarımcıların yaratıcılık ve özgünlük algıları, tasarımcıların teknik beklentileri ve yapay zekâ kullanımı sırasında karşılaştıkları zorluklar ve olanaklar üzerinde durulmuştur. Bu kapsamda yapılan çalışmalar sonucunda yapay zekâ teknolojilerinin poster ve ambalaj tasarımı alanında oldukça verimli bir araç olarak kullanılabileceği ancak logo tasarımı konusunda halen yetersiz olduğu sonucuna varılmıştır. Tasarımcıların bu alanda güncel olmaları gerektiği vurgulanarak, grafik tasarım eğitimi veren kurumların da eğitimlerinde üretken yapay zekâları kapsayacak şekilde güncellenmesi tavsiye edilmiştir.

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Anahtar Kelimeler: Grafik Tasarım, GAN, Hesaplamalı Tasarım, Üretken Tasarım, Yapay Zekâ.

1. GİRİŞ (INTRODUCTION)

Grafik tasarım alanı, teknolojik gelişmeler ile birlikte sürekli olarak değişmekte ve yenilenmektedir. Günümüzde, YZ (yapay zekâ) teknolojilerinin hızla gelişmesi, bu alanı tekrar önemli bir dönüşüm sürecinin içine girmesine neden olmuştur. Grafik tasarımın geleceğini şekillendirme potansiyeline sahip bu teknoloji, tasarım pratiğindeki kavramsal ve uygulamalı değişikliklerin bir yansımasıdır. 2010 yılından itibaren grafik tasarım alanında, başlangıçta görüntü işleme, tipografi ve düzen gibi tekrarlanan görevlerin otomatikleştirilmesi için kullanılan YZ teknolojisi, işlevsellik ve kapsam bakımından kısıtlamalara sahip olmasına rağmen, son yıllarda daha gelişmiş YZ tabanlı yöntem ve araçlarının oluşumuna zemin hazırlamıştır (Mustafa, 2023). Özellikle derin öğrenme ve sinir ağlarındaki ilerlemeler sayesinde, artık büyük veri kümelerini benzersiz bir şekilde değerlendirerek yorumlayabilir hale gelen bu teknoloji, tasarımcılara renk seçenekleri ve kompozisyon gibi konularda oldukça faydalı araçlar sunmaya başlamıştır (Mustafa, 2023). YZ, veri ve algoritmaların inovasyon süreçlerine entegrasyonu yoluyla tasarım ve inovasyon anlayışımızı köklü bir şekilde dönüştürmektedir. Bu durum, tasarımcıların tasarım süreçlerinde öğrenme ve adaptasyon yeteneklerini geliştirmekte, böylece tasarımın bir karar verme ve problem çözme süreci olduğu gerçeğini öne çıkartmaktadır (Vergant, Vendraminelli, & Iansiti, 2020). Grafik tasarım alanında, YZ teknolojisindeki bu gelişmelerin, YZ'nın tasarım süreçlerinde yenilikçilik ve adaptasyon, zaman tasarrufu ve verimliliği artırma, yaratıcı süreçlere yardımcı olma, yenilikçi tasarım seçenekleri sunma, özelleştirilmiş ve benzersiz içerik üretme gibi konularda oldukça etkili olabileceği düşünülmektedir. Bu teknolojinin tasarım dünyasında yeni bir dönemin kapılarını aralayacağına inanılmaktadır. (Jockims, 2022). Kulkarni ve arkadaşlarının yaptığı bir çalışmada, profesyonel olmayan tasarımcıların YZ ile görsel oluştururken yazdıkları promptları test edip geliştirerek daha iyi sonuçlara ulaştıkları belirtilmiştir. Ayrıca, YZ modellerinin tasarım süreçlerini yenilikçi biçimde geliştirdiğini ve tasarımcı olmayanların da bu araçlarla etkili tasarımlar üreterek tasarım süreçlerine dahil olabilecekleri ifade edilmiştir (Kulkarni, ve diğerleri, 2023). Mustafa (2023) ise çalışmasında, bu araçların bilinçsiz kullanımıyla oluşturulan tasarımların benzerlik ve aynılaşma riski taşıması nedeniyle, yaratıcılık ve özgünlüğe değer veren bir sektör için

ideal olmayacağını belirtmiştir. Luis (2023) çalışmasında, YZ uygulamalarının grafik tasarım süreçlerini hızlandırdığını ve yaratıcılığı desteklediğini ancak nihai tasarım sonuçları için insan tasarımcıların müdahalesinin gerekli olduğunu belirtmiştir. Hashemieh (2020) ve Hien (2023) benzer şekilde, YZ araçlarının grafik tasarım süreçlerine yardımcı olabileceğini, ancak insan tasarımcıların yerini bu araçların almayacağını belirtmişlerdir. Melamin de (2022) çalışmasında, tasarımcıların YZ'yı bir tehdit olarak görmediklerini, aksine rutin görevleri devralarak yaratıcı faaliyetler için tasarımcılara alan açabilecek fırsatlar olarak değerlendirdiklerini belirtmiştir. Liu (2023) ise, bu yeni teknolojinin grafik tasarım alanını önemli ölçüde iyileştirdiğini, alışılmış yöntemlere göre daha karmaşık ve estetik durumlara iyi çözümler sunduğunu belirtmiştir. Li de (2020), bu teknolojinin, daha yenilikçi ve etkili tasarımların oluşumuna imkân sağlayarak, grafik tasarım alanında büyük bir değişim oluşturma potansiyeline sahip olduğunu ifade etmiştir. Aynı şekilde, Meron da (2022), YZ'nın tasarım süreçlerini geliştirebileceğini belirtmiş ve tasarımcılar ile bilgisayar mühendislerinin iş birliğinin bu teknolojinin, tasarımın yaratıcı yönlerini keşfetmesinde önemli rol oynayabileceğini vurgulamıştır. Ancak, Fatima (2023) tasarımcıların bu teknolojiye aşırı güvenmelerinin oluşturulan işlerde özgünlüğün ve yaratıcılığın azalabileceği konusunda endişeler olduğunu, tasarımcıların bu teknolojiye bağımlı hale gelmelerinin oluşturulan tasarımların aynılaşmasına ve tasarımcıların tembelleşmesine yol açabileceğini belirtmiştir.

Bu bağlamda çalışmada, YZ'nın grafik tasarım süreçleri üzerindeki potansiyel etkilerini, tasarımcıların YZ teknolojisine adaptasyon sürecini, bu teknolojiye bakış açılarını, grafik tasarım alanına getirdiği yeniliklerin ve olası değişikliklerin incelenmesi amaçlanmış ve bu kapsamda üç araştırma sorusu belirlenmiştir;

1) Dall-e gibi YZ tabanlı uygulamaların tasarım süreçleri ve tasarımcıların çalışma dinamikleri üzerindeki olumlu ve olumsuz etkileri nelerdir?
2) Tasarımcının tasarım sürecini başlatırken istem (prompt) oluşturma pratiğinin sonuçta elde edilen tasarımın niteliğine olan etkileri nelerdir?
3) Tasarımcıların Dall-e uygulamasını kullanırken karşılaştıkları zorluklar, uygulamanın avantajları ve dezavantajları nelerdir?

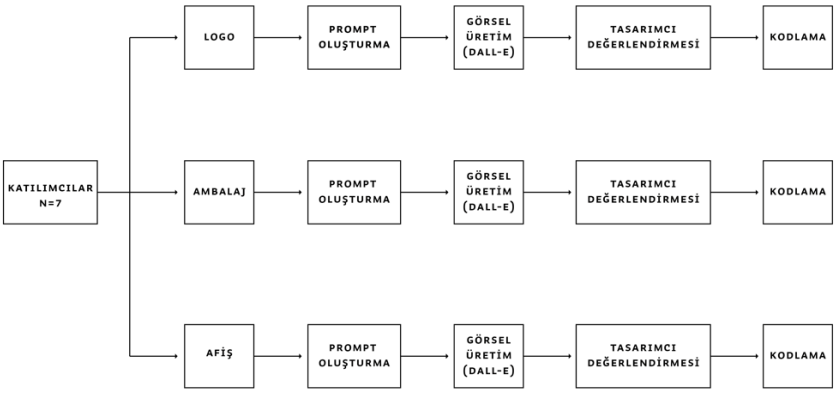
2. GRAFİK TASARIM ALANINDA YAPAY ZEKÂ (DALL-E) UYGULAMALARINA İLİŞKİN VAKA ÇALIŞMALARI (CASE STUDIES ON ARTIFICIAL INTELLIGENCE (DALL-E) APPLICATIONS IN GRAPHIC DESIGN)

Bu çalışma, bir yüksek lisans tezi kapsamında gerçekleştirilmiştir. Çalışmada, belirlenen araştırma sorularına yanıt aramak üzere 7 grafik tasarımcının katıldığı bir vaka çalışması yapılmıştır. Bu kapsamda, tasarımcılarla yapılan görüşmelerde (a) grafik tasarım alanında YZ uygulamalarının geleceği, (b) YZ uygulamalarının grafik tasarım alanına olumlu ve olumsuz yönleri, (c) istem oluşturma pratiğinin elde edilen sonuca etkisi, (d) Dall-e kapsamında oluşturulan görsellerin yeterliliği, (e) gelişen bu teknolojinin gelecekte tasarımcıların rolünü nasıl değiştirebileceği, (f) tasarımcıların yaratıcılık ve özgünlük algıları, (g) tasarımcıların teknik beklentileri ve YZ kullanımı sırasında karşılaştıkları zorluklar ve olanaklar üzerinde durulmuştur.

2.1 Yöntem ve Süreç (Method and Process)

Çalışmalar, yaklaşık 1 saat süren yarı yapılandırılmış görüşmeler kapsamında, 4 ü kadın 3'ü erkek toplam 7 ayrı grafik tasarımcı ile farklı zamanlarda, Google Meet üzerinden ses ve ekran kayıtları alınarak gerçekleştirilmiştir. Katılımcıların 2'si Mimar Sinan Güzel Sanatlar Üniversitesi Grafik Tasarım bölümünde öğretim elemanı, 3'ü profesyonel tasarımcı ve 2'si öğrencidir. Katılımcıların yaş aralığı 26 ile 46 arasındadır. Bu çalışma uzman kullanıcıların bir üretken YZ aracının grafik tasarımın belli alanlarındaki kullanımı ile ilgili kullanıcı görüşlerinin toparlanıp yorumlanmasını hedefleyen bir çalışmadır. Literatürde nitel araştırmalarda ulaşılması gereken katılımcı sayısı ile ilgili bir görüş birliği yoktur (Baker ve ark., 2012). Nitel araştırmanın sayısallaştırılıp istatistik analizler yapılmasının amaçlanması kullanıcı sayısını yüksek tutmayı gerektiren başat faktörlerden biridir (Macefield, 2009). Bu çalışmada ise kullanıcı görüşlerinin çeşitliliğinde (olumlu ve olumsuz) doygunluğa ulaşmak amaçlanmıştır. Nielsen ve Landauer'in (1993) belli bir zaman, alan veya hacimde belli bir olayın gerçekleşme sayısını modellemede kullanılan Poisson sürecine referansla hesapladığına göre 7 kişilik bir kullanıcı grubu ile olası durumların %60-90'ı tespit edilebilir. Bu çalışmada 7 kişilik grup aynı alanda 3 farklı konuda çalışmıştır. Çalışmanın tekrarlanması da olası olayların tespitinde kolaylaştırıcı bir rol oynamaktadır.

Çalışma kapsamında her bir katılımcı A, B, C, D, E, F, G şeklinde kodlanmıştır. Her tasarımcı, içerikleri belirlenen logo, gıda ambalajı ve afiş tasarım briefleri doğrultusunda üç alan için ayrı ayrı üçer ayrı istem oluşturmuş ve her bir istemi üç kez Dall-e YZ uygulamasına girerek tek bir tasarım alanı için 9 görsel üretim gerçekleştirmiş, diğer tasarım alanları için de aynı protokolü uygulayarak toplam 27 görsel çıktı elde etmişlerdir (Şekil 1). Dall-e tarafından oluşturulan görsel çıktılar arasından her bir alan için katılımcıların tasarım kriterlerine en çok uyan üçer görsel çıktı seçilmiş ve değerlendirilmiştir. Daha sonra görüşmelerden elde edilen veriler nitel analiz yöntemi ile analiz edilerek kod kitapları çıkartılmış ve çıkartılan kod kitapları kapsamında çalışmanın bulgular kısmı elde edilmiştir.



Şekil 1: Vaka çalışmaları akış diyagramı (Flow diagram of the case studies) (Şekerli, 2024).

2.1.1 Çalışmalarda Dall-e Yapay Zekâ Aracının Kullanım Nedenleri ve Versiyonu (Reasons for Using Dall-e Artificial Intelligence Tool in Studies and Version)

Araştırmada, Dall-e'nin 3. versiyonu kullanılmıştır. Dall-e 3'ün tercih edilme nedeni, özellikle insan detayları gibi hassas unsurlarda metin oluştururken önceki modellere kıyasla getirdiği belirgin gelişmelerdir. Dall-e 3, özellikle görüntülere eklenmiş okunabilir metinler gibi yeni özellikler sunarak kullanıcıların geniş bir yaratıcılık ve esneklik alanına erişimini sağlamaktadır (Franzen, 2023). Dall-e 3'ün metin/tipografi ile görüntü oluşturma becerisi, kullanıcıların daha karmaşık ve detaylı görüntüler oluşturmasını sağlayarak görsel iletişimde etkili bir şekilde kullanılmasına olanak tanımaktadır. Mevcut durumda, diğer YZ modellerinin metin ve tipografi ile görüntü oluşturma konusunda belirli kısıtlamaları bulunmaktadır (Franzen, 2023). Bu bağlamda, Dall-e 3'ün sunduğu özelliklerin, kullanıcıların görsel ve metinsel içeriği daha etkin

bir şekilde birleştirmesine imkân tanıması, gerçekleştirilen vaka çalışmaları için daha uygun bir model olarak değerlendirilmiş ve Dall-e YZ modeli ile çalışmalar yürütülmüştür.

