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Cover: A view of a kindergarden building and its lounge; p.68.

Ankara, June 2024

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YAZI KURULU'NDAN

ODTÜ Mimarlık Fakültesi Dergisinin Haziran 2024 41(1) Sayısını sizlerle paylaşmaktan ötürü mutluyuz.

Derginin bu sayısında; 16 yazar tarafından 9 yazı sunulmaktadır. Bu yazıların altı tanesi İngilizce, üç tanesi ise Türkçe olarak hazırlanmıştır. Bu sayımızda ayrıca bir de Görüş Yazısı'na yer veriyoruz. Bu yazıda Fritz Janeba tarafından oluşturulmuş bir tasarım eğitimi yönteminin ODTÜ Mimarlık Fakültesi'ndeki uygulaması ele alınmaktadır.

Bütün yazarlara akademik üretime yapmış oldukları katkıları nedeniyle teşekkür ederiz.

EDITORIAL

We are happy to present the June 2024 41(1) issue of the METU Journal of the Faculty of Architecture.

In this issue; 9 articles are presented by 16 authors. Six of these articles were prepared in English and three in Turkish. More to that, we present a Viewpoint which discusses the application of Fritz Janeba's design teaching at METU Faculty of Architecture.

We thank all authors for their contributions to academic production.

BÜYÜYEN RAYLI TOPLU TAŞIMA SİSTEM AĞINDA HATLAR VE İSTASYONLAR: İSTANBUL ÖRNEĞİ

Buğra GÖKCE*

Alındı: 14.08.2023; Son Metin: 04.03.2024

Anahtar Sözcükler: İstanbul; raylı toplu taşıma; istasyon yerleri; raylı toplu taşıma yolcu değerleri.

1. Bu kilometre artışının neredeyse yarısı Avrupa'dan gelmiştir (UITP, 2023, 3).

2. 1930'larda yaklaşık 900'ün üzerinde kentte tramvay faal olarak işlemekte idi. II. Büyük Savaş sonrasındaki refah dönemi ve (popüler) otomobil çağının açılışıyla tramvayı olan kentlerin sayısı 1990'a kadar olan dönemde 300'e inmiştir. (Bu azalış trendine Türkiye'den İstanbul ve İzmir'i de katabiliriz.) 1990'lar sonrasındaki canlanma döneminde günümüzde sayı 400'e çıkmıştır (UITP, 2023, 2).

3. Bkz. Lynch (1960). Eserin, *Kent İmgesi* başlığı altında Türkçe çevirisi de mevcuttur.

GİRİŞ

Dünyada kent içi raylı toplu taşıma sistem yatırımları giderek artış göstermektedir (Newman ve Kenworthy, 2015, 33-76). 1960 ile 1980 arasında dünyada 32 yeni metro sistemi hayata geçerken, 1980 ile 2000 arasında bu sayı 51'e, 2000 ile 2017 arasında 75'e çıkmıştır (UITP, 2018, 4). 2016 ile 2021 yılları arasında ise dünyadaki hafif raylı ve tramvay hat uzunluğunda da 1.340 km artış olmuştur (1); her ne kadar hafif raylı sistemler (tramvay) 1930'lardaki (2) zirvesinin çok gerisinde olsa da, günümüzdeki artışlar kayda değer ve gelecek vadetmektedir (UITP, 2023, 2-4). Raylı sistemler, lastik tekerlekli sistemlerden yolu, araçları, teknolojileri, erişim noktaları (istasyon ve duraklar) yanı sıra topolojisi olmak üzere birçok özelliğe ayrılmaktadır (Vuchic, 2007, 45-90). Ancak bir özelliği var ki tüm bakış açımızı tamamlayan bir etki yapmaktadır: Raylı sistem hattı ve istasyonları kalıcıdır. Çünkü raylı sistemler inşa edildiğinde yakın çevreleri için kalıcı erişebilirlik sağlar (Mulley vd., 2021, 125). Kalıcı olması nedeniyle, Kevin Lynch'e öykünerek, raylı sistem istasyonunun yakın çevresi için düğüm (*node*) ve işaret (*landmark*) imgelerine dönüşme potansiyelini taşıdığını rahatlıkla ileri sürebiliriz (3).

Raylı sistemler üzerine yapılan çalışmalarda da bir istasyonun, raylı sistem ağında/hattında düğüm (*node*) olduğu, yakın çevresinde ise yer (*place*) olduğu işlenmektedir (Bertolini ve Spit, 1998; Bertolini, 2008). Türkiye'de yapılan çalışmalarda raylı sistemlerin yer özelliklerini (istasyon çevresi tasarımı) ya da diğer türlerle aktarma olanaklarını konu edinen çalışmalar bulunmaktadır. Örneğin Ankara özelinde, yer özelliklerine karşılık yolcu sayısını ya hatlar bütününde ya da kısıtlı sayıda istasyon özelinde konu edinmiştir (Özgür-Cevher, 2014)(Özgür-Cevher vd., 2021). Şenbil vd. (2020) ise tersine odaklanarak, istasyonların mahallere olan nüfus etkisine bakmıştır. Ancak İstanbul'da olduğu gibi istikrarla büyüyen/genişleyen raylı sistem ağlarının zaman içindeki gelişimi sonucunda sistemdeki tüm istasyonların düğüm özelliklerine bağlı olarak yolcu sayısındaki

* İstanbul Planning Agency (IPA), İstanbul, TÜRKİYE.

değişimi konu edinen çalışma bulunmamaktadır. Büyüyen ve gelişen raylı sistem ağlarında, ağa eklenen her bir istasyonun (düğümün) ağa katkısı söz konusudur. Ancak bu katkının istasyonun bağlamına (düğüm ve yer özellikleri) göre değişebileceği de açıktır. Mevcut çalışmada on yıla yayılan panel veri aracılığıyla yer özelliklerinin kontrol edilerek düğüm özelliklerinin de öne çıkarılması söz konusudur. Bir raylı sistem hattının bir başka hat ile ortak düğüm noktası oluşturması (transfer istasyonu), iki hattın da yolcu sayılarını artıracaktır. En azından bir başka hat ile ortak istasyonu olmayan tek bir hatta eklenen istasyondan, *ceteris paribus*, daha fazla yolcu sayısını çekeceği ileri sürebilir. Buradaki temel nokta, giderek metropoliten alanın farklı alanlarına doğru büyüyen raylı sistem ağının her bir istasyon noktasına etkisinin farklı olacağı, bu etkilerin istasyon noktasının ağdaki konumu yanı sıra yakın çevre özellikleriyle (arazi kullanımı, nüfus yapısı, sosyo-ekonomik durum, otomobil sahipliği vb.) ilişkili olduğudur (Zhao vd., 2013). Dolayısıyla belirli bir zamanda her bir istasyonun (düğümün) kendi bağlamı (yer ve düğüm özellikleri) yolcu sayısının da temel belirleyicisidir.

Ancak karşımızda yer özelliklerinin değişiminden daha hızlı büyüyen ve genişleyen toplu taşıma ağı varsa durum biraz farklıdır. Büyüyen ve genişleyen bir ağda düğüm noktası olarak mevcut bir istasyonun menzile erişebilirliğinin (4) (*destination accessibility*) değişimiyle (artışıyla) yolculuk sayıları da değişecektir (artacaktır). Dolayısıyla iki yıl gibi süreleri dikkate alarak arazi kullanım değişiminin görece aynı olduğunu kabul ettiğimiz yıllar arasında mevcut istasyonların yolculuk sayılarındaki artışın varış noktası erişebilirliği (düğüm özelliği) ile yakından ilişkili olduğunu ileri sürebiliriz. Bu temel beklenti üzerine bu çalışmada İstanbul metropoliten alanının son on yılda hızla büyüyen ve genişleyen raylı sistem ağındaki düğüm noktası özelliklerinin etkisini ortaya koymaya çalışacağız.

Çalışmada öncelikle İstanbul raylı toplu taşıma sisteminin tarihsel gelişimini son otuz yıla odaklanarak inceleyeceğiz (5). Görülecektir ki İstanbul'da kentsel dönüşümden daha kapsamlı ve istikrarlı bir şekilde kentsel ulaşım dönüşümü yaşanmaktadır. Lastik tekerlekli toplu taşıma giderek yerini raylı toplu taşımaya bırakmaktadır. Artan otomobilleşme ve otomobil kullanımı yanı sıra karayolu uzunluğunun düşük olması nedeniyle normalden daha fazla yaşanmakta olan trafik sıkışıklığı sonucunda oluşan toplu ulaşım talebi ana arterler boyunca raylı sistemler (ve metrobüs) yolcu tabanını büyütmektedir. Otobüs ve minibüs sistemindeki kişi başına yolcu kilometreleri giderek azalmakta, bir ya da birden fazla noktada raylı toplu taşımayla yolcu alışverişi yaparak yolcu aktarma/besleme gibi son kilometre işlevleri giderek artmaktadır (Dong vd., 2022). Her ne kadar arzu edilen bu olsa da sistem bütününde bir ana plan ile yolcu tabanının pekiştirilmesinin ihtiyacı da giderek artmaktadır.

Bir istasyonun "yolcu tabanı büyüme" sürecinde birçok etmen mevcuttur (6). İstasyonun düğüm özelliklerine bağlı olarak raylı toplu taşıma hattında/ağında meydana gelen gelişmeler ile lastik tekerlekli sistemdeki yeni düzenlemelerin yanı sıra yani toplu taşıma sistemi dışında, yeni arazi kullanım kararları (plan değişiklikleri), otomobilleşme, otomobil kullanımı, yakıt ve otopark maliyetlerindeki değişim gibi öğeler bir istasyonun yolcu tabanına önemli ölçüde etki etmektedir (7). Ancak takdir edilecektir ki yolcu tabanı büyütme sürecinin asıl ögesi raylı sistem ağı üzerinden erişilebilen noktalardır. Giderek büyüyen raylı sistemin zaman içindeki değişiminde kimi kritik aşamalar vardır ki erişebilirlik önemli sıçramalar gösterir, sistemin metabolik yapısı değişir, sistem farklı bir

4. Prof. Dr. Robert Cervero'nun dahil olduğu kimi çalışmaları bu konuda aydınlatıcıdır: Cervero ve Kockelman, 1997; Cervero vd., 2009. 1997 yılındaki çalışmada yer özelliklerini daha fazla vurgulayan 3D (Yoğunluk/Density, Tasarım/Design, Çeşitlilik/Diversity) işlenmiştir. Sonraki çalışmada ise menzile erişebilirliği (*destination accessibility*) ve istasyona olan mesafe (*distance to station*) kriterlerini ekleyerek 3D, 5D'ye çıkarılmıştır.

5. 1960 öncesi raylı sistemler için bakınız Tekeli (2009).

6. Bu çalışmada yolcu tabanı, raylı sistem istasyonunu hem çıkış noktası hem de varış noktası olarak kullanabilecek yolcuların bütünü olarak görülmektedir.

7. Örneğin, Ankara'da 2014 yılında hizmete giren, Dumlupınar Bulvarı (Eskişehir Yolu) altından çalışan Kuru Metro (M2 hattı) Tarım Bakanlığı-Danıştay istasyonu, 2019 yılında Ankara Şehir Hastanesi açılana kadar çok düşük seviyelerde yolcu taşımıştır. Aynı hattın Ümitköy istasyonunda ise farklı bir durum meydana gelmiştir. Daha önce bu istasyonu ara durak olarak kullanan otobüs hatları besleme hatlarına dönüştürülmesi sonrasında yolcu sayıları artmıştır. İstanbul'daki en tipik örneklerden birisi ise M1 hattı üzerindeki Kocatepe istasyonudur. İstasyonun yanı başında ama çıkışı olmadığı AVM açıldıktan hemen sonra istasyonun yolcu sayısı artmamıştır. NE zaman ki AVM'ye yeni bir çıkış açılmış sonrasında ancak yolcu sayısında büyük artış görülmüştür.

8. 2013, 2015, 2017, 2019 ve (pandemi dönemini atlayarak) 2022 yılları.

9. Kimi örnekler verilebilir. Yenikapı İstasyonu muhtemelen en tipik örnektir. 2013 yılında sadece Marmaray istasyonu olarak çalışmakta iken 2015 yılında hem M1 hatlarına hem de M2 hattına transfer imkanının ortaya çıkması ile istasyonun yolcu sayısı 2013 yılına nazaran 2015 yılında 13,7 kat artış göstermiştir. M3 ve M7 metro hatlarının kesişiminde transfer istasyonu olarak da hizmet veren Mahmutbey İstasyonu ise bir diğer örnektir. 2013 yılından bu yana hizmet veren M3 hattının ara istasyonu olan Mahmutbey İstasyonu, 2020 yılında hizmete alınan M7 hattının ise batıdaki son istasyonudur. M7'nin de hizmete girmesi ile daha önceki yolcu sayısı 2019 yılı ile 2022 yılları arasında 5,5 katına çıkmıştır. Bu istasyonlardaki yolculuk artışlarının yer özelliklerini de içerdiği ya da lastik tekerlekli toplu taşımadan ya da özel araç yolculuklarından önemli ölçüde yolculuk aldıkları da düşünülebilir. Burada bizim aradığımız temel nokta ağın büyümesi sonucu erişebilirliğin iyileşmesi ve bunun raylı toplu taşıma yolculuklarında artış olarak yansımalarıdır.

fazda işlemeye başlar. Bu nedenle ikinci bölümde İstanbul'daki raylı toplu taşıma sisteminin tarihsel gelişimine odaklanacağız. 1990'larda sade bir hattan oluşan raylı toplu taşıma sistemi, günümüzde İstanbul nüfusunun yarısından fazlasına makul erişim mesafesi içinde hızlı, rahat, konforlu yolculuk olanağı sunabilecek düzeye erişmiştir. Bunun daha ileriye götürülebilmesine yönelik çalışmalarda istasyonların zaman içindeki yolcu sayılarındaki değişimin ağ yapısı içinde ele alınmasının faydalı olacağı açıktır.

Çalışmada kullandığımız veri, 2013 ile 2022 yılları arasındaki yaklaşık on yıllık sürede, iki yıllık aralıklarla (8), istasyonlara ait günlük yolcu sayıları kapsamaktadır. Çalışmanın veri kısmında hatlar ve istasyonlar özelinde betimleyici istatistikler sunulacaktır. Yaz (Temmuz ikinci hafta) ve kış (Aralık ikinci hafta) sezonlarında yedi güne ilişkin (haftalık) yolcu sayıları, yıllık ortalamaya yakın yolcu sayısı değerlerini üretmektedir. İstanbul'un raylı toplu taşımasında son on yıl önemlidir. 2013 ile 2022 yılları arasında raylı toplu taşıma sisteminde önemli değişiklikler olmuştur. Marmaray, 29 Ekim 2013'de Boğaz geçişini de içeren kısa bir kesitte hizmete girmesi sonrasında 12 Mart 2019'da Anadolu ve Avrupa yakalarındaki istasyonlarıyla (toplam 43 istasyon) hizmete girmiştir. 2015 yılında Yenikapı'da M1, M2 ve Marmaray hatları ortak istasyon yapmıştır. Yenikapı istasyonu, Türkiye'de yer altından çalışan üç hattın bir araya gelerek transfer istasyonu olduğu ilk örnektir. Bu arada da M4 hattı uzamış, M5, M7 ve M8 hatları hizmete girmiş, yeni transfer istasyonları ortaya çıkmıştır.

Analiz kısmında öncelikle ardışık iki gözlem yılında mevcut olan istasyonların yolcu sayısındaki değişimler ile istasyonların düğüm özellikleri arasında ilişki kurulmaya çalışılacaktır. Toplu taşıma hatlarının giderek birbiriyle eklenmesi sonucunda görülecektir ki yolculukların da yapısında değişiklikler olmaktadır. Toplu taşıma sistemi büyüyüp genişledikçe mevcut hatlarda meydana gelen değişiklikler çeşitlilik gösterebilmektedir. Analiz kısmında bu değişiklikleri olası nedenleriyle birlikte açıklamaya çalışacağız. Örneğin, daha önce daha uzun güzergâh takip eden yolculuklar, daha kısa bağlantı sunan hatta kayabilmektedir. Ya da daha önce mevcut olmayan bir bağlantının çıkışı bir başka hattın tüm istasyonlarına olumlu etki edebilmektedir. Birinci durum yerine koyma (*substitution*), ikinci durum ise tamamlayıcı (*complementary*) özellikler taşımaktadır. Bunun için genel olarak yakın çevre nüfusunun ve arazi kullanımının değişmediği istasyonların esas alınmasına dikkat edilmiştir (9). Yeni hat ya da istasyonların açılış tarihlerini dikkate alarak karşılaştırmalar da yapılacaktır. Burada raylı sistem arasındaki farklılıkları da dikkate almak gerekmektedir. Banliyö, metro ve hafif raylı toplu taşıma sistemleri arasında kapasite ve işletme açısından birçok farklılıklar mevcuttur. Bu nedenle karşılaştırmalar yapılırken bu farklılıkları da göz önünde bulunduracağız. Analiz kısmını 2013 ile 2022 yılları arasındaki istasyon bazlı yolcu verisini kullanarak regresyon modeli (beş zaman noktasına ait panel veri rastgele etkiler analizi) aracılığıyla hat ve istasyon özelliklerindeki değişimin etkilerini yakalamaya çalışacağız. Sonuçlar ve öneriler kısmında analizlerden elde edilen bulgular üzerine politika önerileri ile çalışmayı sonlandıracağız.

İSTANBUL RAYLI TOPLU TAŞIMA SİSTEMİ

İstanbul'un raylı sistemlerle tanışıklığı 19. yüzyıla kadar geri gitmektedir (Tekeli, 2009). Ancak eskiyen teknolojileri sonucu yavaş olmalarının yanı

sıra daha hızlı seyreden lastik tekerlekli motorlu araç (otomobil) trafiğine yol hakkı (*right-of-way*) sağlamak amacıyla raylı sistemler (tramvay hatları) 1950'lerden sonra yavaş yavaş hizmetten kaldırılarak yerini lastik tekerlekli sisteme (otobüs, minibüs, dolmuş) bırakmıştır (Tekeli, 2009, 50-62). Anadolu ve Avrupa yakalarında Marmara denizine paralel çalışan banliyö hatlarını saymazsak 1970'ler sonrası İstanbul'un toplu taşıma sistemi tamamıyla lastik tekerlekli sisteme dayanıyordu. Daha çok kısa mesafelerde bağlantı sağlayan dolmuş ile genelinde gecekonduların hizmet veren minibüs, İETT ve halk otobüsü işletmecileri tarafından sağlanan konvansiyonel otobüs toplu taşımasının kimi mahallerde tamamlayıcısı, kimi mahallerde ise sadece tek toplu taşıma aracıydı.

1930'lardan günümüze İstanbul il sınırları içinde toplu taşıma hizmeti sunan İETT, büyükşehir belediyesi örgütlenmesinden çok daha önce (bir düzineden fazla birbirinden bağımsız belediyenin örgütlediği) metropoliten alanın bütününde hizmet sunacak şekilde kurumsal kapasite geliştirmiştir. 1980'lerdeki büyükşehir düzenlemeleri sonucunda ortaya çıkan büyükşehir belediyesi örgütlenmesi ölçek ekonomilerine sahip altyapıya —ulaştırma altyapısı da bunlardan birisidir— ait yatırım ve yönetim işlerini metropoliten alan bütününde tek bir çatı altında toplamıştır. Büyükşehir belediyesinin yüksek maliyetli raylı sistem yatırımlarını gündeme alabilecek mali güce kavuşmasıyla, toplu ulaşım yatırımlarındaki seçim raylı sistem yatırımlarına yönelmiştir (10).

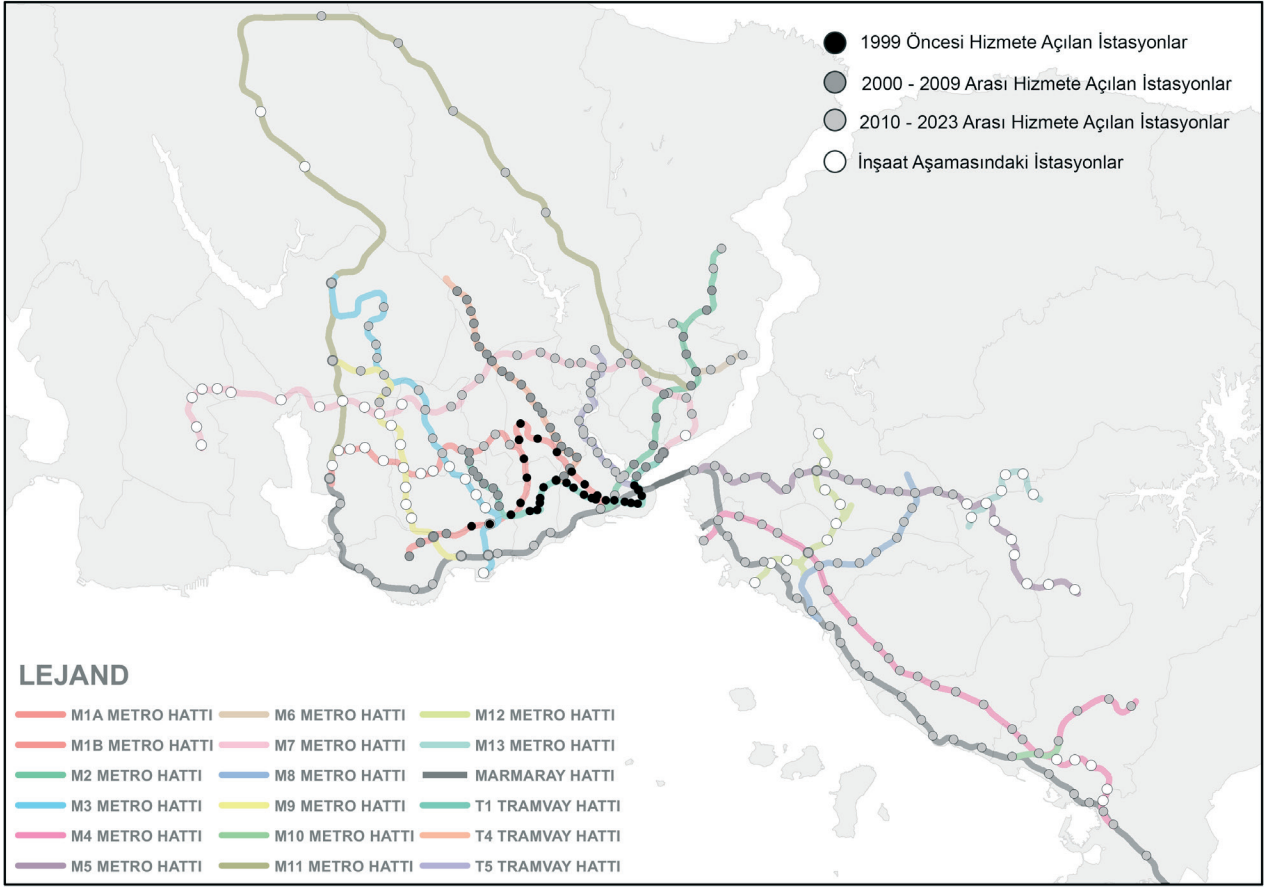
İstanbul'da ilk olarak, (Yenikapı-Atatürk Havalimanı arasında hizmet veren) M1 metro hattının Aksaray-Kartaltepe (Kocatepe) arasındaki kesimi hizmete girmiştir. Günümüzde Kabataş-Bağcılar arasında hizmet veren T1 tramvayı ise Tarihi Yarımada'da kısa bir kesitte hayata geçmiştir. Dikkat edileceği üzere her bir hat tamamlanan kesimleri itibarıyla hizmete girmiş, kalan kısmı tamamlandıkça peyderpey hizmete girmiştir. Günümüzde **Resim 1**'de verildiği üzere (yeniden hayata geçen) modern raylı sistemler İstanbul'un birçok köşesine uzanmaktadır:

İstanbul'un ilk metro hattı olan M1 hattı (Açılış: 03.09.1989) zaman içerisinde Atatürk Havalimanına kadar uzamıştır (20.12.2002). Otogar istasyonundan sonra hattın ikiye ayrılarak Kirazlı'ya kadar olan kesim M1B hattı olarak hizmete girmiştir (14.06.2013); mevcut havalimanına kadar olan hat ise M1A ismini almıştır. Günümüzde M1A hattı, 2007 yılından sonra öncelikle D100 karayolunun Avrupa kesiminde hayata geçirilen hızlı otobüs toplu taşıma hattı (metrobüs) ile en fazla transfer noktasına sahip raylı sistem hattı olarak karşımıza çıkmaktadır. İlk döneminde sadece Tarihi Yarımada içinde kalan T1 tramvay hattı 1992 yılında Sirkeci ile Topkapı arasında yolcu taşımaya başlamıştır (11). T1 hattı, 1996 yılında surların dışına çıkarak Zeytinburnu'na erişmiştir. İstanbul'un kuzey yönüne olan ve İstanbul (Tarihi Yarımada) ile Beyoğlu'nu, sonrasında Büyükdere Caddesi'nin üzerinden geçtiği güzergahı takip ederek daha kuzeydeki kesimlere erişim sağlayan M2 metro hattı, 2000 yılında Taksim - 4. Levent arasında hizmete girmiştir.

M2 hattı, 2009 yılında kuzey ve güney uç noktalarından uzayarak Atatürk Oto Sanayi (kuzey) ile Şişhane (güney) arasında hizmet vermeye başlamıştır. 2011 yılında kuzeydeki hedef noktası olan Hacıosman istasyonuna kadar uzamıştır. Tarihi Yarımada'ya uzama ise 2014 yılında tamamlanmıştır. Böylece M2 hattı, merkezi iş alanının 19. yüzyıldan günümüze kadar olan gelişiminin güzergâhını takip ederek, geleneksel merkez ile modern merkezi birbirine bağlamaktadır. M1, T1 ve M2 hatlarının tarihi merkez ve yeni merkez içinde kalan kesimleri, gün içindeki

10. Tekeli (2009)'un giriş kısmı bu konuyu Tekeli'nin kişisel tarihi ile işlemektedir.

11. 13.06.1992 Aksaray-Beyazıt, 10.07.1992 Beyazıt-Sirkeci, 29.12.1992 Aksaray-Topkapı.



Resim 1. 2023 yılı İstanbul raylı sistemler ağı haritası (Kaynak: Yazar).

zirve saatlerinin temel bileşeni olan ev-iş ve ev-okul yolculukları dışında, gün içine dağılmış rekreasyon ve iş takibi amaçlı yolculuklara, hafta içi ve hafta sonu farklı faaliyetlere hizmet vermektedir. Bu nedenle söz konusu üç hattın merkezi alanlar içinde kalan kesimleri yolcu/yolculuk çeşitliliği açısından diğer hatlara göre zenginlik göstermektedir.

M2 hattının Büyükdere Caddesi üzerinde iki adet kısa bağlantısı söz konusudur. Birincisi Seyrantepe depo alanı yakınındaki stadyuma erişim sağlayan Seyrantepe istasyonudur; ikincisi ise 19 Nisan 2015 tarihinde hizmete giren Levent-Boğaziçi Üniversitesi arasındaki M6 hattıdır. M2 hattı Boğaza paralel güzergâhı takip etmesi nedeniyle düşük kottaki Boğaz kıyısıyla üç yerde bağlantı kurmaktadır. Birincisi, (Şişhane istasyonu yürüme mesafesinde) Beyoğlu'ndan Karaköy'e bağlanan dünyanın ilk yeraltı trenlerinden (1875) Tünel (F2); ikincisi, 2006 yılından bu yana Taksim istasyonundan Kabataş'a bağlantı sağlayan Taksim-Kabataş füniküleri (F1); üçüncüsü ise M2-M6 devamında Boğaziçi Üniversitesi ile Aşiyan arasındaki füniküler (F4; Açılış: 28 Ekim 2022) olarak hizmet vermektedir. M2 hattına Seyrantepe istasyonu üzerinden bağlanan F3 füniküleri ise Seyrantepe istasyonunu batı yönüyle buluşturmuştur.

2006 yılında hizmete giren T2 hattıyla T1 hattının son durağı Zeytinburnu'ndan Bağcılar'a kadar uzanan kesim, raylı sistemi Avrupa yakasının iç kesimlerine kadar uzatmıştır. T2 hattının araç ve istasyon altyapısının yeniden düzenlenmesi ile her iki hattın birleşmesi 3 Şubat 2011 tarihinde gerçekleşerek günümüze kadar hizmet vermekte olan 19,3 km'lik tramvay hattını ortaya çıkıştır. Tarihi Yarımada içindeki kesiminde

yayalaştırılmış alanın içinden de geçen tramvay hattı, Boğaz denizyolu taşımacılığını da önemli ölçüde desteklemektedir. (Kadıköy sahili ile Moda arasında 2003'den bu yana dairesel hat üzerinde hizmet vermekte olan T3 tramvayı, nostaljik tramvay ve son kilometre bağlantı hattı olarak çalışmaktadır. Bu nedenle mevcut yazıda raylı sistem ağı dışında bırakılmıştır.) İstanbul'un Avrupa yakasındaki T4 tramvay hattı da M2 gibi kuzey yönelimli bir hattır. İlk olarak Edirnekapı Şehitliği ile Mescid-i Selam arasında 2007 yılında hizmete giren hat, Edirnekapı sonrasında 2009 yılında D-100 karayolunu üstten geçip, Tarihi Yarımada surları takip ederek Topkapı Park içine kadar uzamıştır.

Anadolu yakasındaki ilk hat ise Kadıköy'den başlayarak Acıbadem istasyonu ile birlikte D100 karayolunu takip eden M4 hattıdır. D100 karayolunun Avrupa yakasındaki kesimindeki toplu taşıma türü metrobüs iken Anadolu yakasındaki toplu taşıma türü metro hattıdır. Avrupa yakasında lastik tekerlekli metrobüsün olmasının bir nedeni Haliç topoğrafyasındaki istikrarsızlıktır.

Kadıköy çıkışlı M4 hattının diğer ucu kademeli olarak doğruya doğru ilerlemiştir. 17 Ağustos 2011 tarihinde Kadıköy-Kartal arasında hizmet vermeye başlayan M4 hattı, 10 Ekim 2016 tarihinde Kartaltepe'ye, 2 Ekim 2022 tarihinde ise D100 karayolu güzergâhından ayrılarak Sabiha Gökçen Havalimanına erişmiştir. M4 hattının raylı sistem ile ilk transfer noktası, 29 Ekim 2013'de Marmaray'ın Boğaz geçişinin hizmete girmesi ile aynı zamanda Ayrılık Çeşmesi istasyonu ile hizmete girmiştir. Marmaray'ın 12 Mart 2019 tarihinde Gebze-Halkalı arasında hizmete girmesiyle bu transfer istasyonunun önemi daha da artmıştır. 2 Ekim 2022'de Sabiha Gökçen Havalimanına kadar uzayan M4 hattı raylı sistem ağında ayrıcalıklı konuma yükselmiştir.

2023 itibariyle Kirazlı-Kayaşehir arasında hizmet veren M3 hattı, 14 Haziran 2013 tarihinde raylı sistem ağına eklenerek Avrupa yakasında kuzey bağlantısı sağlayan üçüncü hat olarak hizmete girmiştir. Güneyde M1B hattının sonlandığı Kirazlı istasyonundan başlayarak Başakşehir Metrokent istasyonunda sonlanan hattın şehir hastanesini de kapsayan Kayaşehir uzantısı 8 Nisan 2023 tarihinde işletmeye girmiştir. Üsküdar sahilinde ilk durağını yapan M5 hattı, Anadolu yakasında doğu yönüne uzanan üçüncü hat olarak karşımıza çıkmaktadır. Üsküdar, Ümraniye, Çekmeköy ve Sultanbeyli ilçelerini bağlayacak hattın Yamanevler'e kadar olan etabı 15 Aralık 2017, Çekmeköy'e kadar olan etabı ise 21 Ekim 2018 tarihinde hizmete girmiştir.

Avrupa yakasında metrobüs, Marmaray, M1 ve T1 sonrasındaki beşinci doğu-batı yönelimli toplu taşıma hattı olan M7 hattı ise E-80 TEM otoyolu güneyinde kalan kentsel alanlara hizmet vermektedir. 28 Ekim 2020 tarihinde Mecidiyeköy-Mahmutbey arasında hizmete giren hat, pandemi dönemi sonrasında 2 Ocak 2023'de Fulya ve Yıldız istasyonlarıyla Boğaz kıyısına doğru uzamıştır. M7, gelecekteki Beşiktaş ve Kabataş istasyonlarıyla Beyoğlu yakasından Boğaz kıyısına aktarmasız erişim sağlayan ilk metro hattı olacaktır.

Anadolu yakasında batı-doğu yönelimli üç hattın sonra ilk güney-kuzey bağlantısı Bostancı ile Parseller arasındaki M8 metro hattıdır. 06 Ocak 2023 tarihinde hizmete giren M8 hattı, batı-doğu yönelimli üç hat (Marmaray, M4, M5) ile transfer yapabilmektedir. Hâlihazırda Kirazlı ile Kayaşehir Merkez arasında hizmet veren M3 ile Bahariye-Olimpiyat arasında hizmet veren M9 hatlarının güneye doğru uzanan kesimlerinin tamamlanmasıyla

Avrupa yakasında Marmara kıyısından (Bakırköy ile Ataköy) iç kesimlere güney-kuzey bağlantıları da tamamlanmış olacaktır. M10 metro hattı, Sabiha Gökçen Havalimanında sonlanan M4 hattı ile Pendik merkezi bağlayacak bir bağlantı hattı olarak da görülebilir. M4'ün D100 altından İçmeler'e kadar olan uzantısı ise Tavşantepe sonrasındaki çatal hat olarak ele alınabilir. Sonuç olarak M4 hattı, Bostancı sonrasında Pendik ve İçmeler'de Marmaray ile transfer olanağı sağlamış olacaktır.

Avrupa yakasında Gayrettepe'den kuzeybatı yönünde İstanbul Havalimanı'na eriştikten sonra güneybatı yönünde Halkalı'da sonlanan M11 hattı, havalimanı yanı sıra Kemerburgaz ve Göktürk gibi kuzey yerleşmelerini de şehir merkezi ile bağlama amacı taşımaktadır. M11'in İstanbul Havalimanı sonrasındaki kesiminde ise mevcut hatların batı yönünde planlanan uzatmaları ile kesişmesi söz konusudur. Böylece havalimanına olan erişim önemli ölçüde iyileşecektir. M12 metro hattı, Anadolu yakasında Göztepe'den iç kesimlere doğru ikinci güney-kuzey bağlantısı olacaktır. İstanbul metropoliten alanının doğudaki son sınırında yer alan Bahçeşehir'e Halkalı'dan olan raylı sistem bağlantısı ise B2 hattı olarak (Marmaray olarak bildiğimiz banliyö hattı B1'dir.) gün içinde sadece iki karşılıklı sefer yapmaktadır.