2.2 Vaka Çalışmaları (Case Studies)

Dall-e YZ uygulamasının farklı tasarım disiplinlerine entegrasyonunun genel etkinliğini değerlendirmek amacıyla logo tasarımı, gıda ambalaj tasarımı ve afiş tasarımı gibi çeşitli alanlar seçilmiştir. Bu kapsamda, logo tasarım alanı seçilerek, markanın kimliğini ve değerlerini görsel olarak temsil etmek için oluşturulan logo tasarımlarının sembolik ve soyut unsurlarını Dall-e'nin nasıl bir araya getirdiğini incelemek, özgün ve anlamlı semboller üretme becerisinin araştırmak amaçlanmıştır. Gıda ambalaj tasarım alanının seçilme nedeni ise, bir ürünün korunması, taşınması ve pazarlanması için kullanılan görsel ve yapısal tasarım süreçlerini içeren bir nesne olmasıdır. Bu süreç, tüketicilere ürünün özelliklerini, marka kimliğini ve kullanım bilgilerini etkili bir şekilde iletmek için yaratıcı ve teknik becerilerin bir araya getirilmesini gerektirir. Bu kapsamda, Dall-e'nin oluşturduğu ambalajları üç boyutlu nesnelerle nasıl ilişkilendirildiği ve ürünün fiziksel özelliklerini nasıl aktardığının araştırılması amaçlanmıştır. Dall-e'nin görsel üretimdeki illüstratif yeteneklerinin değerlendirilmesi için ise afiş tasarım alanı seçilmiştir. Ayrıca, Dall-e'nin oluşturduğu illüstrasyonları tipografi ile nasıl birleştirdiği ve bu birleşimin tasarım kriterlerine ne kadar uygun olduğu üzerine de odaklanılarak Dall-e'nin bu alandaki becerisi incelenmiştir. Bu çalışmada elde edilen sonuçlar, Dall-e'nin çeşitli grafik tasarım alanlarındaki performansını ve YZ teknolojilerinin tasarım süreçlerine nasıl dahil edilebileceğinin anlaşılmasına yardımcı olacağı düşünülmektedir.

2.2.1 Logo Tasarımı Çalışması (Logo Design Study)

Bu çalışmada, katılımcılar 'Fika' çikolata markası için YZ aracı Dall-e kullanarak logo tasarımları gerçekleştirmişlerdir. Verilen logo briefi doğrultusunda tasarımcılardan minimalist ve basit bir tasarım yaklaşımı kullanarak, modern, çekici ve akılda kalıcı bir logo tasarımı oluşturmaları ve bu doğrultuda istemler yazmaları talep edilmiştir. Aşağıda sırayla katılımcıların yorumları, Dall-e ile oluşturdukları logo tasarımları ve birer görselin istemi belirtilmiştir.

Katılımcı A, Dall-e ile oluşturduğu logo tasarımları için; Dall-e'nin tipografi unsurlarını kullanmada (yazı karakterleri, harf aralıkları, renk,

boyut vb.) ve tasarım detaylarını oluşturma konusunda yetersiz kaldığını, bu sebeple belirli kısıtlamalara sahip olduğunu ifade etmiştir. Katılımcı, elde edilen görsellerin tamamlanmış bir logo tasarımı olarak kabul edilemeyeceğini vurgulayarak, Dall-e'nin özellikle tasarım sürecinin ilk aşamalarında, fikir geliştirme amacıyla faydalı olduğunu belirtmiştir. Bununla birlikte, bu aracın yaratıcılığı şekillendirme ve tasarımcının özgünlüğünü sınırlama potansiyeline sahip olduğu konusunda bazı endişelerini ifade etmiştir. Ayrıca, YZ'nın logo tasarımında tam anlamıyla bağımsız bir şekilde çalışamayacağına ve bir tasarımcının yönlendirmesi gerektiğini belirterek, bu durumun gelecekteki teknolojik gelişmelerle değişebileceğini belirtmiştir.

"*Create an image of a single mountain with a round form in a fluid and minimal style. The design should be in black, with smooth transitions and a flowing aesthetic that conveys the elegance and simplicity of a mountain range. Aim for a serene and artistic impression, with the mountain appearing abstract yet identifiable. The artwork should have a flat, vector-style design. Below the mountain, include the word 'Fika' written in a sharp, distinct font, contributing to the overall minimalist and stylish presentation*." *(Akıcı ve minimal bir tarzda yuvarlak bir forma sahip tek bir dağ görüntüsü oluştur. Tasarım siyah renkte olmalı, yumuşak geçişler içermeli ve bir dağ sırasının zarafetini ve sadeliğini yansıtan akıcı bir estetiğe sahip olmalıdır. Dağın soyut ancak tanımlanabilir göründüğü dingin ve sanatsal bir izlenim hedefle. Resim düz, vektör tarzı bir tasarıma sahip olmalıdır. Dağın altında, genel minimalist ve şık sunuma katkıda bulunacak şekilde, keskin ve farklı bir yazı tipiyle yazılmış 'Fika' kelimesi yer almalıdır.)* Ortadaki 2. görsel için yazılan istem (Şekil 2).

Şekil 2: Katılımcı A'nın vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu logo tasarımları. (Participant A's logo designs created by using Dall-e artificial intelligence tool during the case studies. (Şekerli, 2024).

Katılımcı B, Dall-e ile oluşturduğu logo tasarımları için; Dall-e'nin tipografi unsurlarını kullanmada (yazı karakterleri, harf aralıkları, renk, boyut vb.) ve tasarım detaylarının entegrasyonu konusunda yetersiz kaldığını ve bu durumun birtakım sınırlamalar yarattığı belirtilmiştir. Katılımcı, özellikle logoların netlik ve minimalist yaklaşımlar gerektirdiği noktasında, Dall-e'nin bu alanlarda sınırlamalarının olduğunu ifade etmiştir. Katılımcı, Dall-e'yi fikir oluşturma aşamasında yararlı bulmakla birlikte, bu aracın yaratıcı süreçleri etkileyebileceğini ve tasarımcının

özgün yaklaşımlarını sınırlandırabileceğini dile getirmiştir. Bunun yanı sıra, katılımcı YZ'nın logo tasarımında bağımsız olarak etkin bir rol oynamasının şu an mümkün olmadığını, bunun yerine bir tasarımcının rehberliğine ihtiyaç duyulduğunu ifade etmiştir.

"Design a minimalist logo for the 'F I K A' chocolate brand. The emblem should feature a visually weighted 'F' with soft transitions, capturing the fluidity reminiscent of chocolate. Craft the logo in a brown color with a vector-based structure. Beneath the emblem, include the 'F I K A' text in a sans-serif and contemporary font." ('F I K A' çikolata markası için minimalist bir logo tasarla. Amblem, çikolatayı anımsatan akışkanlığı yakalayan yumuşak geçişlere sahip görsel olarak ağırlıklı bir 'F' içermelidir. Logoyu kahverengi renkte ve vektör tabanlı bir yapıda oluştur. Amblemin altında, sans-serif ve modern bir yazı tipinde 'F I K A' metnini ekle.) Baştaki 1. görsel için yazılan istem **(Şekil 3)**

Şekil 3: Katılımcı B'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu logo tasarımları. (Participant B's logo designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

Katılımcı C, Dall-e ile oluşturduğu logo tasarımları için; Dall-e'nin logo tasarımında belirli yönlerde eksiklikler gösterdiğini ve tasarımın genel vizyonunu tam anlamıyla yansıtamadığını belirtmiştir. Katılımcı, Dall-e'nin yazılan istemlere başarılı bir şekilde yanıt vermesine rağmen, logo tasarımında istemlerde belirtilen renk ve formu beklediği düzeyde aktaramadığını ifade etmiştir. Ayrıca, oluşturduğu amblem ile tipografiyi birleştirerek logolaştırma konusunda yetersiz kaldığını belirtmiştir. Katılımcı, Dall-e'nin tipografik unsurların (yazı karakterleri, harf aralıkları, renk, boyut vb.) kullanımında da yetersizlikler olduğunu belirtmiştir. Bununla birlikte, katılımcı, Dall-e'nin tasarım sürecinin ilk aşamalarında, özellikle fikir üretiminde yararlı olabileceğini ifade etmiş ve istem yazımının sonuçlar üzerinde büyük etkisi olduğunu vurgulamıştır. Ayrıca, tasarımcıların mesleki terminolojiye olan hakimiyetinin bu süreçte çok önemli olduğunu da dile getirmiştir.

Şekil 4: Katılımcı C'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu logo tasarımları. (Participant C's logo designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Minimal logo design for chocolate company Fika, use black, brown and white background, create an emblem with linear patterns inside a round form. The company name 'Fika' should be displayed below it in a modern font." (Çikolata şirketi Fika için minimal logo tasarımı, siyah, kahverengi ve beyaz arka plan kullan, yuvarlak bir form içinde doğrusal desenlerle bir amblem oluştur. Şirket adı 'Fika' modern bir yazı tipiyle altında gösterilmelidir.) Ortadaki 2. görsel için yazılan istem **(Şekil 4)**.

Katılımcı D, Dall-e ile oluşturduğu logo tasarımları için; Dall-e YZ aracının, belirtilen serif yazı tipini tam anlamıyla kavrayamadığını ve tipografik ayrıntıları istenen düzeyde yansıtamadığını ifade etmiştir. Ancak, ikinci istemde K ve A harfleri üzerinde yapılan lekesel çözüm ve istenen efektin uygulanması konusunda Dall-e'nin yaratıcı yaklaşımlar sunduğunu belirtilmiştir. Katılımcı D, ayrıca, istemde belirtilmeyen bazı formların üretiminin, tasarım sürecinde yeni fikirlerin oluşmasına katkı sağlayabileceğini dile getirmiştir. Son istemde ise, Dall-e'nin tipografi ve amblemle uyumlu bir kompozisyon oluşturarak, harfler arasındaki boşlukları dengeli bir biçimde kullandığını ifade etmiştir. Katılımcı, istemde koyu-mor rengini zemin olarak düşündüğünü belirtmiş, fakat Dall-e'nin bu renk seçimini logonun geneline uyguladığını ve bunun istemle ilişkili olabileceğini ifade etmiştir.

Şekil 5: Katılımcı D'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu logo tasarımları. (Participant D's logo designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a vector logo featuring a minimal and stylized peacock. "fika" should be written under the icon with geometric monospace typography. The color scheme should be dark, purple as referring the luxury." (Minimal ve stilize bir tavus kuşu içeren vektörel bir logo tasarla. Simgenin altında geometrik monospace tipografi ile "fika" yaz. Renk

düzeni lükse atıfta bulunacak şekilde koyu mor olmalıdır.) Sondaki 3. görsel için yazılan istem **(Şekil 5)**.

Katılımcı E, Dall-e ile oluşturduğu logo tasarımları için; Dall-e tarafından oluşturulan logolarda tasarımsal eksiklikler bulunmasına karşın, bu aracın bir yapı kurmaya çalıştığını ifade etmiştir. Katılımcı, özellikle logo tasarımlarında okunurluk sorunlarına ve tipografinin yetersiz kullanımına dikkat çekerek, elde edilen görsellerin pratik açıdan çok işlevsel olmadığını, ancak detaylı istemler ile daha iyi sonuçlar elde edilebileceğini belirtmiştir. Özellikle üçüncü istemde belirttiği lüks konseptine karşı Dall-e'nin eski bir tarzda görsel oluşturduğunu fakat bu istemde illüstrasyon açısından daha olumlu sonuçlar elde edildiğini ifade etmiştir. Genel olarak, katılımcı Dall-e'nin logo tasarımında yaratıcı fikirler üretme konusunda yardımcı olabileceğini, ancak şu an için doğrudan bir tasarım sonucu sağlama konusunda yeterince başarılı olmadığını belirtmiştir.

Şekil 6: Katılımcı E'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu logo tasarımları. (Participant D's logo designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a simple chocolate fountain logotype for luxury chocolate brand called Fika. Brown color." (Fika adlı lüks çikolata markası için basit bir çikolata çeşmesi logosu tasarla. Kahverengi renk.) Sondaki 3. görsel için yazılan istem **(Şekil 6)**.

Katılımcı F, Dall-e ile oluşturduğu logo tasarımları için; Dall-e'nin logo tasarımı sırasında oluşturduğu görsellerin grafik kalitesinin düşük olduğunu ve bu görsellerin daha çok tematik bir yaklaşım sunduğunu dile getirmiştir. Katılımcının isteminde vurguladığı modernlik temasının Dall-e tarafından tam olarak kavranamadığını ve sonuç olarak daha süslü, dekoratif görsellerin ortaya çıktığını ifade etmiştir. Bununla birlikte, bu temaların Dall-e'ye daha açık bir biçimde aktarılmasının gerekliliğine değinmiştir. Katılımcı F, Dall-e'nin ürettiği görsellerin kesin sonuçlar sağlamadığını ve nihai tasarım için insan müdahalesi gerektirdiğini vurgulamıştır. Ancak, Dall-e'nin fikir üretme aşamasında

faydalı bir araç olabileceğini ve kendisinin de normal tasarım süreçlerinde YZ teknolojisini bu amaçla kullandığını belirtmiştir.

Şekil 7: Katılımcı F'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu logo tasarımları. (Participant F's logo designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a solid, clean and luxury logo for a distinguished chocolate/cocoa brand named 'Fika'. The key color will be black, and the typographic style will be modern and fashionary. It will include an emblem resembles luxury and prosperity. Consider it is a high-quality product for the general customer." ('Fika' adlı seçkin bir çikolata/kakao markası için sağlam, temiz ve lüks bir logo tasarla. Ana renk siyah olacak ve tipografik stil modern ve modaya uygun olmalı. Lüks ve refahı andıran bir amblem içerecektir. Genel müşteri için yüksek kaliteli bir ürün olduğunu düşün.) Sondaki 3. görsel için yazılan istem **(Şekil 7)**.

Katılımcı G, Dall-e ile oluşturduğu logo tasarımları için; Dall-e'nin logo tasarım prensiplerini tam anlamıyla kavrayamadığı ve sonuç olarak daha çok resimsel görseller ürettiğini belirtmiştir. Katılımcı, Dall-e tarafından oluşturulan logo görsellerinin aşırı süslemeli ve sade olmaktan uzak bir tarzda yapıldığını ifade etmiş, bu durumun logo tasarımı için işlevsel bir yapı oluşturmadığını vurgulamıştır. Bunun yanı sıra, istemlerde belirtilmemiş olmasına rağmen, Dall-e'nin logo görsellerine gereksiz tasarım elemanları eklediğini belirtmiştir. Ayrıca, Dall-e'nin istemlerde belirtilen markanın ismini doğru bir şekilde algılayamadığını ve çoğunlukla yanlış yazdığını, belirtilen tipografi unsurlarını (yazı karakterleri, harf aralıkları, renk, boyut vb.) oluşturmada da yetersiz kaldığını ifade etmiştir. Katılımcı ayrıca, istemlerde belirttiği kavramların Dall-e tarafından tam olarak yansıtılamadığını da dile getirerek, süreç içinde üretilen görsellerin nihai tasarım sonuçları olarak kabul edilemeyeceğini ifade etmiştir.

Şekil 8: Katılımcı G'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu logo tasarımları. (Participant G's logo designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a logo for a chocolate brand, named "Fika". This is a new brand which has very elegant approach on their quality chocolates. Use a san-serif typeface in the logo and use only capital letters. The feeling of the logo must be chic and simple. Use only dark blue colours. Use some positive tracking in between each letter." (Fika" isimli bir çikolata markası için logo tasarımı. Kaliteli çikolatalarında çok zarif bir yaklaşıma sahip yeni bir markadır. Logoda san-serif yazı karakteri kullan ve sadece büyük harfler kullan. Logonun hissi şık ve sade olmalıdır. Sadece koyu mavi renkleri kullan. Her harf arasında biraz boşluk kullan.) Ortadaki 2. görsel için yazılan istem **(Şekil 8)**.