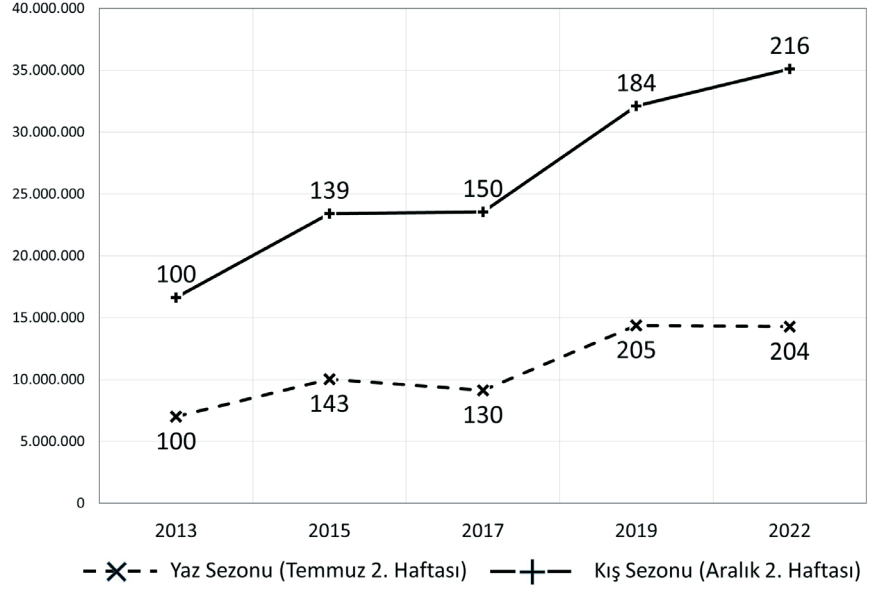
Son otuz yılda İstanbul'da görülen; raylı toplu taşımanın 2000 yılı öncesinde Avrupa yakasında yoğunlaşırken, zaman içerisinde İstanbul geneline yayılmakta olduğudur (**Resim 1**). 2010'lu yıllar öncesinde daha çok bağımsız hatlar olarak çalışan raylı sistem hatlarının son on yıl içerisinde transfer istasyonlarıyla giderek ağ oluşumuna doğru evrildiği de görülmektedir. Yeni hatların ortaya çıkışı ile raylı sistem ağındaki yolculuk güzergâhlarında da değişiklikler olacaktır.

2017 yılı Adrese Dayalı Nüfus Kayıt Sistemi (ADNKS) bina bazlı verisine göre 2023 yılına kadar hizmete girmiş raylı sistem istasyonlarının bir kilometre yarıçapında 6.536.489 kişi yaşıyordu. 2023 sonrasında hizmete girecek istasyonları da hesaba kattığımızda (2017 - ADNKS verilerine göre) 8.585.440 kişi en az bir raylı sistem istasyonuna erişim sağlamaktadır (İstanbul'un 2017 nüfusunun %57'si). Diğer bir deyişle raylı sistem ağı, İstanbul'un nüfus artışından daha hızlı bir şekilde büyüyerek kapsama alanını genişletmektedir.

VERİ

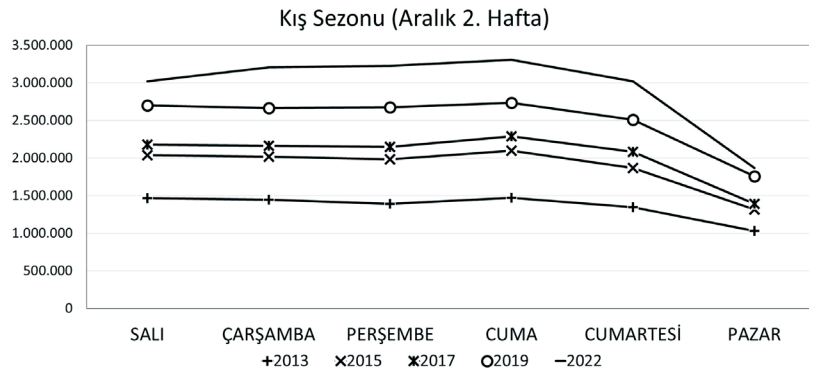
Çalışmada kullanılan veri 2013 yılından 2022 yılına kadar geçen süre içerisinde (pandemi dönemine rastlayan 2021 yılını atlayarak) iki yıllık aralıklarla, yaz ve kış dönemlerinde, birer haftalık, istasyon bazlı günlük yolculuk sayılarından (elektronik kart okumaları) oluşmaktadır (**12**). Aradan geçen on yılda raylı sistemlerin taşıdığı yolcu sayısı neredeyse iki katına çıkmıştır (**Resim 2**). 2013 yılının Aralık ayının ikinci haftası yolcu sayısını 100 olarak kabul ettiğimizde 2022 Aralık ayının ikinci haftasına yolcu sayısı 216'ya çıkmıştır. Temmuz ayının ikinci haftasını esas aldığımızda aynı dönemde 100 olan yolcu sayısı 204'e çıkmıştır. Buradan hareketle raylı sisteme ait her istasyon ya da durak yolcu sayısının iki kat artacağını varsaymak yanlış olur. Arada geçen zamanda büyük değişiklikler olmuş, raylı sistemlerin İstanbul'daki büyümesine ve genişlemesiyle birlikte yolculuk tabanı da değişmiştir. Bu durumda uzun mesafe toplu taşıma talebinin yüksek olduğu mahallerde ya da menzil erişimi yükselen istasyonlarda yolcu sayısındaki artışın daha fazla olacağını beklemek daha doğru bir yaklaşım olacaktır.

12. İBB Belbim ve Ulaşım Dairesi Yolcu istatistikleri 2013: 08-14 Temmuz, 09-15 Aralık; 2015: 13-19 Temmuz, 14-20 Aralık; 2017: 10-16 Temmuz, 11-17 Aralık; 2019: 08-14 Temmuz, 09-15 Aralık; 2022: 11-17 Temmuz, 12-18 Aralık

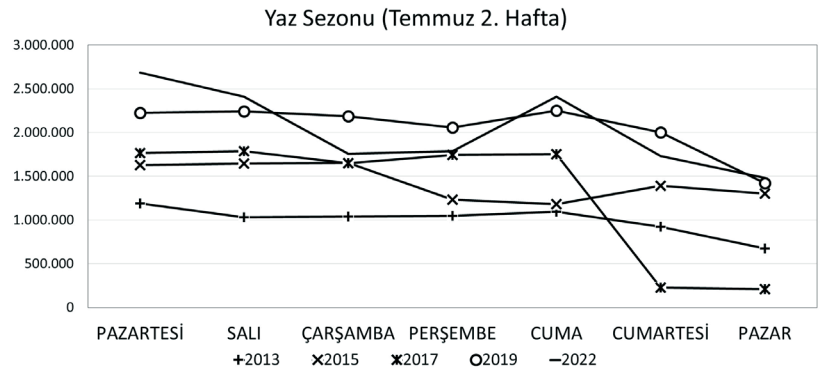


Resim 2. İstanbul'da 2013-2022 yılları arasında raylı sistem haftalık yolcu sayıları.

Haftanın günlerine göre veriye baktığımızda okul ve iş yolculuklarının düzenli olduğu kış sezonunda (Aralık 2. hafta) yıllara göre artış açıkça görülmektedir (**Resim 3**). Kış sezonunda hafta sonu Pazar günü, tüm haftanın en düşük seviyesine Cumartesi gününden sonra erişildiği sezona özgü yolculuk düzeni ortaya çıkmaktadır. Yaz sezonu, iş ve okul yolculuklarında meydana gelen düzensizliğin ve hafta sonu rekreasyon olanaklarının ortaya çıktığı bir dönemdir.

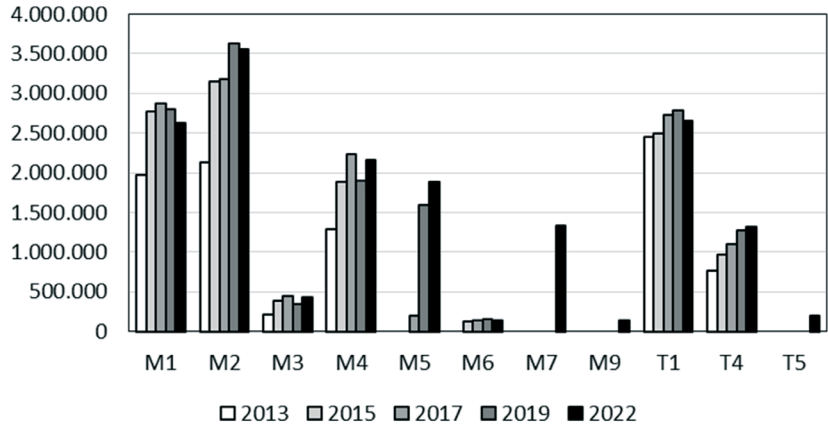


(a) Kış Sezonu

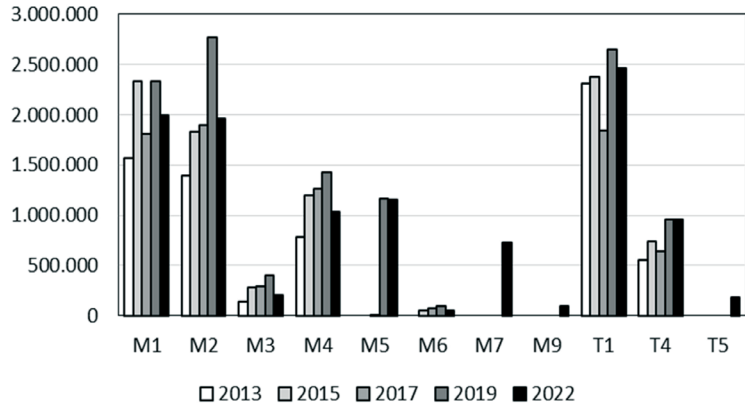


(b) Yaz Sezonu

Resim 3. İstanbul'da 2013-2022 arasında raylı sistem yolcu sayıları yaz/kış, haftanın günleri.



(a) Kış sezonu (Aralık 2. Hafta)



(b) Yaz Sezonu (Temmuz 2. Hafta)

Resim 4. İstanbul'da 2013-2022 arası raylı sistem hatlarında haftalık yolcu sayısı.

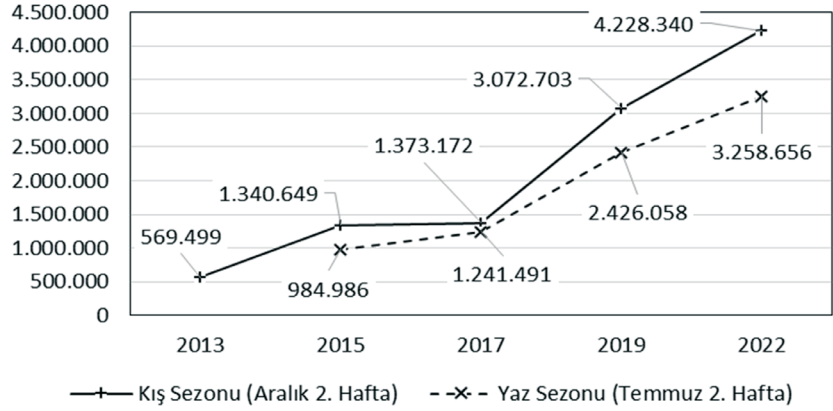
Nitekim yıllara göre grafikler incelendiğinde de kış (Aralık) ve yaz (Temmuz) sezonları arasındaki farklılık, her iki sezonun birbirinden çok farklı yolculuk yapılarına sahip olduğunu göstermektedir. Genel olarak kış sezonunda hafta içi günleri aynı düzeylerde kalırken, yaz sezonunda özellikle 2015 ve 2022 yıllarında hafta içi değişkenliği artmaktadır. 2015 yılı dışında yaz sezonunda Pazar günü, en düşük raylı sistem kullanım seviyesine düşmekle beraber kış sezonuna nazaran belirsizliğin arttığını da ileri sürebiliriz. Kış ve yaz sezonları arasındaki değişim metro ve hafif raylı hatlarına, Avrupa ve Anadolu yakalarına göre de farklılaşmaktadır (Resim 4).

2013 yılından bu yana, önce İstanbul'un, Boğaz'ın iki yakasını birleştiren Marmaray, 2019 yılına metropoliten alanın Marmara kıyısındaki bütününe genişleyerek raylı sistem içindeki en büyük mekânsal büyümeyi gerçekleştirmiştir (13). Bu büyüme yolculuk sayılarına doğrudan yansımıştır (Resim 5).

Kış sezonunu esas aldığımızda 2013 yılı ile 2022 yılları arasında Marmaray 7,42 kat artışla raylı sistem içindeki en yüksek değere sahiptir. Bunun esas nedeni Marmaray güzergâhının 19. yüzyıldan günümüze gelen eski demiryolu ile İstanbul'un bu demiryolunu esas alan Marmara Denizi kıyısı

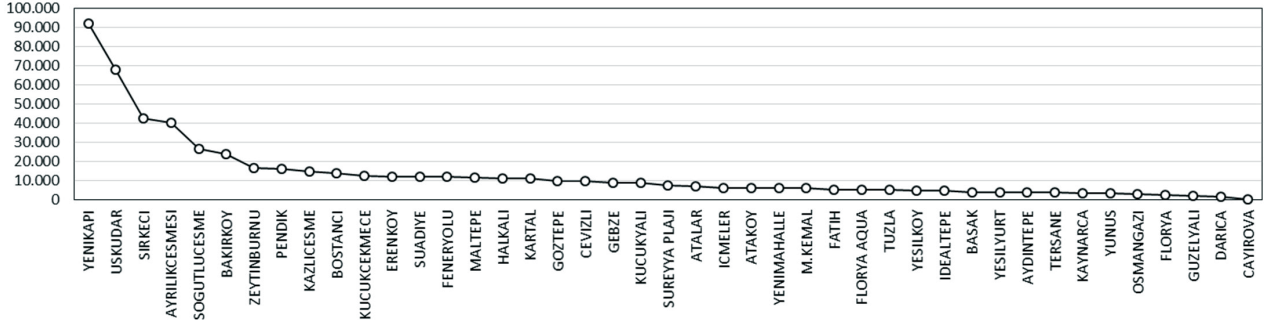
13. Yaklaşık 77 km uzunluğundaki hat üzerinde 43 istasyon mevcuttur. On araçtan oluşan bir setin yolcu taşıma kapasitesi 3.500 civarındadır.

MARMARAY



Resim 5. Marmaray haftalık yolcu sayıları.

Marmaray İstasyonları Yolcu Sayıları (13.12.2022/Salı)



Resim 6. Marmaray istasyonları hafta içi günlük yolcu sayıları.

lineer metropoliten alan gelişimidir (Resim 6). İstanbul'daki raylı sistemler dikkate alındığında gelişmesi 1950 öncesine dayanan yerleşmelere ağırlıklı olarak Marmaray, gelişmesi 1950'ler sonrası olan (özellikle gecekonduvan dönüşen) yerleşmelere ise ağırlıklı olarak metro ve hafif raylı sistem hizmet etmektedir (14).

Marmaray'ın hizmet verdiği Marmara kıyısı yerleşmelerinde istasyonların yolcu sayıları merkezi alanlara yaklaştıkça artış göstermektedir (Resim 6). Merkezi kesimde hattın en fazla yolcuya hizmet veren istasyonları farklı hatlarla transfer imkanı olan istasyonlardır. Bunlar içinde iki metro hattı ile transfer olanağına sahip olan Yenikapı istasyonu öne çıkmaktadır. Sirkeci'nin tarihi kent merkezine hizmet vermesine rağmen Üsküdar'ın arkasında kalmasının nedeni, Üsküdar istasyonunun metro ile Sirkeci istasyonunun ise hafif raylı sistem ile transfer imkanına sahip olmasıdır. Birincisinin kapasitesinin daha yüksek olması istasyondaki yolcu sayısını etkilemektedir.

ANALİZLER

İstanbul'un ilk hizmete giren metro hattı olan Avrupa yakasındaki M1 hattı 2013 yılının başında Aksaray ile Atatürk Havalimanı arasındaki 17 istasyon ile toplu taşıma hizmeti vermekte idi. Aynı yıl içinde M1B çatılandırılması ile Otogar istasyonundan sonra beş istasyon (15) ilavesi gelmiş (14.06.2013), yine aynı gün açılan M3 hattı ile de Kirazlı istasyonunda buluşmuştur. 2011

14. Doğal olarak metro ve hafif raylı sistemin kent merkezine hizmet veren kesimleri de mevcuttur.

15. Esenler, Menderes, Üçyüzlü, Bağcılar Meydan, Kirazlı-Bağcılar.

16. 2011 ile 2013 arasında İstanbul'un nüfusu %3,9 oranında büyümüştür.

17. Marmaray, 2013 ve 2019 yılları arasında Ayrılıkçeşme ile Kazlıçeşme arasında kısa etapta hizmet vermiştir.

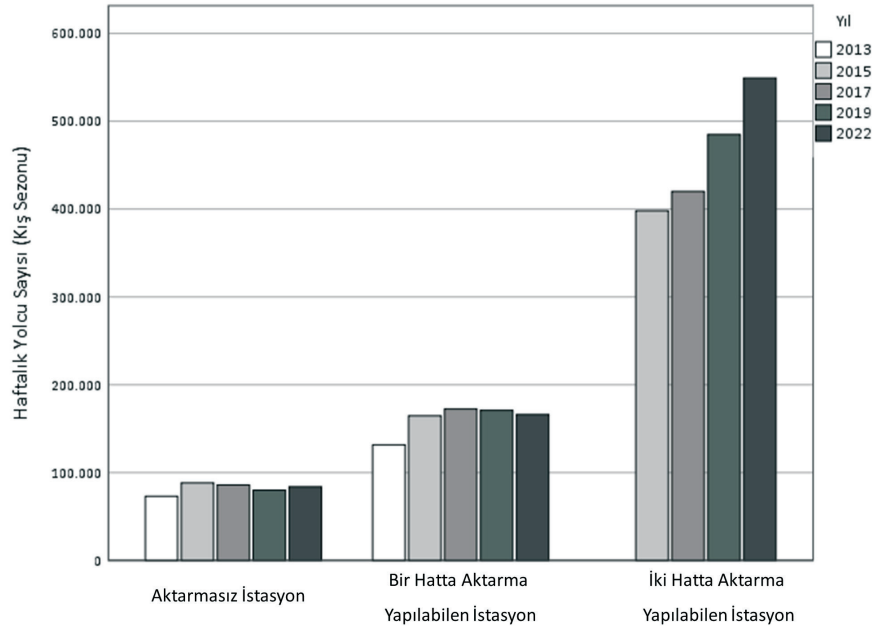
18. M2 ve M6 hatlarını bu çalışmada birlikte değerlendirmektedirim.

yılında (12.12.2011/Salı) M1 hattı 226.313 yolcuya hizmet verirken, 2013 yılındaki büyüme sonucunda yolcu sayısı 277.743 (10.12.2013/Salı) yolcuya erişmiştir (%23,1 artış). Tarihi Yarımada'dan Bağcılar'a kadar kesintisiz tramvay erişimi sağlayan T1 hattında aynı tarihler arasında yolcu sayısı %16,1 oranında, T4 tramvayı %9,4 oranında artmıştır (16). Bu artışların, Avrupa yakasının iç kesimlerini Tarihi Yarımada'ya bağlayan genişleme sonucu meydana geldiği ileri sürülebilir.

2014 yılında açılan Yenikapı transfer istasyonu ile M1 ve M2 metro hatları ile Marmaray (17) transfer olanağına kavuşmuştur. Ayrıca 19.04.2015 tarihinde M2 hattı, Boğaziçi Üniversitesine bağlanan M6 hattı ile Levent istasyonundan Boğaza doğru çatallanmıştır (18). (M2 hattının bir diğer çatal hattı Sanayi Mahallesi'nden Seyrantepe'ye ayrılmaktadır.) Anadolu yakasında, 29 Ekim 2013 yılında Marmaray ile Ayrılık Çeşmesi istasyonu ile transfer olanağına kavuşan M4 hattında ise 2016 yılına kadar herhangi bir başka değişiklik olmamıştır. 2013 ile 2015 arasındaki en büyük değişiklik, Yenikapı ve Ayrılık Çeşmesi transfer istasyonlarıyla raylı sistemlerin, Avrupa ve Anadolu yakalarını (İstanbul, Beyoğlu ve Anadolu) kesintisiz olarak birleştirmiş olmasıdır. Bu bağlantının etkisi tüm raylı sistem üzerinde gözlemlenmiştir.

Örnek olarak günümüzde Kadıköy ile Sabiha Gökçen Havalimanı arasında hizmet veren M4 hattını ele alalım. Hattın Ayrılık Çeşmesi istasyonu, Marmaray'ın Ayrılık Çeşmesi ile Kazlıçeşme arasındaki etabıyla aynı günde açılmıştır (29 Ekim 2013). 2013 Eylül ayında günlük ortalama 138.418 yolcuya hizmet veren M4 hattı bütünü, 2013 Kasım ayında 180.710 ortalama yolcu seviyesine çıkmıştır (%30,55 artış). Bu artışı Ayrılık Çeşmesi istasyonunun açılışına bağlayabiliriz. Yenikapı'da M2 hattı ile transfer olanağının ortaya çıktığı 2014 Şubat ayı sonrasında M4 hattının hizmet verdiği yolcu sayısı 2013 Aralık ortalaması 181.737 iken 2014 Mart ortalaması 195.674'e artmıştır (%7,7 artış). Yenikapı istasyonuna M1 hattının da bağlandığı 2014 Kasım ayı sonrasındaki artış ise %20 civarında gerçekleşmiştir. M4 özelinde görülen bu durum sistem geneline yayılmaktadır. Bu etkileri tamamlayıcı etkiler olarak görmekteyiz.

Bir başka örneği ise TEM otoyolunun hemen altındaki yerleşmeleri doğu-batı yönünde kateden günümüzde Yıldız ile Mahmutbey arasında hizmet veren M7 metrosuna ilişkin verebiliriz. Hattın birinci etabı olan Mecidiyeköy-Mahmutbey arasındaki kesimi 28 Ekim 2020 tarihinde hizmete girmiştir. Hat, İstanbul'un merkezi iş alanına olan erişimi, Tarihi Yarımada'ya uğramadan sağlamaktadır. Diğer bir deyişle, Mahmutbey'den M3, M1 ve M2 metrolarını kullanarak 46 dakikalık araç içi yolculuk yanı sıra aktarmalar için en az 10 dakika süren yürüme ve bekleme sonucu Mecidiyeköy'e erişim sağlanırken, M7 metrosu aktarmaya gerek olmadan aynı çıkış varış noktaları arasında 31 dakikada erişim sağlamaktadır. (M3 ile M1, M1 ile M2 arasındaki aktarmaların parasal maliyeti de söz konusudur.) M3'ün hizmet verdiği alandan Mecidiyeköy'e erişim amacıyla M7 açıkça daha avantajlı olduğundan, bu alandan M1'e olan aktarmalar normal olarak sonlanacaktır. Nitekim M7 açılışı öncesinde M1 metrosu bir günde (10.12.2019) 417.173 yolcuya hizmet verirken M7 hattı açılışı sonrasında bir günde (13.12.2022) hizmet verdiği yolcu sayısı 375.911'e düşmüştür (%9,9 azalış). Buna karşın M3 metrosunun günlük yolcu sayısı ise 54.727'den 68.243'e çıkmıştır (%24,7 artış). M3 hattından M1'e aktarma yaparak Mecidiyeköy yönüne gidecek olan yolcuların M7 hattına aktarma yaparak M3 ile M7 arasında tamamlayıcılık, M1 ile M7 arasında ise ikame ilişkileri olduğunu ileri sürebiliriz.



Resim 7. Yıllara göre raylı sistem aktarma istasyonlarındaki yolcu sayısı değişimi.

Yukarıdaki örnekler hat geneline ilişkindir. Bu gelişmelerin istasyon özelinde incelenmesi de söz konusudur. İlginç bir örnek M2 hattına ilişkin verilebilir. Zira 2019 ile 2022 yılları arasında M2 hattı genel olarak yolcu kaybetmiş (%-2,1) olmasına karşın M7 ile bağlantı sağlayan Şişli-Mecidiyeköy istasyonunun kuzey girişlerindeki geçişler %82 ise oranında artmıştır. Hattın genelindeki yolcu azalmasına karşın bu örnek transfer istasyonunda artan yolcu sayısına işaret etmektedir (**Resim 7**).

Gerçekten de transfer istasyonları diğer istasyonlardan her zaman daha fazla yolcu taşımakla beraber etkileri tüm istasyonlarda hissedilmektedir. Örneğin, Avrupa yakasında Yenikapı istasyonunda üç hattın entegrasyonu, bağlantı sağlanan tüm hatlar üzerindeki istasyonların özellikleriyle orantılı olarak artış göstermiştir. Çalışmada gelinen noktada, bir istasyonun yolcu sayılarına etkileyen özelliklerinin ortaya çıkarılmasına panel veriye uygun bir model (rastgele etkiler panel veri lineer regresyon modeli/*random effects panel data linear regression*) kullanarak daha kapsamlı bir yaklaşıma ihtiyaç olduğu açıktır. Mevcut çalışmada kullanılan panel veri beş zaman noktasında istasyonlara ilişkin toplanan veridir. Bu zaman noktalarında (2013, 2015, 2017, 2019 ve 2022) hizmette olan her istasyona ait bir haftalık (Aralık ayı, ikinci hafta, kış sezonu) yolcu sayıları (doğal logaritması) bağımlı değişken olarak ele alınmıştır. Bağımsız değişkenler ise yer ve düğüm etkilerini ortaya çıkarmaya yönelik değişkenlerdir. Değişkenlere ilişkin betimleyici istatistiklerden önce Rastgele Etkiler Regresyon Modelinin temel kurgusunu şu şekilde verebiliriz (Adkins ve Hill, 2011, 458):

$$y_{it} = \beta_1 + \beta' x + (e_{it} + u_i) \quad (1)$$

y = ln(yolcu sayısı).

x = Bağımsız değişkenleri içeren vektör

β = parametre değerlerini içeren vektör

t = gözlem yılları (2013,2015, 2017, 2019, 2022).

i = istasyon (186 adet).

e = Yıl ve istasyon bazlı sapma terimi.

u = istasyon bazlı sapma terimi.

$$v_{it}=(u_i+e_{it}) \quad (2)$$

Sapma teriminin (v) varyansı şu şekildedir:

$$\sigma_v^2 = \text{var}(v_{it}) = \text{var}(u_i + e_{it}) = \sigma_u^2 + \sigma_e^2 \quad (3)$$

Yukarıda verilen model içinde bir istasyonun iki zamandaki ölçümleri arasındaki kovaryans her istasyon için aynı kabul edilmekte $-\text{cov}(v_{it}, v_{is}) = \sigma_u^2$ aynı dönemde iki istasyon arasındaki kovaryans ise sifıra eşitlenmiştir: $\text{cov}(v_{it}, v_{jt}) = 0$. Mevcut kabuller kullanılarak bir istasyonun hizmet verdiği yolcu sayısının iki zaman dilimi arasındaki korelasyonu ise şu şekilde hesaplanır:

$$\rho = \text{corr}(v_{it}, v_{is}) = \frac{\text{cov}(v_{it}, v_{is})}{\sqrt{\text{var}(v_{it})\text{var}(v_{is})}} = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_e^2} \quad (4)$$

Yukarıda sunulan modelde iki tip yer değişkeni kullanılmaktadır. Bunlardan birincisi istasyonun 1 km yarıçap içinde yaşayan nüfustur. Elimizde 2017 ve 2022'ye ait ADNKS verileri mevcuttur. 2017 ve 2022 yılları için nüfus verisi olmasına rağmen diğer yılları eksik bıraktığımızda model anlamsız sonuçlar üretmektedir. Bunun yerine model tahmininde tüm istasyonlar ve yıllar için orta yıl olan 2017 yılı nüfusu kullanılmıştır. İkinci yer verisi için işyeri sayısı kullanılmaktadır. Özellikle kentin içindeki yerlerde küçük işletmelerin olduğu varsayılırsa işyeri sayısının da nüfus benzeri ele alınabileceği düşünülebilir. Her iki yer verisinin doğal logaritması modele girmiştir. Gerek bağımlı değişken olan yolcu sayılarının gerekse de yer özelliklerini temsil eden söz konusu iki bağımsız değişkenin (istasyon civarı nüfusu ile işyeri sayısı) logaritma ile modele dahil edilmesi parametre anlamlılıklarını da önemli ölçüde iyileştirirken, diğer yandan da belirli bir seviyenin ötesinde etkilerin üst sınırına yaklaşacağı iç kabulünü de ortaya koymaktadır. Öte yandan yer değişkenlerinin tahmin edilen katsayıların esneklik değerleri olarak da değerlendirilebilir. Diğer bir deyişle, yer değişkenlerinin yukarıda verilen model aracılığıyla tahmin edilen katsayıları yer değişkeninde meydana gelen %1 artışa karşı yolcu sayılarında meydana gelecek yüzde artışa işaret etmektedir. İstanbul'un Boğaz ile bölünmüş iki yakadan oluşmuş olması nedeniyle her iki yakanın özellikleri bağlamında toplu taşıma düzeylerinde de farklılıklar vardır. Bu hipotezin model içindeki temsilcisi istasyonun bulunduğu yakayı (Avrupa) ifade eden bir ikili değişkendir. Avrupa yakasının nüfus ve işyeri açısından Anadolu yakasına üstün olduğunu biliyoruz. Buradan hareketle bu değişkenin de diğer değişkenlerin etkileri kontrol edildiğinde dahi etkisini sürdürüleceğini ileri sürebiliriz.

Düğüm değişkenleri ise istasyonun bulunduğu hattın yanı sıra, hat üzerindeki konumu, hattın işletmesi ile transfer özelliklerini içermektedir. En basit düğüm özelliği bir istasyonun merkezi alanlar esas alınarak, merkezden uzaklığını veren, istasyon sırasındır. Avrupa'da Tarihi Yarımada/deniz kıyısı, Anadolu'da ise Boğaz/deniz kıyısı esas alınarak

istasyonlarının sıralarının istasyonların kullanımı ile yakın ilişki içinde olduğu düşünülmektedir. Keza istasyonlara ilişkin yolcu değerleri de bunu desteklemektedir. İkinci en önemli düşün özelliği ise transfer olanağıdır. Bu olanak birçok açıdan incelenebilir. Çünkü transferler kolaylık sağlasa da zorluklar da içerir. Bir istasyondan diğer bir istasyona yürümeyi içeren faaliyet olarak transferin kapalı alanda ya da açık alanda yapılması, mesafesi gibi unsurlar transfer istasyonunun yolcu seviyeleri (başarısı) ile yakından ilişkilidir. Ancak yukarıda verilen kimi bilgiler ışığında değerlendirme yaptığımızda transferlerin hatlar arasındaki tamamlayıcılık özelliğini birçok istasyon özelinde ortaya çıkardığı da gerçektir. Mevcut çalışmanın toplulaştırılmış veriye dayalı olması nedeniyle, transferlere ilişkin daha detaylı değişkenlere sapsmadan transfer olanağının olup olmadığına dair değişken kullanılmıştır. Çalışmada iki tür transfer birbirinden ayrılmıştır: raylı sistem içinde yapılan transferler ve metrobüse olan transferler. Raylı sistem içinde yapılan transferde ise bir hattın istasyonun kaç tane hatta transfer sağladığı yönünde değer kullanılmıştır. Çalışmanın son on yılı içerdiği göz önüne alındığında ve raylı sistemin giderek büyüdüğü ve mekânsal olarak yayıldığı bir ortamda yıllar içinde transferlerde artış olacağı da açıktır. Raylı sistemler içinde 2013 yılında düşük seviyelerde olan transfer olanakları 2015 yılından sonra hızla iyileşme göstermiştir. Metrobüs transferleri ilk hizmete girdiği dönemlerde M1 ve M2 hattıyla gerçekleşmiş, daha sonra Anadolu ve Avrupa yakasındaki diğer raylı sistem istasyonları da bu olanağa kavuşmuştur.

Genelinde doğu-batı yönelimli hatların olduğu İstanbul'da güney-kuzey yönelimli hatların ayrıcalık oluşturacağı düşünülmektedir. Bu amaçla güney-kuzey hatlarına ait istasyonlar ikili değişkenlerle diğer istasyonlardan ayrıştırılmıştır. Hatların işletmesine ait iki değişken kullanılabilir. Bunlardan birincisi hattın bütününde değil de talebin yüksek olduğu bir kesimde hizmet verilmesidir. İstanbul raylı sistemleri dikkate alındığında iki hat bu nitelikte hizmet vermektedir. Birincisi Boğaz geçişi de içeren ve 80 km gibi bir mesafeyi kat eden Marmaray hattıdır. Marmaray, gün içerisinde iki uç noktası (Halkalı ile Gebze) yanı sıra Ataköy (Halkalı yönünden sekizinci istasyon) ve Pendik (Gebze yönünden on ikinci istasyon) arasında da banliyö (ağır raylı) toplu taşıma hizmeti vermektedir. Bu hattın uç kesimleri (doğuda Kocaeli ilinde kalan Gebze ve Darca dahil) genel olarak İstanbul metropoliten alanının kıyısında kalmaktadır. Gerek işletme gerekse araç filosunun yetersizlikleri nedeniyle uç kesimlere, iç kesimlere nazaran daha az hizmet verilmektedir. Marmaray'a benzer bir diğer işletme T1 hattı üzerinden Eminönü ile Cevizlibağ arasındaki kesimde verilmektedir. Her iki işletme şekli de iç hat olarak bağımsız değişkenler arasında dahil edilmiştir.

Hattın işletmesine ait ikinci değişken ise raylı sistemin kapasitesi ile saatteki frekansı arası dikkate alınarak verilebilir. Ancak her iki değişken de bu zamana kadar işletmeciler tarafından değiştirilmiştir. Bunun birinci nedeni hatların büyümesiyle araç filosu arasındaki dengesizlik oluşturmalarıdır. Yatırımların birbirini takip edememesi ve ekonomik kaynaklar bu alanı sınırlamaktadır. Bu nedenle son on yıl içerisinde servis ve işletme kalitesi/düzeyinde değişiklikler olmuştur. Bu değişiklikleri çalışmamız kapsamında tespit edebilme olanağı olmadığı için raylı sistemi kapasite ve işletmeleri açısından kabaca ayırabilen tasnif kullanılmıştır. Buradan hareketle hafif raylı hatlara 0 değeri verilmiş, yarı metro özellikleri göstermesi nedeniyle M1'e hattına 1 değeri, metrolara 2 ve banliyö hattına 3 değeri atanmıştır. Bu şekilde raylı sistem hatları arasındaki farklılıkları global olarak yakalayabilen bir değişken elde

edilmiştir. Modelde kullanılan değişkenlere ait betimleyici istatistikler **Tablo 1**'de sunulmaktadır. Sadece yolcu sayısı, nüfus ve işyeri sayısına ilişkin değişkenlerin sürekli değişken olarak kullanıldığı modelde diğer değişkenler kesiklidir (ikili ya da tam sayı). Yolcu sayısı değişkenin gözlem sayısının fazla olması İstanbul ili sınırları dışındaki Marmaray istasyonlarından kaynaklanmaktadır. Gebze'den Tuzla'ya kadar olan Marmaray istasyonları model sonuçlarına dahil edilememiştir. Tüm raylı sistem istasyonların %22'si Marmaray istasyonudur; Ataköy ile Pendik arasındaki Marmaray iç hattında ise tüm istasyonların %10'u bulunmaktadır. İstasyonların %64'ü Avrupa yakasında yer alırken, %25'i ise güney-kuzey hatlarında yer almaktadır. Raylı sistem istasyonlarının bir kilometre yarıçapında ortalama 40 bin civarında nüfus, 2.500 civarında işyeri bulunmaktadır. Nüfusun en yoğun olduğu koridor T1 hafif raylı sistem hattı üzerinde bulunmaktadır, işyerleri ise T1, T4 tramvay hatları, Marmaray banliyö hattı, M1A ve M1B ile M2 metro hatları tarafından hizmet verilen Tarihi Yarımada'da yoğunlaşmaktadır.

Tablo 1'de betimlenen veri seti kullanılarak parametre tahmini yapılan modelde 186 istasyona ait toplam 745 gözlem noktası kullanılmıştır. **Tablo 1** raylı sistemlere ait tüm veri setini içermektedir. Modele ise sadece İstanbul il sınırlarında olan istasyonlar dahil edilmiştir. İstasyonların farklı tarihlerde hizmete girmiş olması nedeniyle kimi istasyonların beşten daha az zaman noktasında verisi söz konusudur. Sonuç olarak modele giren veri noktası azalmıştır.

Tablo 2 model parametre tahminleri yanı sıra model performansını göstermektedir. Model, sabit sonrasında eklenen 11 değişkenin anlamlı sonuçlar ürettiğini göstermektedir (Bkz. Wald Testi). Bir istasyonun zamana bağlı sapma değerleri arasındaki korelasyon değeri (yukarıda denklem 4) 0,766 gibi yüksek bir değere sahiptir. Diğer bir deyişle, istasyonun kendine has özelliklerini zaman içerisinde devam ettirdiğini göstermektedir.

Makroform yer özellikleri yerine kullanılan güney-kuzey hattı ve Avrupa yakası hattı olma özelliklerinin modelde anlamlı sonuçlar üretmediği görülmektedir (her iki değişkene ait t-istatistikleri, sırasıyla, -1,49 ve 0,68 olarak bulunmuştur). Varsa da çok az ve sabit terim ile diğer yer özellikleri

Tablo 1. Rastgele etkiler panel veri lineer regresyon model değişkenleri betimleyici istatistikleri.

Değişken	Değişken Ölçeği/tipi (Notasyon)	Gözlem Sayısı	Ortalama	Std. Sapma	Min.	Maks.
Yolcu Sayısı (ln)	Oran/sürekli	762	11,098	0,890	6,934	1,336
Güney-Kuzey Hattı	Nominal/kesikli (1: Güney-Kuzey Hattı)	970	0,258	0,438	0	1
Avrupa Yakası	Nominal/kesikli (1: Avrupa Yakası)	970	0,644	0,479	0	1
Marmaray	Nominal/kesikli (1: Marmaray)	970	0,222	0,416	0	1
İstasyon Sırası	Sıralı/kesikli (1: Kent merkezi, 29: son istasyon)	778	9,940	6,411	1	29
Raylı Sisteme Transfer Sayısı	Sıralı/kesikli (1: Transfersiz; 2: Transfer hat sayısı)	777	0,160	0,406	0	2
Metrobüs Transferi	Nominal/kesikli (1: Transfer Var)	968	0,061	0,239	0	1
Nüfus (1km yarıçapı, ln)	Oran/sürekli	939	10,616	1,110	3,135	12,304
İşyeri Sayısı (1km yarıçapı, ln)	Oran/sürekli	934	7,794	1,441	0,000	10,914
Marmaray İç Hat (Ataköy-Pendik)	Nominal/kesikli (1: İç hat)	970	0,124	0,329	0	1
Tramvay İç Hat (Eminönü-Cevizlibağ)	Nominal/kesikli (1: İç hat)	970	0,098	0,297	0	1
Hat Tipi	Nominal/kesikli (0: Tramvay, 1: M1, 2: Metro; 3: Marmaray)	970	1,557	1,113	0	3

	Değişken	Katsayı Değeri	t-istatistiği
0	Sabit	7,553	12,35
1	Güney-Kuzey Hattı	-0,193	-1,49
2	Avrupa Yakası	0,092	0,68
3	Marmaray	-0,842	-3,56
4	İstasyon Sırası	-0,001	-0,14
5	Raylı Sisteme Transfer Sayısı	0,910	10,19
6	Metrobüs Transferi	0,714	4,21
7	Nüfus (1km yarıçapı, ln)	0,108	2,29
8	İşyeri Sayısı (1km yarıçapı, ln)	0,229	6,56
9	Marmaray İç Hat (Ataköy-Pendik)	0,410	1,76
10	Tramvay İç Hat (Eminönü-Cevizlibağ)	0,131	0,59
11	Hat Tipi	0,334	3,90
	sigma (u)	0,595	
	sigma (e)	0,333	
	rho	0,762	
	R ²	0,401	
	Wald Testi (bağımsızlık derecesi: 11)	234,18	
	İstasyon Sayısı (Grup)	186	
	Toplan gözlem sayısı (N)	745	

Tablo 2. Model katsayı tahminleri ve performansı.

arasında anlamını kaybettiği de ileri sürülebilir. En önemli yer özellikleri nüfus (ln) ve işyeri sayısı (ln) olarak öne çıkmaktadır. Bağımlı değişken yolcu sayısının da (ln) olması nedeniyle, aralarındaki ilişkiyi ortaya koyan katsayı değerlerinin esneklik değerleri olarak da ele alınabileceği açıktır. Diğer bir deyişle, istasyon çevresindeki nüfusun %1 değişmesi karşısında yolcu sayılarında %0,10 değişiklik görülmesi söz konusudur. İşyeri sayısı açısından da işyeri sayısının %1 artışı yolcu sayısında %0,20 oranında artış sağlamaktadır. Her iki değişkenin de yüksek anlamlılık düzeyleri yer özelliklerinin önemli ölçüde etkisinin olduğunu göstermektedir.

Düğüm özellikleri söz konusu olduğundaysa en temel değişkenimiz transfer olanaklarıdır. Bir istasyonun transfer olanağı arttıkça yolcu sayısı da artmaktadır. Bu hem raylı sistemlerde (0,910) hem de metrobüs aktarmalarında (0,714) yüksek değerleri üretmiştir. Örneğin, ortalama bir istasyonun haftalık yolcu sayısının 66 bin seviyesinde [$\exp(11,098)$] olduğunu düşünürsek, tek raylı sisteme olan transfer 164 bin değerinin [$\exp(11,098+0,910)$] üzerine çıkarmaktadır. Dolayısıyla transferlerin tamamlayıcılık özelliğini önemli ölçüde ileri götürdüğü açıktır.

Marmaray istasyonu değişkeninin negatif olması ilk bakışta yanıltıcı olabilir bu değişkenin hat tipi ile birlikte değerlendirilmesi doğru sonuca yöneltir. Zira hat tipinde Marmaray "3" değeri (Tablo 1) almaktadır. Dolayısıyla Marmaray'ın etkisi pozitif 0,16 seviyesindedir. Bu değer de Marmaray'ın İstanbul metropoliten alanı için ne kadar önemli olduğunu ortaya koymaktadır.

TARTIŞMA VE ÖNERİLER

Özellikle son yirmi yıl içerisinde İstanbul'un mekansal değişim ve dönüşümünün hızı artmıştır. Gerek Avrupa gerekse de Anadolu yakalarındaki kuzeyde görülen kentsel yayılma, sanayi alanları ile iş ve alışveriş merkez ve mekanlarındaki değişim ve çeşitlenme İstanbul'daki

günlük rutinleri ile yolculuk desenlerini değiştirmektedir (Önden ve Çakmak, 2020; Yiğit ve Hayır-Kanat, 2017). Her ne kadar İstanbul'un coğrafyası ve tarihsel gelişmesi toplu taşıma türleri arasındaki transferleri desteklese ve kentin hafızasında bu nitelikte davranış biçimi olsa da toplu taşıma sisteminin işleyişi türler arasındaki aktarmalara, Boğaz kıyısından iç kesimlere, farklı türlerden tek bir türe doğru kaymaktadır (Önden ve Çakmak, 2020). Genişleyerek Boğazı denizaltından aşan (ve zamanla üstten aşacak) raylı sistemler, İstanbul'da ana ulaşım türü olma yoluna girmiştir. Bu esnada diğer toplu taşıma türleri de özelliklerine uygun şekilde raylı sistemi destekleyen dönüşüm sürecindedir ve İstanbul toplu taşıma sistemi yeni bir döneme girmiştir.

Kentsel alanlarda raylı sistemler ağ niteliğine büründükçe farklılaşan güzergahlar da giderek artmaktadır. Bir otobüs içinde neredeyse tüm yolcular aynı varış noktasına doğru yol alırken, raylı sistem aracı içindeki yolcuların varış noktaları birbirinden ayrılmaktadır. Ağsal şebekelerde önemli düğümler, farklı yönlere hareket olanağı sağlayan transfer noktalarıdır. Bu çalışmadaki analizler transfer istasyonlarının raylı sistem yolcu sayısına olumlu etkide bulunduğunu, transfer olanağı sağlayan hatların yolcu tabanını genişlettiğini göstermiştir. Ancak raylı sistem büyüdükçe hatlar arasında tamamlayıcılık ve ikame ilişkilerinin de ortaya çıkacağı da açıktır. Zira daha önce daha uzun güzergah takip edilen çıkış-varış noktaları arası yolculuklar yeni hatların hayata geçmesi ile yeni güzergahlara kaymıştır. Beşiktaş ile Mahmutbey arasındaki hattın (M7) daha güneyindeki metro ve tramvay hatlarına bu yönde bir etkisi olmuştur. Dolayısıyla raylı sistem kullanımının zaman-mekânsal gözlemi de büyük önem taşımaktadır. Kimi zaman bu gözlemsel etkiler modeller aracılığıyla da yakalanamamaktadır.

Çalışmada raylı sistem içinde Marmaray'ın önemli olduğu ortaya çıkmıştır. Hem kapasite hem de talep açısından İstanbul'daki en önemli güzergâh üzerinde Boğazı aşan tek raylı sistem hattı olarak hizmet vermektedir. Marmaray'ın verimli çalışmasının diğer raylı sistem kullanımına önemli ölçüde etki edeceğini söyleyebiliriz. Marmaray ağır raylı sistem olması nedeniyle yüksek kapasite yanı sıra hızlı servis sunma potansiyeline sahiptir. Buna karşın hattın başından sonuna olan süre uzundur. Bunun farklı servislerle aşılarak özellikle yolcu sayılarının cılız olduğu uç noktalardan merkezi alanlara olan yolculuk sürelerinin düşürülmesiyle yolcu sayıları artırılabilir. Bu artışın olumlu etkilerinin sistem bütününe yayılacağı açıktır. Her ne kadar model sonuçlarında güney-kuzey yönelimli hatlar anlamlı sonuçlar üretmemiş olsa da gelecekte büyüyen ağ yapısı içinde bu hatların transfer olanaklarının artırılması ve iyileştirilmesiyle kıyıya dik hatlarda yolcu seviyelerinin ciddi biçimde artacağını ve diğer türler ile entegrasyon kapasitesinin yükseltilmesiyle verimliliğin yükseleceğini ileri sürebiliriz.

Yapmış olduğumuz analizler doğrultusunda, nüfusla paralel yolcu artışı olmadığını, ofis ve üretici hizmetler ile ticari işlevlerin yolcu kapasitesi artışında iki kat fazla etki ettiğini görmekteyiz. 1900'lü yılların başında bu yana İstanbul'un Marmara kıyısındaki tarihsel gelişmesinin odağında yer alan eski banliyö hatları üzerine inşa edilmiş Marmaray'dan kuzey yönüne bağlantılar, deniz yolu, metrobüs ve diğer metro hatlarına entegrasyonun öncelikle geliştirilmesi gerekir. Marmaray'da, mevcut transfer noktalarının kapasite verimliliğinin artırılması ve yeni kırılma noktaları yaratmanın yerinde olabileceği, bu anlamda Anadolu yakasında, Üsküdar, Ayrılık Çeşmesi, Bostancı ve Göztepe; Avrupa yakasında ise Yenikapı, Bakırköy,

Ataköy ve Sefaköy istasyonlarının bu gözle yeniden değerlendirilmesinin gerekli ve yerinde olacağı söylenebilir.

Raylı sistem hatlarına etki eden bir diğer konu hatların erişim sağladığı yolculuk üretimi açısından önemli noktalardır. Bunlardan birisi havalimanlarıdır. Havalimanlarına erişim sağlayan hatların yolcu sayılarında artış söz konusudur. Aynı şekilde erişim sonlandığında da bu düşüş görülmektedir. Verinin toplandığı zaman zarfında Atatürk Havalimanının kapatılması nedeniyle yolculuk talebi havalimanına erişim sağlayan M1A metrosunda düşmüştür.

Düğüm ve yer özelliklerinin kullanıldığı model çalışmasının büyüyen hatlar söz konusu olduğunda düğüm ve yer özelliklerinin de dinamik arka plana sahip olduğu düşünülmektedir. Bu nedenle mevcut çalışmanın panel veri setiyle gerçekleştirilmiş olmasının bu dinamizmi yakalamaya yönelik en önemli katkısı olduğu ileri sürülebilir. Ancak panel veri setindeki yıllar bazında olabilecek eksiklikler modelin kalitesine etki edebilecektir. Özellikle raylı sistemler söz konusu olduğunda kentin makroform özelliklerinin dikkate alınması önemlidir. Bu çalışmada kullanılan Avrupa yakası değişkeni bir sonuç üretmezken, raylı sistemlerin iç hat denilen şehrin görece merkezi alanlarına yakın alt bölgelerini içeren kesimleri anlamlı sonuçlar üretmiştir.

Çalışmada raylı sistem istasyonlarının düğüm ve yer özelliklerinin, Bertolini ve Spit (1998) ve Bertolini (2008) gibi önemli çalışmalarda ileri sürülen temel unsurlarla paralellik içerdiği düşünülmektedir. Ancak buradaki temel sorulardan birisi raylı sistem yer özelliklerinin yolcu sayılarını artırma amacıyla (stratejik olarak) nasıl kullanılacağıdır. Bu konuda en temel çalışmalardan biri olan Cervero ve Kockelman (1997), bu çalışmada açık kalan noktaları tamamlayacak niteliktedir. Nitekim istasyon alanlarının yer özelliklerini, yoğunluk, çeşitlilik ve tasarım boyutlarıyla ele alan çalışmanın, İstanbul (ve benzer diğer gelişmekte olan şehirler) söz konusu olduğunda en temel katkıyı en son boyutta tasarım konusunda vereceği düşünülmektedir. Zaten gelişmekte olan şehirlerin temel özelliklerinden sayılan yüksek nüfus yoğunluğu ve karma arazi kullanımı raylı sistemleri bir yere kadar destekleyebilmektedir. Eksik olan ise tasarım boyutudur. Tasarımın hem yer özelliklerine hem de düğüm özelliklerine olumlu etkilerini artıracak şekilde öne çıkarılması, raylı sistemlerin geleceği için önemli gözükmektedir. Bu İstanbul gibi dinamik bir arka plana sahip megapoler için özellikle önemlidir.

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Keywords: Istanbul; rail transit; station locations; rail transit passenger values.

STATIONS AND LINES IN A GROWING RAIL TRANSIT SYSTEM NETWORK: THE CASE OF ISTANBUL

The world is witnessing a new era of urban transit with increasing emphasis on rail transport modes. The reasons behind this surge are various. Not only cities of developing countries but also cities of developed countries entertain new rail transit investments. Turkey's major cities follow suit with great enthusiasm. Istanbul, the biggest city in Turkey, has accomplished great success in expanding its rail network, especially in the last decade. Taking expanding into the center, this study deals with changes in passenger patterns in growing networks with new lines and stations. To do so, a ten-year period from 2013 to 2022 is investigated in four biennial time points, i.e., 2013, 2015, 2017, 2019, and 2022 to bypass pandemic effects on transit usage. In a growing network, passenger levels at stations and line usage change as new lines and/or stations are added. The interrelationships might be complementary or substituting between rail lines, which can be directly detected in station usage. Istanbul shows similar patterns, too. As new routes are made available by expansion and transfer stations are added to the network, rail transit passenger level has increased in the meantime. However, changes in passenger levels across lines and stations show high variation. As shorter routes emerge, longer routes lose passengers (substitutions). As a new transfer station is added between different lines, all lines benefit from this (complementation). The regression model reveals that transfer stations and different services on a single line increase and/or maintain high passenger levels pointing to the effects of complementation mostly. The study proposes a particular focus on transfer stations as an important factor in increasing rail passengers. Transfer stations play a crucial role in passenger demand, especially on routes with high passenger demand, usually between city center and peripheral areas. Together with the oldest rail services in Istanbul, suburban line(s) have been modernized and connected by an undersea tunnel and put into service as Marmaray, a single line. The regression model refers to Marmaray as İstanbul's most significant trunk line. Thus, having transfer points with Marmaray supports a rail line.

BÜYÜYEN RAYLI TOPLU TAŞIMA SİSTEM AĞINDA HATLAR VE İSTASYONLAR: İSTANBUL ÖRNEĞİ

Dünya, raylı toplu taşıma modlarına verilen önemin arttığı yeni bir kentsel ulaşım çağına tanıklık ediyor. Bu artışın ardındaki nedenler çok çeşitlidir. Sadece gelişmekte olan ülkelerin şehirleri değil, gelişmiş ülkelerin şehirleri de yeni raylı ulaşım yatırımlarına ev sahipliği yapıyor. Türkiye'nin büyük şehirleri de bu süreci heyecanla takip ediyor. Türkiye'nin en büyük şehri olan İstanbul, özellikle son on yılda demiryolu ağını genişletme konusunda büyük başarılar elde etmiştir. Bu çalışma, büyümeyi merkeze alarak, yeni hatlar ve istasyonlarla büyüyen ağlarda yolcu desenindeki değişiklikleri ele almaktadır. Bunu yapmak için, 2013'ten 2022'ye kadar olan on yıllık bir dönem, pandeminin transit kullanımı üzerindeki etkilerini atlamak için iki yılda bir dört zaman noktasında, yani 2013, 2015, 2017, 2019 ve 2022'de incelenmiştir. Büyüyen ağda, yeni hatlar ve/veya istasyonlar eklendikçe istasyonlardaki yolcu seviyeleri ve hat kullanımı değişmektedir. İstasyon kullanımında doğrudan tespit edilebilen karşılıklı ilişkiler, demiryolu hatları arasında tamamlayıcı veya ikame edici olabilir. İstanbul da benzer örüntüler göstermektedir. Hatların genişletilmesi ve aktarma istasyonlarının ağa eklenmesiyle yeni güzergâhlar kullanıma

açıldıkça, demiryolu transit yolcu seviyesi de artmıştır. Ancak, hatlar ve istasyonlar arasında yolcu seviyelerindeki değişimler yüksek farklılıklar göstermektedir. Daha kısa güzergâhlar ortaya çıktıkça, daha uzun güzergâhlar yolcu kaybeder (ikameler). Farklı hatlar arasında yeni bir aktarma istasyonu eklendikçe, tüm hatlar bundan faydalanmaktadır (tamamlama). Regresyon modeli, aktarma istasyonlarının ve tek bir hat üzerindeki farklı hizmetlerin yüksek yolcu seviyelerini artırdığını ve/veya koruduğunu ortaya koymakta ve çoğunlukla tamamlayıcılığın etkilerine işaret etmektedir. Çalışma, demiryolu yolcularının artırılmasında önemli bir faktör olarak aktarma istasyonlarına özellikle odaklanılmasını önermektedir. Aktarma istasyonları, özellikle yolcu talebinin yüksek olduğu güzergâhlarda, genellikle şehir merkezi ile çevre bölgeler arasında, yolcu talebinde önemli bir rol oynamaktadır. İstanbul'daki en eski demiryolu hizmetleri ile birlikte banliyö hatları modernize edilmiş ve bir denizaltı tüneli ile bağlanarak tek bir hat olan Marmaray olarak hizmete girmiştir. Regresyon modeli Marmaray'ı İstanbul'un en önemli ana hattı olarak ifade etmektedir. Dolayısıyla, Marmaray ile aktarma noktalarının olması bir demiryolu hattını desteklemektedir.

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DÖŞEME ÖRÜNTÜSÜ TASARIMINDAKİ VERİM ETKENİNİN SİMETRİ GRUP KURAMI VE ALGORİTMA DESTEKLİ TASARIM ARAÇLARIYLA DEĞERLENDİRİLMESİ (1)

Korcan GÜLFİDAN*, İpek FİTOZ**

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Anahtar Sözcükler: Algoritma destekli tasarım; yüzey tasarımı; döşeme örüntüsü; parametrik tasarım

1. "Döşeme Örüntüsü Tasarımındaki Verim Etkeninin Simetri Grup Kuramı ve Algoritma Destekli Tasarım Araçlarıyla Değerlendirilmesi" başlıklı bu makale 2022 yılında yayınlanmış, Korcan Gülfidan tarafından Prof. Dr. İpek Fitoz danışmanlığında yazılmış "İç Mimari Yüzey Tasarımında Simetri Algoritmalarının Kullanımına Yönelik Bir Model Önerisi" başlıklı doktora tezinden üretilmiştir.

GİRİŞ: NİTEL VE NİCEL BİR KAYNAK OLARAK SİMETRİ

Doğa sayısız çeşitlilikte biçime ev sahipliği yapar. İnsanlar doğaya dair gözlemlerinden doğan verilere, yaşam çevrelerindeki estetik, işlevsel ya da tinsel ihtiyaç ve sorunlara yönelik çözümler olarak sıklıkla başvurmuştur. 20. yüzyılın matematikçilerinden Hermann Weyl, "Simetri, geçmişten bugüne evreni anlamaya çalışan insanlığın, algıladığı düzen, güzellik ve kusursuzluğu tanımlayabilmek adına ürettiği bir fikirdir" der (Weyl, 1989, 5). Nobel ödüllü fizikçi Leon Max Ledermann ve fizikçi Christopher Hill'e göre (2004, 13-14) ise fiziksel olan her şeyin temelinde simetri vardır. Simetri doğal mekânla insan yapısı olan mekânın, nitelenebilir olanla ölçülebilir olanın ortasındadır.

"Simetri" sözcüğü Klasik Antik Yunanca'da değerler arası ölçülebilirliğin ortak bir ifadesi olarak "*summetria*" ismi ve "*summetrion*" sıfatı şeklinde kullanılmış; Mimar Marcus Vitruvius Pollio tarafından "bir bütünün parçalarıyla ve parçaların birbirleriyle uyumu" anlamına gelen "*symmetria*" formatıyla Latinceleştirilmiştir (Hon and Goldstein, 2008, 70-71). Kıyas etkenini ima eden bu tanımlara ek olarak, güncel ve teknik bir ifadeyle simetri günümüzde hem bir nesnenin nitel bir dengeden kaynaklanan armonik durumunu, hem de çeşitli parçaları arasındaki birbirine eş olma, birbirine benzeme ve birbirini tutma durumlarını tanımlar. Bununla birlikte simetri, bir nesne ya da sistemin dönüşümler karşısında gösterdiği değişmezlik ile ilgilidir (Lederman ve Hill, 2004, 13-14). Dolayısıyla simetri hem geometrik bir olgu, hem de estetik uyum ve oranla ilgili bir ifadedir (Hargittai ve Hargittai, 2009: 1).

Simetri ile yakından ilişkili modülerlik kavramı, hem doğal hem de yapay yollarla şekillenmiş mekânda bir yarar unsuru olan tasarruf ve verimlilik ile aynı zeminde buluşur. Modülerlik, doğanın ekonomik işleyişine dair temel bir unsurdur (Jablan, 2002, 269). Pek çok doğal strüktür modüler dizilimlere sahiptir ve çoğu tür, hücreleri arasındaki simetrik ilişkileri oluşturacak olan altın oran, altın açığı gibi sayısal belirleyicileri milyonlarca

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Resim 1. Doğada simetrik etkinlikler (Birinci sütun: Su moleküllerinin altıgen yollar izleyerek özgün kar kristali formlarında kompaktlaşması. Fotoğraflar: Wilson A. Bentley, 1931 (Bentley, 1999). İkinci sütun: Diatomlarda harekete bağlı simetri. Fotoğraflar: Stephen Main, Rex Lowe, Sarah Spaulding, Mark Edlund, (Spaulding & Edlund, 2008) Üçüncü sütun: Doğanın çeşitli örneklerinde eşbiçimlilik. Dördüncü sütun: Bitkilerden çeşitli simetrik dönüşüm örnekleri. (M. Hargittai ve Hargittai, 2009)

nesildir kaybetmemiştir (Glaeser, 2013, 263). Matematiksel biyolojinin kurucusu D'Arcy Thompson (1942, 958-1025), "Büyüme ve Biçim Üzerine" adlı yapıtında doğal strüktürlerin geometrilerinde söz konusu oransal kuralları takip etmesini işleyişte ekonomik olan yolu seçme eğilimleri ile açıklamaktadır. Doğa, simetriyi kompaktlaştırma yolu için bugün daha çok şey söyleniyor olsa da mısır bitkisinin parankimasında, göz retinal mozaiklerinde, diatomlarda; daha bilindik örnekleriyle ise bal peteklerinde ve kar kristallerinde bu hesaplamaları kullanır (Weyl, 1989, 85-87).

Harcanan enerjinin düşürülmesi, minimum enerji girdisiyle maksimum yarar sağlama eylemi de bir tasarruf yöntemidir. Kompakt kristaller olan virüsler hücreyi enfekte edebilmek için çok yüzlü simetrik düzenleri takip ederek biçimlenir ve enerjilerini minimize ederler. Benzer şekilde; papatya tepciklerindeki spirallerde Fibonacci dizisiyle benzerlik gösteren simetrik tutum da doğanın mümkün olduğunca çok tohumu en küçük yüzeye yerleştirebilme çabasından ileri gelir (Stewart ve Golubitsky, 1993, 251-258). Biyomimetik alanda çalışmalar yapan bilim insanı Julian Vincent "doğada malzemeler değerli, biçimler ise ucuzdur" der. Doğa, malzemenin verimli kullanımını için oldukça ekonomik, form geliştirme konusunda olabildiğince maharetlidir (Pawlyn, 2016, 9). Simetri ile sağlanacak tekrarlılık iş verimini artırır, yeniden kullanım olanakları sağlar ve benzer parçalar tasarım ve üretim maliyetlerini düşürür (Conway vd., 2008, 7). **Resim 1**'de doğada mevcut olan simetrik etkinliklere dair bir grup örnek görülmektedir.

Nesnelerin ve mekânların algılanmasını sağlayan ve tüm yapının en dışında bulunan fiziksel katmanlar yüzeylerdir. Simetri, yüzeylerin

verimli bölünebilmesinde, işlevselliğinin artırılmasında, biçimsel ve estetik karakterlerin belirlenmesinde çeşitli getirileri olan bir kavramdır. Simetrisinin kuralları doğada oldukça karmaşık işler ve doğal simetrisi ulaşılabilen tasarım teknolojisi ile erişilemeyecek verim ile ilişkili standartlardadır. Ancak simetriyi meydana getiren birim, işlem ve olayların meydana getirebileceği geometrik olasılıklar, tasarımda özdeş parça kullanımı ile tasarruf etkeninin değerlendirilebilmesi için kuramsal bir zemin olarak değerlendirilebilir.

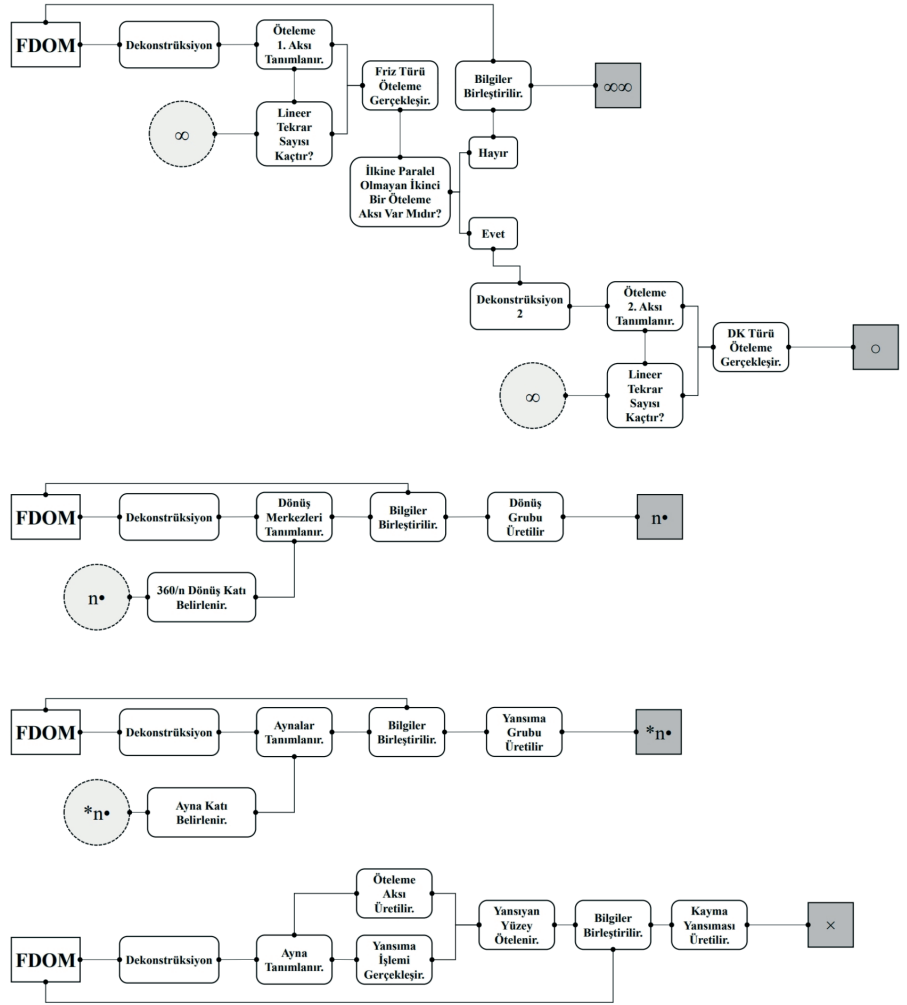
Günümüzde tasarım teknolojisinin üretken tasarım aygıtları, doğal mekân ve insan yapımı mekân arasındaki pragmatik değerlere katkı sağlayacak unsurların keşfi için sınırsız olanaklar taşımaktadır. Üretken tasarım, simetri ve yüzey üzerinde doğadakine benzer kalıtsal ilişkilerin kurgulanmasını, tasarımların sınıflandırılmasını, yapısal olarak değerlendirilebilmesini ve fiziksel dünyadakileri taklit eden koşullar altında test edilebilmesini sağlar. Doğal simetrik öğelerin var oluş şekilleri mekânsal öğeleri etkileyecek ekonomik fayda arayışları konusunda kaynak teşkil edebilir. Binlerce yıldır mimari tasarımda mevcut olan bütünü hücrelere bölerek çözme fikrinin üretken tasarım sürecine dahil edilmesi, doğada meydana gelen ve çok sayıda biçimsel sonuç veren simetrisinin temel işlem basamakları halinde değerlendirilebilmesini sağlar. Bu durum algoritma tabanlı tasarım ölçütünde gerçekleşen iki taraflı bir iş gücü tasarrufu olarak düşünülebilir.

Çalışmada verim ile ilişkili kaygılara bağlı olarak şekillenmiş üretken bir tasarım sistemi önerilmektedir. Sayısal değerlerle kontrol edilebilen ve birbirleriyle belirli düzeylerde kalıtsal ilişkilere sahip parametrik yüzey tasarımları üretebilen yöntemlerin eşbiçimli olarak inşa edilmesi çalışmanın nihai amacıdır. Bu durumda hedeflenen sonuç ürün veya ürünlerin kendisi değil; ürün veya ürünlerin üretilebilmesini sağlayan, bilgilerin sanal bir çerçevede fakat fiziksel dünyaya uyarlanabilir bir düzeyde sistemli olarak tasnif edildiği, üretken tasarım yöntemleriyle kurgulanmış prosedürler olacaktır. Üretken tasarım sürecinin simetri kavramının doğadaki varoluşsal dinamiklerine olan uyumu, doğa ve tasarımcı arasındaki fayda döngüsüne güç, zaman ve veri tasarrufu anlamında yeni olanaklar sağlamak adına kullanılmıştır. Çalışmada simetri grupları birbirleriyle sağ el-sol el ilişkisi, yani kiral bir ilişki kuran parçaları algoritma destekli tasarım programı olan McNeel Grasshopper'da oluşturulmuş yöntem dizinleriyle monohedral, yani birbirine tam olarak eş parçalarla kurulmuş yüzeyler olarak yeniden inşa edebilme amacıyla kullanılmıştır. Bu nedenle periyodik olmayan yarı kristal örüntüler çalışma kapsamının dışında tutulmuştur. Kiralitenin yansıma simetrisine sahip birim hücrelerin monohedraleştirilerek giderilmesi, kalıp maliyetlerini minimize etmek amacıyla. Bu yolla simetrisinin verim ve tasarrufla ilişkisi daha elverişli bir biçimde kullanılacaktır.

TEMEL DÖNÜŞÜMLER VE SİMETRİ GRUPLARI

Temel Dönüşüm Algoritmaları

Tasarım araştırma alanı içerisinde simetri, kültürel bir değer, bilişsel bir algı etkeni, tasarruf ve yarar unsuru olarak veya hareket unsurunu destekleyici biçimde ya da bilimsel niteliklerinden hareketle elde edilebilecek çeşitli başlıklar altında değerlendirilmeye uygundur. Ancak, bir yüzeyin simetri bağlamında değerlendirilebilmesi için simetriye dair bir takım temel araçlara başvurulmalı ve simetrisinin uzayda kendisini var



Resim 2. Temel hücrenin simetrik dönüşüm algoritmaları

etme yolu olan dönüşüm işlemleri incelenmelidir. Simetrik biçimi meydana getiren; “transformasyon” (Crowe, 2001, 3; Liu vd., 2010, 6; Makovicky, 2016, 92), “primitif simetri” (Liu vd., 2010, 7) ya da “rijit hareket” (Hahn, 2012, 93; Kaplan, 2009, 12) adları da verilen ve simetriyi kurgulama-çözümleme prosedürlerinin adımları olan bu işlemler simetri etkinliğinin oluşturucularıdır.