Katılımcıların genel görüşü, Dall-e'nin logo tasarımlarında tipografik unsurları (yazı karakterleri, harf aralıkları, renk, boyut vb.) kullanmada ve görsel detayları yansıtma konusunda sınırlılıklar yaşadığı yönünde olmuştur. Ayrıca katılımcılar, logo tasarımı için oluşturdukları istemlerin Dall-e tarafından tam olarak algılanamadığını, Dall-e'nin oluşturduğu logo tasarımlarında istenilen netliği ve kesinliği sağlayamadığını, estetik ve fonksiyonel açıdan zayıf sonuçlar ürettiğini vurgulamış, bu nedenle, Dall-e'nin logo tasarım süreçlerinde tam olarak bağımsız çalışamayacağı ve bir tasarımcı tarafından yönlendirilmesi gerektiği konusunda hemfikir olmuşlardır. Ancak, katılımcılar Dall-e'nin, tasarım süreçlerinin başlangıç aşamalarında fikir üretimi için bir esinlenme aracı olarak kullanılabileceğini belirterek bu açıdan oldukça faydalı bulduklarını ifade etmişlerdir.

2.2.2 Ambalaj Tasarımı Çalışması (Packaging Design Study)

Bu çalışmada, katılımcılar 'Fika' çikolata markası için YZ aracı Dall-e kullanarak ambalaj tasarımları gerçekleştirmişleridir. Verilen brief doğrultusunda tasarımcılardan Fika çikolatasının kalitesini ve özgünlüğünü yansıtan lüks bir ambalaj tasarımı oluşturulması istenmiştir. Briefte ambalajın ön yüzeyinde Fika yazısının belirgin bir şekilde yer alması gerektiği belirtilmiştir. Ayrıca, çikolatanın çeşidine (bitter, sütlü, fındıklı vb.) göre renk kodlaması yapılabileceği belirtilerek

tasarımcılardan bu doğrultuda istemler yazmaları talep edilmiştir. Aşağıda sırayla katılımcıların yorumları, Dall-e ile oluşturdukları ambalaj tasarımları ve birer görselin istemi belirtilmiştir.

Katılımcı A, Dall-e ile oluşturduğu ambalaj tasarımları için; Dall-e'nin ambalaj tasarımındaki kompozisyon kurulumunu başarılı bulduğu ve logo tasarımlarına kıyasla daha iyi bir düzenleme sağladığını belirtilmiştir. Katılımcı, Dall-e'nin tipografi ve illüstrasyon arasındaki ilişkiyi etkili bir şekilde kurduğunu ve kurduğu bu ilişkinin tasarımcılara geliştirilebilir bir tasarım yapı sunduğunu ifade etmiştir. Özellikle ambalaj tasarımında Dall-e'nin renk, doku kullanımında ve çikolata temalı illüstrasyonlarda güçlü bir performans sergilediğini, vektörel gölgelendirmede parlaklık hissi yaratabildiğini dile getirmiştir. Katılımcı, tasarım süreçlerinde Dall-e'nin başlangıç aşamalarında ilham verici olabileceğini ve farklı konseptler üzerinde hızlı denemeler yapılmasını sağlayabileceğini vurgulamıştır. Ancak, ambalaj tasarımının son aşamalarında Dall-e'nin yetersiz kaldığını, ilk süreçlerdeki eskiz aşamasını hızlandırarak farklı konseptlerin denenmesine katkıda bulunabileceğini belirtmiştir. Katılımcı ayrıca, Dall-e tarafından oluşturulan görsellerin üç boyutlu model (mockup) olarak sunulmasının tasarımcılara ürünün piyasaya çıkış öncesi görünümü hakkında fikir verdiğini ve bu durumun tasarımcının tasarımın son halini ekstra çaba sarf etmeden görebilmesine olanak sağladığını ifade etmiş, bunu tasarım sürecinde iş yükünü azaltan bir avantaj olarak değerlendirmiştir. Yine de katılımcı özgünlük konusunda bazı endişeler taşıdığını ve tasarımcıların özgün tasarım yeteneklerinin YZ kullanımıyla olumsuz etkilenebileceğini dile getirmiştir.

Şekil 9: Katılımcı A'nın vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu ambalaj tasarımları. (Participant A's packaging designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Create a chocolate bar with deer luxury packaging for the Fika chocolate company. The packaging must have Fika written on it and have a minimal design." (Fika çikolata şirketi için geyik ile lüks ambalajlı bir çikolata oluştur. Ambalajın üzerinde Fika yazmalı ve minimal bir tasarıma sahip olmalıdır.) Ortadaki 2. görsel için yazılan istem **(Şekil 9)**.

Katılımcı B, Dall-e ile oluşturduğu ambalaj tasarımları için; tasarımcı, Fika kelimesinin anlamını baz alarak İskandinav tarzı minimal tasarımlar yapmayı hedeflediği ve bu doğrultuda hazırladığı istemlerle Dall-e'nin ambalaj tasarımında bu tarzı başarıyla yansıttığını belirtilmiştir. Tasarımcı, oluşturulan tasarımların detayları ve baskı tekniklerinin kullanımını etkileyici bulmuştur. Ayrıca, Dall-e'nin ambalaj görsellerinin piyasadaki potansiyel duruşuna dair iyi bir öngörü sağladığını, hızlı ve pratik üç boyutlu model görsellerle tasarım sürecini kolaylaştırdığını ve zaman kazandırdığını ifade etmiştir. Tasarımcı, özellikle renk, illüstrasyon ve baskı teknikleri konusunda Dall-e'nin başarılı olduğunu, ancak tipografi ve kompozisyonel dengede bazen zorlanabildiğini belirtmiştir.

Şekil 10: Katılımcı B'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu amblaj tasarımları. (Participant B's packaging designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Photo of a chocolate bar packaging design for 'Fika' with a Nordic minimalist theme. The packaging showcases geometric illustrations of mountains and snow, incorporating pastel shades of blue and white. The lower part of the packaging features a subtle pattern of abstract flowers, in a contrasting warm gold color, to symbolize the warmth amidst the cold Nordic landscape." (Fika için tasarlanmış, İskandinav minimalist tema ile yapılmış bir çikolata barı ambalaj tasarımının fotoğrafı. Ambalaj, mavi ve beyazın pastel tonlarını içeren geometrik dağ ve kar illüstrasyonlarını göstermeli. Ambalajın alt kısmında ise soğuk İskandinav manzarasının arasında sıcaklığı simgelemek için kontrast oluşturan altın renginde soyut çiçek desenleri yer alsın.) Baştaki 1. görsel için yazılan istem **(Şekil 10)**.

Katılımcı C, Dall-e ile oluşturduğu ambalaj tasarımları için; Dall-e'nin ambalaj tasarımında lüks bir atmosfer yaratmada genel olarak iyi sonuçlar verdiğini belirtmiştir. Tasarımcıya göre, Dall-e altın ve kahverengi tonları etkin şekilde kullanmış ve süslü, detaylı illüstrasyonları istemlere uygun olarak başarıyla oluşturmuştur. Ancak, Dall-e'nin bazen kompozisyona gereksiz öğeler ekleyerek tasarımın bütünlüğünü bozabildiğini ifade etmiştir. Genel anlamda, tasarımcı Dall-

e'nin ambalaj tasarımında sunduğu çeşitlilik ve hızlı görsel üretim gerçekleştirmesinden dolayı başarılı bulmuştur.

Şekil 11: Katılımcı C'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu amblaj tasarımları. (Participant C's packaging designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"*Design a modern packaging pattern for the Fika chocolate brand. Should be luxury, simple, classic, vintage, brand packaging for fika chocolate company." (Fika çikolata markası için modern bir ambalaj modeli tasarla. Fika çikolata şirketi için lüks, sade, klasik, vintage bir ambalajı olmalıdır.)* Ortadaki 2. görsel için yazılan istem **(Şekil 11)**.

Katılımcı D, Dall-e ile oluşturduğu ambalaj tasarımları için; Dall-e'nin yazılan istemler için genel olarak iyi sonuçlar oluşturduğunu ifade etmiştir. Dall-e, belirtilen bilgileri tam olarak yansıtamasa da, yakın sonuçlar elde etmiş ve özellikle sistem (grid) yapıları ve boşluk kullanımı konusunda başarılı bir işlevsellik sunmuştur. Ancak, bazen aşırı süslemeci bir tasarım sergilediğini belirtmiş, ayrıca Dall-e'nin istemlerde belirtilmese de ambalaj üzerine bir logo eklemesi gerektiğini anlayıp, bu yönde bir tasarım sunduğunu ve renk kullanımının iyi olduğunu ifade etmiştir.

Şekil 12: Katılımcı D'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu ambalaj tasarımları. (Participant D's packaging designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Create a packaging design for chocolate brand which is well known for its good product quality product. Use purple color to codify dark chocolate especially "%90" should be written as a focal point. "Fika" logo must appear on the front of the packaging with secondary in hierarchical order." (İyi ürün kalitesiyle tanınan çikolata markası için bir ambalaj tasarımı oluştur. Bitter çikolatayı kodlamak için mor renk

kullan, özellikle "%90" odak noktası olarak yazılmalıdır. "Fika" logosu hiyerarşik sırayla ikincil olarak ambalajın ön tarafında görünmelidir.) Sondaki 3. görsel için yazılan istem **(Şekil 12)**.

Katılımcı E, Dall-e ile oluşturduğu ambalaj tasarımları için; Dall-e'nin genel olarak iyi sonuçlar sunduğunu, özellikle sistem yapısı ve tipografik uygulamalarda etkili olduğunu belirtmiştir. İstemlerin genel yazılmasına rağmen, elde edilen sonuçları verimli bulduğunu ifade ederek, özellikle Dall-e'nin ambalaj tasarımlarını üç boyutlu model olarak sunmasının tasarımcılar için işlevsel olduğunu, gerçek hayatta oluşturulacak tasarımların hayal edilmesini ve sürecin hızlanmasını kolaylaştırabileceğini belirtmiştir. Ancak, Dall-e ile üretilen ambalajların dikkat çekici olmasına karşın, özellikle tipografik unsurların kullanımındaki eksiklikler nedeniyle, bir tasarımcı müdahalesinin olması gerektiğini vurgulamıştır.

Şekil 13: Katılımcı E'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu ambalaj tasarımları. (Participant E's packaging designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Create minimal packaging design for luxury chocolate brand called Fika. Use gold foil and dark green colors." (Fika adlı lüks çikolata markası için minimal ambalaj tasarımı oluştur. Altın varak ve koyu yeşil renkler kullan.) Ortadaki 2. görsel için yazılan istem **(Şekil 13)**.

Katılımcı F, Dall-e ile oluşturduğu ambalaj tasarımları için; Dall-e'nin sunduğu görsellerin, nihai materyal seçimleri gibi tasarımcıya önemli bilgiler sunduğunu ve bunu ilgi çekici bulduğunu ifade etmiştir. Dall-e'nin renk ve illüstrasyon dengesi ile iyi tasarım düzenlemeleri yapabildiğini, özellikle detaylı istemlerde beklenilene daha yakın sonuçlar elde edildiğini belirtmiştir. Katılımcı, Dall-e'nin ambalaj tasarımında çarpıcı görseller üretmesine rağmen, nihai sonuçları tam olarak sağlamadığını, nihai tasarımın gerçekleşmesi için tasarımcının müdahalesinin gerekli olduğunu vurgulamış ve Dall-e'nin ambalaj tasarımında etkili bir eskiz aracı olarak kullanılabileceğini ifade etmiştir.

Şekil 14: Katılımcı F'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu ambalaj tasarımları. (Participant F's packaging designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a luxury, neat, and modern packaging for a chocolate/cocoa brand named 'Fika' with coconut and vanilla-milk extracts inside. Use ultra-realistic melted chocolate images. The key colors are dark blue, light blue, and white; the packaging is very modern and high-class. Create it in comparison with Lindt or Toblerone. The package will incorporate glossy and shiny papers. Consider it as Swiss-made chocolate for the high-segment customer profile." ('Fika' isimli bir çikolata/kakao markası için içinde hindistan cevizi ve vanilya sütü özleri bulunan lüks, temiz ve modern bir ambalaj tasarla. Ultra gerçekçi eritilmiş çikolata görselleri kullan. Ana renkler koyu mavi, açık mavi ve beyazdır; ambalaj çok modern ve üst sınıftır. Lindt veya Toblorone ile karşılaştırarak oluştur. Paket parlak ve gösterişli kağıtlar içermeli. Bunu yüksek segment müşteri profili için İsviçre yapımı bir çikolata olarak düşün.) Sondaki 3. görsel için yazılan istem **(Şekil 14)**.

Katılımcı G, Dall-e ile oluşturduğu ambalaj tasarımları için; Dall-e'nin ambalaj tasarımındaki performansını logo tasarımına kıyasla daha etkili bulduğunu, renk kullanımı ve bazı hiyerarşik dengelerin oluşturulması konusunda başarılı olduğunu ifade etmiştir. Ancak, minimalist bir yapı talebine rağmen Dall-e'nin aşırı kalabalık tasarımlar oluşturduğunu ve bu durumun her zaman işlevsel olmayabileceğini belirtmiştir. Katılımcı, Dall-e'nin ürettiği görsellerin tasarımın başlangıç aşamasında ilham kaynağı olabileceğini, ancak bu kullanımın tasarım bilgisine sahip kişiler tarafından yapılması gerektiğini ifade etmiştir. Ayrıca, Dall-e'nin tipografik hatalar yapabildiğini, özellikle harf aralıklarını iyi ayarlayamadığını ve bu nedenle bazı tasarım problemlerine çözüm sunamadığını dile getirmiştir. Bunun yanı sıra, Dall-e'nin ambalaj tasarım süreçlerinde yeni fikirler oluşturmak ve sunduğu materyaller açısından faydalı olabileceğini belirtmiştir.

Şekil 15: Katılımcı G'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu ambalaj tasarımları. (Participant G's packaging designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a logo for a chocolate brand, named "Fika"on its own tablet packaging designs. This is a new brand which has very elegant approach on their quality chocolates. Use a san-serif typeface in the logo and use only capital letters. The feeling of the packaging must be chic and simple. Use only dark blue colours with white. Use white space to give trust." ("Fika" adlı bir çikolata markası için kendi tablet ambalaj tasarımları üzerine bir logo tasarla. Kaliteli çikolatalarında çok zarif bir yaklaşıma sahip yeni bir marka. Logoda san-serif yazı karakteri kullan ve sadece büyük harfler kullan. Ambalajın hissi şık ve sade olmalıdır. Sadece beyaz ile koyu mavi renkleri kullan. Beyaz boşluk alanları oluştur.) Ortadaki 2. görsel için yazılan istem **(Şekil 15)**.

Katılımcılar Dall-e'nin oluşturduğu ambalaj tasarımlarında renk ve doku kullanımı açısında Dall-e'nin iyi sonuçlar ürettiğini, Dall-e tarafından oluşturulan görsellerdeki illüstratif yaklaşımın da oldukça başarılı olduğunu ifade etmişlerdir. Bazı katılımcılar, Dall-e'nin ambalaj tasarımlarında gereksiz elemanlar ekleyerek istenilen minimalist yapıdan bazen saptığını ve işlevselliği azalttığını ifade etmişlerdir. Diğer taraftan, bazı tasarımcılar, Dall-e'nin istemlere dayalı tasarımlarda yaratıcı çözümler sunduğunu ve tasarım süreçlerinde ilham verici olabileceğini düşünmüşlerdir. Ancak, tasarımcıların çoğu, Dall-e'nin ambalaj tasarımı süreçlerinde tam olarak bağımsız çalışamayacağı ve bir tasarımcı tarafından yönlendirilmesi gerektiği konusunda hemfikir olmuşlardır. Tasarımcılar, Dall-e'nin özellikle ambalaj tasarımı konusunda fikir çeşitliliği ve hızlı görsel üretim sağladığını, ancak nihai sonuçların elde edilmesi için insan müdahalesinin gerekli olduğunu vurgulamışlardır.

2.2.3 Afiş Tasarımı Çalışması (Poster Design Study)

Bu çalışmada, katılımcılar ''İstanbul Caz Festivali' afişi için YZ aracı Dall-e kullanarak afiş tasarımları gerçekleştirmişlerdir. Verilen brief doğrultusunda tasarımcılardan İstanbul Caz Festivali'nin ruhunu ve

dinamizmini hissettiren, aynı zamanda İstanbul'un tarihi ve kültürel dokusunu da yansıtan bir afiş tasarımı hazırlamaları istenmiştir. Afişte "İstanbul Caz Festivali" kelimesinin net ve anlaşılır olması gerektiği belirtilmiş ve katılımcılardan bu doğrultuda istemler yazmaları talep edilmiştir. Aşağıda sırayla katılımcıların yorumları, Dall-e ile oluşturdukları afiş tasarımları ve birer görselin istemi belirtilmiştir.

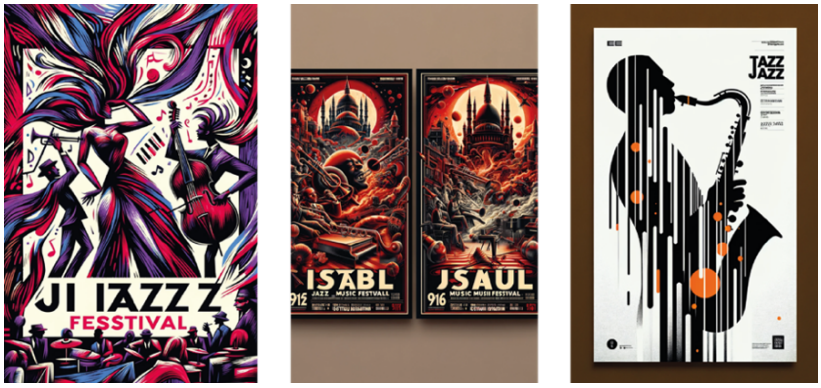
Katılımcı A, Dall-e ile oluşturduğu afiş tasarımları için; Dall-e'nin illüstrasyon açısından etkileyici sonuçlar elde ettiğini, ancak oluşturulan görsellerde tipografi hataları ve boyut problemleri olduğunu belirtmiştir. Buna rağmen, bu görsellerin tasarımın ilk eskiz aşaması olarak değerlendirilebileceğini ifade etmiştir. Katılımcı, aynı istemleri tekrar tekrar deneyerek daha tutarlı ve isteme uygun sonuçlar aldığını, özellikle illüstrasyonların başarılı olduğunu ve bu sürecin zaman yönetimi ve fikir geliştirme konusunda yardımcı olabileceğini belirtmiştir.

Şekil 16: Katılımcı A'nın vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu afiş tasarımları. (Participant A's poster designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design an image for a 9:16 format poster, prominently featuring a double bass at the center, designed with traditional Turkish mosaics. The background should be plain white. Include the text 'Istanbul Jazz Festival' on the poster, also created using mosaics that complement the mosaic double bass. The focus should be on the stunning mosaic double bass with the festival text in a mosaic style, set against a crisp, white background, ensuring a clean and visually striking design." (Geleneksel Türk mozaikleriyle tasarlanmış, merkezinde kontrbas bulunan 9:16 formatında bir poster için bir görsel tasarla. Arka plan düz beyaz olmalıdır. Mozaik kontrbası tamamlayan mozaikler kullanılarak oluşturulan 'İstanbul Caz Festivali' metnini de afişe ekle. Odak noktası çarpıcı mozaik kontrbas olmalı ve festival metni mozaik tarzında, net,

beyaz bir arka plana yerleştirilerek temiz ve görsel olarak çarpıcı bir tasarım sağlanmalıdır.) Ortadaki 2. görsel için yazılan istem **(Şekil 16)**.

Katılımcı B, Dall-e ile oluşturduğu afiş tasarımları için; illüstratif kompozisyonları oluşturması açısından iyi olduğunu ancak nihai afiş tasarımının elde edilmesi için tasarımcı müdahalesinin gerekli olduğunu belirtmiştir. Katılımcı, Dall-e'nin tipografi ile görseli etkin bir şekilde bütünleştiremediğini ve bu alanın geliştirilmesi gerektiğini vurgulamıştır. İstanbul ve caz temalı illüstrasyonlarda etkileyici bir uyum sağlandığını belirtmiş, fakat oluşturulan görsellerin tamamlanmış bir afiş olarak değerlendirilemeyeceğini, bunların daha çok ön taslak ve fikir geliştirme aşamasında kullanılabileceğini ifade etmiştir.



Şekil 17: Katılımcı B'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu afiş tasarımları. (Participant B's poster designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Create a poster for the Jazz Festival with a modernist aesthetic that incorporates elements of negative space. The primary visual should be a stylized saxophone abstracted into vertical stripes, merging seamlessly into the silhouette of a jazz musician. Accentuate this monochromatic design with splashes of vibrant orange to suggest movement and energy. Place the festival's name, 'ISTANBUL JAZZ FESTIVAL,' at the top in a clean, sans-serif font." (Caz Festivali için negatif alan unsurlarını içeren modernist bir estetiğe sahip bir poster oluştur. Ana görsel, bir caz müzisyeninin siluetiyle sorunsuz bir şekilde birleşen, dikey şeritler halinde soyutlanmış stilize bir saksafon olmalı. Bu monokromatik tasarımı, hareket ve enerji çağrıştırması için canlı turuncu sıçramalarla vurgula. Festivalin adı olan 'İSTANBUL CAZ FESTİVALİ'ni temiz, sans-serif bir yazı tipiyle en üste yerleştir. Sondaki 3. görsel için yazılan istem **(Şekil 17)**.

Katılımcı C, Dall-e ile oluşturduğu afiş tasarımları için; Dall-e'nin yazılan istemlere uygun olarak kompozisyon ve renk açısından etkili tasarımlar ürettiğini belirtmiş, ancak tipografik bozulmalar ve anlamsız metin

eklemeleri yüzünden Dall-e'nin tam olarak bitmiş bir afiş sunamadığını ifade etmiştir.

Şekil 18: Katılımcı C'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu afiş tasarımları. (Participant C's poster designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a poster for the Istanbul Jazz Festival. The poster should depict people playing jazz instruments with the Bosporus and the sunset visible in the background. The text 'ISTANBUL JAZZ FESTIVAL' should be written in lively handwriting to capture the dynamic spirit of the festival, and colors reflecting the spirit of jazz music should be used. Poster size should be 9:16. The created composition should be balanced according to the size of the poster." (İstanbul Caz Festivali için bir poster tasarla. Afişte, arka planda Boğaz ve gün batımı görünürken caz enstrümanları çalan insanlar tasvir edilmelidir. Festivalin dinamik ruhunu yakalamak için 'İSTANBUL CAZ FESTİVALİ' metni canlı bir el yazısıyla yazılmalı ve caz müziğinin ruhunu yansıtan renkler kullanılmalıdır. Afiş boyutu 9:16 olmalıdır. Oluşturulan kompozisyon afiş boyutuna göre dengeli olmalıdır.) Ortadaki 2. görsel için yazılan istem **(Şekil 18)**.

Katılımcı D, Dall-e ile oluşturduğu afiş tasarımları için; Dall-e'nin oluşturduğu görsellerin tam anlamıyla afişleşmiş görseller olmasa da, verilen istemlere uygun yaratıcı işler sunduğunu ve bu işlerin tasarım sürecinde yeni fikirlerin geliştirilmesine yardımcı olabileceğini ifade etmiştir. Dall-e'nin tipografi unsurlarını kullanmada zorlandığını ve okunurluk sorunları yaşandığını belirtmiş, ancak renk kullanımı ve illüstratif yönlerde başarılı olduğunu vurgulamıştır. Katılımcı, özellikle son istemde daha soyut bir tasarım talep ettiğinde Dall-e'nin bu isteğe daha uygun, tipografik olarak daha iyi ve genel olarak afişe daha yakın sonuçlar ürettiğini, bunun da doğru anahtar kelimelerin istemde kullanılmasının etkisiyle ilgili olabileceğini belirtmiştir.

Şekil 19: Katılımcı D'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu afiş tasarımları. (Participant D's poster designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a 9:16 poster highlighting jazz music festival with rhythmical graphic composition. The festival's name "İstanbul Caz Festivali", should be prominently displayed and legible. Include the festival dates, "1-7 Temmuz 2023" as informative text on the poster. Use vibrant colors and geometric shapes for visualize jazz music. Keep the style abstract and futuristic." (Caz müzik festivalini ritmik bir grafik kompozisyonla vurgulayan 9:16 boyutunda bir poster tasarla. Festivalin adı "İstanbul Caz Festivali", belirgin ve okunaklı bir şekilde gösterilmelidir. Festival tarihleri olan "1-7 Temmuz 2023" afişte bilgilendirici metin olarak yer almalıdır. Caz müziğini görselleştirmek için canlı renkler ve geometrik şekiller kullan. Stili soyut ve fütüristik tut.) Sondaki 3. görsel için yazılan istem **(Şekil 19)**.

Katılımcı E, Dall-e ile oluşturduğu afiş tasarımları için; elde edilen sonuçların potansiyel taşıdığını ve illüstrasyon ile renk kullanımının etkili olduğunu belirtmiştir. Katılımcı, istemlerde belirtilen kavramlara uygun sonuçlar aldığını ancak Dall-e'nin ürettiği işlerin kendi hayal ettiğiyle tam olarak örtüşmediğini, daha detaylı istemlerle beklenilen sonuçlara yaklaşılabileceğini ifade etmiştir. Dall-e'nin tekrarlı üretimlerde iyi düzenlemeler sunduğunu ve tasarımcılar için yararlı eskizler oluşturduğunu vurgulamış, fakat tipografide ve okunurlukta sorunlar olduğunu ve bu yüzden nihai sonuç için tasarımcı müdahalesinin gerektiğini belirtmiştir

Şekil 20: Katılımcı E'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu afiş tasarımları. (Participant E's poster designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"9:16 Poster for the jazz music festival, and jazz musicians, in the style of playful illustrative style, light navy and red, malika favre style, colorful composition, classic composition, colorful figures with bold title "Istanbul Caz Festivali." (9:16 boyutunda, Caz müzik festivali ve caz müzisyenleri için afiş, eğlenceli illüstratif tarzda, açık lacivert ve kırmızı, Malika Favre tarzı, renkli ve klasik kompozisyon, renkli figürler ile 'İstanbul Caz Festivali' başlığını kalın bir şekilde oluştur.) Sondaki 3. görsel için yazılan istem **(Şekil 20)**.

Katılımcı F, Dall-e ile oluşturduğu afiş tasarımları için; görsellerin ilgi çekici ancak orijinal çalışmalar olarak kabul edilemeyecek nitelikte olduğunu belirtmiştir. Katılımcıya göre, Dall-e, yazılan istemlerde belirtilen tarzları ayrı ayrı işleyerek bir bütünlük sağlayamamış, ancak illüstrasyon ve renk kullanımı açısından olumlu sonuçlar sunmuştur. Ayrıca, Dall-e'nin ürettiği tasarımların yurt dışında yaygın olan afiş tarzlarına benzediğini, Türkiye'de ise bu tarzın daha nadir olduğunu ifade etmiştir. Genel olarak, Katılımcı, Dall-e'nin afiş tasarımında tipografik hatalar yaptığını ve oluşturulan görsellerin bir eskiz aşaması olarak kullanılmasının uygun olduğunu, nihai tasarıma ulaşmak için tasarımcı müdahalesinin gerektiğini vurgulamıştır.

Şekil 21: Katılımcı F'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu afiş tasarımları. (Participant F's poster designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a funky vertical (ratio 9:16) poster for Istanbul Jazz Festival. The key colors are blue, white and beige. Use catchy, vibrant patterns that resembles Istanbul. Typographic style will be vibrant and funky. Take Milton Glaser posters as references." (İstanbul Caz Festivali için eğlenceli bir dikey (9:16 oranında) poster tasarla. Ana renkler mavi, beyaz ve bej olsun. İstanbul'u andıran akılda kalıcı, canlı desenler kullan. Tipografik stili canlı ve neşeli olsun. Milton Glaser posterlerini referans al.) Baştaki 1. görsel için yazılan istem **(Şekil 21)**.

Katılımcı G, Dall-e ile oluşturduğu afiş tasarımları için; oluşturulan görsellerin yaratıcı ve illüstrasyon yönünden başarılı olduğunu ifade etmiştir. Katılımcı, Dall-e'nin, Türkiye'de pek yaygın olmayan ancak yurtdışında popüler olan tarzları kullanarak afişler oluşturduğunu belirtmiş, tipografi ve okunurluk konusunda sorunlar olduğunu ve bu görsellerin bir tasarımcı tarafından geliştirilerek kullanılabileceğini vurgulamıştır. İllüstrasyon, renk kullanımı ve yerleşim düzeni (layout) açısından Dall-e'nin verimli işler sunduğunu ifade etmiş, son denemede ise Dall-e'nin dergi kapaklarına daha uygun tasarımlar ürettiğini ve tasarımcı müdahalesi ile afiş formatına dönüştürülebileceğini belirtmiştir. Katılımcı, Dall-e'nin afiş tasarımlarının genel olarak yaygın üretimler olduğunu ve tasarımcılar için bu görsellerin ilham kaynağı olabileceğini ifade etmiştir.

Şekil 22: Katılımcı G'nin vaka çalışmaları sırasında Dall-e yapay zekâ aracı kullanarak oluşturduğu afiş tasarımları. (Participant G's poster designs created by using Dall-e artificial intelligence tool during the case studies.) (Şekerli, 2024).