Resim 2'de bir temel hücrenin dönüşüm algoritmaları görülmektedir. Dönüşümler, bir tasarımın biçim ve ölçülerini değiştirmeyen rijit hareketlerdir (Hahn, 2012: 93) ve yüzey tasarımlarında eşleşebilir parçaların oluşturulabilmesini sağlarlar (Kaplan, 2009: 12). İki boyutlu Öklid uzayında periyodik bir örüntü ne kadar karmaşık görünürse görünsün çözümlenebilmesini sağlayacak olan temel dönüşümler dört tanedir; bunlar, öteleme, dönüş, yansıma ve kayma yansımasıdır (Conway vd., 2008, 135-136; Liu vd., 2010, 7). FDOM (Fundamental Domain) birim hücreyi temsilen soldan sağa doğru giden bir veri akışı içerisinde işlenir. İlk satırda friz türü öteleme ve iki boyutlu öteleme (o) gerçekleşir. İkinci satır dönüş işlemi ifade eden • karakterini, üçüncü satır yansıma işlemi ifade eden * karakterini içerir. Dördüncü satır kayma yansımasını ifade eden x karakterini içerir.

Simetri Grupları

Bu dönüşümler bireysel değil de sistematik şekilde gerçekleştiklerinde işlem küçük bir dönüşüm yerine daha karmaşık tasarımlar meydana getirir. Tasarımın karmaşıklığından bağımsız olarak; bu dönüşüm kombinasyonları mantıksal ilişkiler barındırmaktaysa, tasarıma ait birim parçalar daima korunur. Simetri grubu, simetrik transformasyonlar altında korunan bu parçaları keşfeden, biçimlendiren ve sistematik olarak incelenebilmesini sağlayan bir yoldur (Hon ve Goldstein, 2008, 2). Simetri grubunu oluşturan bir birim biçim değiştirmeden ve simetrik kimliğini kaybetmeden simetrik tasarımı oluşturur. Aynı zamanda simetri grubu, eşdeğer birim ya da figürleri devamlı bütünlüklere dönüştüren işlemler dizisinin sonuç ürünüdür. Bir dönüşüm işlemi başka bir dönüşümü takip edebilir; bu iki işlemin meydana getirdiği grup ise başka bir simetrik dönüşüm işlemiyle bütüncül bir sonuç üretebilir. Tüm durumlarda, birimin kendisi gibi, birimin dönüşümü de simetri grubunun kimliğini oluşturan esas etkenlerden biridir (Horne, 2000, 7-8).

İki boyutlu Öklid uzayının kapsadığı simetri grupları; uzayın sıfırıncı boyutundaki nokta grupları (dönüşsel grup ve diedral grup), uzayın birinci boyutundaki friz grubu ve uzayın ikinci boyutundaki düzlemsel kristalografik grup ya da diğer adıyla duvar kâğıdı grubudur (Liu vd., 2010, 15-16).

Her simetri grubu, tüm karakteristiklerini ifade eden bir grup diyagramıyla gösterilir. İki boyutlu Öklid uzayındaki simetri grupları, boyut sayısına ve konu edilen grubun transformasyon özelliklerine göre kategorize edilir. Bu kategorizasyonda Schönflies notasyonu, Herman ve Maugin notasyonu, Coxeter notasyonu (Jablan, 2002, 45) ya da bu çalışmada kullanılmış olan Conway notasyonu (Conway vd., 2008, 29-49) gibi harf, rakam ya da semboller içeren çeşitli kısaltmalar kullanılır.

Nokta grubu, dönüşsel grup ve diedral grup olmak üzere iki başlık altında değerlendirilir (Liu vd., 2010). Dönüşsel gruba dair tasarımlarda temel birim merkez nokta ekseninde dönüş etkinliğini $360/n$ derece açıyla gerçekleştirir ve bütünlük bu birimin n sayıda tekrarından oluşur. Çalışmada kullanılan Conway notasyonuna göre * karakteri kaleydoskopları, • karakteri dönüşleri tanımlamak için gösterilir. Bir nokta etrafında biçimlenen tüm mimari rozetler bu notasyona göre • ve * karakterlerinden en az birisini bulundurmaktadır (Conway vd., 2008, 10). Örneğin •2 iki yönlü bir dönüşü, *6, 6 katlı bir kaleydoskopu tanımlar.

Bir noktayı temel alan simetrik düzenlerden farklı olarak frizler ise, iki boyutlu uzayın bir boyutu boyunca uzanır ve bu uzunluk aksı boyunca eşit aralıklı ötelemelere bağlı olarak sonsuz tekrarlılık oluştururlar. Bir doğrultuda toplam 7 farklı türde meydana gelebilen frizler birinci boyutta simetrik olarak ele alınırlar (Crowe, 2001: 6; Mainzer, 2005, 135; Makovicky, 2016, 161). Conway Orbifold Notasyonu (2008: 29-49), friz grubu için üç farklı adlandırma yöntemi önerir. Bunların ilki, grubun birinci boyuttaki sonsuz öteleme dönüşümünü ima eden ∞ karakterini içeren iki ya da üç karakterli temel notasyondur. Bu notasyonda nokta grubunda olduğu gibi * yansıma dönüşümünü temsil eder. Eğer yanında rakam yoksa, ayna sayısı tektir; eğer yanındaki rakam 2 ise iki aynanın kesişmesine dayalı bir kaleydoskop oluşmuştur. Friz grubunun tümü $\infty\infty$, $\infty\times$, ∞^* , $*\infty\infty$, 22∞ , $*22\infty$ ve $2^*\infty$ şeklindedir. o karakteri friz grubundaki doğrultusal

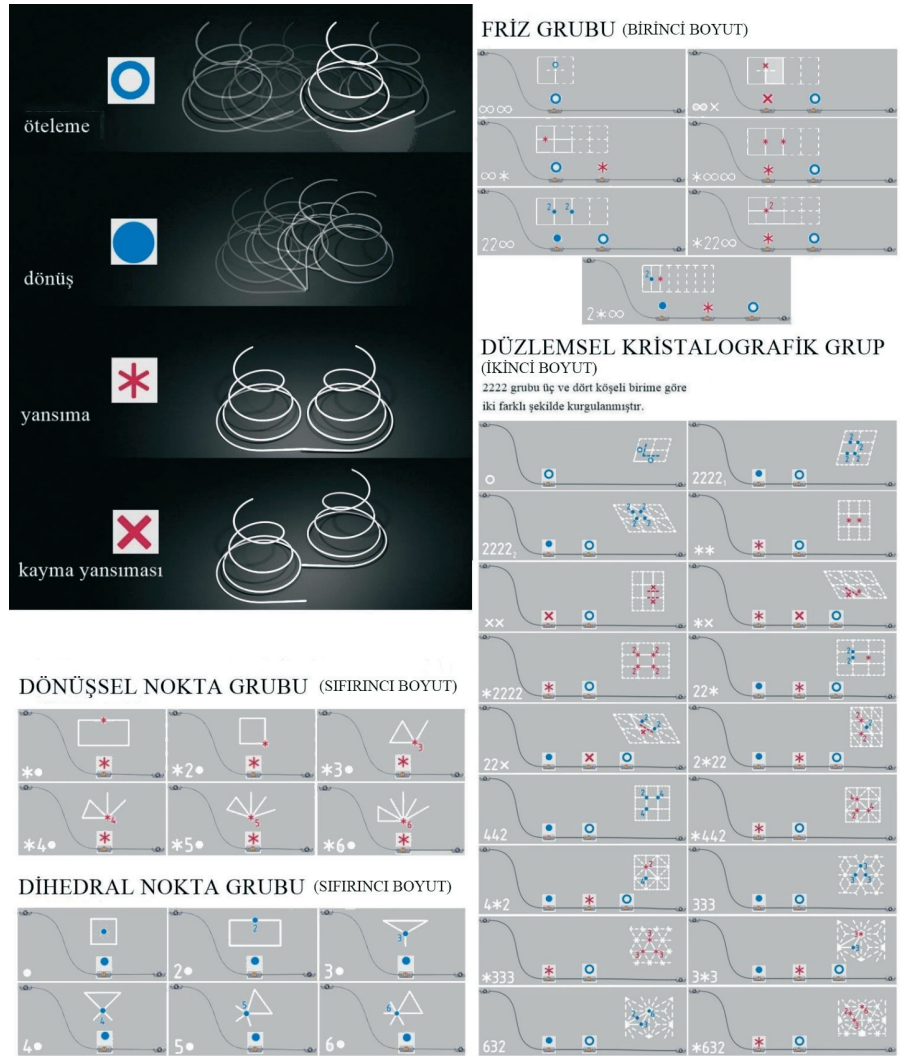
ötelemeyi, \times karakteri ise simetride bir kayma yansıması mevcut olduğunu göstermektedir.

Hem tarihi hem de folklorik perspektiften bakıldığında friz grubunun geometrik kodları geçmişte pek çok kültür tarafından çözülmüştür (Crowe, 2001, 6-8). Tasarım tarihi perspektifinden bakıldığında, Antik Yunan, Roma ve İslam mimarisinin frizler açısından oldukça zengin olduğu görülür. Bununla birlikte tarihte frizler, tek doğrultuda meydana gelen ötelemelere bağlı oldukları için silindir gibi üç boyutlu topolojiler üzerinde dairesel ve spiral düzenlerde de kullanılmıştır (Makovicky, 2016, 31). Friz grubu tasarımda esneklik sağlar ve ona ait doğrusal hattı bölüntüleyecek noktaların sıralı olarak izdüşüm elde edebileceği başka bir eğri, tasarımın projeksiyonu için ek kısıtlamalar belirtmemektedir.

Simetrik bir düzen, birbirine paralel olmayan iki farklı doğrultuda öteleme içeriyorsa bu düzen periyodik olarak kabul edilir. Duvar kâğıdı grubu, iki boyutta çeşitli dönüşüm etkinliklerine sahip, periyodik bir gruptur (Bonner ve Kaplan, 2017, 4). Her duvar kâğıdı grubu, temel dönüşümlerin çeşitli kombinasyonlarıyla kendisini oluşturan daha küçük alanlara bölünebilir. Bu alanlar birim hücre (fundamental domain) olarak tanımlanır. Düzlemsel simetrik tasarımların duvar kâğıdı grubu altında değerlendirilebilmesini sağlayan etken, birim hücrenin ikinci boyuttaki periyodikliğidir (Makovicky, 2016, 35-36). Bu tür düzlemsel simetrik tasarımlar birim hücrenin iki boyutta, dört temel dönüşümün biriyle ya da birkaçıyla sistematik olarak işletilmesi ile tasarlanırlar (Crowe, 2001, 10). Daha açık bir tanımla, öteleme (o), dönüş (*), yansıma (•), kayma yansıması (x) ve bu dönüşümlerin düzleme ve birim hücreye uyarlanabilecek tutarlı kombinasyonları duvar kâğıdı örüntüleri meydana getirir (Mainzer, 1996).

Duvar kâğıdı grubu (Düzlemsel Kristalografik Grup) hakkında kapsamlı sınıflandırma 19. Yüzyılın ikinci yarısından itibaren yapılmıştır. Yine de düzlemsel simetrinin periyodik kullanımlarına dair temel bilgiler MÖ 12. Yüzyıldan itibaren çeşitli uygarlıklar tarafından bilinmekte ve estetik anlamda kullanılmaktadır (Jablan, 2002; Mainzer, 1996). Daha geç dönemlerde hemen hemen her kültürde yer edinmiş olsa da, Klasik Antik Dönem Akdeniz mozaikleri, Cordoba stili mermer ve pişmiş toprak karışımı iki boyutlu örüntüler, Selçuklu, Karahanlı ve Gazneli dönemi girih tasarımları, İznik çinileri, 19. Yüzyıl sonu ve 20. Yüzyıl başında etkin olmuş Art Nouveau akımı bünyesinde tasarlanan duvar kağıtları ve çeşitli döşeme örüntüleri gibi bu konu hakkında gösterilebilecek çok sayıda belirgin örnek vardır (Makovicky, 2016, 58).

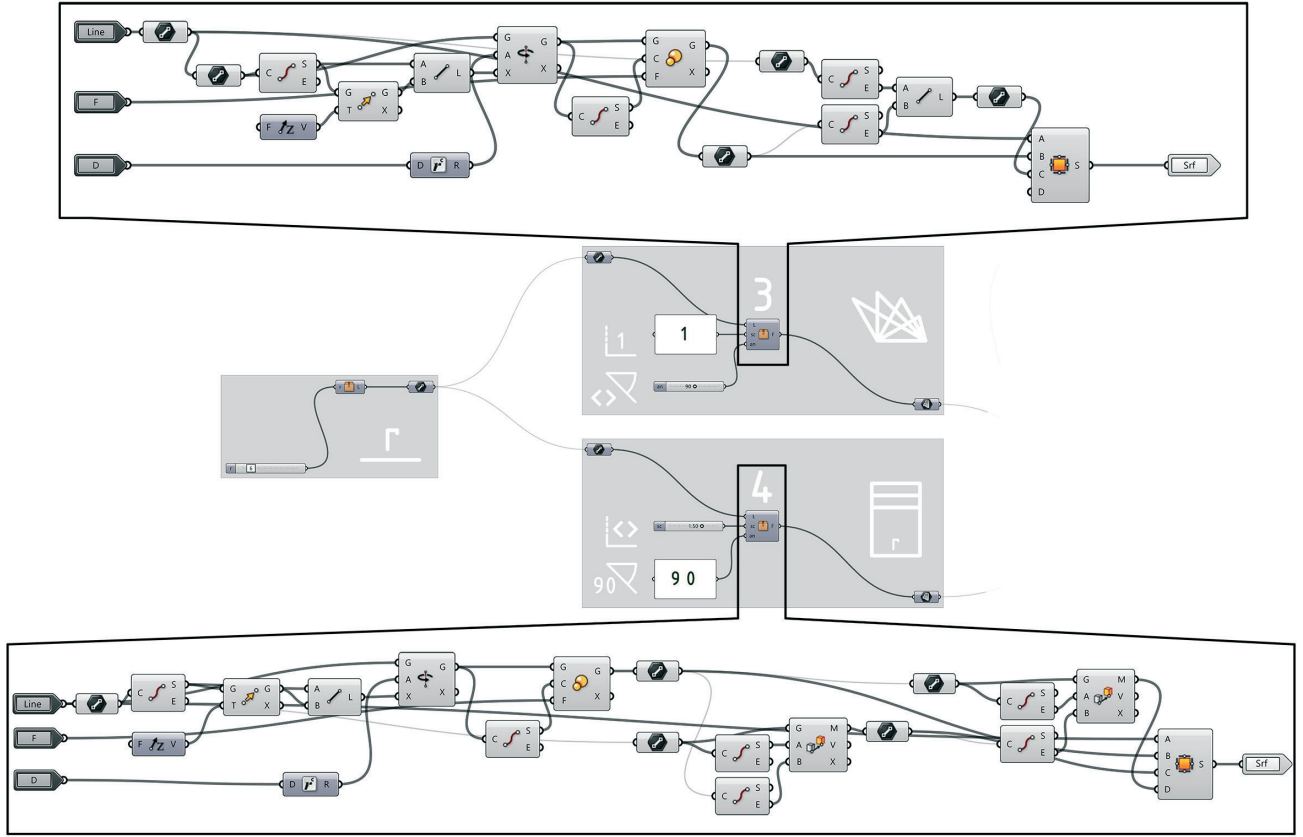
Conway ve diğerlerinin (2008, 29) "Sihirli Kuram" olarak da adlandırdığı duvar kâğıdı grubu, ya da diğer adlarıyla düzlemsel simetri grubu ya da düzlemsel kristalografik grup, bir takım kristalografik kısıtlamalar nedeniyle 17 adettir ve 19. yüzyılın ikinci yarısında yapılmış kapsamlı bilimsel çalışmalardan bugüne dek yeni bir grup tanımlanmamıştır. Bu 17 gruba ek olarak bir yeni grup daha tanımlamanın neden mümkün olmadığına dayalı hesaplamalı ispatlara (Conway vd., 2008, 33-37) adlı çalışmada yer verilmektedir. **Resim 3**, şematik olarak simetrinin iki boyuttaki temel dönüşümlerini ve Conway notasyonuna göre oluşturulmuş Grasshopper algoritmalarını göstermektedir. Bilgisayar kümesi (*cluster*) olarak verilen temel dönüşüm nodlarının (devre düğümü) içerdiği alt yöntem dizinleri ilerleyen bölümlerde ayrıntılı olarak listelenecektir.



Resim 3. Simetrinin iki boyuttaki temel dönüşümleri ve Conway notasyonuna göre oluşturulmuş algoritma

İÇ MİMARİ YÜZEY TASARIMI İÇİN ALGORİTMA TABANLI BİR MODELİN GELİŞTİRİLMESİ

Algoritma tasarlanırken üreteç bazı fonksiyonel katmanlara yanıt verecek ölçütlerde bölümlenmiştir. Bu noktada amaç, bir düzlem olması gerekmeyen, sınırları belirli bir yüzeyi, kendi eşleriyle mekân oluşturucu topolojiler oluşturabilen bir aygıt olarak sıfırıncı boyuttan birinci boyuta, birinci boyuttan ikinci boyuta, ikinci boyuttan üçüncü boyuta ulaşarak kurgulayabilmektir. Bu kurguyu örneklemek için dört temel dönüşümün tümünü içeren 22^* ve $22x$ grupları seçilmiştir. 22^* grubunu oluşturan hücre kare ya da dikdörtgen temel hücreden biri, $22x$ grubunu oluşturan hücre eşit kenarlarının aralarındaki açı değişebilir ikizkenar dik üçgen temel hücredir. İkizkenar dik üçgen temel hücrenin eşit kenarları arasındaki oran sabit ve 1'dir. Kare ya da dikdörtgeni oluşturan gövdede de ayrıtlar arası açı sabit ve 90° 'dir. Gövdedeki sayı kaydırıcılarının değiştirilmesi birim hücrelerin istenen biçime gelmesini kolayca sağlamaktadır. Resim 4, 22^* ve $22x$ grupları için, verilen r uzunluğundaki bir doğru parçasından eşit olmayan açılı değişebilir ikizkenar üçgen ve en boy oranı değişebilir dikdörtgen birim hücre oluşturan bilgisayar kümesinin (cluster) açılımını göstermektedir. Girdiler (*input*) r ayrıt uzunluğu, α ayrıtlar arası açı ve sc ayrıtlar arası ölçek, çıktılar (*output*) ise birim hücrelerdir.



Resim 4. Algoritmanın kök ve gövdesi için açısal değiştirilebilir ikizkenar üçgen ve en boy oranı değiştirilebilir dikdörtgen birim hücre (22^* ve $22x$ grupları için)

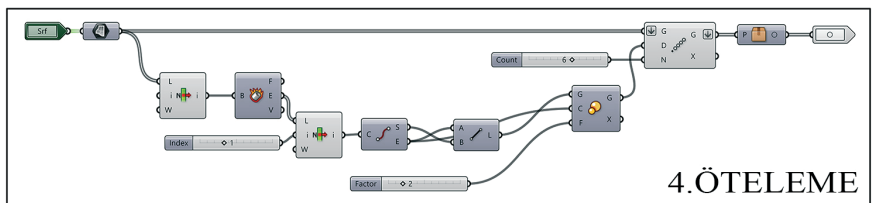
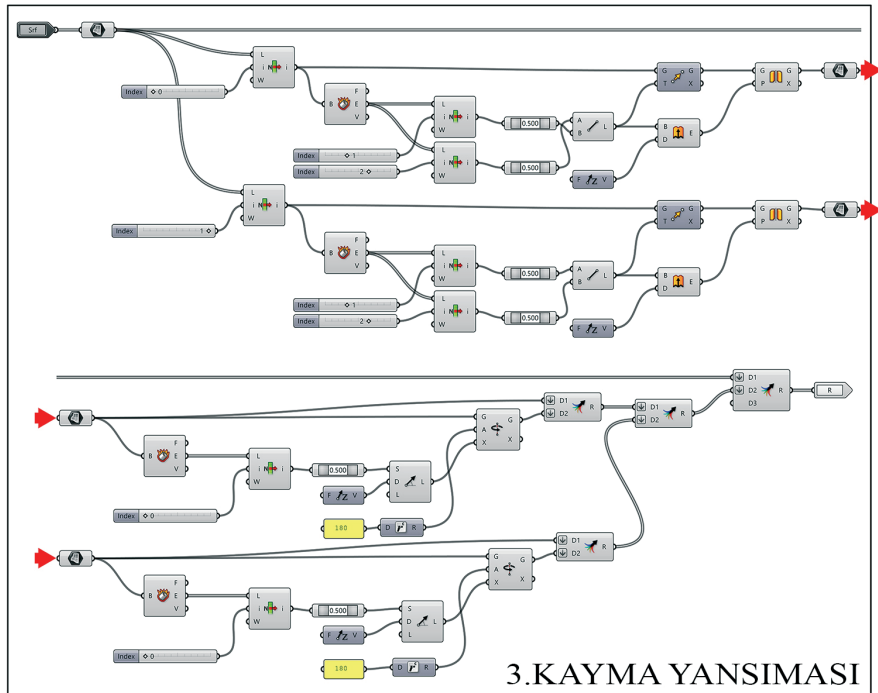
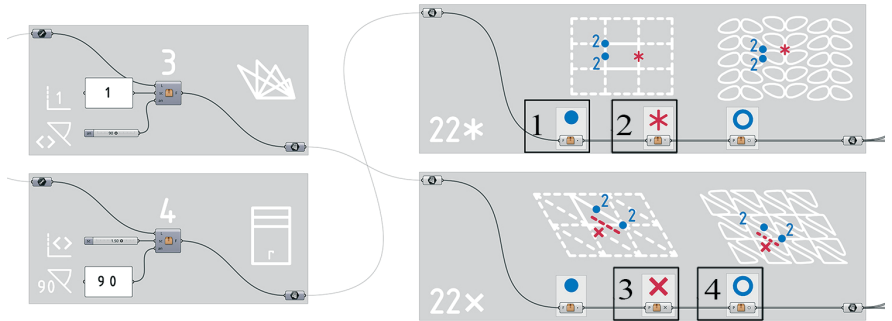
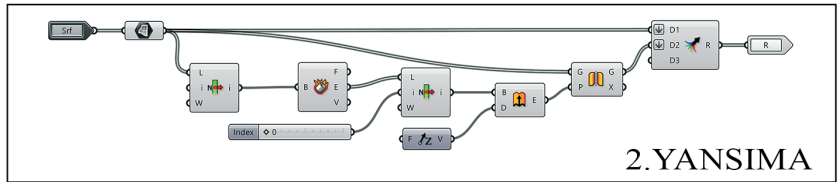
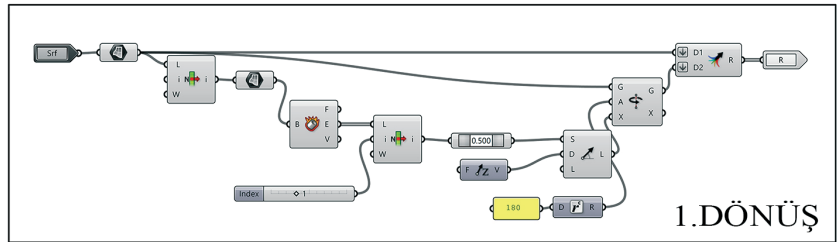
Çalışmanın üretken tasarım sürecini temsil eden görsel algoritma üç katmandan oluşmakta ve simetrik yüzey birimlerini çeşitlendirecek yöntem dizgelerini içermektedir. Satırlardaki kalıtsal benzerlik ve farklılıklar ilişkili simetrik düzenlerin karakteristiklerine dair ipuçları verir. Birinci katmanı temsil eden kök, iç mekân yüzey kurgusunu sağlayacak temel birimin kenar ölçüsünü metrik olarak belirlemekte ve yönünü tayin etmektedir. **Resim 4'**te görüldüğü üzere, gövde olarak tanımlanabilecek ikinci katman ise kenar sayısı ve kenarlar arası olası açılara dair seçenekler sunar ve kapalı temel hücreye ulaşılır.

Üçüncü katman ise simetrik temel dönüşümlerin (öteleme, yansıma, dönüş ve kayma yansıması) gerçekleştiği, işlenmemiş haldeki örüntülere (eğri ve yüzeyler) ulaştırır. Bu kısmı ağacın gövdeye en yakın olan dallarına benzetilebilir. Her simetrik grup kendi karakteristiğine uygun işlem sıralarını takip eder. Bu kısımdaki yegane değişken öteleme işlemlerini belirten sayısal değişkenlerdir. Bu değişkenler örüntüleri oluşturan birimlerin iki doğrultudaki tekrar sayısının yönetilmesini sağlar. **Resim 5**, birim hücreden 22^* ve $22x$ gruplarını oluşturan dalları göstermektedir. Dönüş, yansıma, kayma yansıması ve öteleme ortada kümelenmiş (*cluster*) olarak, siyah dikdörtgen içinde ise açılmış yöntem dizinleri olarak numara sırasına göre gösterilmiştir.

Güç-Zaman Tasarrufu Odaklı Sınırlar

Üzerinde durulması gereken diğer bir kriter eşbiçimliliktir. Doğada bu kurallara daha çok yakınsayan modellere göz atıldığında simetrisinin düzlemsel dönüşüm kuralları ile kolayca tarifi yapılabilecek örneklerle karşılaşılır. Örneğin, çeşitli türler yüzeylerinde eşbiçimlilik gösterir.

Resim 5. Kümelenmiş (cluster) ve açık olarak 22* ve 22* gruplarını oluşturan temel dönüşümleri içeren yöntem dizinleri (Görsel yazarlar tarafından üretilmiştir)



Gözle görülemeyecek derecede küçük ölçekte hareket eden virüslerin ya da daha küçük ölçekte moleküler bağların düzenleri modüler anlamda eşbiçimliliğe önceki örneklere göre daha yakındır. Üreteçlerin kurgusunda sayısal değişkenlerin işlenebilmesi, üç boyutlu tasarım, zaman değişkenine uyarlanabilirlik, çoklu sonuç verebilme, prototipleme ve tahmini üretim-kullanım senaryolarını daha verimli hale getirebilecek iki kriter üzerinde durulmuştur. Bunun nedeni simetri gruplarındaki yansıma özelliğinin modülün ayna eşine ihtiyaç duyabilmesi, bu durumun ise kalıp ve üretim masraflarını arttıracacağı öngörüsüdür.

Kiralitenin Giderilmesi

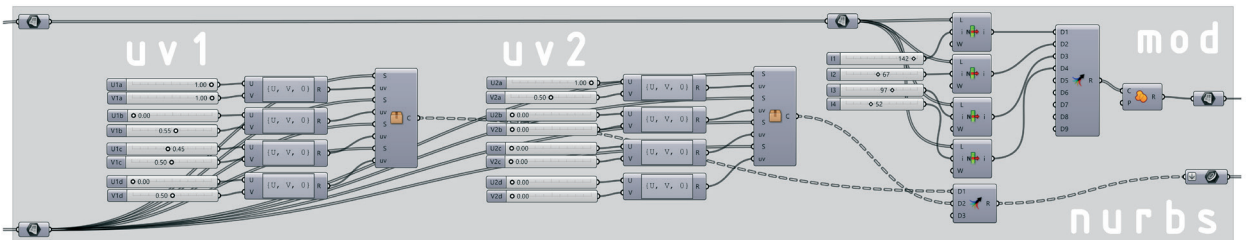
Kiral terimi ayna görüntüsüyle birlikte bulunan cisimleri tanımlamak için kullanılır. Monohedral ve dihedral örüntülerin tümünün ilgili simetri grubu temel alan proksi yüzeyler aracılığıyla monohedralleştirilmesi mümkündür. Bu olasılıktan hareketle simetri gruplarına dair tüm geometrik çıktılar kendi eşleriyle ilgili yüzey örüntüsünü oluşturabilecek ve ayna eşlerine (dihedral kopyalarına) ihtiyaç duymadan yalnızca ötelenerek ilgili simetrik grubu oluşturabilecektir. Bu anlayış, simetri grup kuramı temel alınarak kurgusu yapılan algoritmayla ulaşılabilecek tüm örüntülerin hem monohedral ve dihedral birimlerden ayrı ayrı oluşabilmesi hem de bu geometrilerin sınırları önceden belirlenmiş topolojilere üç boyutlu olarak izdüşüm elde edilebilmesi ihtiyacı ve öngörüsünden doğmuştur ve bu karmaşık işlemin anlaşılması topoloji kavramına değinmeyi gerekli kılmaktadır.

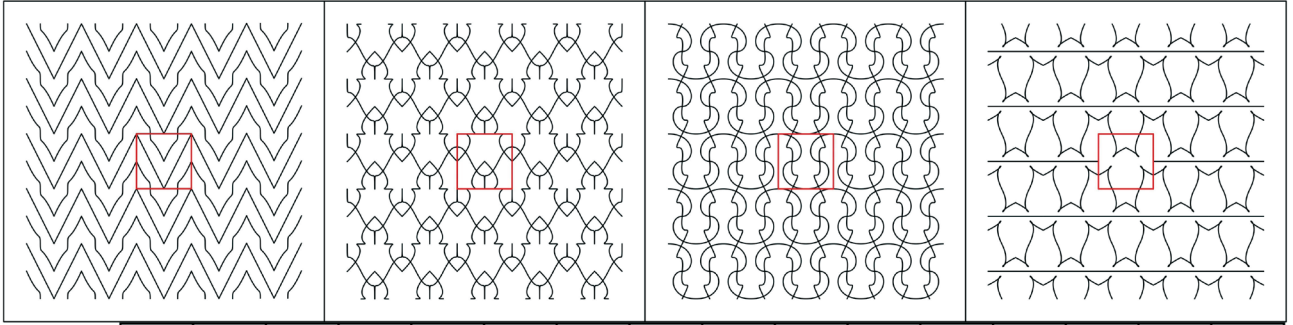
Resim 6, latis (kafes) üzerinde tanımlanan ve birbirini biçimsel olarak tamamlayan iki adet dört kontrol noktalı NURBS eğrisi oluşturmakta ve bu eğriler için monohedral bir yüzey bulmaktadır. Bu sayede dihedrallik içeren örüntülerde de modüllerin ayna eşlerine ihtiyaç duyulmadan belirlenmiş bir açıklık geçilebilecektir.

Üretken Tasarıma Uygunluk

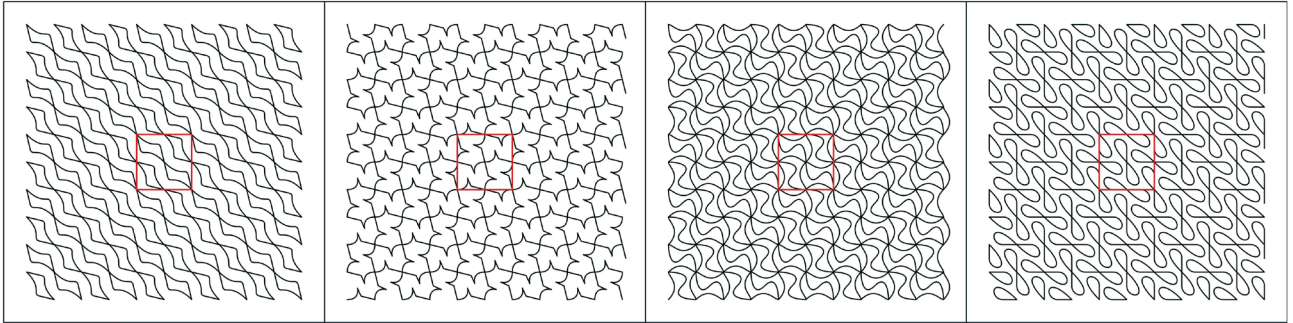
Bu koşullar altında modelin gelişimini oluşturan süreçte yüzeyin tanımı, iç mekân ölçeğini ve örüntü üretim süreçlerinden beklenen ekonomik faydaları gözetebilecek standartlara getirilmelidir. Doğada çoğunlukla harcanan enerjinin düşürülmesi amacıyla hizmet eden simetri dijital tasarım sürecinde de tasarruf amacıyla hizmet edecek, bu yolla normalde ayna ikizlerini, yani iki farklı kalıpta modülü gerekli kılabilecek simetrik parçalar yekpare biçimde monohedral örüntüler kurabilen, aynı zamanda kendi içinde de simetrik bölüntülenmelere olanak tanıyan topolojilere dönüşebilecektir. Bu durum öncelikle bilgisayara verilen görevin işlem tanımına sınır belirlemektedir. Her topoloji için belirlenen $U=10$ ve $V=10$ değeri tüm simetri grupları için dijital ortamda eşit yer kaplayan üç boyutlu veriler üretebilmektedir. Modülün ve modülün eşleriyle kurulan yüzey bütünü dijital ortamda tasarlanması yalnızca temel hücrenin tasarımıyla yeterli olacaktır. İç mimari tasarımda eş parçaların tasarım,

Resim 6. UV koordinatları sayılarla atanan iki adet NURBS eğrisine uygun monohedral bir yüzeyin (mod) bulunması (Görsel yazarlar tarafından üretilmiştir)





	U1a	V1a	U1b	V1b	U1c	V1c	U1d	V1d	U2a	V2a	U2b	V2b	U2c	V2c	U2d	V2d
22*-A	1.00	1.00	0.00	0.55	0.45	0.50	0.00	0.50	1.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00
22*-B	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.50	0.00	0.00	0.96	0.00	0.00	0.00	1.00	0.50
22*-C	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.50	0.00	0.50	1.00	0.00	0.00	0.62	1.00	0.50
22*-D	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.50	1.00	1.00	1.00	0.00	0.50	1.00



	U1a	V1a	U1b	V1b	U1c	V1c	U1d	V1d	U2a	V2a	U2b	V2b	U2c	V2c	U2d	V2d
22x-A	1.00	1.00	1.00	0.39	0.22	0.85	0.24	0.50	0.24	0.50	0.00	0.00	0.00	0.00	0.00	0.00
22x-B	0.00	1.00	0.00	0.31	1.00	0.85	0.25	0.50	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00
22x-C	0.00	1.00	0.51	0.84	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	0.50
22x-D	1.00	0.00	1.00	1.00	0.00	1.00	0.00	0.51	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00

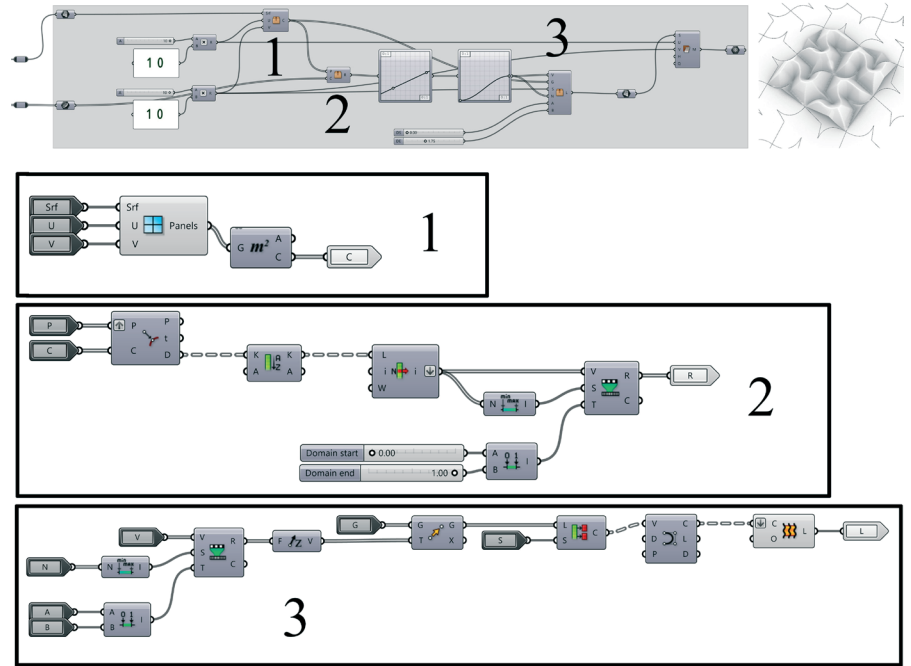
Resim 7. Girilen sıfır ve bir arası U ve V değerlerine göre 22* ve 22x grubu yüzey tasarımları

üretim, yeniden üretim, kullanım ve yeniden kullanım süreçlerine olan olası verim ile ilişkili katkıları ile fiziksel yarar boyutu da gözetilebilir olacaktır. **Resim 7** üretken tasarım programı Grasshopper 3d içerisinde tasarlanmış 22* ve 22x gruplarına verilen UV koordinat sayıları ile alınan sonuçları göstermektedir.

Mekânsallaşma Yolları

Çalışmada iki boyutlu Öklid uzayında üretilmiş örüntülerin üzerine, değerleri 0 ile 1 arasında değişen 16 adet sayı ile birbirleriyle ilişkili iki adet dört kontrol noktalı NURBS eğrisi ile eğri çekici (curve attractor) tasarlanmış, bu eğrinin kontrol noktası verilerinin üçüncü boyuta taşınmasını sağlayan yükseklikler için 0,00 cm ile 10,00 cm arasında değişen hedef aralık (domain) belirlenmiştir. İlk katmanda belirlenmiş herhangi bir metrik değer ile hem modülde hem de yüzeyde ancak bu aralıkta bir rölyef derinliği oluşturması istenmiştir. **Resim 8**, 22x grubundan olup kiral parçalar içeren bir yüzeyin monohedral, rölyefli bir yüzey olarak reparametrize edilme yöntemini göstermektedir.

İki boyutlu verinin üçüncü boyuta işlenmesinde çekiciler (attractor) kullanılmıştır. Bir çekici bir nokta, bir nokta grubu, bir eğri, bir eğri grubu ya da herhangi bir geometrik bütünlük olabilir. Bu bileşen, etrafındaki başka bir geometrik düzeni kendi limitlerine ve yeni tanımlanmış limitlere

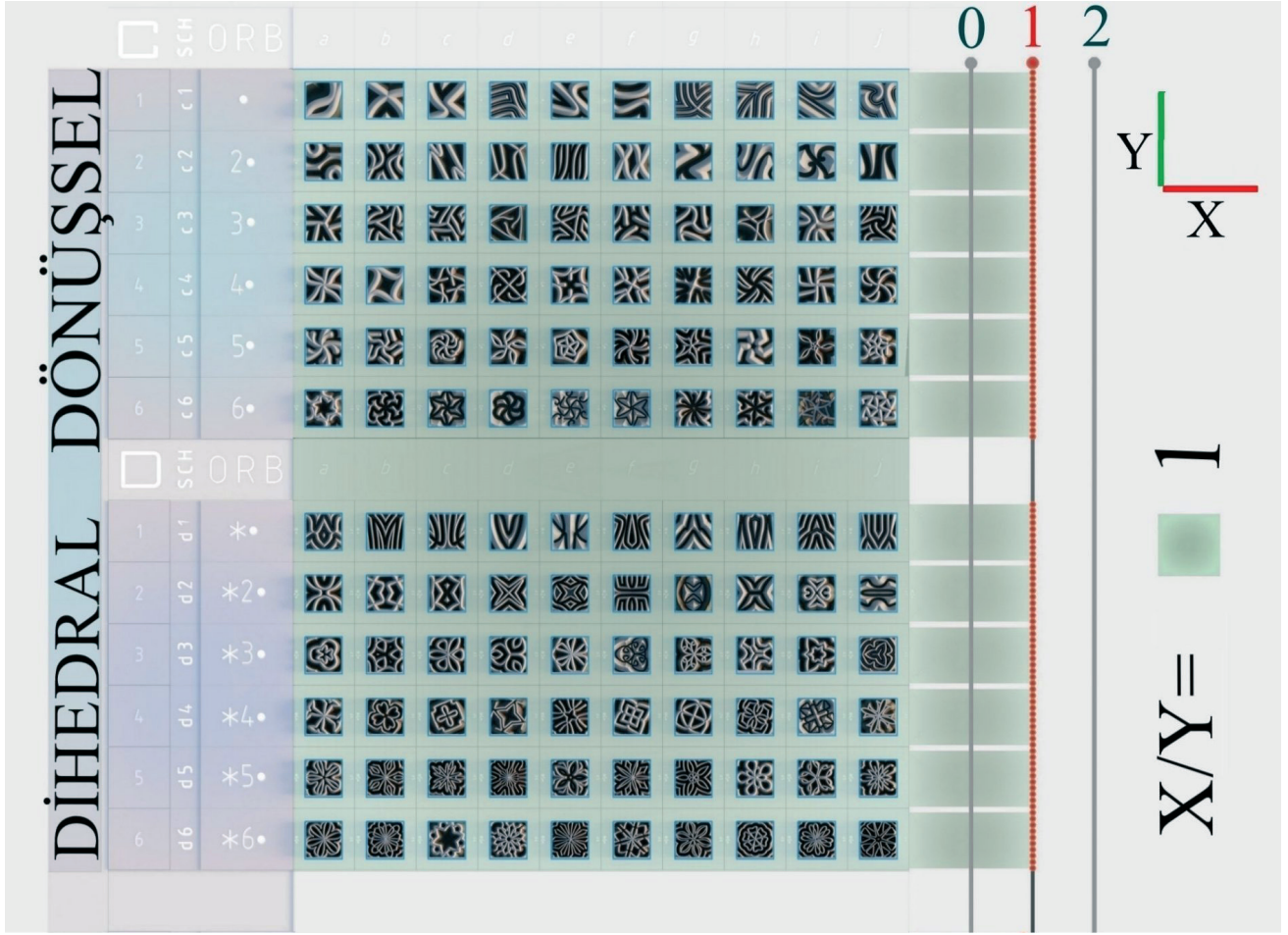


Resim 8. Monohedral yüzey sınırları içerisine eğri çekimi (curve attraction) yöntemine göre tasarlanan, kiral parçalar içeren 22x grubundan bir yüzeyin üretilişi

göre değiştirir (Tedeschi, 2014, 112-118). Giriş verisi olarak alınan $A > B$ aralığına sahip sayısal değişkenleri $A' > B'$ aralığına getiren “Yeniden Haritalandırma” (*remap*) komponentleriyle beraber çalışırlar. Birinci satırda yüzey u ve v sayılarına göre parçalanmaktadır. Bu parçaların merkez noktaları ve periyodik eğri grubu üzerindeki noktalar arasındaki uzaklık yeniden haritalandırılabilir. **Resim 8**'de ikinci satırda bu komponentlerin çalışma prensibi gösterilmiştir. Bu komponent bir kaynak bir de hedef aralık (domain) gerektirir ve kaynaktan alınan tüm sayıları öngörülen hedef aralığa göre yeniden numaralandırır. Örneğin durgun bir göle atılan bir taş kendi biçimsel karakterinden etkilenen bir hareketle suyu halkalar halinde yükseltir. Aynı göle atılan demir çubukta ise bu hareketlenme çubuğun yoğunluğuna ve büyüklüğüne göre farklı bir desende olur. Taş ve çubuğun belirli latislere uyumlu simetrik kopyalarını üretildiğini varsaydığımızda tümü aynı anda atıldığında ortaya simetrik bir girişim deseni çıkar. Simetri gruplarını ve onlara uyumlu çalışacak çekiciler tasarlamak yüzeylerde yaratıcı girişim desenleri ortaya çıkarabilir.

İki boyutta boşluk kalmaksızın ve üst üste binme olmaksızın birleşebilen simetrik örüntüler mekânsallaştıklarında bu tamamlayıcılıklarını kaybedebilirler. Bu nedenle modül-yüzey kurgusunda dikkate alınmış en önemli adımlardan biri, modülü sabit kalabilen, yansıma ve kayma yansıması yapabilen ya da belirli bir açıyla dönüş gerçekleştirebilen, yani çeşitli olasılıklarda bir araya gelebilen eşleriyle estetik açıdan tutarlı bir birleşim yaptırabilmektir. Bu nedenle kenar hatlarında oluşabilecek şişme, dalgalanma ve ezilmeler mantıklı sayısal değişkenlerle denetlenebilir olmalıdır. Bu noktada, topolojideki sayısal tutarlılığı sağlamak adına uygun adımlar tespit ve takip edilmiştir. **Resim 8**'de üçüncü satırda yeniden haritalandırılan veri eğrilere ve loft yüzeylere dönüşmüştür.

Simetrik modüllerin verim etkeni ile birlikte değerlendirilmesi pek çok yolla mümkündür. İş gücü tasarrufunun yanında parça ebatlandırması ile ilgili faydalara dair sorunlar, örneğin modüllerin en boy oranı ve bu modüllerin daha küçük eş parçalara bölünüp bölünemeyeceği

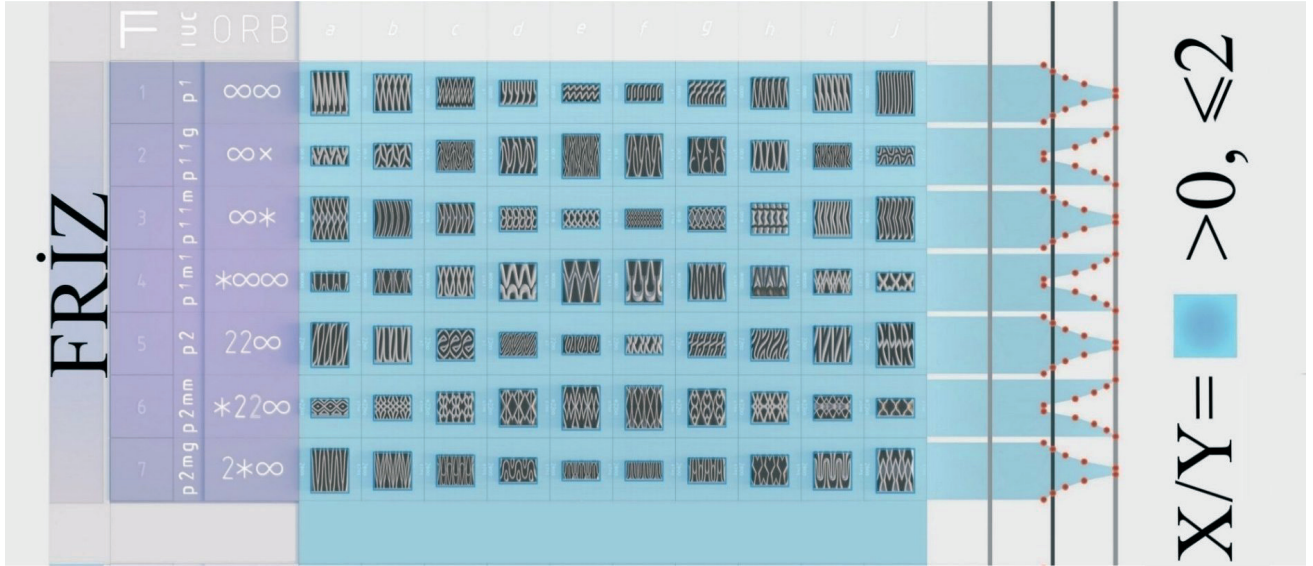


Resim 9. Dönüşsel ve dihedral gruplar için algoritma destekli tasarım programı ile üretilmiş ve tasnif edilmiş örnekler

sorusu verim ve tasarruf etkenleri ışığında yanıtlanabilir. Resim 9'da algoritma destekli tasarım programı Grasshopper 3d ile üretilen noktasal simetriler (dönüşsel ve dihedral) tasnif edilerek çizelgeleştirilmiştir. Bu sınıflandırmada simetrinin yalnızca noktasal etkinlikleri kullanılmıştır.

Tüm noktasal (dönüşsel ve dihedral) grupların basitçe kare içerisinde izdüşümü elde edilmiştir. Yani x/y oranı tüm bu gruplarda 1 değerindedir. Bu grup çizelgede yeşil renkte gösterilmiştir. İlk altı grup dönüşsel grubun ilk altı basamağını tanımlar. • grubuna ait birimler kendisinin simetriğidir, bu yönüyle asimetric modeller üretir. •2, •4 ve 2ⁿ şeklinde dönüş sayısı çeşitlenen gruplar karesel, yani x/y=1 oranına göre birbirlerine denk alt başka parçalara da bölünebilmektedirler. 2ⁿ dönüş sayısına sahip olmayan dönüşsel simetride bu varsayımsal karenin çokgensel olarak parçalanması ya da birbirinin eşdeğeri parçaların bu karenin içinden çıkarılması gerekmektedir.

Dihedral grupta da malzemenin verimli kullanımı için örüntünün parçalarına ayrılma şekli dönüşsel gruba benzer. Yalnız bu defa ilk grup olan •*, • grubundan farklı olarak iki kiral parçaya bölünebilmektedir. Bu durum negatif ve pozitif kalıplar yoluyla kiral parçaların tasarruf beklentisini karşılayacak ölçütlerde oluşturulmasına etki edebilir. Dönüşsel gruptakine benzer bu karesel projeksiyonlarda 2ⁿ katlı dihedral gruplar kiral eşleriyle gruplanan alt parçaların tekrarına dayandıkları için bu kare modeller birbirlerine tamamen eş parçalara bölünebilir. 2ⁿ katlı olmayan kaleydoskoplarda kare modelin çokgensel olarak parçalanması ya da



Resim 10. Friz grubu için algoritma destekli tasarım programı ile üretilmiş ve tasnif edilmiş örnekler

eşdeğer parçaların bu karelerin içinden çıkarılması gerekir. 2^n katlı noktasal simetride bu kolaylığı sağlayabilmek adına nokta gruplarının tümünde x/y değeri 1 olarak kabul edilmiş ve yeşil renkte gösterilmiştir.

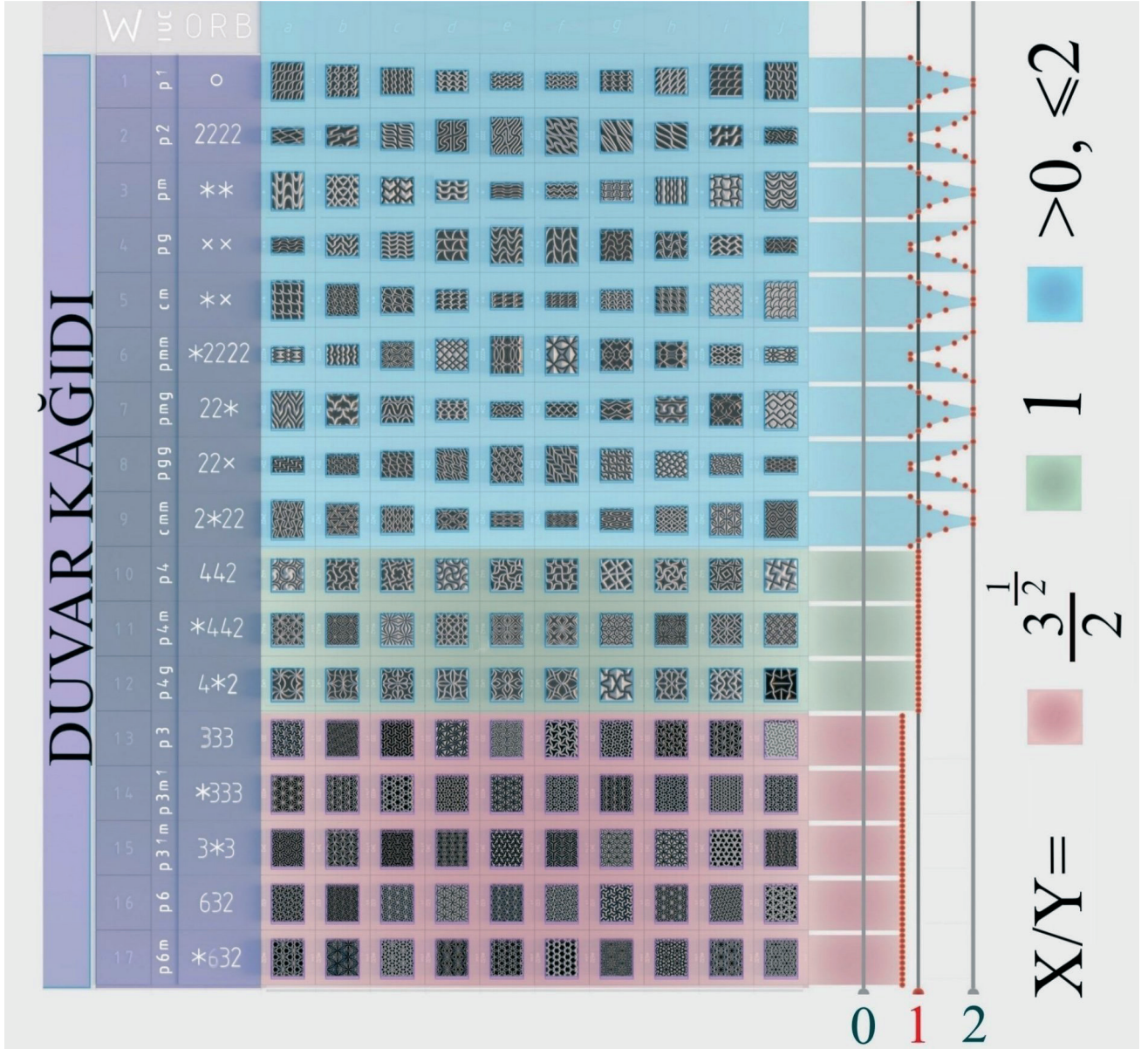
Bu oran ebatsal çeşitlilik oluşturmak adına friz grubunda çeşitlenmektedir. Yedi adet friz grubunun tamamı bu oransal çeşitlenmeye uygundur. Conway notasyonuna göre (2008, 29-49) x olarak ifade edilen kayma yansıması dönüşümünü bulunduran ∞x grubu ve $*$ olarak ifade edilen yansıma dönüşümünü bulunduran ∞^* , $*\infty\infty$, $*22\infty$ ve $2*\infty$ grupları kendi kirali ile gruplanmış tekrarlı parçalar içerir. **Resim 10**'da görülmekte olan friz grubunun tümünde x/y oranı değişebilmektedir ve bu özellik çizelgede mavi renk ile gösterilmiştir.

Kristalografik tekrarlılıklar içeren duvar kağıdı grubunda da semboller ve kirallik ilişkisi bu şekilde işler. Ancak düzlemsel kristalografik gruplardan o , 2222 , $**$, xx , $*x$, $*2222$, 22^* , $22x$ ve $2*22$ friz grubundaki gibi x/y oranı $\frac{3}{4}$ ve 2 arası değişken dörtgensel topolojiler üzerinde izdüşüm elde edebilirken 442 , $*442$ ve $4*2$ gruplarında x/y oranı 1 değerine sabitlenmiştir. Bu kısıtlamadan dolayı bu gruplarda tekrarlılık birbirine denk kare modüllerle oluşmaya uygundur.

333 , $*333$, $3*3$, 632 ve $*632$ gruplarında bu tekrarlılık kare bir formatta ilerleyemediklerinden ve sahip oldukları özgün geometrilerinden dolayı $x/y=\sqrt{3}/2$ oranında modüller oluşturmuş, bu grup çizelgede kırmızı renkle gösterilmiştir. Üçgensel latislere sahip bu örüntülerde kalıp sayıları en ve boy oranı $\sqrt{3}/2$ olan modüller içerisinden çıkarılan üçgen eşkenar dörtgen ve altıgen alt parçalar kullanılarak da azaltılabilir. Aynı zamanda bu gruplar dönüş ve yansıma içeren diğer duvar kağıdı gruplarında olduğu gibi noktasal olarak simetrik (dönüşsel ve dihedral) daha basit parçalara da bölünebilir. **Resim 11**, duvar kağıdı grubunun (düzlemsel kristalografik grup) ebatsal tasnifini göstermektedir.

SONUÇLAR

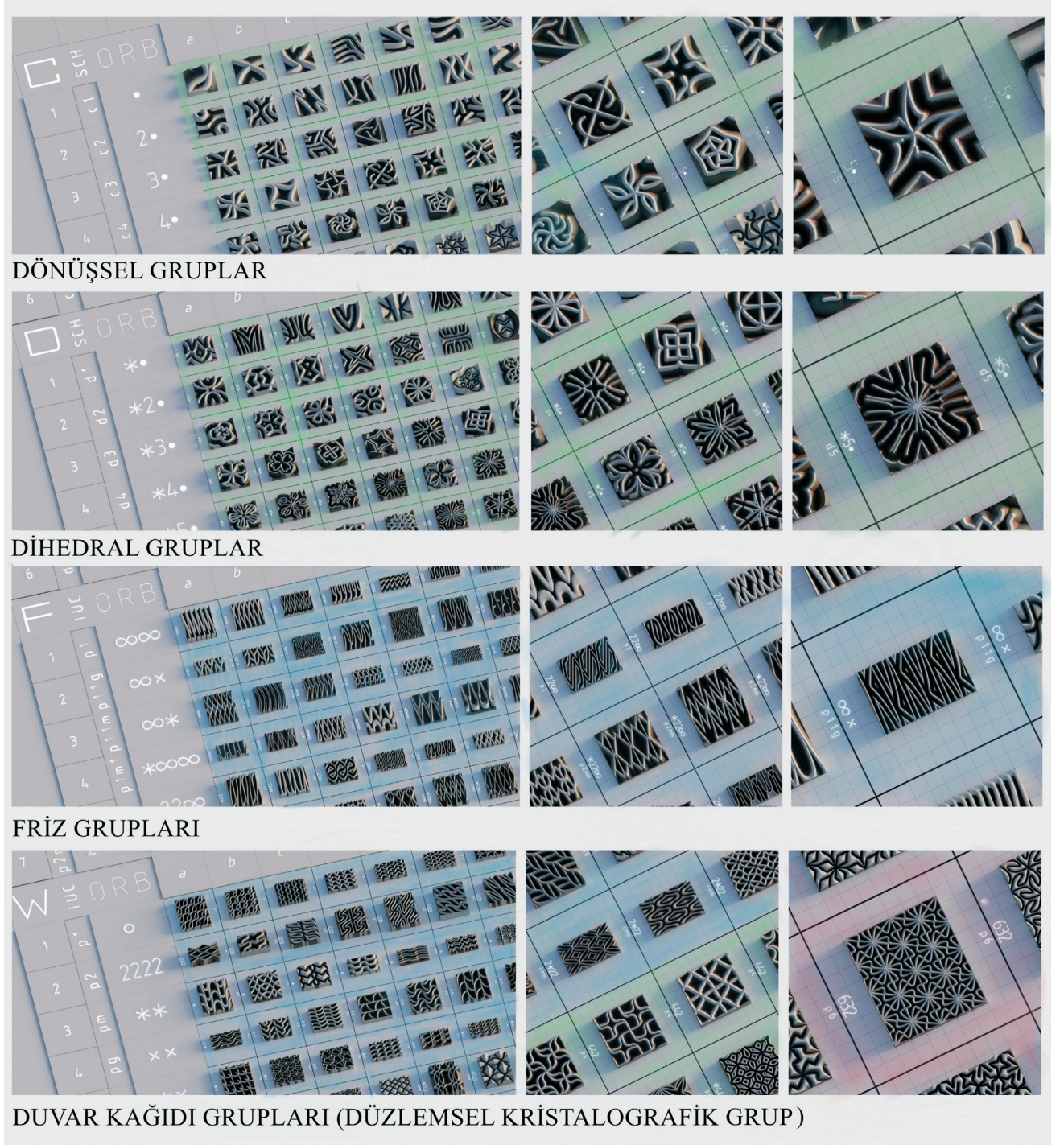
Doğada şablonlar en az işle en fazla verimi sağlamaya yöneliktir. Çalışmada, doğa, tasarım, üretim ve yeniden doğa döngüsünü sağlamak isteyen bir yaklaşımla mimari ve iç mimari yüzey tasarımında kuramsal



Resim 11. Duvar kağıdı grubu (Düzlemsel Kristalografik Grup) için algoritma destekli tasarım programı ile üretilmiş ve tasnif edilmiş örnekler

simetri gruplarını algoritma tabanlı tasarım programı ve prototip üretim süreci ile test etmiştir. 2022 yılında "İç mekan yüzey tasarımında simetri algoritmalarının kullanımına yönelik bir model önerisi" başlıklı doktora tezi kapsamında bilgisayar ortamında 360 adeti eğrisel ve kalanı noktasal çekimli olmak üzere 418 farklı yüzey örüntüsü ve bazı alçı kalıp prototipler üretilmiştir (Gülfidan, 2022). Bu deneyim sonucunda, yüzey üretiminin teknik boyutunu ilgilendiren bulgular şöyledir:

İki boyutlu Öklid uzayında düzenli ve tekrarlı kurgulara olanak sağlayabilecek NURBS tabanlı sistematik bir altyapı oluşturulabilmektedir. Tüm dönüşel gruplar dönüş sayısı kadar eşit module bölünerek yeniden yapılandırılabilir. Bu parçalar birbirlerine boşluksuz ve üst üste binme olmaksızın bağlanabilmektedir. Uygulanan prototip üretim modeline göre modüllerden birinin üç boyutlu baskı ile üretilmesi yüzey kurgusu için yeterlidir.



Resim 12. Dönüşsel, dihedral, friz ve duvar kağıdı grupları için algoritma destekli tasarım programı ile üretilmiş ve tasnif edilmiş örnekler

Tüm dihedral gruplar kiral (sağ el-sol el) ilişkiler içerir. Dolayısıyla simetri etkinliğine katılan en küçük özgün hücrenin üretilmesi dihedral ilişkilerde geleneksel yöntemlerle kalıbın tamamlanması için yeterli değildir. Tasarlanan yöntem dizileri sayesinde bu parçalar iki kiral parçanın birleştirilmesiyle tek kalıpta üretilmekte ve modüller eşleriyle kiraliteden bağımsız olarak boşluk kalmaksızın ve üst üste binme olmaksızın birleşebilmektedir. Kiral modüllerin ayrı kalıplar olarak üretilmesi iki farklı ana kalıp ve kaleydoskop sayısının yarısı kadar kalıplama işlemi gerektirmektedir. Önerilen yöntemle hem dönüşsel hem

de dihedral gruplar genişliği ve uzunluğu ilgili simetri grubunun açısall ilişkilerine göre değişken olan ve tüm ilişkili hücreleri birleştiren dörtgen topolojilere dönüştürülebilmektedir.

Çalışmada friz grubunun tamamı birbirleriyle tek doğrultuda ilişki kurabilen kare ve dikdörtgen sınırlara sahip rölyefli topolojilere dönüştürülmüştür. Birinci boyutta bu üst desenler birbirleriyle boşluksuz ve sürekli olarak birleşebilmekte ya da bu desenler dönüş, yansıma, öteleme ve kayma yansıması işlemlerine göre eşdeğer alt desenlere ayrılabilir.

Tüm düzlemsel simetri grupları her iki boyutta da boşluklar ve örtüşmeler olmaksızın anlamlı birlikler oluşturabilecek kare ve dikdörtgen sınırlı rölyefli topolojilere dönüştürülmüştür. Kare ve dikdörtgen modüller üçgen ve altıgen kafesleri birleştirmek için kapsayıcı bir formül olarak görülmüş ve verimlilik açısından tasarım ve uygulama aşamaları için faydalı bulunmuştur. Desenlerin birim hücrelerini oluşturan açı değerlerinin gruplar arası değişkenliği ya da hücrelerin üçgensel veya dörtgensel karakterde birleşmesi iç mekân tasarımına daha uygun olan dörtgensel topolojilerin üretilmesine engel olmamıştır.

Üretken tasarım yöntemi çalışmada, eşbiçimli modülasyona sahip iç mimari yapıların boyut, malzeme ve işlevsel katmanları için sistematik bir temel sağlamak amacıyla kullanılmıştır. Yöntemin doğası, tasarım süresinin azaltılması, bilgisayar destekli işçilik ve zaman tasarrufu gibi verimlilik ile ilişkili kaygılara dayanmaktadır. Bu bağlamda modelin temel amaçlarından biri yapay çevreyi ilgilendiren iç mimari yüzey tasarımını, simetrisinin doğa ekonomisi ile ilişkili boyutuyla uzlaştırmak ve doğal-yapay arasındaki ilişkileri güçlendirmektir. Bu bağlamda ulaşılan sonuçlar aşağıdaki gibidir:

Doğada harcanan enerjinin düşürülmesi hedefiyle işleyen simetrisinin üretken tasarım ve algoritma destekli tasarım ve üretimin doğasında var olan tasarruf yöntemleriyle örtüşebildiği tespit edilmiş; simetrisinin kuramsal altyapısı iç mimarlık ölçeğinde verim sağlayabilecek bir desen üretim modelinin tasarlanmasında kullanılmıştır. Yüzey çeşitliliği açısından yüksek bir zenginlik gösteren doğa, nitel bir kaynak, onun matematiksel izdüşümleri ise nicel bir rehber olarak kullanılmış; doğada verimliliğe bağlı nedenlerle gelişen estetik değerler sayısal bir kuram olan simetri grupları aracılığıyla algoritma destekli tasarım programına işlenmiştir. Nitel ve estetik açıdan yorumlanabilir sonuçlar veren bu çalışma sonucunda yüzey tasarımında nitel yansımalar olarak modül-modül ve modül-yüzey ilişkilerinin esasında nicel verilerin oluşturduğu kalıtsal akrabalık düzeylerine bağlı olduğu tespit edilmiştir.

Simetrisinin tekrarlanabilme özelliğinden yararlanan veri paketleri aracılığıyla sağlanan yararların bilgisayar destekli tasarım sürecinde etkili olduğu görülmüş, simetrisinin üretim ekonomisine sağlayabileceği olası faydalar üç boyutlu baskı ile prototipleme ve basit alçı kalıplama testleri aracılığıyla değerlendirilmiştir. Simetrisinin düşük maliyetli ve hızlı üretim için kârlı bir yol olduğu görüşü ilgili bağlamda doğrulanmıştır. Simetri ile, üç boyutlu baskı, basit negatif-pozitif kalıplama ve dondurma işlemlerinde hem zamansal hem de finansal yararlar sağlanabileceği görüşüne ulaşılmış; elde edilen sonuçlara göre üreteçler mekânın algılanan sınırlarını tanımlayan düzlemsel ya da kavisli yüzeylerin modüller olarak bölüntülenmesinde analog-dijital yöntemlere kıyasla algoritma destekli süreçlerin tasarruf açısından daha etkin olduğu sonucuna varılmıştır. İnşa

edilebilecek olası işlevsel katmanlara bağlı olarak mevcut değişkenler ya da eklenecek yeni yöntem dizinleriyle simetri mekân ilişkileri konusunda yapılabilecek araştırma alanlarının gelişime açık olduğu tespit edilmiştir. Doğa, tasarım, üretim, kullanım, taşıma, depolama gibi farklı süreç ve işlemlerde verimlilik ve tasarruf açısından bir rehberdir. Bu bağlamda, doğal yapıların koşullara en uygun olan ekonomik yolu seçerek oluşma eğilimi farklı üretken tasarım yöntemleriyle yeniden ele alınabilir, doğal ve yapay mekansallaşma yolları arasında kurulacak diğer uygun bağlantı yolları ile tasarım senaryoları çeşitlendirilebilir. Bununla birlikte Penrose desenleri ve kuasikristalin dizgelerin kapsam dışında tutulduğu bu çalışmadaki simetri gruplarına dair veri paketleri aperiodyk biçimlenişlere sahip dizgelere dair yeni kuramların geliştirilmesine ışık tutabilir. Sanat ve uygarlık tarihi perspektifinden bakıldığında aperiodyk olmayan ve eşbiçimlilik gösteren Akdeniz ve Yakın Doğu girih desenlerinin üretilen algoritmalar yoluyla sınıflandırılacağı sayısal olarak ifade edilebileceği ve yeniden üretilebileceği sonucu bu alanda yapılabilecek yeni çalışmalar için bir temel oluşturabilir. Yeniden üretime dayalı benzer süreçler başka çalışmaların konusudur. Simetrinin temel dönüşüm adımlarının bilgisayar kümeleri (cluster) olarak kaydedilmesi çoğaltılması ve yayınlanmasının simetrinin doğadaki verimlilik amaçlı varlığına paralel olarak tasarım alanlarındaki yeni araştırma süreçlerine benzer tasarruf yolları sağlayabileceği açıktır.

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EVALUATION OF THE EFFICIENCY FACTOR IN TESSELATION DESIGN WITHSYMMETRY GROUP THEORY AND ALGORITHM AIDED DESIGN TOOLS

Formation methods of nature are boundless. In this abundance, symmetry, directly associated with cost and time efficiency, lies behind all activities in physical environments. Throughout history, symmetry is considered a factor of harmony and order in human-made environments as a visual, spiritual, and functional tool, has been seen as a connecting path between the designer and nature. Biomimetic processes involving symmetry, have been shaped by aesthetic and structural expectations, providing compactness and productive contributions to the design processes besides its visual and semantic benefits.

Today, some productive design tools used in design processes offer the opportunity to rethink the aims of symmetry in nature to provide the highest efficiency with the least energy for human-made environments. The study aims to investigate the possible methodological contributions of symmetry to the cycle between nature and design. It overlaps the material, energy and time-saving factors of natural modularity with the architectural surface design process. In this study, qualitative and quantitative findings about the concept of symmetry at the intersection of various fields such as natural sciences, art, and mathematics, as well as various worldviews examining the aesthetic and pragmatic nature of the concept, were used. The study is based on productive design problems such as to achieve more results with fewer steps in tessellation design and to cover more space by using molding and using fewer prototypes. Algorithm-aided design software called McNeel Grasshopper and up-to-date notations of symmetry group theory were used to solve these problems.