"Design a 9:16 poster for a jazz festival called "Istanbul Caz Festivali". The name must be highlighted and legible at the first place. The feeling of the poster must be dynamic and rhythmic. Use a big silhouette of an instrument which plays a significant role in jazz. And fill this silhouette with different other illustrated instruments in white. Keep the colour palette of the poster in vibrant colours." ("İstanbul Caz Festivali" adlı bir caz festivali için 9:16 boyutunda bir afiş tasarla. İsim ilk etapta vurgulanmalı ve dikkat çekici olmalıdır. Afişin duygusu dinamik ve ritmik olmalıdır. Cazda önemli rol oynayan bir enstrümanın büyük bir siluetini kullan. Ve bu silueti beyaz renkte farklı enstrüman resimleriyle oluştur. Posterin renk paleti için canlı renkler kullan.) Ortadaki 2. görsel için yazılan istem **(Şekil 22)**.

Katılımcılar Dall-e'nin oluşturduğu afiş tasarımlarında illüstratif yaklaşımın başarılı olduğunu, ancak tipografik unsurların kullanımı ve istenilen afiş boyutu konusunda zaman zaman istemlerde belirtilen bilgiler dışında çıktılar ürettiğini ifade etmişlerdir. Katılımcılar, Dall-

e'nin renk ve kompozisyon konusunda etkileyici sonuçlar sunduğunu, ancak tipografi ve detaylar konusunda geliştirilmesi gerektiğini ifade etmişlerdir. Ayrıca, Dall-e'nin istemleri doğru algılanması ve daha etkili sonuçlar üretme konusunda gelişme potansiyelinin olduğu belirtilmiştir. Tasarımcılar, Dall-e'nin afiş tasarımında fikir oluşturma ve eskiz aşamasında kullanışlı olabileceğini, ancak bitmiş bir tasarım için yeterli olmadığını vurgulamış, nihai tasarım için insan tasarımcı müdahalesinin mutlaka olması gerektiğini belirtmişlerdir.

2.3 Bulgular (Findings)

Katılımcılar ile yapılan görüşmelerden sonra her bir görüşmenin yazılı dökümü çıkartılmıştır. Daha sonra, yazılı dökümlerden elde edilen verilerin açık kodlamaları yapılmış ve ardından aksiyel kodlar (tema alt başlıklarını kategorileştirme, sınıflandırma) oluşturulmuştur. Bu kodlamalar ile birlikte eş zamanlı olarak seçici kodlamalar yapılmış ve temalara ulaşılmıştır. Bu kapsamda öncelikle kod sistemindeki 3 tema (**Tablo 1, sayfa 26-27**) belirlenmiş daha sonra bu temalar ile ilişkili kategoriler oluşturulmuş ve kod sistemi üzerinde çalışma yapılarak son hali verilmiştir.

Tema (Boyut)	Kategori	Kodlar
Tasarım Sürecinde Yapay Zekâ (Dall-e) ve Tasarımcı Etkileşimi	İstem (Prompt) Oluşturma	**1.1** İstemin Tasarım Çıktıları Üzerindeki Etkisi **1.2** İstem ile İfade Edilen Detayların Önemi **1.3** Beklenmeyen Sonuçlar ve Yorum Katkıları **1.4** Grafik Tasarım Alanındaki Terminolojik Bilgiye Hakimiyet
	Eskiz ve İlk Fikir Geliştirme	**2.1** İlk Taslakların Oluşturulması **2.2** Fikir ve Konsept Geliştirme
	Süreç İyileştirmeleri ve Optimizasyon	**3.1** Süreç Hızı ve Verimliliği **3.2** Yeni Fikirlerin Teşviki ve İlham Kaynakları
	İnsan Müdahalesinin Önemi	**4.1** Kişiselleştirme **4.2** Son Düzenlemeler **4.3** Estetik Dengenin Sağlanması

Tablo 1: Vaka çalışmaları sonucu oluşturulan genel kod sistemi (General code system created as a result of case studies.) (Şekerli, 2024).

Yapay Zekâ Teknolojisinin (Dall-e) Olumlu ve Olumsuz Etkileri	Verimlilik	**1.1** Zaman Tasarrufu ve Hız **1.2** Üretkenlik Değerlendirmesi **1.3** Spesifik Bir Ön Araştırma Aracı Olarak Kullanımı
	Teknolojik Zorluklar ve Sınırlılıklar	**2.1** Algılama ve Yorumlama Yetenekleri **2.2** Başlangıç Seviyesinde İş üretimi **2.3** Teknolojik Gelişim ve Adaptasyon **2.4** Yapay Zekâ Araçlarının Kullanımı **2.5** Sürekli Öğrenme
	Etik ve Yaratıcılık Üzerine Etkiler	**3.1** Tasarım Süreçlerindeki Özgünlük **3.2** Yaratıcılığın Sınırlanması
Tasarımcının Rolü ve Perspektifi	Tasarımcıların Yapay Zekâya Yaklaşımı	**1.1** Bakış Açıları ve Algılar **1.2** Teknolojiye Adaptasyon ve Benimseme
	Mesleki Değişim ve Gelişim	**2.1** Mesleki Rollerde Evrim **2.2** Teknolojik Değişimlere Uyum **2.3** Teknolojinin Eğitim Süreçlerine Entegrasyonu

Birinci tema olan "Tasarım Sürecinde Yapay Zekâ (Dall-e) ve Tasarımcı Etkileşimi" kapsamında YZ'nın tasarım süreçlerine olan etkisi ile istem yazımının elde edilen çıktılar üzerindeki etkisi, eskiz, konsept geliştirme ve süreç optimizasyonuna olan katkıları ve insan müdahalesinin bu bağlamdaki kritik rolü üzerinde durulmuştur.

- Tasarımcılar oluşturdukları istemlerin, elde ettikleri çıktıların sonucuna göre dikkatlice incelenip yeniden düzenlenmesinin, istenilen sonuca ulaşmak için gerekli olduğunu belirtmişlerdir. Özellikle, istemlerin gözden geçirilip revize edilmesinin, yapay zekânın ürettiği sonuçların kalitesini artırabileceği sonucuna varılmıştır. Bu kapsamda bir tasarımcının etkili bir şekilde istem oluşturabilmesi için mesleki terminolojiye de hâkim olması gerektiği ifade edilmiştir.

- Katılımcılar, tasarımcıların alıştıkları tasarlama süreçlerinden farklı olarak yazınsal becerilerinin de geliştirilmesi gerektiğini vurgulamışlardır. Tasarımcılara çalışma sürecinde en çok hangi istemi yazarken zorlandıkları sorulmuş ve 4 katılımcı logo, 1 katılımcı afiş briefi için istem oluştururken zorlandıklarını belirtmiş, diğer 2 katılımcı bu soruya daha genel bir cevap vererek brief bazında bir zorluk belirtmemiş, istem yazma sürecinde pratikliğe ve Dall-e'nin genel olarak neyi anlayıp neyi anlayamayacağını düşünerek istemlerini oluşturmaya çalıştıklarını ve bu süreçte biraz zorlandıklarını ifade etmişlerdir.

- Katılımcılar, Dall-e gibi YZ araçlarının fikir geliştirme ve eskiz aşamalarında tasarımcılar için oldukça faydalı birer araç olabileceğini, bu teknolojilerin tasarım süreçlerinde hız ve verimliliği artırıp, yeni fikirlerin oluşumunu destekleyerek iyi bir ilham kaynağı olabileceğini ifade etmişlerdir.

- Katılımcılar, Dall-e gibi YZ araçlarının kullanılması durumunda, insan tasarımcının YZ araçlarının ürettiği görselleri yönetmesi ve estetik açıdan dengeli bir tasarım oluşturulması için müdahale etmesi gerektiğini belirtmişlerdir. Bu araçlar tarafından yapılan tasarımların kişiselleştirilmesi ve estetik dengeleri göz önünde bulundurulması, sonuçların profesyonel ve kullanışlı olması açısından önemli olduğu, bu nedenle bu sürecin mutlaka bir tasarımcı tarafından yönetilmesi gerektiği vurgulanmıştır. Bu durum, YZ'nın şimdilik sadece bir araç olduğunu, insan dokunuşunun ve yaratıcılığının tasarım süreçlerinde hala önemli olduğunu göstermektedir.

İkinci tema olan "Yapay Zekâ Teknolojisinin (Dall-e) Grafik Tasarım Alanına Olumlu ve Olumsuz Etkileri" kapsamında YZ uygulamalarının tasarım süreçlerindeki verimliliği ve bu teknolojinin tasarım öncesi bir araştırma aracı olarak kullanımı ile teknolojik adaptasyon süreçlerinin yanı sıra etik ve yaratıcılık üzerindeki etkileri ele alınmıştır.

- Katılımcılar, çalışmalar sırasında deneyimledikleri Dall-e YZ aracının tasarım süreçlerinde hızlı üretim gerçekleştirmesinin, tasarımcılara büyük zaman tasarrufu sağlayabileceği ve üretkenliği artırabileceği konusunda oldukça faydalı

bulmuşlardır. Ayrıca tasarım süreçlerinin başlangıç aşamasında spesifik bir ön araştırma aracı olarak da kullanılabileceği düşünülmüştür. Bununla birlikte, katılımcılar bu araçların özellikle Dall-e'nin, tasarım süreçlerindeki algılama ve yorumlama yeteneklerini ele alarak yazılan istemlerin bazen YZ aracı Dall-e tarafından tam olarak algılanamadığını ve zaman zaman kendi yorumunu ekleyerek beklenmedik sonuçlar ürettiği belirtmişlerdir. Özellikle istemlerde belirtilen tipografik kullanım taleplerinin çoğunlukla Dall-e tarafından yanlış algılandığını ve yanlış sonuçlar ürettiğini ifade etmişlerdir.

- Katılımcılar, Dall-e YZ aracının, etik ve yaratıcılık üzerine etkileri kapsamında, bu teknolojinin tasarımcıların yaratıcılığını kısıtlayabileceğini ve yönlendirebileceğini ifade etmişlerdir. Ayrıca oluşturulan görsellerin tam anlamıyla özgünlük açısından yeterli olamayacağını ve bu teknolojinin sadece tasarım süreçlerinde ilham alma ve eskiz aşamasında kullanılması gerektiğini belirtmişlerdir.

Üçüncü tema olan "Tasarımcının Rolü ve Perspektifi" kapsamında tasarımcıların bu teknolojiye yaklaşımları ve bu kapsamda mesleki değişim ve gelişimleri üzerine odaklanılmıştır.

- Çalışmalara katılan tasarımcılar, bu teknolojilerin genel olarak tasarım süreçlerinde etkili birer tasarım aracı olarak kullanılabileceğini ifade ederek, YZ araçlarının kullanımında öğrenme ve adaptasyonun önemli olduğunu ve bu teknolojilerin gelecekte tasarım süreçleri içerisinde daha fazla kullanılabileceğini belirtmişlerdir.

- Araştırmaya katılan tasarımcılar, Dall-e gibi YZ uygulamalarının gelişimi ve grafik tasarım alanına entegrasyonu ile birlikte tasarımcıların tasarlama süreçlerinde fazla zaman harcadıkları gündelik işlere artık zaman ayırmak yerine daha yaratıcı alanlarda etkin olabileceklerini belirtmişlerdir. Bu kapsamda, teknolojik değişimlere uyumun önemli olduğunu ve tasarımcıların bu teknolojilerden kopmadan kendilerini güncel tutmaları gerektiğini ifade ederek, eğitim sektöründe de bu teknolojilerin entegrasyonunun oldukça önemli olduğunu ifade etmişlerdir.

3. TARTIŞMA ve SONUÇ (DISCUSSION AND CONCLUSION)

Çalışmada, YZ teknolojilerinin grafik tasarım alanına nasıl dahil olacağı, tasarım süreçlerine ve tasarımcılara etkileri incelenmiş; bu yeni teknolojik dönüşümün grafik tasarım alanında olası değişimleri ele alınmıştır. Araştırma sorularının yanıtlarına ulaşılarak, bulguların alanyazındaki çalışmaların sonuçları ile örtüştüğü gözlemlenmiştir.

(AS1) Dall-e gibi YZ tabanlı uygulamaların tasarım süreçleri ve tasarımcıların çalışma dinamikleri üzerindeki olumlu ve olumsuz etkileri nelerdir sorusu kapsamında araştırmada elde edilen sonuçlar;

- Dall-e YZ aracının tasarım süreçlerine dahil edilmesinin, hızlı üretim gerçekleştirmesinden dolayı tasarımcılara büyük zaman tasarrufu sağlayabileceği ve üretkenliği artırabileceği düşünülmektedir. Kulkarni ve arkadaşlarının (2023), yaptığı çalışmada da bulgularının bu yönde olduğu görülmektedir. Tasarım süreçlerinde ilham alma ve eskiz aşamasında bu teknolojilerin kullanılması, bu süreçlere destek sağlama açısından olumlu bir şekilde değerlendirilmiştir. Yapılan başka bir araştırmada da YZ araçlarının bu yönde tasarım süreçlerine dahil edilmesi gerektiği bunun üretilen işlerin özgünlüğü ve kalitesi açısından önemli olduğu vurgulanmıştır (Mustafa, 2023).
- Dall-e YZ aracının tasarım süreçlerinde kullanımı, tasarımcıların yaratıcılığını kısıtlayabileceği ve yönlendirebileceği endişelerine neden olmuş ve bu bir olumsuzluk olarak düşünülmüştür.

(AS2) Tasarımcının tasarım sürecini başlatırken istem oluşturma pratiğinin sonuçta elde edilen tasarımın niteliğine olan etkileri nelerdir sorusu kapsamında araştırmada elde edilen sonuçlar;

- Dall-e yapay YZ aracı ile görsel çıktıların niteliğini belirgin bir şekilde etkilemek için, yazılan istemlerin detaylı ve net bir şekilde oluşturulmasının önemli olduğu sonucuna varılmıştır.
- Tasarımcıların etkili bir şekilde istem oluşturabilmesi için, mesleki terminolojiye hâkim olmalarının ve alıştıkları tasarlama süreçlerinden farklı olarak yazınsal becerilerinin de geliştirilmesi gerektiği vurgulanmıştır.

(AS3) Tasarımcıların Dall-e uygulamasını kullanırken karşılaştıkları zorluklar, uygulamanın avantajları ve dezavantajları nelerdir sorusu kapsamında araştırmada elde edilen sonuçlar;

- Bu teknolojilerin, tasarımcılar için yeni bir spesifik ön araştırma aracı olarak kullanılabileceği ve tasarımcıların üretkenliğini artırarak, yaratıcı süreçleri için daha fazla zaman oluşturabileceği durumu bir avantaj olarak görülmüştür. Aynı şekilde Li'nin (2020) ve Liu'nun yaptıkları çalışmaların sonucunda bu teknolojinin grafik tasarım süreçlerindeki kullanımının, yenilikçi ve etkileyici tasarımlar oluşturulmasına imkân tanıyarak tasarım süreçlerinde verimliliği artırabileceği yönündedir.
- Tasarımcıların bu teknolojik değişimlere uyum sağlaması gerektiği ve kendilerini sürekli güncel tutarak geliştirmelerinin önemli olduğu sonucuna varılmış bunun bir teknolojik adaptasyon zorluğu olabileceği düşünülmüştür. Hien (2023) ve Meron'un (2022) çalışmalarında da aynı şekilde YZ teknolojilerinin giderek artan etkilerine adapte olabilmek adına, tasarımcıların yaratıcılık, empati ve eleştirel düşünme gibi becerilerini geliştirmeleri gerektiği ve bu alanda meydana gelen yenilikleri sürekli izleyerek kendilerini güncel tutmalarının önemli olduğu vurgulanmaktadır.