In the generative design method, the curve attraction method, in which the curves are effective in formation, is projected to the Z coordinate with sinus and bezier graphics, and three-dimensional surface modules that can be combined with each other are created. In this way, a total of 360 printable digital tiling patterns were produced and classified according to the symmetry group theory. Experimental prototypes were produced for some models. For the algorithm-based design process developed, an experimental method that investigates the production ways in digital and physical environments for module and surface design has been designed. The main purpose of this method is to ensure that strings in different crystallographic manners can be reproduced repetitively with square and rectangular bases.

In order to adapt this theoretical model related to nature to the design process, generative design devices that allow controllable hereditary relations through numerical values are used in the production of form. The generative design method allowed analogical simplifications of symmetry and modularity in nature, enabling symmetrical activities to be evaluated through inherited similarities to those in nature. With the algorithm designed on the pragmatic basis of the physical limits of nature, a systematic template that can be used in different spatial systems has been produced. It has been concluded that natural and artificial surfaces can play similar roles within the framework of time and cost efficiency, but numerical values should be observed in structures with different symmetry types in order to facilitate production.

DÖŞEME ÖRÜNTÜSÜ TASARIMINDAKİ VERİM ETKENİNİN SİMETRİ GRUP KURAMI VE ALGORİTMA DESTEKLİ TASARIM ARAÇLARIYLA DEĞERLENDİRİLMESİ

Doğada biçimlenme yöntemleri sayılamayacak kadar çeşitlidir. Bu çeşitlilikte verim, tasarruf ve yarar olguları ile doğrudan ilişkili olarak görev alan simetri, fiziksel çevrelerdeki tüm etkinliklerin temelindedir. Tarih boyunca insan yapısı çevrelerin inşasında simetriyi doğada oluşturan yollar uyum ve düzen sağlamak amacıyla taklit edilmiş; simetriye duyulan bu ilgi, tasarımı görsel, anlamsal ya da işlevsel düzeylerde ilgilendirebilecek çeşitli doğaya öykünme modelleri ortaya çıkarmıştır. Bu biyomimetik süreçler kimi zaman estetik, kimi zaman yapısal beklentilerle şekillenmiş; simetrinin kompaktlık getirileri ile pek çok zaman yapısal ve üretimsel faydalar sağlanmıştır.

Günümüzde tasarım süreçlerinde kullanılan kimi üretken tasarım araçları, simetrisinin doğadaki en az enerji ile en çok verim sağlayabilme amaçlarını insan yapısı çevreler için yeniden düşünme imkanı sunmaktadır. Çalışma, simetrisinin doğa ve tasarım arasındaki döngü için olası yöntemsel katkılarını bu yönetime göre araştırma ve doğal modülerliğin malzeme, enerji ve zaman tasarrufu etkenlerini mimari yüzey tasarım süreci ile örtüştürme amaçları üzerine inşa edilmiştir. Çalışmada, doğa bilimleri, sanat ve matematik gibi çeşitli alanların kesişimindeki simetri kavramına dair olan nitel ve nicel bulgulardan ve kavramın estetik ve pragmatik doğasını irdeleyen çeşitli dünya görüşlerinden yararlanılmıştır. Çalışma, döşeme örüntüsü tasarımında daha az hamle ile daha fazla sonuç elde edebilmek ve daha az sayıda prototipi kalıp olarak kullanarak daha fazla alan geçebilmek gibi verim ile ilişkili tasarım sorunlarına dayanmaktadır. Bu sorunların çözümü için Grasshopper 3d algoritma destekli tasarım programı simetri grup kuramına dair güncel notasyonlarla birlikte kullanılmıştır.

Kurgulanan üretken tasarım yönteminde eğrilerin biçimlendirmede etkili olduğu eğrisel çekim metodu sinus ve bezier grafikleriyle Z koordinatına olan izdüşümü hesaplanmış ve birbirleriyle uyumlu olarak birleşebilen üç boyutlu yüzey modülleri oluşturulmuştur. Bu yolla baskısı alınabilir toplam 360 adet dijital döşeme örüntüsü üretilmiş ve simetri grup kuramına göre tasnif edilmiş; bazı modeller için deneysel prototip üretimi yapılmıştır. Geliştirilen algoritma tabanlı tasarım süreci için modül ve yüzey tasarımında verim beklentisini karşılamak adına, simetri grup kuramını temel alan yöntem dizinlerinin yer aldığı, dijital ve fiziksel ortamda üretim yollarını araştıran deneysel bir yöntem kurgulanmıştır. Bu yöntemdeki temel amaç farklı kristalografik tavırlardaki dizgelerin kare ve dikdörtgenel platformlar yoluyla tekrarlı olarak üretilebilmesini sağlamaktır.

Doğa ile ilişkili bu kuramsal modelin tasarım sürecine adaptasyonu için biçim üretiminde sayısal değerler aracılığıyla denetlenebilir kalıtsal ilişkiler planlamaya olanak tanıyan üretken tasarım aygıtları kullanılmıştır. Üretken tasarım yöntemi, simetriye ve doğadaki modülerliğe dair analogik basitleştirmelere olanak tanımış ve simetrik etkinliklerin doğadakine benzer kalıtsal benzerlikler yoluyla değerlendirilebilmesini sağlamıştır. Doğanın fiziksel sınırlarını pragmatik anlamda temel alarak tasarlanan algoritmayla eşbiçimli modülerlik içeren farklı mekânsal dizgelerde de kullanılabilecek sistematik bir şablon üretilmiş; doğal ve yapay yüzeylerin zaman ve maliyet verimliliği çerçevesinde benzer roller üstlenebileceği, fakat üretimde kolaylık sağlamak adına farklı simetri türlerindeki yapılarda sayısal değerlerin gözetiminin gerektiği sonucuna varılmıştır.

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KIZIL VİYANA: REUMANNHOF BELEDİYE SOSYAL KONUTLARINDA İDEOLOJİ, MİMARLIK VE SANAT

Şule PFEIFFER TAŞ*, Rabia TEMEL**

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GİRİŞ

Viyana'nın ilk Sosyal Demokrat Belediye Başkanı Jakob Reumann'ın liderliğindeki, işçilerin yaşam koşullarını iyileştirmeyi hedefleyen sosyal konut programı kapsamında mimar Hubert Johann Gessner (1871-1943) tarafından Margaretengürtel'de uygulanan Reumannhof Binası (1924-1926), dönemin ideolojisinin temsiliyeti açısından önemlidir.

Mimaride temsil, tasarım, mekân, zaman, sözlü veya sözsüz ifade araçlarıyla bireylerin veya toplulukların aktivitelerini, değerlerini ve amaçlarını yansıtabilen bir organizasyondur (Rapoport, 1982, 178, 181; Tanyeli, 2002, 76). İşaret, malzeme, renk, biçim, boyut, mobilya, çevre düzenlemesi gibi unsurlarla temsiliyet gerçekleştirilir. Mekân, mekânsal pratik yoluyla algılanır, mekânın temsili ile tasarlanır ve temsil mekân aracılığıyla yaşanan unsurlar üzerinden deneyimlenir; günlük yaşamın içindeki temsil mekânı, geçmişle bağlantı kurar. Mekân, toplumsal ilişkilerin kolektif bir yansıması olmanın yanında, toplumsal yapıya müdahale aracı olarak da değerlendirilmektedir (Lefebvre, 1970, 60; Lefebvre, 1974, 63, 70, 364). Reumannhof da kent belleğinde Kızıl Viyana (1919-1934) dönemini temsil eden en önemli simge yapılardan biri olarak yer edinmiştir; yapıda işçi sınıfının refah düzeyini iyileştirmeyi hedefleyen sosyal demokrat ideolojinin, mimari tasarım, peyzaj düzenlemeleri ve sanat yoluyla yansıtıldığı görülmektedir.

Reumannhof'un mimarisi, bu dönemde inşa edilen belediye sosyal konutları örneklerini kültürel, sosyal, ideolojik ve ekonomik koşullar kapsamında ele alan Eve Blau'nun *The Architecture of Red Vienna 1919-1934* (Kızıl Viyana Mimarisi 1919-1934) adlı kitabında genel değerlendirme içinde yer almaktadır (1999); ancak daha önce tek yapı ölçeğinde ayrıntılı olarak incelenmemiştir. Araştırmamızda, yapı ayrıntılarıyla incelenerek Kızıl Viyana ideolojisi ve sosyal demokrat görüşün işçi sınıfına vaat ettiği refahın temsiliyeti üzerinden sorgulanacaktır. Ayrıca sosyal konut programı çerçevesinde belediyenin 1919'dan itibaren

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hazırladığı standartlaşma kriterlerinin bu yapıda yansımaları, standart dışı uygulamalar ve yenilikçi yaklaşımlar irdelenecektir. Dönemin siyasi ve sosyo-ekonomik koşullarıyla ilişkili olarak Reumannhof'un tasarımı ve mimari unsurları, arşiv belgeleri, fotoğraf ve çizimleri ile saha araştırmasında çekilen fotoğraflarla birlikte karşılaştırılarak incelenecektir.

MİMARLIK, SANAT VE İDEOLOJİ İLİŞKİSİ

Fikirler, düşünceler topluluğunun oluşturduğu bir sistemle bağlantılı biçimde karşılaştığımız *ideologia*, terim olarak on sekizinci yüzyıldan itibaren toplumun değerlerini yansıtan farklı alanları içermesiyle bilinmektedir. İdeoloji, bir topluma, döneme ya da toplumsal sınıfa özgü değerler ve/veya inançlar bütününe kapsadığından, insanların varoluş koşulları ve ilişkilerinden doğan yaşam tarzlarıyla ilgili tasarımların tümünde etkinliğini gösterebilir. Mimarlık da bu anlamda ideoloji kavramıyla güçlü bağ kurar. Egemen üretimle etkileşimli bir alan olan mimarlık, mekânı bu üretimin doğal ürünü haline getirir. Mekân, iktidarın veya iktidara ait ideolojilerin, yansıması ve propaganda aracı olabilmektedir (Althusser, 1970, 51, 55; Gürallar Yeşilkaya, 1999, 19). İktidar etkilerinin gerek kent gerekse tek yapı ölçeğinde mekâna yansıması, mimarlık tarihinde, jeopolitik stratejilerden konut tasarımına kadar siyaset tarihi hakkında bilgi sunar. Ekonomik ve politik sistemleri anlamamanın bir yolu da insanların mekânı nasıl kullandığını ve yaşadığını incelemektir (Foucault, 1980, 148, 149). Genellikle siyasi hareketler, sistemler veya sosyal bağlamlarla ilişkilendirilen ideoloji kavramı, mimarlık, sanat, tasarım gibi farklı disiplinlerde kullanımına göre anlam kazanır. İdeolojinin birbirinden farklı on altı anlamını ifade eden Eagleton, kavramın, çoğunlukla göstergeler, anlamlar ve değerlerin, iktidarın oluşumuna katkıda bulunma tarzları üzerinde durur; aynı zamanda siyasal çıkarlar ile iktidar ve söylem konjonktürünü de vurgular. Bireylerin inandığı fikirlerin ötesinde, sosyal güç ve iktidar ilişkilerini haklı çıkarmak, sürdürmek için kullanılan inançlar sistemi olarak yorumladığı ideolojinin, genellikle toplumdaki çelişkileri, eşitsizlikleri doğal veya kaçınılmazmış gibi sunarak örtbas etmeye çalıştığı yanını da belirtir. Eagleton'ın görüşünde ideolojinin, dünyayı algılayışımızı ve onunla etkileşim biçimimizi yönlendirdiğine, sosyal yaşama önemli katkısına vurgusu (Eagleton, 1991, 17-18, 304-308) bu araştırma bağlamında da öne çıkmaktadır.

İdeoloji ile sıkça karşımıza çıkan diğer bir olgu, propagandadır. Antik dönemden beri sanat ve mimarlıkla bağlantılı olarak iktidarın gücünü yansıtan propaganda, özellikle Roma döneminde Augustus tarafından yoğun biçimde kullanılmış (Zanker, 1988) sonraki dönemlerde de birçok alanda sanatın gücünden faydalanılmıştır (Clark, 1995; Groys, 2013). Reumannhof'un bulunduğu Viyana'da, on altıncı-on sekizinci yüzyıllarda Habsburg Hanedanlığı'nın, siyaset ve diplomaside özellikle Türklere karşı yoğun biçimde kullandığı propaganda, bu kente mimarlık ve sanat bağlamında yabancı değildir (Pfeiffer Taş, 2020; Pfeiffer Taş, 2023). Propaganda kavramı, dünyada on sekizinci ve on dokuzuncu yüzyılda ticari reklamcılığın geniş alanlara yayılmasına karşılık gelen bir ifadeye dönüşmüştür. Birinci Dünya Savaşı ile kavramın kullanımı, psikolojik mücadele aracı olarak yoğunlaşmıştır. 1917'den sonra Sovyet Rusya ve 1933 sonrasında Nazi Almanyası gibi tek parti devletlerin, propagandayı ideolojilerinin iletişim aracı için kullanması, olumsuz çağrışımları artırmıştır (Clark, 1995, 11, 12).

İktidarların ideolojilerini kitlelere aktarmak üzere yürüttüğü propaganda faaliyetleri, sanat ve mimarlıkta yoğun olarak yer bulmaktadır. İdeoloji-propaganda-mimari etkileşimi, belirli inançların ve değerlerin temsiliyeti üzerinden; binaların, anıtların ve kamusal alanların tasarlanmasında ön plana çıkmaktadır. Avusturya Sosyal Demokrat İşçi Partisi ideoloji ve propagandasıyla özdeşleşmiş Kızıl Viyana olarak adlandırılan dönem de bunu yansıtan en iyi örneklerdendir. Bu bağlamda, Viyana'da sosyal demokratların belediye sosyal konut projesi önemli bir yere sahiptir.

Kızıl Viyana döneminin sosyo-ekonomik boyutu ve mimarisini kapsamlı biçimde ele alan Blau, ideoloji ve temsiliyet ilişkisini incelediği bölümde, Günter Hirschel-Prottsch, Helfried Kodré, Friedrich Achleitner, Manfredo Tafuri gibi araştırmacıların yorumlarına yer vermiştir. Belediye sosyal konutlarının, sosyal demokratların politik programlarına bağlı kaldığı, mimari dilin parti liderliğinin burjuva kültürel değerlerinin bir yansıması olduğu görüşü bulunmaktadır; daha radikal bir sosyalizm biçimine inanan Avusturya-Marksistlerinin devrimci idealleri ile sosyal demokrat belediye programlarının reformist politikaları arasındaki temel çelişkinin yansımalarını taşıdığı ileri sürülmektedir (Blau, 1999, 342, 344, 481). Binaların temsil ettiği tarihi olaylara ve eğilimlere odaklanan Tafuri, bu projeye idealist bir yaklaşımla başladığını, ancak uzun vadeli fizibilitelerin dikkate alınmadığını vurgulamıştır (Tafuri, 1980, 7; Davidovici, 2017, 44, 48). Belediyenin konut tasarımlarında, sanatsal birliğin kurulmaması, tutarlı bir mimari programın olmaması ve mimarlara tam yetki verilmeden belediye görevlilerinin yapılarla ilgili önemli kararlar alması, yapıların kent silüetine birbirinden bağımsız, karmaşık biçimlerle iz bıraktığı görüşü de eleştiriler arasında yer almaktadır (Hegemann, 1926, 362-370). Viyana'daki sosyal konutlarda da olduğu gibi, sosyal yoğunlukların yapı bloklarından harekete geçmesi, buralardan taşması ve kentin geneline dağılması, iyi bir kentsel strateji olarak da yorumlanmıştır (Haynes ve Borsi, 2022, 129). Sosyal konutların kentin Döbling, Hietzing, Währing gibi daha önceki dönemlerin burjuva kültürünün Barok, Neoklasik, Jugendstil gibi yansımaları mimarlık ve sanat aracılığıyla temsil edildiği semtlerinde de uygulanmış olması sınıf ayrımı karşıtı bir ideolojinin göstergesidir.

AVUSTURYA SOSYAL DEMOKRAT İŞÇİ PARTİSİ VE KIZIL VİYANA DÖNEMİ

Yirminci yüzyıl siyasi faaliyetlerinden öne çıkan gelişmelerden biri, ideal toplum modeli sunmayı hedefleyen sosyalizmin yükselişi olmuştur. 1848'de Karl Marx ve Friedrich Engels tarafından Komünist Parti Manifestosu'nun yayımlanmasının ardından farklı sosyalist ideolojiler gelişmiştir (Politzer, 1972, 206-208, 212). Avrupa'da işçilerin siyasi ve ekonomik haklarını ve yaşam koşullarını iyileştirmeyi hedefleyen sosyal demokrat partiler kurulmaya başlamıştır (Arnhart, 2003, 391-393).

Alman-Avusturya Demokrat Cumhuriyeti'nin ilan edilmesinin ardından, Şubat 1919'da *Sozialdemokratische Arbeiterpartei*, *SDAP* (Alman-Avusturya Sosyal Demokrat İşçi Partisi) ve *Christlichsoziale Partei* (Hristiyan Sosyal Parti) koalisyon hükümeti kurulmuş, Viyana belediye seçimlerini de kazanmasıyla, Jakob Reumann (1853-1925) belediye başkanı seçilmiş ve 1923'e kadar bu görevi yürütmüştür. Belediye sosyal konutlarının başlatılması, eğitim reformları, yeşil alanlar ve modern eğlence tesisleri yaratmaya yönelik ilk çalışmalar da onun öncülüğünde gerçekleştirilmiştir (dasrotewien.at, 2017a; Passecker, 1933, 350).

VIYANA BELEDİYESİ SOSYAL KONUT PROJESİ

Sosyal konut, bir devlet kurumu veya kâr amacı gütmeyen kuruluşlara ait olup, düşük gelirli bireylere sunulan uygun fiyatlı, kaliteli konutlar olarak bilinmektedir. Avrupa'da ilk sosyal konut yasaları yirminci yüzyılın ilk on yılında kabul edilmiştir (Reinprecht, 2014, 63). Sosyal konutların toplumsal boyutu konusunda August Bebel (1840-1913) *Kadın ve Sosyalizm* (1879) adlı kitabında sosyalist toplumun ev hayatındaki değişimleri vurgulamıştır. Kadın ve erkeğin çalıştığına, çoğunlukla çocukların evde kendi hallerine bırakıldığına ve fabrikalara uzak konutlarda yaşandığına dikkat çekmiştir. İşçilerin yaşadığı sağlıksız konutlarda hijyen koşullarının, havalandırma ve doğal ışıktan faydalanmanın sağlanamamasını en büyük toplumsal sorunlardan biri olarak değerlendirmiştir. Bu koşulların iyileştirilmesi hedeflenen sosyal konutlarda, ısıtma ve aydınlatmanın merkezi sistemlerle çözülmesi, soğuk ve sıcak su tesisatının kurulması ve konutlarda zor koşullarda yapılan çamaşır yıkama sorununun ortak çamaşırhaneler yoluyla çözülmesi öngörülmüştür (Bebel, 1879, 83-84, 249-251).

Avusturya'da 1919'da sosyal demokrat belediye yönetimi, ideolojisiyle bağlantılı olarak Viyana özelinde kapsamlı bir konut inşası programı hazırlanmıştır. Bu program, Kızıl Viyana döneminin sosyal politikalarının fiziksel yansımalarından en prestijlisi olarak yorumlanmıştır. Bütçe, devlet desteğinin yanı sıra belediyenin geliştirdiği konut vergisi ve lüks tüketim ürünlerine getirilen yeni vergi sistemiyle sağlanmıştır. Bu dönemde başlayan sosyal konut projeleri, İkinci Dünya Savaşı'ndan sonra (1945) ulusal düzeye taşınmıştır (Reinprecht, 2014, 63, 64). 1970'lerden itibaren ise anti-Marksist bir yapılanma ile önceki örneklere kıyasla daha az ideolojik, belirli bir çevre veya sınıf gözetmeden herkesin içinde yer alabileceği projeler de karşımıza çıkmaktadır. Mekânın ideoloji ile bağlantısının tartışmaya açıldığı, Viyana'da özerk ortak konutlara örnek oluşturan Sargfabrik (1994-1996) incelemesinde, kapitalizmin, tüm toplumsal süreçlere nüfuz ederek ideoloji kavramını muğlaklaştırdığı ve mimaride algılanamaz hale getirdiği ifade edilmiştir. İdeolojinin ancak finansal, toplumsal ve politik yapıdaki değişimlerle yeni anlamlar kazanarak mimariye yansiyebileceği belirtilmiştir. Sargfabrik de mimarisıyla çelişkili olarak yorumlanan ideolojik yaklaşımın, alternatif bir ekonomik model sunulmasıyla temsil edilebileceğini göstermektedir (Schnell, 2022, 69-78).

Endüstrinin gelişmesiyle yirminci yüzyılın başında Viyana'da büyük bir konut ihtiyacı doğmuş, çok sayıda işçi, özel konutlarda vardiya saatlerine göre gündüz ve gece değişimli olarak, saatlik yatak kiralamak zorunda kalmıştır. On dokuzuncu yüzyıl sonunda yatak kiralayan işçilerin Margareten'in de dâhil olduğu Gürtel etrafında yoğunlaştığı görülmektedir (Das Rote Wien in Zahlen 1919-1934, 2019, 24). 1900'lerde Viyana'da yaklaşık 170.000 kişinin kiracı veya mutfak gibi ortak alanları kullanamayan yalnızca yatak kiracısı olduğu, bunun da nüfusun yüzde 10'unu oluşturduğu bilinmektedir (**Resim 1**). Sosyal konut projelerinin gerçekleştirilmesiyle birlikte bu sayının azaldığı, 1934 yılında ise yatak kiralayanların nüfusa oranının yüzde 0,1'e düştüğü görülmektedir (Pohl, 2019).

1900 civarında ortalama 5 kişilik işçi ailelerinin 30 metrekarelik oda-mutfaktan oluşan konutlarda yaşadığı, tuvalet ve su tesisatının apartmanların ortak koridorlarında bulunduğu bilinmektedir. Havalandırma ise kat koridorlarındaki pencerelerden sağlanmaktadır. Konutlarda su tesisatı bulunmadığı için, yıkanma ve hijyen sorununu



Resim 1. Viyana'da konut sıkıntısı, 1900
(ÖNB Bildarchiv und Grafiksammlung, Env.
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gidermek amacıyla 1887'de açılan Viyana Halk Banyoları yoğun olarak kullanılmıştır (Pohl, 2019).

Sosyal demokrat politikacı Danneberg, 1928 tarihli *Vienna under Socialist Rule* adlı kitabında, işçi konutlarında iyileştirmeyi hedefleyen Viyana Belediyesi'nin idari organizasyonu, finansal girişimleri ile halk sağlığı, gıda temini ve sosyal konut hakkındaki çalışmalarıyla ilgili bilgi vermekte, Birinci Dünya Savaşı'ndan önce inşa edilen her 1000 konutun 953'ünde su tesisatı ve 921'inde tuvalet olmadığına, bu bağlamda sosyal konut tasarımındaki ilkelerin önemine dikkat çekmektedir (Danneberg, 1928, 6, 43, 44).

Belediyenin 19 Şubat 1919 tarihli halka açık oturumunda, belediye sosyal konut programına dair ilk öneriler sunulmuştur. Viyana'da mevcut durumda 553.000 konutun 255.000'inin tek odalı, küçük konutlardan oluştuğu bilgisi verilerek program için biri *Wohnküche* (oturma odası+mutfak) olmak üzere en az iki odalı konut planları önerilmiştir. Temiz hava, gün ışığı, elektrikli aydınlatma, gaz ve su tesisatının sağlanması; işlevsel, kullanımı kolay, iş yükünü azaltan ekipmanlar, sifonlu tuvalet, dolap ve gömme dolapların gerekliliği üzerinde durulmuştur. Konut içinde veya ortak tesislerde yıkanma alanlarının yapılması, elverişli yapılara asansör kurulması, merkezi ısıtma sisteminin kullanılması ve tüm odaların gün ışığına göre yerleştirilmesi vurgulanmıştır. Avlular için peyzaj düzenlemeleri, yaşlıların dinlenebileceği banklar, oyun odaları ve anaokuluna erişimin yanı sıra açık havada çocuk oyun alanları, küçük konutlu yapılarda ise çocuklar için oyun odası yer alması önerilmiştir (Amtsblatt der Stadt Wien, 1919, 470; Blau, 1999, 176, 177). Birinci Dünya Savaşı'ndan yeni çıkan Viyana'da 1919-1923 arasında 1272 sosyal konut inşa edilmesi (Gemeinde Wien, 1927, 58-62), dönemin ekonomik koşullarına göre oldukça önemli bir gelişme olarak değerlendirilmelidir.

Viyana'daki ilk belediye sosyal konut binası Metzleinstalerhof'un da tasarımcısı Gessner'dir. İlk binaya, 1916'da Robert Kalesa'nın tasarımıyla Margaretengürtel 90-98 numarada küçük konutlar yapmak amacıyla başlanmıştır, ancak savaş nedeniyle tamamlanamamıştır. 1919-1921'de sosyal

konuta dönüştürülerek devam edilmiş, 1923-1924'te Gessner'in eklemeleri sonucu toplam 244 konut kapasitesiyle yeni ismini (Metzleinstalerhof) almıştır. Gessner, Metzleinstalerhof'ta, ortak çamaşırhane, ortak banyo, anaokulu ve açık oyun alanları tanımlamıştır (Gessner, 1924, 1). Kentteki konutlarda genellikle 300-350 cm arasındaki tavan yükseklikleri, bu yapıda yaklaşık 260 cm'ye düşürülerek, konutların daha ekonomik ısıtılması amaçlanmıştır. Reumannhof'ta da karşılaştığımız cephedeki pencereler ve pencere çıkımları, konutlarda gün ışığından daha fazla yararlanılmasına yöneliktir. Margaretengürtel 90-98'in plan ve organizasyonunda tanımlanan yenilikler, 1922'de inşasına başlanan on bir belediye sosyal konut binasında standart hale gelmiştir. Mekân boyutları, ortak ve kamusal alanlar, mimarî detaylandırma açısından farklılaşsa da temelde üç tip konut inşa edildiği görülmektedir; oturma odası+mutfak ve tuvalet hepsinde bulunmakta, konutlar bir oda, iki oda veya bir oda ve bir kabin/küçük oda olarak ayrılmaktadır. Ek olarak bazı konutlarda antre, bulaşık yıkama alanları veya balkon bulunmaktadır. Tuvalet dâhil tüm mekânlarda doğrudan gün ışığı ve havalandırma sağlanmasına özen gösterilmiştir (Blau, 1999, 179, 181).

Metzleinstalerhof'tan övgüyle bahseden sosyal demokratlar, erken tarihli propaganda metinlerinde, burayı belediyenin beş yıllık sosyal konut programı için bir model olarak öne çıkarmıştır. 1923 seçim kampanyası sırasında, yeni konut tiplerindeki tasarımların uygulandığı Margaretengürtel bölgesinin görselleri kullanılmıştır (Blau, 1999, 227-228). 21 Eylül 1923'te Viyana belediye meclisi, beş yıl içinde 25.000 konut inşa etme kararı almıştır (Die Wohnungspolitik der Gemeinde Wien, 1926, 15). 1926 yılına kadar, 1806'sı Margaretengürtel'in bulunduğu V. bölgede olmak üzere, kentin I. ve VI. bölgesi dışındaki on dokuz bölgede 25.000 konutun inşası tamamlanmıştır (Gemeinde Wien, 1927, 62). 1934 yılına kadar 60.000'in üzerinde konut bitirilmiştir (Das Rote Wien in Zahlen 1919-1934, 2019, 16). Neredeyse her ilçede ve özellikle en yoğun yerleşim alanlarında inşa edilen konutlar, kentin mevcut dokusuna entegre edilerek işçilerin kent üzerindeki hak iddiasının bir göstergesi olmuştur (Loeb, 1997, 110).

1923'te konutların tasarımı için planlama ilkeleri tanımlanmış, standartlaşmaya bağlı olarak iki konut tipi geliştirilmiştir. İlki, antre, oturma odası+mutfak, tuvalet ve yaklaşık 20 m² bir odadan oluşan 38 m² büyüklüğünde konutlar; ikincisi ise bir küçük odanın daha eklendiği 48 m² büyüklüğündeki konutlardır. Konutların yaklaşık yüzde yetmiş beşi 38 m² ve yüzde yirmi beşi de 48 m²lik tiplere göre yapılmıştır. Ayrıca, az sayıda, antre, oturma odası+mutfak ve tuvaleti olan tek odalı veya iki odalı daha büyük konutlar inşa edilmiştir. Hepsinde, düşük tavan yüksekliği, su tesisatı, sifonlu tuvaletler, gaz ocağı ve elektrikli aydınlatma, çoğunda da balkon uygulanmıştır (Blau, 1999, 177-181; Die Wohnungspolitik der Gemeinde Wien, 1926, 28-31). Konutlardaki antre, soğuk ve gürültüye karşı koruyucu alan, kamusal alandan özel alana geçiş mekânı ve tuvalet ile yaşam alanları arasında bir ara-mekân oluşturarak yaşam kalitesini iyileştirmektedir. (Fuchs, 1924, 9; Gemeinde Wien, 1927, 54).

Belirlenen ilkelere göre, yapılardaki kamusal ve özel alanlara giriş, avlu üzerinden kurgulanmıştır. Daha büyük yapılarda, tüm kiracılar için modern, buhar gücüyle çalışan yıkama ve kurutma makineli ortak çamaşırhane, ortak duşlar ve sembolik bir ücretle küvetler planlanmıştır. Halk kütüphaneleri, tüberküloz ve doğum danışma merkezleri, diş klinikleri, gıda maddeleri için iş yerleri ve dernekler için mekânlar da sağlanmıştır (Gemeinde Wien, 1927, 53-56). Balkonlar, avlular ve ortak

çalışma alanları, özellikle kadınlara çalışma ve sosyalleşme mekânları sunmaktadır (Haynes ve Borsi, 2022, 128).

İşçi sınıfının alışkanlıklarına uygun olarak planlanan oturma odası+mutfak mekânları, yeni sosyal konutların eskiyle bağlantı kurması açısından dikkat çekmektedir. Ekonomik koşullar ile ilişkilendirilen oturma odası+mutfak, merkezi ısıtma sağlanamadığından, ısıtma işlevine de sahip olmuştur. Oturma odası+mutfak uygulaması için kömürlü fırınların gaz ocaklarıyla değiştirilmesi, yıkama işleri için su tesisatı ve lavabonun olduğu ayrı bir bulaşık alanı konumlandırılması gibi iyileştirmeler yapılmıştır. 16-20 m² arasındaki bu mekânlardaki yemek masası ve oturma alanı, yemek, mutfak işlerinin yanında çocukların çalışma ve oyun alanı işlevine de sahiptir (Fuchs, 1924, 9; Blau, 1999, 182-183).

Oturma odası+mutfakları çağdaştırma çalışmalarından birisi de iş verimini artıran tasarımların geliştirilmesi olmuştur. Daha sonra ülkeyi terk edecek ve Türkiye'ye gelecek olan Avusturyalı mimar ve aktivist Margarete Schütte-Lihotzky (1897-2000) (Horncastle, 2019), ilk kez 1922'de, *Österreichischer Verband für Siedlungs- und Kleingartenwesen-ÖVSK* (Avusturya Yerleşim ve Küçük Bahçeler Derneği) için yaptığı tasarıma mutfak nişi veya bulaşık yıkama yeri eklemiştir. Bu tasarımda, "Taylor tarzı çalışma yöntemi" kapsamında konut içi düzenleme ve donatılar sayesinde iş yükünü azaltmaya ilişkin Christine Frederick'in kitabındaki prensiplerden yararlanmıştı. Schütte-Lihotzky'nin tasarımına göre, mutfakta yemek pişirme ve ısıtma işlevi olan soba, eski köy evi mutfaklarında olduğu gibi, merkezi konumda olmalıdır. Suyla yapılan mutfak işleri oturma odası+mutfaktan ayrılarak banyo ve çamaşır yıkama odası işlevi de görebilen, bir yemek pişirme nişi veya bulaşık yıkama yeri ile donatılmalıdır. Bu tasarım Schütte-Lihotzky'nin daha sonra 1926'da *Frankfurter Küche* olarak tanınacak mutfak tasarımının da öncüsüdür (Blau, 1999, 182-184). Belediye Meclisi'nden Franz Siegel, Şubat 1924'te *Arbeiter-Zeitung'da* (Viyana İşçi Gazetesi), belediye sosyal konutlarını ele alarak, işçi sınıfının zamanının çoğunu mutfakta geçirdiğini vurgulamış, yemek pişirmenin yanında yaşanabilir, geniş, samimi bir mutfak yaratılmak istendiğini belirtmiştir. Bu tip oturma odası+mutfaklar için "Taylor tarzı çalışma yöntemi"nin özel avantajlara sahip olacağına dikkat çekmiştir (Siegel, 1924, 8).

Belediye sosyal konutlarında, Taylor tarzı çalışma yöntemi kapsamında oturma odası+mutfak içinde çalışma nişi tasarımları başlamıştır. Oturma odası+mutfakta gaz sobası, dolap, raf, lavabo, damlalık, ahşap kapaklı lavabo, üstü tezgâh veya masa olarak kullanılabilen bir küvet, gazla çalışan su ısıtıcısı, çift gözlü ocak, katlanır masa, mutfak dolabı, antreden boşaltılabilen çöp kutusu, mutfak dolabının yanından açılabilen bir ütü masası yer almıştır. Sosyal konutların çoğunda malzeme dayanıklılığı ve işçiliğe öncelik verilmiştir. 1922 sonrası konutlarda, odalarda parke, ıslak mekânlarda seramik zemin, sıvalı duvarlar, havalandırma paneli ve ahşap çitalı panjuru olan, standart ahşap veya metal çerçeveli pencereler kullanılmıştır. 1924'te gömme dolap eklenmesi denemesinden daha sonra vazgeçilmiştir (Blau, 1999, 183-187, 193). 1927'de alınan karar ile başlanan inşaa programında 21, 40, 49 ve 57 m² boyutlarında yeni konut tipleri geliştirilmiştir (Hardy ve Kuczynski, 1934, 62-66). 1927 tarihli bu yeni konut tipleri, Reumannhof'un 1926'da tamamlanmasından sonra geliştirildiği için bu yazıda detaylandırılmamıştır.