Gelecekteki araştırmaların YZ teknolojilerinin etik ve sürdürülebilir tasarım üzerindeki etkisini incelemesi, tasarım eğitimi programlarının bu teknolojilere nasıl daha etkin şekilde adapte olabileceğini araştırması ve tasarım süreçlerinde insan-yapay zekâ iş birliğinin optimizasyonuna odaklanması önerilmektedir. Bu çalışmaların, YZ'nın grafik tasarım endüstrisindeki rolünü daha iyi anlamamıza ve tasarım pratiğine entegrasyonunu geliştirmemize katkı sağlayacağı düşünülmektedir.

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Digital Surrealism: Video Game Space

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The concept of virtual reality (VR), perceived as a copy of physical reality, restricts both the creators and users of the space, leaving no room for potential surreal experiences. The main motivation for conducting the research on virtual surreal space is to open up creative/productive spatial possibilities for discussion from a thought perspective that goes beyond this definition.
Although there are various approaches to digital space in the literature, these studies mostly rely on computational methods. In contrast, this study aims to explore space from the perspective of "digital surrealism" which is ignored in spatial studies, through the computer-based gaming experience. Scholars writing about architecture and surrealism have argued that, unlike other forms of fine art, architecture was never an integral part of surrealism. Against this perspective of the digital game experience, the study aims to question whether it is possible to interpret the space with a surreal perspective and to investigate whether the space can approach surrealist thought with the digital game experience fed by computational methods that support the concepts of 'autonomy' and 'ubiquity'.
The main goal of the study is to explore the relations between surrealism and architecture and the spatial potential of these relations through the experiences of the players. The surrealist spatial potential of digital space experience is explored in Superliminal (2019), a puzzle game that transforms the experience into allegories of dreams, free-thinking and multiple opportunities. Data analysis performed on the STEAM platform and the First Manifesto of Surrealism (1924), in which surrealism came into existence as a movement, were analyzed with Python software. The experimental group's thoughts and comments expressed on the STEAM platform were analyzed.
Preliminary results of the study are presented with the "regression tree" method. Using the Python programming language, analyses are prosuded to discuss game spaces from a lens of surrealism perspective.

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Dijital Sürrealizm: Video Oyun Mekanı

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Fiziksel gerçekliğin bir kopyası gibi algılanan sanal gerçeklik (VR) kavramı, mekânın hem yaratıcılarını hem de kullanıcılarını kısıtlayarak potansiyel gerçeküstü deneyimlere yer bırakmamaktadır. Araştırmanın sanal gerçeküstü mekân üzerine yapılmasının temel motivasyonu, bu tanımın ötesine geçen bir düşünce perspektifinden, yaratıcı/üretken mekânsal olasılıkları tartışmaya açmaktır.
Literatürde dijital mekâna yönelik çeşitli yaklaşımlar mevcut olsa da bu çalışmalar çoğunlukla hesaplama yöntemlerine bağlı kalmaktadır. Buna karşılık, bu çalışma, bilgisayar tabanlı oyun deneyimi yoluyla, mekânsal çalışmalarda göz ardı edilen "dijital gerçeküstücülük" perspektifinden mekânı keşfetmeyi amaçlamaktadır. Mimarlık ve gerçeküstücülük hakkında yazan araştırmacılar, diğer güzel sanat türlerinden farklı olarak mimarinin hiçbir zaman gerçeküstücülüğün ayrılmaz bir parçası olmadığını öne sürdüler. Çalışma, dijital oyun deneyiminin bu bakış açısına karşı, mekânı gerçeküstü perspektifle yorumlamanın mümkün olup olmayacağını sorgulamayı ve mekanın, 'özerklik' ve 'her yerde bulunurluk' kavramlarını destekleyen hesaplamalı yöntemlerden beslenen dijital oyun deneyimiyle sürrealist düşünceye yaklaşıp yaklaşamayacağını araştırmayı hedefler.
Sürrealizm ile mimarlık arasındaki ilişkileri ve bu ilişkilerin mekansal potansiyellerini, oyuncuların deneyimleri aracılığıyla keşfetmek çalışmanın ana hedefidir. Deneyimi rüyalar, özgür düşünme ve çoklu fırsatlar alegorilerine dönüştüren bulmaca oyunu (puzzle game) Superliminal'de (2019) dijital uzam deneyiminin sürrealist mekansallık potansiyeli araştırılmaktadır. STEAM platformu üzerinden yapılan veri analizleri ve sürrealizmin bir akım olarak vücut bulduğu birinci sürrealizm manifestosu (1924) Phyton yazılımı ile analiz edilmiştir. Bilinçli olarak deney grubunun tamamen kendi düşüncelerini, STEAM platformunda ifade ettikleri yorumlar analiz edilmiştir.
Çalışmanın ön sonuçları “regression tree” metodu ile görselleştirilmiştir. Python programlama dili kullanılarak oyun mekanlarının sürrealizm perspektifinden tartışılmasına yönelik analizler sunulmuştur.

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1.INTRODUCTION: EXPLORING THE POTENTIAL OF SURREALISM IN VIDEO GAME SPACE

Surrealism, as defined by Breton (1924) in his "Manifesto of Surrealism," emphasizes the importance of understanding one's surroundings through the lens of the inner self rather than relying on external perceptions. This artistic movement aims to bring to life the imagery of the subconscious and dreams, challenging traditional notions of nature. Surrealism investigates how individuals relate to the external world through subconscious filters and suggests that neglected associations and the boundless power of dreams possess a higher reality.

In contrast to traditional modernist approaches, surrealism prioritizes exploration over discovery. It rejects the idea of constructing a rational thinking based on logical data or creating new structures that reflect external reality. Moreover, it invites individuals to turn inward, to explore hidden and suppressed inner perspectives. By revealing these hidden perspectives, surrealism seeks to transcend the creation of merely aesthetically pleasing spaces and delve into the deeper role of human exploration. It suggests that space should be seen as something to be discovered rather than pre-existing (Hopkins, 2004).

Furthermore, Breton has articulated his surrealistic perspective on space, highlighting that Surrealism maintains a certain distance from architecture in contrast to its closer engagement with other fine arts (Altınyıldız Artun, 2020). In consideration of these factors, this research seeks to investigate the possibility of bridging Surrealism and architecture through the immersive experience of digital space. Through interactions within the digital gaming space, it draws nearer to cultivating a surrealistic encounter. This study delves into the potential inherent within digital game spaces, offering a more expansive array of interaction opportunities when contrasted with other virtual environments such as cinema and social media platforms. In the interplay between the game space and the player, both undergo transformation, fostering exploration, which in turn possesses the potential for dreamlike spatiality. At this point, consider exploration as an inherently creative act, with game spaces serving as ideal arenas for such creative exploration.

Within the realm of games, James P. Carse (1986), a researcher, discerns between finite and infinite games. Finite games are played with the aim of achieving victory through strategic maneuvers to attain a predetermined outcome. Their objective lies in establishing a binary result upon game completion, often at the expense of neglecting the player's spatial experience. On the other hand, an infinite game can only be sustained through dialogue within a physical and/or digital space that defines a finite ground. Instead of focusing on a definitive triumph, infinite games, played to perpetuate the game itself, prioritize exploration. While a finite game concludes with a winner, an infinite game offers different outcomes, potentially leading to creative endeavors.

The research subject of this research is limited to the games for explorers in the definition of Bartle player types (Bartle, 1996). This study's inspiration for a new sense of creativity from the less-known field of game design. In addition to being similar to game design, visual arts, music and other fields with many current results, it is thought to establish a deep and active communication with the community it addresses. It feeds the user's perception/creativity as well as leaving gaps to be filled to the player.

In light of all these thoughts and research, this study aims to explore the development of a productive relationship between game spaces and players and to investigate how it can contribute to spatial experience as a non-linear way of thinking. It aims to examine the transformative dynamics between virtual game spaces, which give rise to hybrid spatiality, and surrealism. By exploring their applicability and adaptability to spatial experience, this research seeks to uncover the potential emerging from the intersection of surrealism and virtual game spaces. Crucially, this study positions surrealism not merely as a stylistic influence but as a strategic mindset. Mentioned mindset will be examined in detail in the surrealism section of the research.

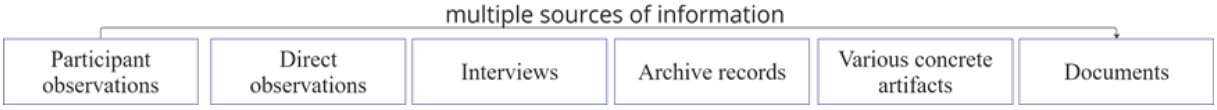
By focusing on gameplay and player experience, this study embraces a theoretical explanation that surpasses data and code methods, emphasizing the importance of experimentation and exploring gameplay dynamics in understanding the possibilities of surrealist thought. In the upcoming chapters, will delve into the revival of

surrealism within architectural spaces, employing a theoretical lens rooted in surrealistic principles. This exploration will be conducted through the medium of video games tailored to the preferences and tendencies of the explorer player type. The aim is to investigate and clarify the current state of game space research in terms of surrealist space and to suggest further research avenues.

2. METHODOLOGY

This study is conducted using the case study research method. Various procedures can be used when conducting the case study, but Yin's (2009) studies will be used as a reference in this study. As suggested by Yin (2009), six types of information sources were used to collect data (Figure 1).

Figure 1: Research Sources (created by author).



The methodology of the study consists of two stages: investigation of surrealism, architecture, and videogame space using literature documents and extracting the critical parameters of surrealism mindset and exploring the example game environments according to player comments on STEAM for the perspective of surrealistic spatiality, then implementing the parameters into the conceptual regression tree using Phyton software.

Overall, this methodology focuses on understanding the relationship between surrealism and selected game space, identifying the important parameters involved, evaluating their manifestation within a specific context (video game space), and finally integrating them into a conceptual regression tree. As the primary objective, the study explores the relationship between architecture and surrealism through the lens of the digital space experience.

To discuss the fundamental elements of surrealism and understand surrealism in its simplest form, André Breton's First Surrealist Manifesto was used. This manifesto, the first written work highlighting the mindset of surrealism as a movement, was analyzed using the content

analysis script with Python, and the most frequently used words were determined.

The most suitable games were selected to address the research questions, and a cross-case analysis was conducted within the framework of the relationships between the situations. The research is conducted on the STEAM platform where players can freely express their experiences rather than by asking specific questions to an experimental group. Comments related to the game "Superliminal" on the Steam platform were gathered, and these comments were categorized using the same method, with the frequencies of words determined. The incorporation of automatic analysis methods derived from the advantages of digital space aligns research methodologies with surrealist thinking.

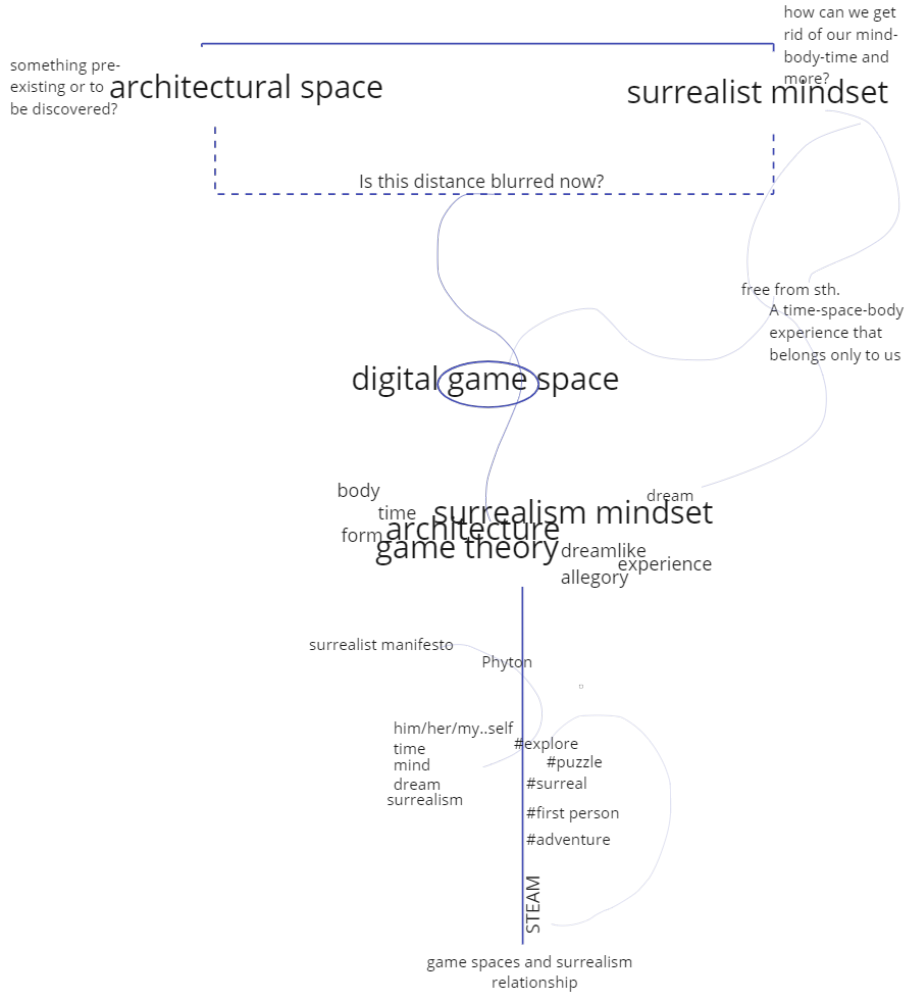


Figure 2: Research Structure (created by author).

3. SURREALISM

Surrealism, an artistic and cultural movement led by André Breton in the early 20th century, wielded significant influence, particularly in art and literature. Its origins can be traced to a convergence of various influences, notably the Dada movement (1917) and principles from psychoanalysis. The definitive initiation of surrealism as a movement transpired with André Breton's "Manifesto of Surrealism" in 1924. Positioned as a responsive departure from established norms in art and literature, surrealism emphasized the prominence of subconscious mechanisms and dream states. Techniques like automatic writing and automatism in painting were employed with the explicit aim of exploring and expressing the surrealist's subconscious. The movement, rejecting rational thought and societal conventions, gave rise to a distinctive and critical vocabulary within the realm of artistic expression.

3.1 Surrealism and Architecture

The texts that makeup Architectural Design's Surrealism and Architecture file dated 1978, which is the first source to comprehensively investigate these relationships, constitute an important basis for this part of the research.

According to Dalibor Vesely (1978), architecture has never been like other branches of art; Painting has not been an integral part of surrealist thought like sculpture and objects. According to Kenneth Frampton, another writer who supports this idea, 'it can be argued that there is no such thing as surreal in architecture' (Altınyıldız Artun, 2014). Surrealists, on the one hand, tried to erode the modernist rigid rules of architecture. On the other hand, they try to produce alternatives to this. Against temporality and desires that modern architecture ignores, they want to explain architecture as a place where desires and time accumulate. They argue that time and experience enrich the space by layering and overlapping, creating the soul of the space. By making architecture the object of poetic experience, they imagine the existence of poetic space that rationalism destroyed. According to them, this is a formless, a timeless architecture that changes according to the flow of desires. The best-known example of this understanding of space important source for the research- is Nadja.

Nadja can be considered one of the basic texts of the surrealist space experience.

In mentioned text describes the experience of Paris, the main character is not only the experienced city but also the subject who experiences the city. The question "Who am I?" mentioned by Breton in Nadja's first page, regarding the identity, nature of the subconscious, or the relations between mind and body, was fundamental in Surrealism (Breton, 1928).

The main character of the book, as an explorer of urban space, also explores himself. A person discovers oneself through space and discovers space based on their own identity. Spatial experience exists not only with external but also internal elements. Here the experience of the one is at the same time active, hallucinatory, and shocking. It is a spontaneous creation at every step (Ojalvo, 2011). In Benjamin's words (as for Baudelaire before him), the flaneur's dreams evoked by perceptions are set free in this kind of experience (Benjamin, 1995). The city turns into a surreal place, it is turned upside down in the mind and constantly reconstructed through imaginary connections. Reality and dreams are inextricably merged. The book's character and the city are intertwined and become one. This existence with the city, Nadja, and overlapping times makes Paris a collage of magic. In surrealism, space, time and the subject who experiences it are becoming one. Space is formed through these experiences and through the accumulation of time.

In this case, the form limits the existence of other possibilities by enclosing these possibilities within a framework. Batallie explains this situation with the concept of formless "L'INFORME" (Batallie, 1929).
Batallie affiliated with the surrealist movement, is a philosopher who challenges societal norms and established hierarchies, actively seeking their dismantlement.

The figure drawn by the painter André Masson, depicting a headless person with the pelvis covered by a skull, represents Georges Bataille's concept of the "formless'' (Figure 3). The concept, introduced by Bataille, rejects all encoded, systematized, and hierarchical definitions of matter or objects. According to this perspective, the condition for an

individual's liberation metaphorically involves rebellion against even their own body.

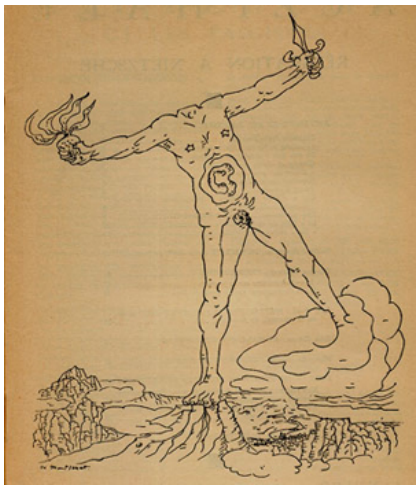


Figure 3: André Masson's cover for the first issue of Acéphale,1936

Despite the rigid stance of space, the emphasis is on the surrealist potential of experience. Based on these thoughts, a "game", in which a person resists one's own body, time, and place, and builds one's identity only with an inner impulse (winning, discovering, spending time, creating), is a way to get rid of these boundaries - prisons.

3.2 Digital Surrealism

The concept of digital surrealism is utilized in this study by placing space at the center of focus. As mentioned in previous sections, architecture has often steered clear of a surrealist approach. The central problem of this study is to investigate how architecture and surrealism converge or diverge through the experience of digital space.

Various "automatic analysis" methods that emerge as advantages of digital space also align research methodologies with surrealist thinking. The methods used by surrealists to reveal the unconscious and break free from the limits of consciousness have become more pronounced in the digital world. This situation paves the way for the use of surrealist creative methods in digital platforms. However, in the literature, the concept of Digital surrealism has been limited to cinema studies and there are still very few studies.

For instance, Ferguson proposes the concept of digital surrealism as a method of digital manipulation, using scientific image analysis software

such as “ImageJ” to manipulate film frames. The aim is to examine film texts beyond the ordinary through the images resulting from these manipulations. Referring to Roland Barthes's idea of structural activity, which involves taking apart an object and then reassembling it to create something new, Ferguson emphasizes that the digital surrealism method targets a similar creative process. Drawing on a quote from Roland Barthes about "the structuralist activity," Ferguson highlights that structural analysis takes apart the truth and then reassembles it to create something new. Ferguson's use of digital surrealism as a method involves manipulating film frames with scientific image analysis software to examine film texts in extraordinary ways, echoing Roland Barthes's concept of structural activity (Ferguson, 2017).

Andrei Kartashov considered this concept from the perspective of surrealist film theory and used this concept in his work on cinema works that have surrealist qualities and consciously use digital technology in their production (Kartashov, 2018).

3.3 Surrealism and Game

It is said that Surrealists produced creative ideas with the games they played, such as exquisite corpses, automatic drawing, etc. The relationship between games and surrealism is important because surrealists encouraged creativity and free thought via games (**Figure 4**).

Figure 4: (on the left) André Mason, Automatic Drawing, 1924, (on the right) Hannah Hoch, Da Dandy, 1919, Photomontage

David Graeber expresses the relationship of games with freedom by arguing that playing is the purest form of freedom. He says freedom is our ability to make up just because we can. When we feel free, we are

more likely to play or invent. Game is not only what gives birth to freedom, but also what arises from freedom. Through playing, the limits of the mind are exceeded (Graeber, 2018).

According to Huizinga, playing games is a tendency that comes from the instinct of 'being different'. Even though the game is inherently bound by rules, it is free and subject to pleasure. The fact that it can be postponed at any moment makes the game free from time, and one is free in the field of play, both in terms of the decision to be in it and in terms of establishing the space. The game always creates other possibilities, and even though it depends on the rules, it gives birth to itself by turning into another game with a new rule at any moment. According to Huizinga, excessive systematization and increased discipline of the game overshadow the playful content (Huizinga, 2015). In that case, game designers cannot directly design the game, they create an indirect experience for the player by designing the rules that give rise to experience. The game includes the objective choices a player makes and the conditions reached in the game, as well as the player's subjective reactions and expectations. At the limits of imagination, space is built and unbuilt over and over again in the mind throughout the playing process. For this reason, digital games do share a viewpoint in terms of spatiality with other visual forms, photography, painting, etc. - but they differ from them with their interactive nature.
The distinct difference between video games and other forms of visual media is the main reason for choosing a case video game environment for this study. Videogames exploit all of the four key affordances of digital media: They are procedural, participatory, encyclopedic, and spatial (Murray, 2011) (Figure 5).

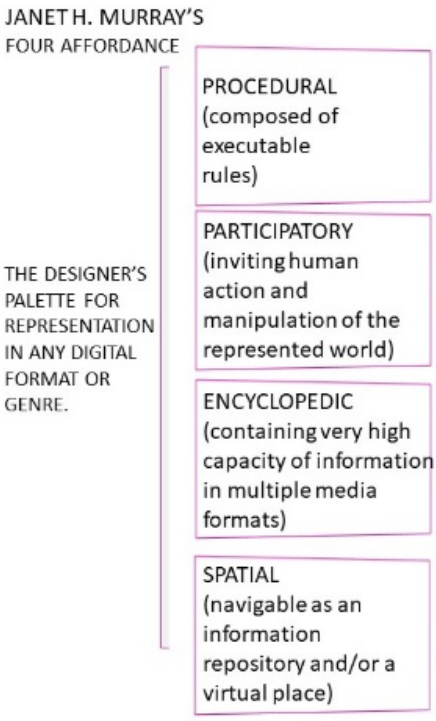


Figure 5: Janet Murray's four affordance of digital media (created by author).

Digital game environments allow players to experience space in unique ways via their limited bodies and subconscious. In this study, the experience of the space by integrating the limited human body and perception with an unlimited subconscious, and digital game spaces that directly affect the user by looking at the space from a surrealist viewpoint through these experiences and reveal the subconscious by keeping the moment alive, are discussed. Within the scope of the study, spatial narrative is examined through digital game spaces, and the emergence of space through the experience created by the synthesis of architecture, game, and surrealism is explained with examples. In this section, game spaces with non-Euclidean spatiality features were selected as cases in order to support and examine the hypothesis mentioned/explained in the previous sections.

4. VIDEO GAME AS SPATIAL SURREALIST EXPERIENCE

In research on video games, space to date, game space has been seen as architectural metaphors (Günzel, 2013) representational and textual spaces of the imagination (Schwartz, 2006) a form of storytelling or interactive spaces (Jenkins, 2004).

Henry Jenkins, who associates the concept of narrative with games in his article written in 2004, talks about the potential of researching games not only as stories but also as spaces that mature/create themselves with narrative possibilities. While playing a game, the players construct their own narrative with the contribution of the potential narrative of the game. The concept of narrative in the game is a situation that is affected not only by storytelling but also by other mechanics of the game -environment, object that constructs game space, time, player's perspective, and more. When talking about narrative or other game mechanics that come into play from the player's experience, all can be classified under the concept of interactivity. The game offers the players a potential for an experience, it does not design the experience. It creates an interactive environment to explore and build their own experience. In this respect, game designers can be defined as narrative architects rather than storytellers (Jenkins, 2004).

Jenkins defines the term ''narrative'' as something pre-structured or programmed, something that takes shape through play, nor does it mean unstructured or chaotic. This means that playing the game allows the player to create their own stories. The story itself is structured through the actions of the player. Experience is a product of the continuous and cumulative interaction of an organic self with the world. In this interaction, the interactor (player in this context) is in a constant state of transformation. In this case, the game space provides a ground where mutual change is continuous. More than just a spatial element created by the game, the self is also reconstructed in the game world. The players experience the game space in another dimension, with a different identity, and with new skills, through players' avatars.

Dewey defines experience as consisting of stories, each of which has its own plot, a beginning and a progression towards closure, of a non-repetitive nature. For example, since a staircase is mechanical, it progresses in individual steps rather than a solid progression, and an inclined plane is distinguished from other things by its apparent steepening. An experience has a pattern. They do not consist merely of following and exposure to each other, but of these occurring in relation to each other. Action and its result must be united in perception. The scope and content of relationships are the measure of the content of an experience. (The depth and breadth of a child's experience is low

due to the lack of background and the lack of understanding of the relationships between exposure and doing.) Through the object, the artist/designer and the active observer-experiencer- encounter each other, their material and mental environments, and their culture at large (Dewey, 2021) (Figure 6).

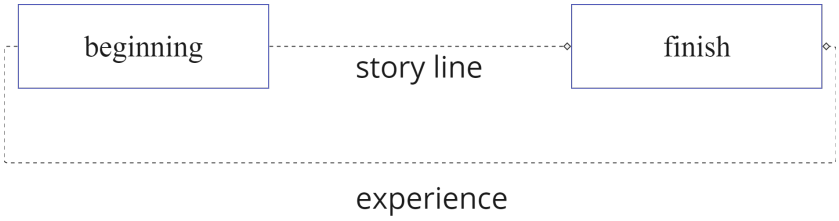


Figure 6: John Dewey's experience definition (by author)

5. VIDEO GAMES AS A FIELD OF STUDY

Video games have distinct characteristics that differentiate them based on their gameplay styles. Platform games, RTS (Real-Time Strategy) games, TBS (Turn-Based Strategy) games, adventure games, simulations, FPS (First-Person Shooter) games, TPS (Third-Person Shooter) games, and RPGs (Role-Playing Games) each have unique game mechanics, gameplay styles, and objectives (Tanyeli, 2011). And the puzzle games included in this research. The main focus of puzzle games is the player's ability to manipulate various objects to solve challenges and progress. This feature provides players with an active role in the development of the story and the opportunity to solve various puzzles.

In the scope of this study, puzzle games were chosen for their potential to enhance players' different thinking. In puzzle games, each puzzle or object change represents a crucial element that assists the player in advancing the story or interacting with game space.

This situation provides players with an interactive experience, allowing them to actively participate in the development of the story. According to Bartle's player types, it is believed that conducting research through games that specifically appeal to Explorer-type players would be productive in this study's scope (Figure 7).

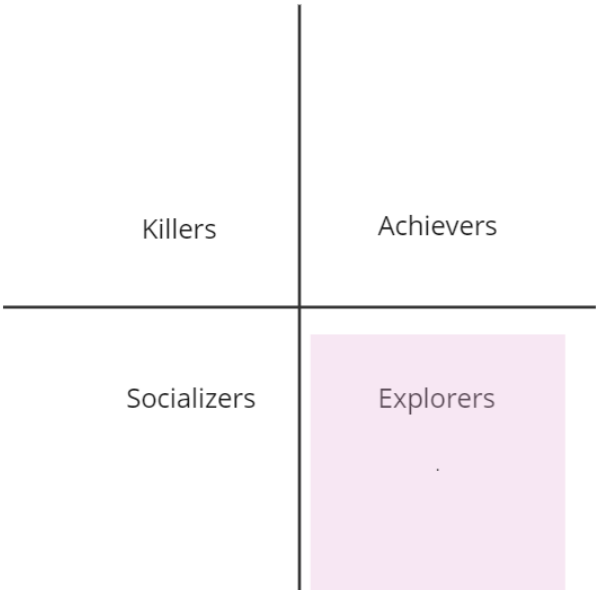


Figure 7: Type of players (Bartle, 1996).

Explorer types enjoy exploring all aspects of a game, including its mechanics, various story elements, and want to know everything about what they can do in it. Bartle explains that they are interested in how the game works and look for interesting and abnormal characteristics such as bugs (Bartle, 1996). Explorers are less concerned about competition and more interested in spending time experiencing the story that the game has to offer.

Games that focus on single-player experiences and include tags such as "Puzzle," "Surreal," "Exploration," "First-Person," and "Adventure" were considered in order to exclude the impact of other players on the game. Tags such as "Horror", "Psychological Horror" and "Survival Horror" were excluded due to the games being perceived as surreal due to their visual effects only. The "Realistic" tag was not included in the elimination criteria as it was outside the scope of the research. Games with at least 1000 reviews were listed as shown in **Table 1.**

Table 1: Created from 04.01.2024 STEAM data (created by author).