1930'a kadar inşa edilen büyük sosyal konut binaları nedeniyle Margaretengürtel, işçi sınıfının bir temsiliyeti haline dönüşmüş ve

“*Die Ringstrasse des Proletariats*” (Proletaryanın Ring Bulvarı) adını almıştır. Burjuvazinin temsil edildiği, kent merkezindeki tarihi surların 1857’den sonra yıkılmasıyla kurulan Ringstrasse Bulvarı (Tabor, 1996, 13) imparatorluğun ihtişamı ve zenginliğiyle özdeşleşmişken, Margaretengürtel ve onun yan sokakları işçilerin yaşadığı apartmanlara ev sahipliği yaparak işçi sınıfı hareketini yansıtmaya başlamıştır. *Neue Freie Presse* Gazetesi’nde (1924, Ocak 13) yayımlandığı üzere Margaretengürtel çevresinde, 1890’da kenti çevreleyen ikinci bir kuşak olan kent duvarlarının yıkılması ile oluşan Gürtelstrasse hattının, sosyalistler tarafından geniş çaplı kalkınma için hedef alındığı bilinmektedir (Blau, 1999, 226, 227, 252; Gruber, 1991, 16, 18). *Die Unzufriedene* (Hoşnutsuzlar) dergisinde, Margaretengürtel hakkındaki yazıda *Die Ringstrasse des Proletariats* başlığı kullanılmıştır. Yazıda, Reumannhof, “Viyana Belediyesi’nin Margaretengürtel üzerindeki muhtemelen en güzel konut binası” olarak tanımlanmış ve yapının karşısındaki Haydnpark’tan söz edilmiştir. Saatlerce çalışma ve yorgunluktan sonra burada dinlenme alanları, parkın yanında gençlik oyun ve spor alanları sunulduğuna, mutlu ve sınıf bilincine sahip genç bir kesimin bu bölgede yetiştiğine vurgu yapılmıştır (Die Unzufriedene, 1930, 1) (**Resim 2**). Birinci Dünya Savaşı sırasında arazi sebze, meyve yetiştirmek için kullanılmıştır. Margaretengürtel’in gelişimi, Gessner ve Schmid-Aichinger’in yapılarıyla temellenmiştir. Reumannhof ve Metzleinstalerhof’un yanına inşa edilen, büyük sosyal konut yapılarından Herweghhof, Julius Poppohof ve Matteottihof (**Resim 4**) bölgeyi bu anlamda güçlendirmiştir (Blau, 1999, 252, 259-261).

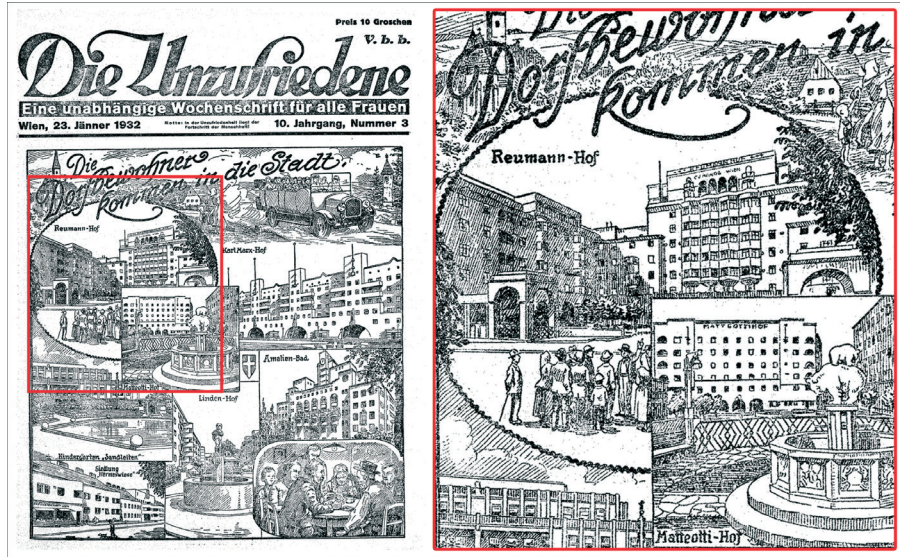
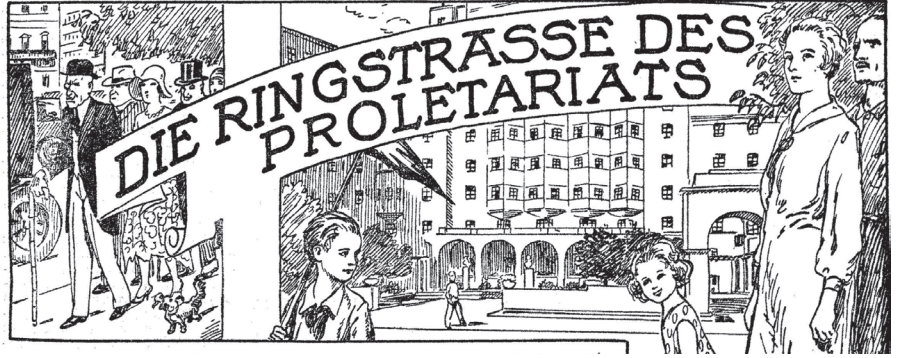
Belediye sosyal konut programındaki öneriler ile sosyal konutlara ilişkin görüşleri örtüşen August Bebel’in isminin, Karl Ehn’in tasarımıyla 1925’te inşa edilen Bebel-Hof’a (Blau, 1999, 266) verilmesi bu açıdan önemlidir. Viyana’da sunulması hedeflenen yaşam biçimini en iyi yansıtan örneklerden olan, ancak Margaretengürtel’den biraz uzak kalan Karl Marx-Hof (1927-1930), 1,1 kilometre uzunluğundaki cepheye, büyük kemerlere ve kale benzeri anıtsal bir görünüme sahiptir. Burada da çamaşırhaneler, yıkanma alanları, kütüphane, eğitim tesisleri, topluluk salonları, sakinlerin sağlık ve refah düzeyini artırmaya odaklanan (diş hekimi, doktor, eczane, aile planlaması kliniği vb.) imkânlar yer almaktadır (Alic, 2019, 35). Karl Marx-Hof’un, burjuva değerlerinden arınmış proleter karşı-kültürünün yaratılmasında, sosyal demokratlar tarafından burjuva aygıtlarının kullanıldığı bir alan yarattığına yönelik görüşler de bulunmaktadır (Sudaş, 2011, 99).

23 Ocak 1932 tarihli *Die Unzufriedene* dergisinin, “Köylüler Şehre Geliyor” başlıklı yazısının kapak resminde Reumannhof’un da bulunduğu sosyal konutlardan örnekler vardır. Yazıda çevre kasabalardan bir grubun, Margaretengürtel’dekiler başta olmak üzere belediye sosyal konutlarını kapsayan Yeni Viyana Gezisi haber yapılmıştır (Prokop, 1932, 2). Bu etkinliğin haberi, sosyal konutların, ideolojinin temsili ve Kızıl Viyana propagandasının önemli bir parçası olduğunun göstergelerindedir (**Resim 3**).

Kızıl Viyana’nın mimarları konutları kentle ilişkili olarak yerleştirerek, Viyana’nın kimliğini imparatorluk merkezinden, kendi geleceğini belirleyen ve yaşam kalitesiyle de temsil edilen bir yönetime dönüştürme sürecini başlatmıştır (Loeb, 1997, 111). Kent Konut Departmanı, yapıların tasarımı ve inşası için ülkedeki en yetenekli mimarlardan destek almıştır; Otto Wagner’in Viyana Güzel Sanatlar Akademisi Mimarlık Bölümü’ne başkanlık ettiği dönemdeki (1894-1912) öğrencilerinden Hubert Gessner,



Resim 2. Die Ringstrasse des Proletariats
(Proletaryanın Ring Bulvarı)(Die
Unzufriedene, 1930, 1; yalnızca alt kısmı Blau,
1999, 260)



Resim 3. "Die Dorfbewohner kommen in die
Stadt" (Köylüler Şehre Geliyor) başlığıyla
Belediye Sosyal Konutları ve Reumannhof
(Die Unzufriedene, 1932, kapak sayfası)

Heinrich Schmid, Hermann Aichinger, Karl Ehn, Rudolf Perco gibi mimarlar, konutların mekânsal örgütlenmesinde ve kentin geleneksel yapıyla ilişki kurarken Wagner Okulu etkisini yansıtmıştır. Konutların inşasında, belediye yapı malzemelerini sağlamış, işin yürütülmesi ise açık rekabet usulü ile müteahhitlere ihale edilmiştir (Blau, 1999, 232, 239, 352; Danneberg, 1928, 44; Scheidl, 2008). İşçi sınıfı için yeni mimari çözümler yaratmasıyla iz bırakan Gessner, bir yıl Wagner'in stüdyosunda çalışmış ve yirminci yüzyıl başındaki yapılarında *Secession* etkilerini yansıtan örneklerle de imza atmıştır. 1930'lara doğru dönemin modern ruhuna uygun, işlevsel ve düşük maliyetli tasarımlarıyla, mimaride rasyonalizasyon üzerine yoğunlaşmış, konut binaları, kamu yapıları, endüstriyel ve ticari yapı tasarımları gerçekleştirmiştir. Gessner'in tasarımlarındaki, dengeli orantı, simetri, kat planı düzenlemeleri gibi unsurlar Wagner'in ilkelerini benimsediğini göstermektedir. Belediye sosyal konut tasarımları arasında Lassalle-Hof (1924-1926), Heizmann-Hof (1925-1926), Karl-Seitz-Hof

(1926-1933), Robert Zangerl-Hof (1927-1928) ve bu araştırmaya konu olan Reumannhof (1924-1926) bulunmaktadır (Gessner, 1926a, 10; Blau, 1999, 222, 359; Scheidl, 2008). Reumannhof, Kızıl Viyana'daki ilk büyük avluya sahip proje olması ve belediye sosyal konutlarındaki anıtsal tarzı simgelemesiyle öne çıkmaktadır. "Proletaryanın Ring Bulvarı"nda, iki savaş arası dönemdeki en heybetli yapı ve sosyal konutların içinde temsiliyeti en güçlü örneklerden biridir (Weihsmann, 2002, 222).

REUMANNHOF

Reumannhof 27 Haziran 1926'da açılmıştır. 1922-1926 arasında Viyana'nın V. bölgesi olan Margaretengürtel'de Reumannhof'un yanı sıra 2052 konut kapasiteli 8 sosyal konut sitesi inşa edilmiştir (Gemeinde Wien, 1927, 58). Yapının yakınında Metzleinstalerhof ve 1924-1930 yıllarında inşa edilerek günümüze ulaşan önemli sosyal konut yapıları yer almaktadır (**Resim 4**).

Gessner'in Reumannhof için merkezde 12 katlı bir bina öngördüğü ilk tasarımı 1924'te, 11 Ocak tarihli *Der Tag* Gazetesi'nde "Margaretengürtel'de Yüksek Bina" başlığıyla yayımlanmıştır. Bu tasarım, Viyana'da yüksek yapılara ihtiyaç olmadığı yönünde tartışmalara yol açmıştır. Gessner, tasarımı yenilemek zorunda kalmış, merkezdeki 12 katlı kütleli, konutlardan oluşan altı kat ve sanatçılar için teraslı ve balkonlu atölyelerin yer aldığı iki "penthouse" katı olarak değiştirmiş, proje 30 Mayıs 1924'te belediye tarafından onaylanmıştır (Der Tag, 1924, 6; Blau, 1999, 254-255) (**Resim 5**).

Resim 4. Reumannhof ve çevresindeki Kızıl Viyana dönemi sosyal konutları (Google Earth, tb., işlenmiş harita)





Resim 5. Gessner'in Reumannhof tasarımı (Der Tag, 11 Ocak 1924, 6; yalnızca yapı çizimi Blau, 1999, 254)

26 Haziran 1926 tarihli *Arbeiter-Zeitung*'da Reumannhof, Margaretengürtel üzerinde, güzel ve güneş alan konutları, geniş, düzenlenmiş avluları içermesiyle etkileyici bir tasarım olarak anlatılmıştır. Viyana Belediyesi için özel bir onur olan “çok modern bir toplu konut binası” sözleriyle yapının önemi ifade edilmiştir (Bittner, 1926, 8). 30 Haziran 1926'da Reumannhof ve Fuchsenfeldhof'un açılışından görüntüler, “Mutlu Pazar Kutlamaları” başlığıyla haber yapılmıştır (*Arbeiter-Zeitung*, 1926, 8).

Yapı, Kızıl Viyana yönetiminin düzenlediği etkinliklere ve tarihsel olaylara tanıklık etmesi açısından dikkat çekmektedir. 1930'da sosyal demokratların seçim kampanyası filmi Reumannhof'ta izlenime sunması buna örnektir (Der Kuckuck, 1930, 2). 19-26 Temmuz 1931'de gerçekleşen 2. İşçi Olimpiyatları sırasında farklı ülkelerden gelen sporcular, sosyal konutlarda ağırlanmış, Reumannhof da İskoç sporculara ev sahipliği yapmıştır (Das Kleine Blatt, 1931, 3) (Resim 6). Medyada yer alan haber ve görseller, Reumannhof ile özdeşleşen sosyal demokrat ideolojinin yansımalarını göstermektedir.

Resim 6. a. Reumannhof'ta Sosyal Demokratların Seçim Filmi Afişi (“Bugün, Saat 6.30'da Avluda Sinema Gösterisi vardır. Seçmenler, kalabalık gelin!”) (Der Kuckuck, 02 Kasım 1930, 2) b. İskoç Sporcular Reumannhof'ta (Das Kleine Blatt, 23 Temmuz 1931, 3)

Bu yansıma, Nazi dönemindeki faşizme karşı da bir sembol olmuştur. 1934'te Reumannhof, Cumhuriyetçi Koruma Birliği'nin ana üssü olarak kullanılmış, 12 Şubat 1934'te polis Reumannhof'u işgal etmeye çalıştığında, çatışma çıkmıştır. Takviye ve askeri yardıma rağmen, polis



Oben: Eine von den vielen sozialdemokratischen Flammenschriften auf den Dächern Wiens

Rechts: Wo der sozialdemokratische Wahlfilm auch zu sehen ist — im Reumannhof



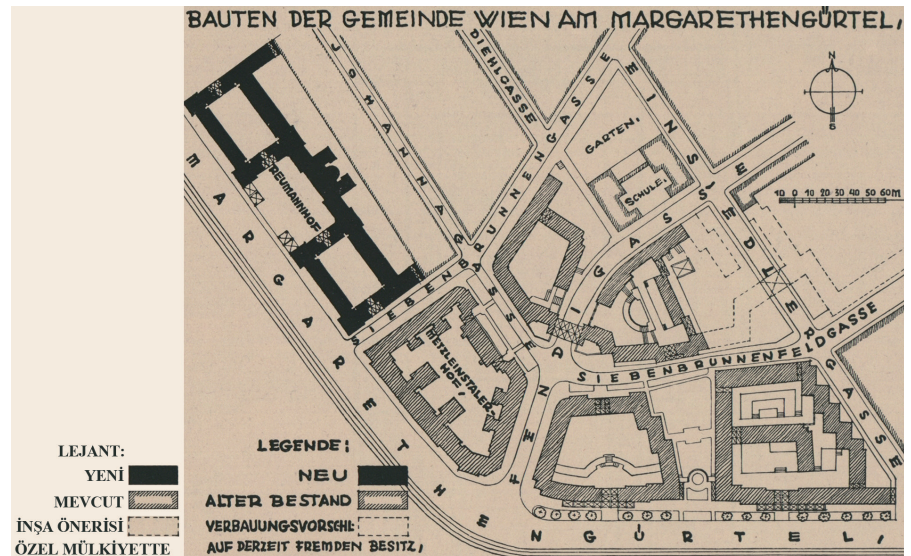
Die schottischen Sportler mit ihren fetzen Köbchen vor dem Reumannhof.

başlangıçta binayı ele geçirememiştir. Bu olay, ideolojinin yeni temsiliyeti ve faşizme karşı sosyalist mücadelenin bir simgesi olarak bellekte yer edinmiştir. Merkez avludaki, Franz Seifert'in eseri olan bronz Jakob Reumann büstünün (Gessner, 1926a, 25) önüne, bu olayların ellinci yılı anısına 12 Şubat 1984'te bir anıt levha eklenmiştir (dasrotewien.at, 2017b) (**Resim 16**). Levhada "Hier im Reumannhof verteidigten am 12. Februar 1934 Sozialdemokraten die Demokratie gegen den Faschismus." (12 Şubat 1934'te burada Reumannhof'ta sosyal demokratlar faşizme karşı demokrasiyi savundular.) yazmaktadır. 10 Nisan 1945'te Sovyet ordusu savaş nedeniyle barınma sorunu, hastalık, açlık ve kaosun öne çıktığı Margareten'e gelerek Rus karargâhını kurmuştur. Margareten, Eylül 1946'da kentte enkazdan temizlenen ilk bölge olmuş ve yeniden yapılanma başlayabilmiştir (Mayer, 2003). İkinci Dünya Savaşı'nın bıraktığı yıkım, Reumannhof'un ve bölgedeki diğer sosyal konutların kentsel ölçekteki etkisini irdelemeyi zorlaştırmış, tarihsel olarak kütleyle çevresini nasıl dönüştürdüğünün izlerini silmiştir. Reumannhof, hasar almışsa da büyük oranda korunmuş olup 1993-1996 arasında yenilenmiş, 1997 Kentsel Yenilenme Ödülü'ne layık görülmüştür (dasrotewien.at, 2017b). Yapı özgün niteliği büyük oranda korunarak gerçekleştirilen onarım ve eklemelerle konut sitesi işlevini günümüzde de sürdürmektedir.

REUMANNHOF CEPHE ÖZELLİKLERİNİN İDEOLOJİ BAĞLANTILI ANALİZİ

Reumannhof, kuzeybatıda Brandmayergasse, güneybatıda Margareten Gürtel ve güneydoğuda Siebenbrunnengasse arasındaki araziye yerleştirilmiştir. Yapı yaklaşık 12.823 m² toplam alanı ve avlular hariç yaklaşık 6.603 m² inşa alanıyla Belediye Sosyal Konutu Projesi'nin en büyüklerindedir (Gessner, 1926a, 10; Blau, 1999, 253) (**Resim 7**).

Josef Joachim Mayer'in tasarladığı, besteci Josef Haydn'ın mezarının buradaki mezarlıkta bulunmasından dolayı bu ismi alan Haydnpark, 1925'te Reumannhof'un karşısına yapılmış, sosyal demokratların yeni halk bahçelerinden biri olarak nitelendirilmiştir. 20.400 m² büyüklüğündeki parkta 6.000 m² alanın spor için ayrılması (Blau, 1999, 255) bu dönemde sağlıklı yaşam ve spora verilen önemin göstergelerindedir (**Resim 8**).



Resim 7. Margareten Gürtel'de Viyana Belediyesi yapıları, Gessner, 1924 (Gessner, 1926a, 5)

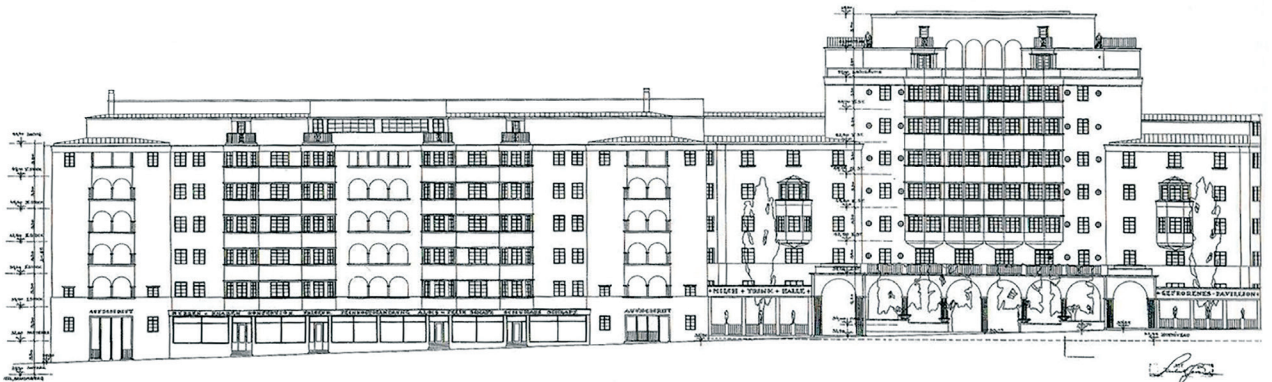


Resim 8. Haydnpark ve Reumannhof, 1926
(Wien Museum Online Sammlung, 1926b,
Env. Nr. 309144)

Reumannhof, büyüklüğü, mimari biçimi, 180 metre uzunluğundaki sarı renk cephesi sayesinde uzaktan bütün yapı kütleli görünümü vermektedir. Merkezindeki yüksek kütle ve iki tarafındaki bloklar birbirine simetrik düzen içinde bağlanarak sıralanmaktadır (Gessner, 1926a, 9). Yapıda, Viyana'daki gücün saray tarafından temsilini yansıtan Schönbrunn Sarayı'na göndermeler dikkat çekmektedir; ortadaki ana kütle, önündeki havuz, yanlardaki iki kanat, bahçe, Schönbrunn Sarayı, Maria Theresia Sarayı ya da Habsburg Sarayı olarak bilinen ve Habsburg temsil mimarisini ile özdeşleşmiş sarı rengin (Hueber, 2005, 12) cephede kullanımı gibi unsurlar saraya atıftır. Maria Theresia'nın özellikle Türklere karşı gücünün propagandası olarak inşa edilen ve on dokuzuncu yüzyıl başlarından itibaren sarı rengin hâkim olduğu Schönbrunn Sarayı'nın (Pfeiffer Taş, 2023, 974-975; Koller, 2003, 5) mimarisine yapılan bu atıf, konutların, işçilerin refah düzeyini artıran, yalın ve gösterişten uzak tasarımı ile Barok dönemine meydan okuyan ve sosyalist ideolojiyi temsil eden modern bir anıt olarak görülmektedir (**Resim 8, 9**).

Günümüzde bütün yapı cepheleri açık sarı renktedir. Ancak 1985 yılına ait fotoğraflarda ve 1999 tarihli betimlemede sarı ve kırmızı renkte olduğu dikkat çekmektedir (Blau, 1999, 255, 257). Merkez avlu ile kamusal alan arasındaki geçirgenlik, ortada araç geçişi için uygun genişlikte bir ana giriş ve iki yanında simetrik olarak konumlandırılmış kemerli iki yaya

Resim 9. Gessner tarafından yapılan
Margaretengürtel'e bakan cephenin kısmi
çizimi (Blau, 1999, 360)





Resim 10. Margaretengürtel'den Reumannhof a.1926 görünüşü (Wien Museum Online Sammlung, 1926a, Env. Nr. 309142) b. 2022 Görünüşü (Şule Pfeiffer Taş kişisel arşivi)

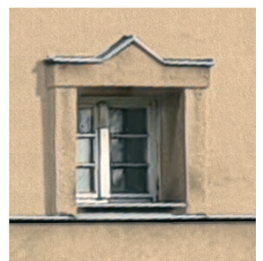
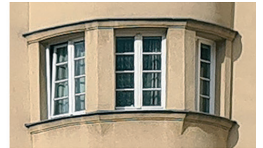
girişi ile güçlendirilerek sağlanmıştır. Böylece, avlu kamusal alanın bir uzantısı olarak algılanmaktadır (**Resim 10**). Bu tasarım, kamusal ve özel alan arasındaki hiyerarşinin değişimini, mekânsal ve işlevsel olarak farklı bileşenlerin bir araya gelmesini yansıtmaktadır (Blau, 1999, 227; Haynes ve Borsi, 2022, 128).

Merkez avlunun iki yanındaki blokların zemin katında ana kütlede dışarı taşan, büyük camlı, caddeye açılan dükkânlar da kamusal alan ile iletişim kurmaktadır. Üst katlarda tekli, ikili veya üçlü gruplar halinde dairesel ve dikdörtgen pencereler, önünde yivli sütunların taşıdığı ikili ve üçlü kemerli balkonlar ile pencereli dört sıra çıkma ve üstündeki balkonlar güneş ışığına, temiz havaya ve Haydnpark manzarasına erişim sağlamaktadır (**Resim 11**).

Güneybatı cephesi dışındaki yan cephelerde, doğu ve batıdan gün ışığının konutlara daha fazla girişini sağlamak için, pencereli çıkmalar üçgen planlı olarak tasarlanmıştır. Balkon korkuluklarında ve giriş kapılarında kırmızı renkli ferforje sosyalist ideolojiye göndermedir (**Resim 12**).

Yüksek kütlede zemin katındaki kemerli girişin üstü kırmızı ferforje korkuluklarla donatılmış teras olarak tasarlanmıştır; en üst katında da

Resim 11. Margaretengürtel ve Brandmayergasse'ye bakan cepheler, çıkma, balkon ve pencere ayrıntı (Şule Pfeiffer Taş kişisel arşivi, 2022)





Resim 12. Kuzeybatı Cephesi a. Ferforje Kapılar b. Ferforje Kapı, Pencere Ayrıntıları (Şule Pfeiffer Taş kişisel arşivi, 2022)

uygulanan teraslar, kentin manzarasına, güneşe ve temiz havaya erişim sunmaktadır (Gessner, 1926a, 10) (**Resim 13**).

Kuzeybatı ve güneydoğudaki bloklar, arazinin kuzeybatıya doğru genişlemesinden kaynaklanan uzunluk farkı dışında büyük oranda benzerdir. Blokların köşelerinde konumlandırılan merdivenlerin pencere açıklıkları ve iki yanına yerleştirilmiş balkonlar yine doğal aydınlatma ve havalandırma sağlamaktadır. Kuzeydoğu ve güneybatı cephelerinin merkezindeki geniş saçaklı bina girişleri, iki yönlü basamaklarla yükseltilecek korunaklı bir alan oluşturmaktadır. Kapalı bisiklet odaları yaşamı kolaylaştıran tasarımlardan birisidir (**Resim 14**).

Resim 13. a.Yüksek kütleli giriş cephesi ve "Wir grüßen euch im roten Wien" (Kızıl Viyana'da Sizi Selamlıyoruz) yazan afiş (John, 1925/1939) b. Jakob Reumann büstü (Şule Pfeiffer Taş kişisel arşivi, 2022)

Binanın mevcut halinde, çatı katında değişiklikler olduğu, merdiven boşluğunun iki yanındaki balkonların camla kapatıldığı, bina girişlerindeki saçakların üzerinde eklemeye yapıldığı görülmektedir. Yapının genel özelliklerinin devam ettirildiği, pencerelerin doğal ışık yönüne göre





Resim 14. Kuzeybatıdaki blok ve avlu a. 1926 (Wien Museum Online Sammlung, 1926c Env. Nr. 57962/49) b. 2022 (Şule Pfeiffer Taş kişisel arşivi, 2022)

1. *The Architecture of Red Vienna* başlıklı kitabın 13. dipnotunda referans gösterilmeden 485 adet konut bilgisi verilmiştir (Blau, 1999, 253)

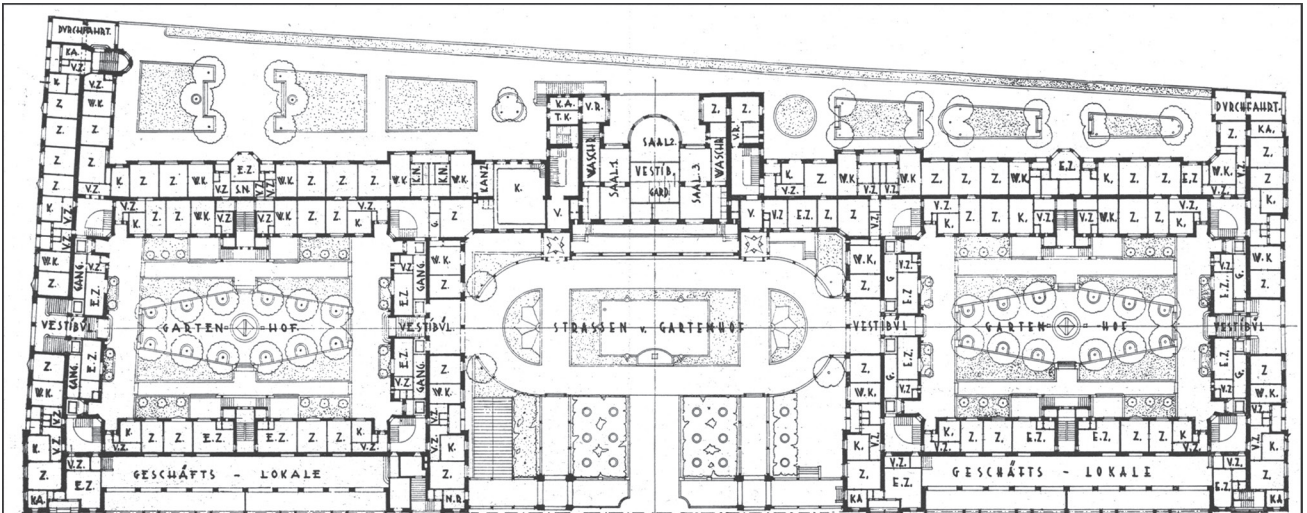
yerleştirildiği anlaşılmaktadır. Reumannhof'a bitişik inşa edilen yapılar kuzeydoğudaki arka cepheyi incelemeyi engellemektedir.

REUMANNHOF PLAN ÖZELLİKLERİNİN İDEOLOJİ BAĞLANTILI DEĞERLENDİRİLMESİ

Reumannhof plan tasarımında açıklık, akış ve alandan en çok verimi almaya yönelik uygulamalar öne çıkmaktadır. Ortak alanlar, merkezi avlu etrafında toplanmış, her konut bloğuna girişler avlu üzerinden ayrı kapılarla sağlanmıştır (Gessner, 1926a, 10). (**Resim 15, 16**).

Reumannhof'ta belediyenin 1923 tarihli standart konut metrekarelerinden farklı büyüklükte konutlar tasarlandığı dikkat çekmektedir. Mimarın verdiği bilgilere göre büyüklükleri 25 ile 60 m² arasında değişen yaklaşık 480 konut tasarlanmıştır (Gessner, 1926a, 10; Blau 1999, 253) (1). Konutların tümünde doğrudan gün ışığı alan antre ve tuvalet bulunurken, mutfak veya oturma odası+mutfak seçeneği, oda sayısına ve balkon ya da çıkma olup olmadığına göre farklılık göstermektedir. Bir veya iki odaya sahip bu konutlarda öne çıkan unsurlardan birisi de doğal ışık, havalandırma ve ek

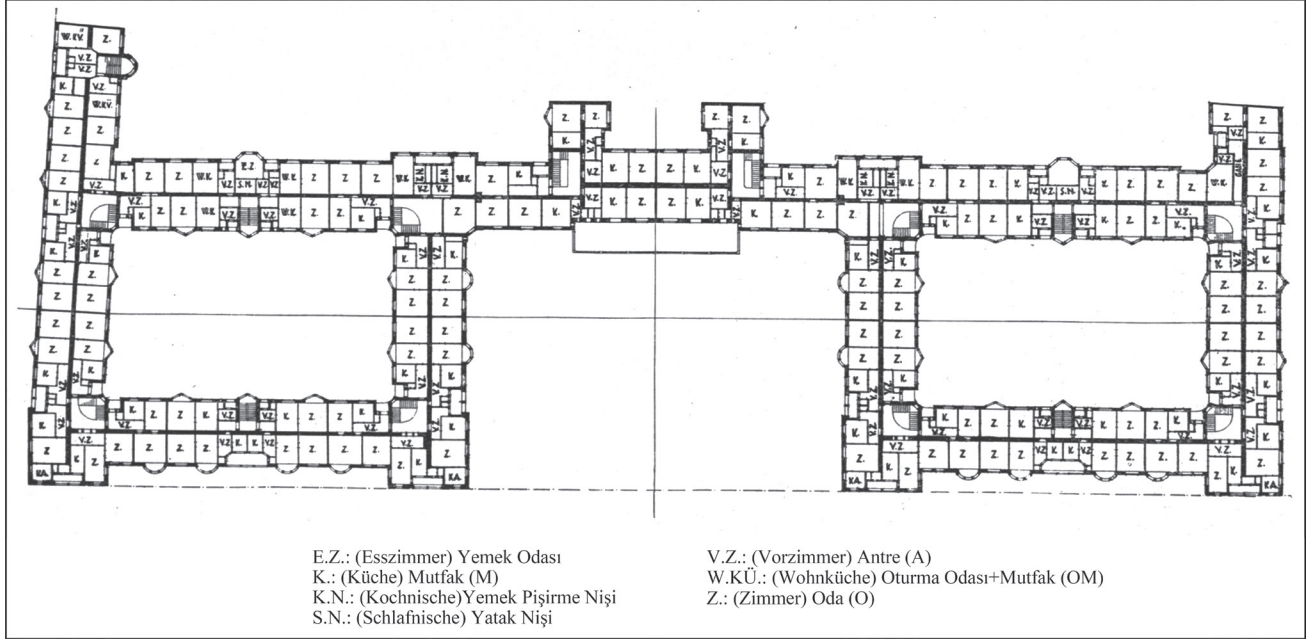
Resim 15. Reumannhof zemin kat planı, Gessner, 1924 (Gessner, 1926a, 6'dan alınarak işlenmiştir)



DURCHFART.: Geçit
E.Z.: (Esszimmer) Yemek Odası
GANG.: Koridor
GARD.: (Gardrobe) Vestiyer
GARTEN-HOF: Bahçe Avlusu
GESCHÄFTS-LOKALE: Mağaza
K.: (Küche) Mutfak (M)

K.N.: (Kochnische) Yemek Pişirme Nişi
N.R.: (Nebenraum) Yan Oda, Küçük Oda
S.N.: (Schlafnische) Yatak Nişi
SAAL1.: Salon 1
SAAL2.: Salon 2
SAAL3.: Salon 3
STRASSEN v. GARTENHOF: Bahçe Avluları Caddeleri

T.K.: (Tee Küche) Çay Ocağı
V.: (Vestibül) Giriş Holü
V.Z.: (Vorzimmer) Antre (A)
W.K.: (Wohnküche) Oturma Odası+Mutfak (OM)
WASCHR.: (Waschraum) Çamaşırhane, Banyo
Z.: (Zimmer) Oda (O)



Resim 16. Reumannhof kat planı (Gessner, 1926a, 7'den alınarak işlenmiştir)

alan sağlayan pencereci çıkmalardır. Yan avlulara bakan cephelerde küçük ve tek konut için tasarlanmış özel balkonlar, merkez avluya ve caddelere bakan cephelerde daha büyük ölçekli, iki konut tarafından kullanılan, kemerli, üstü örtülü ortak balkonlar görülmektedir. Yüksek kütlelerin birinci katındaki teras, güneş ve temiz havaya iki konuttan erişim sağlamakta, avluyla iletişim kurmakta ve manzaranın izlenmesine olanak tanımaktadır (Resim 16).