Game	Most popular user-defined tags	Release date	Review
The Stanley Parable	#Comedy, #Narration, #Indie, #Walking Simulator, #First-Person	2013	38,673
Superliminal	#Puzzle, #First-Person, #Surreal, #Narration, #Physics	2019	21,178
The Witness	#Puzzle, #Exploration, #First-Person, #Open World, #Singleplayer	2016	13,163
Antichamber	#Puzzle, #First-Person, #Indie, #Surreal, #Exploration	2013	12,348
Manifold garden	#Puzzle, #Surreal, #Abstract, #First-Person, #Exploration	2020	5,061
Viewfinder	#Puzzle-Platformer, #First-Person, #Puzzle, #Singleplayer, #3D-Platformer	2023	4,423
Moncage	#Puzzle, #Casual, #Indie, #Singleplayer, #Drama	2021	4,386
Quern UndyingThoughts	#Adventure, #Puzzle, #Mystery, #Atmospheric, #Exploration	2016	2,972
Call of the Sea	#Adventure, #Puzzle, #Story Rich, #First-Person, #Female Protagonist	2020	2,880
Obduction	#Adventure, #Puzzle, #Exploration, #Indie, #First-Person	2016	2,784
The Unfinished Swan	#Adventure, #Puzzle, #Indie, #Exploration, #Puzzle Platformer	2020	1,283
realMyst: Masterpiece Edition	#Adventure, #Puzzle, #Point & Click, #Exploration, #Mystery	2014	1,245
Hyperbolica	#Surreal, #Exploration, #First-Person, #Adventure, #Puzzle	2022	1,125
Riven: The Sequel to MYST	#Adventure, #Puzzle, #Point & Click, #Exploration, #Classic	2010	1,080

5.1. Spatial Surrealist Experience in Superliminal Game

The game space of Superliminal with non-Euclidean spatiality feature was selected as a case in order to examine the hypothesis mentioned in the previous sections. According to the research conducted by Arsenault and Larochelle (2014), the spatiality of digital games adheres to illusionistic projections of Euclidean space. Games like Superliminal or Antichamber, which feature non-Euclidean spatial characteristics, can significantly impact players' perception of object permanence and evoke feelings reminiscent of childhood (Backe,2020).

Superliminal strategically engages players in a cognitive challenge, prompting them to explore their cognitive abilities and devise inventive solutions. By manipulating perception through alterations in point of view, achieved via perspective changes and optical illusions, the game transcends conventional spatial representations found in digital games. Through interventions on spatial elements, such as resizing objects, eliminating barriers, and generating navigable platforms, players gain

direct influence over the game space, transforming it into an allegorical entity.

Granting players the authority to manipulate the game space fosters a surreal atmosphere, akin to a dream that defies the constraints of physics and perception. This departure from traditional spatial logic encourages players to explore unconventional cognitive pathways. The non-linear narrative structure of the game empowers players to formulate subjective interpretations. The surreal potential embedded in the game space compels players to transcend conventional cognitive mapping, fostering an experiential journey into spatial surrealist possibilities facilitated by perspective shifts and optical illusions. Consequently, the game makes possible an exploration into the subconscious depths within a dream-like ambiance.

5.2. Exploring Subconscious Dimensions of Space Perception: A Conceptual regression tree

Surrealism aimed to transcend the confines of visual imagery and its conventional purpose. It envisioned itself as a thought factory, a lifestyle that embraced playfulness and creativity. Surrealism was not merely an art movement; rather, it embodied a way of life that allowed for unbridled experimentation within the realm of the inner self, free from external constraints (Klingsöhr-Leroy, 2004).

André Breton's First Surrealist Manifesto (1924) has been chosen to evaluate how the surrealist experience is manifested or exists in terms of creativity, playfulness in the video game space.

The manifesto is considered significant for research as a written text that gives substance to surrealism as a movement. The most frequently occurring words in the manifesto have been analyzed using Python software (Appendix 1). Stop words have been eliminated and most used words have been categorized (Figure 8).

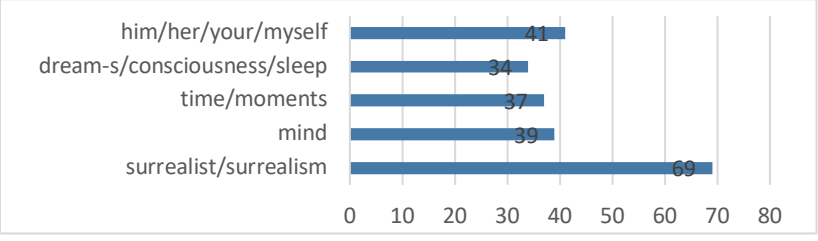


Figure 8: Most used concepts in First Surrealist Manifesto (English version) (created by author).

Concepts such as individuality-mind-time-dream- within surrealism are deemed important for questioning the surrealist experience in the game space. In this context, when these concepts are determined as categories, it is important which of these elements are experienced in the game space and in what way. Inherent to the main logic of surrealism, Steam (n.d.) has been selected as the research field, where users share their comments without any specific purpose, instead of conducting interviews with specific users chosen as the research area.

The goal is to reach as much data and commentary as possible without making distinctions such as hierarchy or gender/country/age range among the comments. The intersection between what the players can and cannot do in the game, determines the possibility space of the game universe. Players' preferences and how they perceive the game provide important clues for understanding and improving game design. In this context, methods such as interviews with players can play a critical role in the game analysis process.

Digital games, being interactive spaces, make user feedback a crucial evaluation data for research. It is believed that the Steam platform, which possesses the broadest pool of information, is suitable for accessing such data. Specifically, for the "Superliminal" game on Steam, comments made in English between November 1, 2020, and December 28, 2023, were considered. Among a total of 25,021 comments, those deemed helpful by at least 2 individuals (via the most helpful category filter) were filtered, resulting in 13,244 comments for analysis (Stream, n.d.).

Stop words (such as prepositions) have been eliminated. Following this analysis, the filtered comments were analyzed using Python software, and the frequencies of the concepts mentioned in the comments were determined (Table 2).

The frequencies of the concepts in the table provide a starting point for understanding which aspects of the play are prominent and how they influence the surrealist space perception. According to the results of the analysis, it is seen that the players frequently use expressions such as bending, and melting regarding mind, and words such as bending and illusion regarding time (Table 2). When the analysis is taken into

consideration, it can be seen how they experience these concepts. In the context of the research on the surrealist space experience, the ways of experiencing it can be seen in these categories.

Table 2: Relationship between surrealist manifesto and Superliminal Game comments on STEAM platform (created by author).

Concepts	Frequency	Concepts	Frequency
Dream		**Surrealist/surrealism**	
play/played/player/s	435	puzzle/s	674
story/storytelling	170	play/played/player/s	435
dream/s/ing/sleep	112	mind/brain/mental	202
gameplay	86	experience/s/experiment	196
unique	70	fun/entertaining//enjoyed/enjoy/able	136
narrative/narration	65	dream/s/ing/sleep	112
creative/creativity/create	51	interesting	96
simulator	33	trippy/weird/odd/fantastic	87
imagine	16	outofthebox/exceptional	53
exploring	16	change/changing/ed	50
built	13	design/s	46
hidden	12	unexpected/surprised	40
complex	12	illusion/s	38
journey	9	environments/place	38
provoking	8	variety/various/multiple	27
non-euclidean	7	atmosphere	24
inspiring	7	secret/s	24
visually	7	explore/ation	24
phenomenal	6	art	22
hallways	6	surreal	22
intuitive	6	humor	22
profound	6	visuals	19
subliminal	6	confused/ing	17
manipulation	6	imagine	16
vision	6	possible	16
metaphor	5	rules	13
inventive	5	pretentious	12
charming	5	complex	12
physics	5	impossible	12
emotional	5	inspired/inspirational	12
Him/her/your/my self		designed	11
experience/s/experiment	196	puzzler	11

Concepts	Frequency	Concepts	Frequency
perspective/s	179	replayability	11
feel/s/ing	161	acting	11
firstperson	103	aesthetic	9
creative/creativity/create	51	crazy	9
times	35	endless	9
optical	21	novel	9
depending	20	potential	8
focus/es	19	non-euclidean	7
dialogue/interact/interactive	23	inspiring	7
personally	13	particular	7
aspect	11	visually	7
characters	5	phenomenal	6
inventive	5	inception	6
Mind		intuitive	6
perspective/s	179	bizarre	6
feel/s/ing	161	subliminal	6
solve/solving/solution/s	206	philosophical/philosophy	10
challenge/s	55	puzzling	5
perception	54	doubt	5
change/changing/ed	50	stunning	5
expected/expectations/expecting	49	choice	5
challenging	40	metaphor	5
illusion/s	38	inventive	5
times	35	creepy	5
secret/s	24	charming	5
explore/ation	24	physics	5
thinking	23	messes	5
satisfying	22	intriguing	5
impressive/ed	21	emotional	5
therapy	20	**Time**	
headache/sickness	20	bending	38
hurts/pain	18	illusion/s	38
confused/ing	17	playthrough	21
blind	16	certain	18
blowing/melting	16	speedrun	18
relaxing	15	constantly	18
built	13	repetitive	15
problems	13	progress	14
hidden	12	impossible	12
complex	12	endless	9
inspired/inspirational	12	constant	7
puzzler	11	limits	7
high	11	free	7
acting	11	sequence	7
depth	10	progression	6
crazy	9	limited	6
forced	8	immediately	5
provoking	8	loop	5
shrink	7		
attention	7		
treatment	7		
blast	6		
puzzling	5		
doubt	5		
stunning	5		
creepy	5		

6. CONCLUSION

As can be seen, there are points where the concepts, which are divided into categories and seen as the basic concepts of surrealism as a result of the research, overlap with the comments made about the game experience (Table 2). It can be used as a preliminary study for future studies that can be taken into consideration in the process of designing digital game experiences. The concepts of time, mind, individuality, dream and their related concepts can be taken into consideration in the design of digital game space experience.

During the research process, an effort was made to examine the relationship of surrealism, which emerged in the 20th century and has now ended, with space. The works of Surrealists, how they adopted this understanding, how they integrated it into their lives, their creative works, their relationship with mechanization and Surrealist manifestos were among the main sources of this study. Walter Benjamin's definition, "history is not looking for traces of the past today, but discovering traces of the present in the ruins of the past", is the source of inspiration for efforts to see the present in the ruins of surrealism during the research process. It can be said that the inclusive and creative perspective in these ruins is not far from the experience of space due to the position that mechanization has reached in the 21st century.

In this case, since the categorized concepts interweave with each other and shape an experience that cannot be thought of independently, it would be more appropriate to present a table where intersections occur rather than listing them vertically in a table (Figure 10). As spatial experience consists of multiple variables, it will contain various points of intersection.

Understanding surrealism's non-linear way of thinking, experiencing, and producing, not as a series of absurd images but as the mindset of surrealism, liberates our minds in designing and experiencing space. The perspective that liberates the designer's mind also liberates the experience of the experiencing subject.

Thus, space, rather than being the prison of our body, like a frame that contains us, can lead us to completely different experiences by freeing us from time and space. The way digital game spaces liberate our minds from time, framed spaces, and even our bodies have been investigated within the scope of this study.

Future studies can expand the results of these studies and focus more on how surrealists use techniques such as dreaming, stream of subconscious and automatism, how these techniques can be reinterpreted in digital space design, and how the surrealist mindset can be integrated into digital space design.

Surrealism's dream of separating the subject from the body, time, and everything that comes as a boundary between every element of one's experiences and offering there an experience in the limitlessness of the dream can be realized in the game spaces in the digital world. It is anticipated that the parameters emerging as a result of these studies will be preliminary research, in that they will always lead to the imagination of other possibilities in space design.

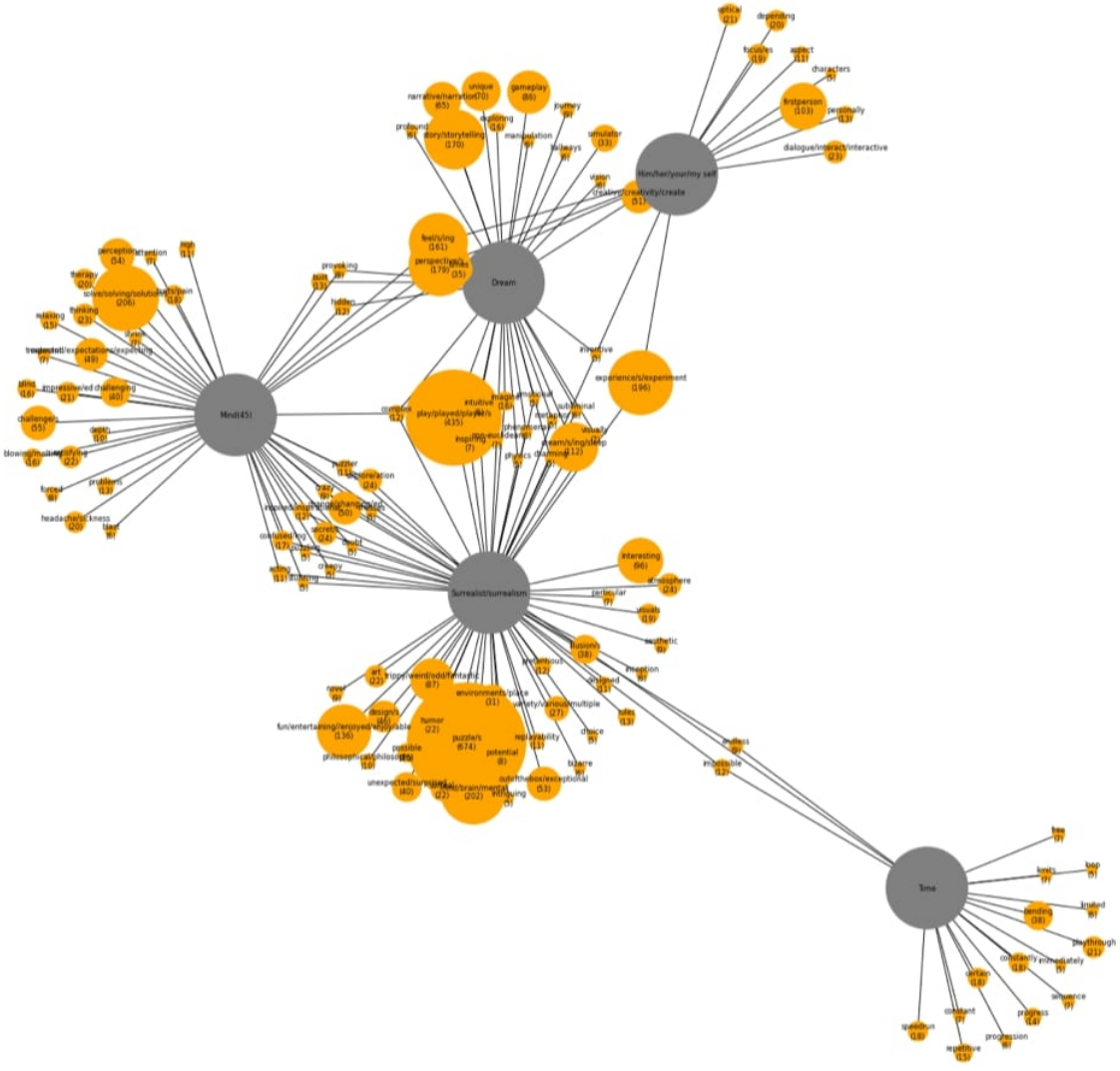


Figure 10: Conceptual regression tree (created by author).

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Conflict of Interest Statement

The authors of the study declare that there is no financial or other substantive conflict of interest that could influence the results or interpretations of this work.

Author Contribution

The authors declare that they have contributed equally to the manuscript.

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