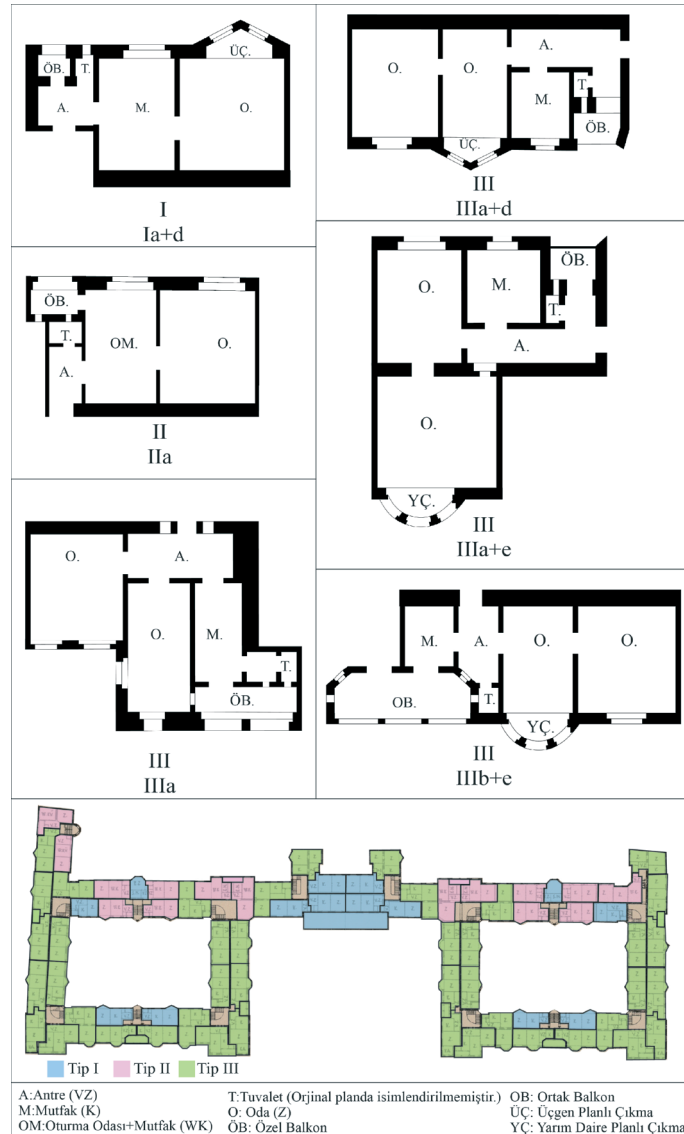
Yapının tipik kat planı incelendiğinde temelde üç tip konut birimi ile karşılaşılmaktadır: I, II ve III olarak adlandırılan tiplerin ve alt grupların içerdiği mekânlar Tablo 1'de gösterilmiştir. Konutlara ait daha ayrıntılı planlara ulaşılamaması nedeniyle, Gessner'in çizdiği plandan yola çıkarak bir tipoloji önerisi sunabilmek için bu üç tip konutun özellikleri incelenmiştir. Ana plan tipolojisi yapılırken konutlardaki balkon, teras, çıkma vb. dikkate alınmamıştır. Bu unsurlar her konut tipinde alt grup olarak değerlendirilmiş olup özel balkon a, ortak balkon b, ortak teras c, üçgen planlı çıkma d, yarım daire planlı çıkma e harfleri ile gösterilmiştir.

Üç tipe ait konutlardan balkon veya çıkma kullanımına göre farklılık gösteren altı örnek seçilmiş, özgün plan üzerinden yapılan çizimleri

Tip	Mekânlar
I Ia+d	Antre (A), Tuvalet (T), Yemek Odası ve/veya Mutfak (M), Tek Oda (O), Özel Balkon (ÖB), Üçgen Planlı Çıkma (ÜÇ)
II IIa	Antre (A), Tuvalet (T), Oturma Odası+Mutfak (OM), Tek Oda (O), Özel Balkon (ÖB)
III IIIa	Antre (A), Tuvalet (T), Mutfak (M), İki Oda (O), Özel Balkon (ÖB)
III IIIa+d	Antre (A), Tuvalet (T), Mutfak (M), İki Oda (O), Özel Balkon (ÖB), Üçgen Planlı Çıkma (ÜÇ)
III IIIa+e	Antre (A), Tuvalet (T), Mutfak (M), İki Oda (O), Özel Balkon (ÖB), Yarım Daire Planlı Çıkma (YÇ)
III IIIb+e	Antre (A), Tuvalet (T), Mutfak (M), İki Oda (O), Ortak Balkon (OB), Yarım Daire Planlı Çıkma (YÇ)

Tablo 1. Çizimi yapılan konut tiplerinin ve alt grupların mekânsal özellikleri

aşağıda verilmiştir. Genel planda konut tipleri renklendirilerek gösterilmiş, anlatımı zorlaştırmaması için renklendirme yapılırken alt gruplar dikkate alınmamıştır. Konut tiplerinde T ile gösterilen mekân, Reumannhof özgün planında isimlendirilmemiştir. Belediyenin 1923'te hazırladığı 38 ve 48 m² standart konut tipleri (Die Wohnungspolitik der Gemeinde Wien, 1926, 28, 30) ve Gessner'in Karl-Seitz-Hof konut planları (Gessner, 1926b) göz önünde bulundurulduğunda bu mekânın tuvalet olduğu öngörülmüştür. Planda simetrik olarak kuzeydoğuda konumlandırılmış olan iki konutta, yarım daire planlı çıkmaya sahip E.Z.= *Esszimmer* (yemek odası) ve S.N.=*Schlafnische* (yatak nişi) bulunmaktadır. Bu konutlarda mutfak ayrı olarak tanımlanmadığından, mutfağın yemek odasının içinde yer aldığı varsayılmıştır. Bazı konutlarda K.N.=*Kochnische* (yemek pişirme nişi) bulunmaktadır. Bu uygulama, binanın inşa tarihinden kısa süre önce Schütte-Lihotzky tarafından önerilen mutfak işlerinin oturma odası+mutfaktan ayrılarak, bir mutfak nişi veya bulaşık yıkama yeri ile donatılması fikrini yansıtmaktadır. Yüksek kütlede birinci katta terasa açılan konutlar da I. tip özelliklerini taşımakta olup, aynı gruptaki diğer konutlardan bu yönüyle ayrılmaktadır (Resim 17).



2. *The Architecture of Red Vienna* başlıklı kitabın 13. dipnotunda referans gösterilmeden 22 adet dükkan bilgisi verilmiştir (Blau, 1999, 253).

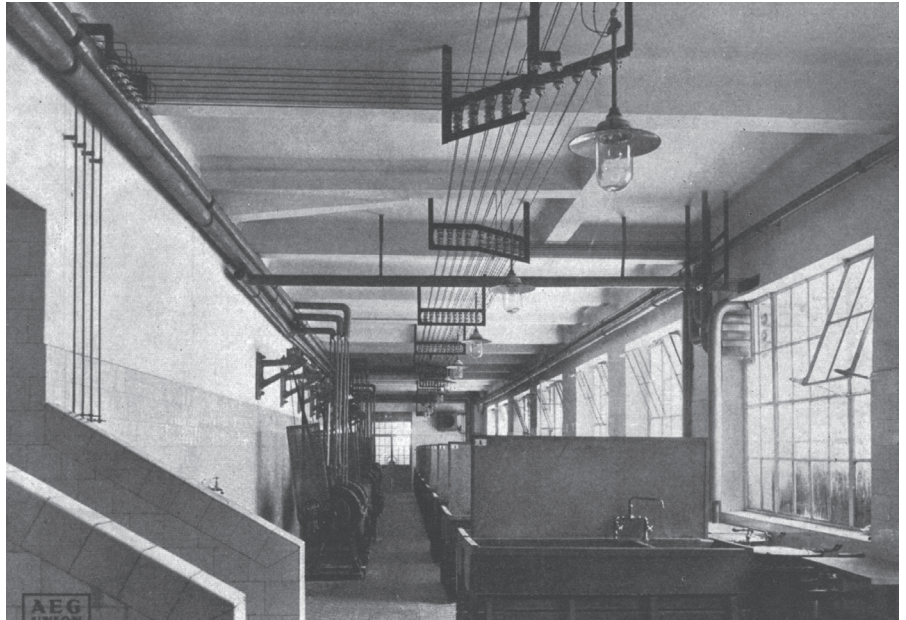
Reumannhof'ta antre, tuvalet, mutfak ve iki odadan oluşan özel veya ortak balkon ve/veya çıkmaya sahip, konfor düzeyinin en yüksek olduğu III. tip konutların ağırlıklı olarak uygulandığı gözlemlenmektedir.

1923'teki 25.000 konut inşası programında belirlenen sosyal konut tipleri ile Reumannhof konutları arasında önemli benzerliklerin bulunduğu, plan tipleri ve metrekaresi karşılaştırıldığında farklı özelliklerin de olduğu görülmektedir. Standart konutlardan birincisini oluşturan antre, oturma odası+mutfak, tuvalet ve tek odadan oluşan 38 m² büyüklüğündeki konutların, Reumannhof'ta II. tip ile benzerlikleri vardır. İkinci gruptaki bir küçük odanın daha eklendiği 48 m² büyüklüğündeki konutlar ise III. tip ile benzerdir. I. tip, 1923 standartlaşmasında yer almamaktadır. 1922'de inşasına başlanan on bir belediye sosyal konut yapısında standart hale gelen oturma odası+mutfak ve tuvalet, Reumannhof'ta yalnızca II. tipte uygulanmıştır. Tümünde, konut programındaki önerilere uygun olarak mekânlar arasında geçiş, tuvaletlerde havalandırma penceresi, antre ve balkon kullanılması öne çıkmaktadır.

Yapıda konutların dışında 19 dükkân, restoranlar, anaokulu, oyun alanları, etkinlik odaları, kütüphaneler, atölyeler ve teknik donanıma sahip çamaşırhane gibi ortak tesisler bulunmaktadır (Gessner, 1926a, 10; Blau 1999, 253) (2). Dükkânların, Margaretengürtel'e bakan ön bloklarda konumlandırılması, bölgenin sakinlerine de hizmet sunması ve iletişim açısından önemlidir (**Resim 18**).

AVLU VE SOSYAL ALANLARIN TASARIMINDA İDEOLOJİK YANSIMALAR

Reumannhof'un avlularında, belediyenin önerilerine uygun peyzaj düzenlemeleri, pergolalar, kent mobilyaları, iklimlendirme ve bitkiler için havuzlar, çeşmeler yer almaktadır. Merkez avluda, havuzun iki yanında konumlanan aydınlatma direkleri de kırmızı ferforje detayları ve biçimsel özellikleriyle bütünlük sağlamaktadır (**Resim 15, 19**).



Resim 18. Merkezi Çamaşırhane (Gessner, 1926a, 24)



Resim 19. a. Güneydoğudaki blok ve havuz, 1926 sonrası (ÖNB Bildarchiv und Grafiksammlung, Env. Nr. L31.142-C POR MAG) b. Kuzeybatıdaki blok ve havuz (Şule Pfeiffer Taş kişisel arşivi, 2022)

Merkez avluda yapı bloklarının önündeki kare planlı, yalın sütunlu beton pergolalar, konutlarla yarı kamusal alanları sınırlandırmakta ve korunaklı alanlar sunmaktadır (**Resim 20**).

Reumannhof'ta görsel bütünlüğe verilen önemin bir örneği de eşkenar dörtgen formunun, demir kapılar ve zemindeki ızgaralarda uygulanmasıdır (**Resim 21a**). Yapıdaki blok numaralarını gösteren tabelalar el üretimi seramikten yapılmış, bloklar arasındaki geçişlere, duvarlara veya kapıların üzerine yerleştirilmiştir. Rakamlar ve süslemelerde kırmızının kullanılmasıyla dikkat çeken tüm seramiklerin imalatı, *Wiener Kunstkeramische Werkstätte*'de (Viyana Sanatsal Seramik Atölyesi) gerçekleştirilmiştir (Gessner, 1926a, 25) (**Resim 21, 22**). Böylece dönemin ideolojisinin üretim ile bağlantılı olarak da yansıdığı görülmektedir.

Kuzeybatıdaki avluya geçiş kapısı, Gessner'in tasarladığı sırlı seramiklerle çevrelenmiştir. Kapının sağ ve sol yanındaki seramik panellerdeki sol üstten başlayarak mühendis, marangoz, çilingir, boya/badana ustası, duvar ustası, madenci, demirci, çatı ustası gibi mesleklerin sembolleri, emekçileri onurlandırmaktadır. Seramik kaplı lentonun üstünde, iç içe geçmiş üçgen bezemelerin aralarında konumlandırılmış bir dizi zambak motifi Hristiyan sosyal demokratları simgelerken, lentonun üzerindeki dikey parçalardan oluşan seramik panelin iki ucunda birer seramik meşale formu ise sosyal demokrat ideolojiye atıfta bulunmaktadır. Bunların üstündeki üçgen bir alınlıkla sonlandırılmış seramik inşa yazıtı, Reumannhof'un 1924-1925 yıllarında konut vergileri ile yapıldığını, Viyana Belediyesi İmar İşleri yönetiminde, Gessner tarafından tasarlanarak uygulandığını belgelemektedir. Yazıt, Viyana Belediye Başkanı Karl Seitz'in beraberinde belediyede görevli meclis üyelerinin de isimlerini içermektedir: Mali İşlerden Sorumlu Hugo Breitner, İnşaat İşleri için Franz Siegel, Konut İşlerinden Sorumlu Anton Weber yazıtla onurlandırılmıştır (**Resim 22**).

Avlular arası geçişlerde ve Margaretengürtel'e açılan site girişinde sarkıt aydınlatma elemanları, hava karardıktan sonra da güvenli geçiş yolları sunmaktadır. Altıgen ve sekizgen biçimlerinin temel alındığı



Resim 20. Merkez avludaki pergolalar (Şule Pfeiffer Taş kişisel arşivi, 2022)

aydınlatmaların tasarımı, tavanlardaki bezemeler, ferforjeler, alınlıklar ve çıkmaların çizgisel hatları bütünlük oluşturmaktadır (Resim 23).

Yapının kuzeybatı ve güneydoğusundaki avlularda peyzaj alanları, banklar, saksılar ve birer adet havuzlu beton çeşme bulunmaktadır. Altıgen beton saksılarda, seramiklerdeki stilize edilmiş motifler yine ideolojik bir gösterge olarak karşımıza çıkmaktadır (Resim 24).

Motiflerin, zambak ya da meşale ateşinin geometrik bir yorumu olabileceği düşünülmektedir. Burjuva kültürünü eleştiren ve sosyal demokrat parti üyeleri tarafından benimsenen derginin ismi *Die Fackel* (Born ve Lambert, 2020, 696), meşale anlamındadır ve logosunda da meşale figürü bulunmaktadır. Dergi, Karl Kraus'un editörlüğünde 1899'dan itibaren 39 yıl boyunca yayımlanarak, Avusturya toplumundaki olayları ve günlük basını eleştirel bir yaklaşımla ele almıştır. Yapının temsil ettiği



Resim 21. Kuzeybatı yönündeki avlular arası geçiş a. Ferforje kapı ve zeminde ızgara b. Tavan ve aydınlatma ayrıntı c. Sekizinci blok kapısı (Şule Pfeiffer Taş kişisel arşivi, 2022)



Resim 22. Kuzeybatıdaki avlu geçiş kapısı seramikleri (Şule Pfeiffer Taş kişisel arşivi, 2022)



Resim 23. a. Merkez ve güneydoğu avlu arası geçiş b. Güneydoğu yönündeki avlu (Şule Pfeiffer Taş kişisel arşivi, 2022)



Resim 24. Saksılardaki ve seramiklerdeki motifler (Şule Pfeiffer Taş kişisel arşivi, 2022)

sosyal demokrat yaşam biçimi ile derginin uyumlu olması, motiflerin sosyal demokratların ve Hristiyan sosyal demokratların simgesi olarak kullanıldığını göstermektedir. (Resim 25).

Çalışan kadınların çocukları için güvenli ortamlar yaratarak kadın istihdamına katkı sağlamak için önemli bir unsur olan anaokulu, Reumannhof'ta da bulunmaktadır. Anaokulu girişinin iki tarafındaki Max Krejca tasarımı (Gessner, 1926a, 10, 25) oyun oynayan çocukların heykelleri ideolojik bir yansımadır (Resim 26).

Yapının tasarımında atık yönetiminin düzenli biçimde sürdürülmesi için de tanımlı alanlar yaratılmıştır; güneybatıda Margaretengürtel'de çöp kutuları konumlandırılmıştır. Ana cadde üzerinden çöp arabalarıyla erişimin ve etrafının açık bırakılarak doğal havalandırılmanın sağlandığı, çatı örtüsü ile hava koşullarından korunaklı, sağlıklı ve işlevsel bir alan tanımlanmış olması günümüzde de kullanım konforu sunmaktadır (Resim 27).

Sunulan veriler, Reumannhof'un ideoloji, mimarlık ve sanat bağlamında kent belleğindeki yerini göstermektedir.

Resim 25. Die Fackel Dergisi (1899) 3. Sayı, Kapak ve İç Sayfalardan Görünüm (Die Fackel, 1899, AAC - Austrian Academy Corpus, Österreichische Akademie der Wissenschaften ÖAW)



wir ihn allmählich zum selbständigen Arrangement größerer Feste emporreihen. Heute fungiert er bei Blumen-corsos als Berater der Fürstin Metternich und vor Gräbern vertritt er seit längerer Zeit die »Concordia«, die sich ihn neustens sogar zu ihrem Präsidenten erwählt hat. Überall, wo sich das gesellige oder das geistige Wien zu besonderen Veranstaltungen einigt, tänzelt Herr von Spiegl, Ceremonienmeister der Wiener Seichtheit, voran, und die fremden Dichter, die in unserer Stadt gewieilt, tragen die Erinnerung an einen kleinen echauffierten Herrn von hier fort, der ihnen mit den Gesten eines Coillon-Arrangeurs den Willkommenruß der deutsch-österreichischen Kunst entboten hat.

So sehen wir, dass die Carrière, die Herr U. A. einschlägt, ihn zuweilen in einer repräsentativen Lebensstellung landen lässt. Ich hätte mich, wenn dies nicht der Fall wäre und wenn sich nicht Dank dem liberalen Wohlwollen der Wiener Presse unsere Mitesser und Mitgeher zu einer socialen Gefahr auswüchsen, mit dem Typus nicht beschäftigt. Wer sich vom Pokertisch wegschneht und lieber gleich alle Literatur- und Kunstplätze besetzen möchte, wer dem Publicum, das von ihm nichts weiß und nichts wissen will, täglich von neuem sich aufdrängt, wer allerorten u. a. anwesend sein möchte, der muss es sich auch gefallen lassen, einmal u. a. abgefertigt zu werden. Vielleicht führt der amerikanische Humorist, der alles, was in Wien bemerkt werden will, nach und nach zurückgedrängt hat, eine endgiltige Reinigung der Wiener Zeitungsspalten herbei; dann sei der Tag seiner Ankunft gesegnet und alle Qual und alle Belastigung der »deutschen Sprache« vergessen. Kein Zweifel, den bereits — Anwesenden kam Herr Mark Twain sehr ungelogen. Sie mögen eine Protestversammlung gegen ihn einberufen, damit wenigstens noch einmal in den Zeitungen so schön geschrieben stehe: Anwesend waren u. a. . . .



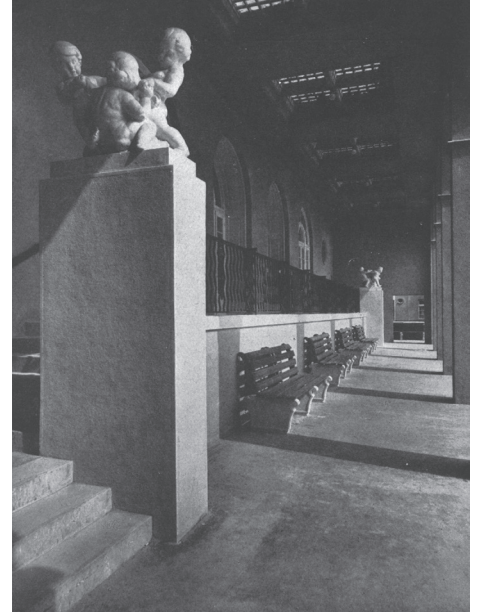
etwas wie ein Reichsrath, in dem sie »vertreten« seien, vorkommen. Nun gibt es schon seit längerem keinen solchen Reichsrath. Der Österreicher hat zwar ein Vaterland, »er liebt's und hat auch Ursache«, es zu lieben, aber er ist in Verlegenheit, es zu benennen. In Zeiten, da die Gesetzgebung von den Kundgebungen der Parteien abgelöst ist und alles von der Stilisierung eines Communiqués abhängt, sei darum dem Patrioten, der doch endlich wissen will, was er eigentlich liebt, als prägnantester Name empfohlen: »Die von den Herren Mendel Singer und Penizek journalistisch vertreteneu Königreiche und Länder.«



Uneingeweihte wissen, dass die Regierung eine große Action zur Hebung des österreichischen Actienwesens plant. Und so oft die »Reform« einen ihrer tippischen Schritte nach vorwärts hat, schwelte Frühlingsahnen von einer neuen Gründungsschwindel-ära die Brust unserer M. Bauer und Tausig.

Das neueste in dieser Action, die durch ein banales Exposé und ein scheinwissenschaftliches, in Deutschland nicht wenig belächeltes Questionnaire eingeleitet war, ist ein höchst bezeichnender Rückzug. Wir sollen kein Gesetz bekommen, sondern ein Regulativ. Es sollen nicht gesetzlich die Bedingungen festgelegt werden, von denen die Gründung und der Fortbestand der Actiengesellschaften abhängt; ihre Rechtsverhältnisse sollen nicht codificiert, sondern es soll das alte Concessions- und Aufsichtssystem beibehalten werden. Dagegen wird die Regierung, sich selbst bindend und doch wieder nicht bindend, ein- für allemal verkünden, unter welchen Bedingungen die Bildung und den Fortbestand von Gesellschaften duldet. Sie wird vorschreiben, wie das Statut beschaffen sein muss und welche Rechte statutarisch — nicht gesetzlich — den





Resim 26. a. Anaokulu ve bekleme alanı
b. Anaokulu girişindeki heykeller (Gessner, 1926a, 15, 16)



Resim 27. Merkezi avludan güneydoğudaki atık toplama alanı (Şule Pfeiffer Taş kişisel arşivi, 2022)

SONUÇ

Reumannhof'taki mimari ve sanatsal uygulamaların ideoloji ile ilişkisini kurabilmek için dönemin siyasi ve sosyo-ekonomik koşulları, mekânsal pratik, mekânın temsili ile bağlantılı olarak yapılan araştırmada, kullanıcının refah düzeyinin artırılmasına yönelik hedeflere ulaşıldığı görülmüştür. SDAP'nin politik yaklaşımı ve sosyalist bir toplum oluşturma ideolojisinin barınma, refah, eğitim ve kültür alanlarındaki yansımalarının belirgin olduğu gözlemlenmiştir.

Endüstri devrimiyle birlikte, yoğun işçi göçü Viyana'da barınma ihtiyacının artmasına ve Birinci Dünya Savaşı'nın tahribatı yetersiz konut kapasitesinin daha da düşmesine neden olmuştur. 1900'lerin başlarında işçi ailelerinin çoğunlukla 30 metrekarelik tek oda veya kısmen saatlik yatak kiraladıkları, apartmanların koridorlarındaki su tesisatı ve tuvaletleri ortak kullandıkları, doğal ışık ve güneşten yeterince faydalanamadıkları görülmüştür. Barınma koşullarını iyileştirmek için belediye sosyal konut programında hazırlanan ilk önerilerde "oturma odası+mutfak" ile en az iki odanın olması, temiz hava, gün ışığı, elektrikli aydınlatma, gaz ve su tesisatı, merkezi ısıtma sistemi sağlanmasının yanı sıra, mutfak tezgâhı, dolap vb. işlevsel

donanımlar ve konut içinde veya ortak tesislerde yıkanma alanlarının yapılmasının gerekliliği vurgulanmıştır. Temiz hava, doğa ve güneş ışığından daha çok faydalanmak için avlularda peyzaj düzenlenmeleri, dinlenme ve oyun alanları planlanması da öneriler arasındadır.

Hubert Gessner tarafından 1923-1924 yılında son hali verilen, Metzleinstalerhof'taki yenilikler, belediye sosyal konut bloklarında standart hale gelmiştir. Bu standartlaşmaya göre, mekân boyutları, ortak ve kamusal alanlar, mimari detaylandırma farklılaşsa da üç tip konut inşa edildiği görülmektedir; oturma odası+mutfak ve tuvalet hepsinde vardır; bir oda, iki oda veya bir oda ve bir küçük oda olarak farklılık göstermektedir. Bazı konutlarda antre, bulaşık yıkama alanları veya balkon da bulunmaktadır. Tuvalet dâhil tüm mekânlarda gün ışığından faydalanma ve havalandırma sağlanması, tavan yükseklikleri 260 cm'ye düşürülerek, daha ekonomik ısıtma amaçlanmıştır. 1923'te belediye iki tip konut standardı koymuştur; ilki, antre, oturma odası+mutfak, tuvalet ve bir odadan oluşan 38 m² ve ikincisi ise bir küçük odanın daha eklendiği 48 m² büyüklüğündeki konutlardır.

Reumannhof'un tasarımında da bu standartlaşmanın büyük oranda uygulandığı, ancak bazı konutların daha büyük tasarlandığı tespit edilmiştir. Yapıda I, II, III olarak adlandırdığımız üç ana konut tipi uygulanmıştır. En çok uygulanan ise en konforlu olan III. konut tipidir. Ekonomik, pencere, çıkma, balkon ve teraslarla güneş ışığı ve temiz havaya erişim sağlayan, içinde ısıtma, su tesisatı olan konutların, 25-60 m² arasında büyüklükte, tavan yükseklikleri düşük, hepsinde antre, tuvalet bulunduğu, bir ya da iki oda ve mutfak/yemek pişirme nişi veya oturma odası+mutfak gibi seçeneklerle sunulduğu görülmektedir. Reumannhof'ta, 1922'de Schütte-Lihotzky tarafından tasarlanan, daha sonra *Frankfurter Küche* olarak tanınacak olan mutfak modelinin uygulanmış olması yenilikçi bir çözümün göstergesidir; pişirme ve ısıtma işlevi olan merkezi soba, az sayıda yemek pişirme nişi bulunmaktadır. Tüm konutlarda doğrudan gün ışığı alan antre ve tuvalet bulunurken, mutfak veya oturma odası+mutfak seçeneği, oda sayısına ve balkon ya da çıkma olup olmadığına göre farklılık göstermektedir. Üçgen planlı pencereli çıkmalar yan cephelerde doğudan ve batıdan gün ışığının konutlara daha fazla girmesini sağlamaktadır. Yüksek kütleli en üst katında kent manzarasının seyredilebileceği teraslar, sosyal demokrat ideolojinin yansıtıldığı, işçilerin refahını artırıcı uygulamalardan birisidir.

Belediyenin belirlediği ilkelere uygun olarak kamusal ve özel alanlara giriş, demokratik toplumun vatandaşlarına kendi ihtiyaçları ve isteklerine göre şekillenebilen bir kent fikrinin de yansımaları olan, yeşil ve sosyalleşme alanları sunan merkez ve yan avlular üzerinden kurgulanmıştır. Dükkânlar, anaokulu, restoranlar, açık ve kapalı oyun alanları, etkinlik odaları, kütüphaneler, atölyeler ve karşısındaki Haydnpark, dinlenme, oyun, sosyalleşme ve spor olanakları ile sosyal demokrat ideolojisinin yansımalarıdır. İşçi ailelerinin çocuklarını güvenle bırakabilecekleri, yeşil alanlarla iletişim halinde konumlandırılan anaokulu, yaşam koşullarını iyileştirmenin yanında eğitime verilen önemi de göstermektedir. Anaokulunun önündeki oyun oynayan üç çocuk heykeli ideal mutlu aile imgesini ve devinimi temsil ederek sosyalist düşüncenin sanat yoluyla gelecek kuşaklara aktarımına hizmet etmektedir. Ortak çamaşırhane, konutlarda zor koşullarda gerçekleştirilen çamaşır yıkama işlerini çözüme ulaştırarak yaşam koşullarını iyileştirmeye yönelik uygulamalardan biridir.

Reumannhof'un mimari ve peyzaj özellikleri, minimal düzeyde kullanılan kemerler, sütunlar, silmeler, alınlıklar vb. ile desteklenen vurgu, saraylara özellikle de Barok dönem propaganda yapısı Schönbrunn Sarayı'na gönderme yaparak, sosyalist ideolojiyi temsil eden modern bir anıt olarak işçi sınıfının ihtişamını ve gücünü temsil etmektedir. Yapı, malzeme, mekân organizasyonu ve kütle biçimlenişinde işlevsellik, yalnlık, yenilikçilik gibi özellikleriyle, modernizme geçişi de belgelemektedir. Yapının ismi ve işçi kesiminin yaşadığı bir bölge olan Margaretengürtel'de konumlandırılması, dönemin ideolojik yaklaşımıyla doğrudan bağının ilk göstergeleridir. Mimari ile ideolojinin kesişimi, iktidardaki Hristiyan sosyal demokratların zambak ve sosyal demokratların meşale ve kırmızı renk ile temsil edildiğini göstermektedir. Kuzeybatıdaki yan avluya geçiş kapısındaki sırlı seramiklerde, yapıya katkıda bulunan mimar, politikacı vb. isimler ölümsüzleştirilerek meslek dallarını temsil eden semboller ile zanaat ve emeğe verilen önem vurgulanmıştır. Sonraki dönemlerde de parti seçim filminin burada gösterilmesi, 2. İşçi Olimpiyatları'nda sporcuların burada ağırlandığı basında geniş yer alması gibi unsurlar da yapının ideolojik temsilinin yansımalarıdır.

Reumannhof, hâlâ yoğunlukla işçi veya işçi ailelerinin yaşadığı konut işlevini sürdürmektedir. 2011'de Reumannhof'taki yaşam kalitesine yönelik araştırmada; site sakinlerinin mimari, güvenlik, kira bedeli, peyzaj, açık alanlar, komşuluk ilişkileri ve toplu taşıma ile ulaşım açısından memnuniyetlerini; tesisin temizliği ve engelliler için erişilebilirlik konularında ise eksiklikleri dile getirdikleri bilgisine ulaşılmıştır (Sassik, 2011, 102, 103, 109, 110). 2022'de *Der Spiegel* Gazetesi'nde Reumannhof'un sakinleri ile gerçekleştirilen röportajda, hâlâ uygun fiyatlı konut imkânı sunulduğu belirtilmiştir (Petter, 2022). Yapı, ismini aldığı Reumann'ın politik kimliği ile birlikte Kızıl Viyana dönemi ideolojisinin mimarlık ve sanat aracılığıyla aktarıldığı güçlü bir simge olarak karşımıza çıkmaktadır.

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RED VIENNA: IDEOLOGY, ARCHITECTURE AND ART IN THE REUMANNHOF MUNICIPAL SOCIAL HOUSING

This study focuses on the Reumannhof Social Housing Complex, which was designed by Hubert Gessner (1871-1943) and constructed between 1924 and 1926 in Vienna. It was one of the largest buildings as part of the Municipal Social Housing Program for workers implemented under the leadership of Jakob Reumann, who was the mayor of Vienna between 1919

and 1923. According to the social democratic ideology in Vienna, known as the Red Vienna period (1919-1934) of the city administration, this program aimed to meet the housing needs of the working class and to provide them with better living conditions. Due to the increase in worker migration to the city after the Industrial Revolution and upon the demolition of the city during World War I, a housing crisis emerged in Vienna and unfavorable living conditions - such as one-room apartments and rental beds even for a few hours - became a necessity. The paper attempts to probe into the nature of the connection between the Reumannhof Complex architecture and the Red Vienna ideology in light of the social democratic perspective of the working class. In order to do so, the entire structure - known as "the palace of the working class" - is analyzed in detail while pointing to similar social housing complexes, such as Metzleinstalerhof on the Margaretengürtel known as "Proletarian's Boulevard" and nearby. Additionally, the standardization criteria, as envisioned within the context of the social housing program, are examined to find out any traces of their presence (or improvements/modifications upon them) in the Reumannhof Complex. In the context of the political and socio-economic conditions of that era, a comparative analysis of the architectural elements and landscape architecture is conducted, such as courtyards and Haydnpark on the front in the latter case. Original archival documents, photographs, and drawings of the complex were collected and during the course of the field research, photographs were taken.

A housing typology and drawings were made in accordance with the general floor plan of the building, drawn by Gessner himself to determine the details related to the features of the houses - such as kitchen, living room+kitchen, and the number and function of the rooms - in order to determine the reflection of the living comfort promised by the social democratic ideology. As a result, three main plan types were identified based on the spaces contained within the houses, and subgroups were created according to balconies, terraces, or bay windows, all of which provided daylight and fresh air. In conclusion, the research establishes that the Reumannhof Complex houses, common facilities as terraces, infant school, laundry rooms, etc. all implemented standards that were mostly aligned with those related to welfare and in line with the principles of social democratic ideology. Lastly, it is revealed that architectural and artistic elements, such as wrought iron, ceramic panels illustrating craftsmen and different professions, motifs, and sculptures, not only reflect the social democratic ideology and motto, but also create new living environments by integrating architectural design with green spaces for the working class. As witness to this assertion, it is useful to notice that the complex still serves the function of economic housing for the working class and remains important as a symbol of social democratic ideology.

KIZIL VİYANA: REUMANNHOF BELEDİYE SOSYAL KONUTLARINDA İDEOLOJİ, MİMARLIK VE SANAT

Bu çalışma, Hubert Gessner (1871-1943) tarafından tasarlanan ve 1924 ile 1926 yılları arasında Viyana'da inşa edilen Reumannhof Sosyal Konut Binası'nın araştırılmasına odaklanmaktadır. Yapı, 1919-1923 yılları arasında Viyana Belediyesi Başkanı olan Jakob Reumann önderliğinde işçiler için geliştirilen belediye sosyal konut programı kapsamında inşa edilen öncü ve en büyük uygulamalardan biridir. Program, Viyana'da iktidarda olan sosyal demokrat ideoloji doğrultusunda, Kızıl Viyana dönemi (1919-

1934) olarak bilinen kent yönetiminin, işçi sınıfının konut ihtiyaçlarını karşılamayı ve onlara daha iyi yaşam koşulları sağlamayı amaçlamıştır. Sanayi Devrimi sonrası kente işçi göçünün artması ve I. Dünya Savaşı sırasında kentin var olan konutlarının da tahrip olmasına bağlı olarak Viyana’da bir konut krizi ortaya çıkmış ve tek odalı evler veya birkaç saatliğine kiralanarak yataklar gibi elverişsiz yaşam koşulları bir zorunluluk haline gelmiştir. Bu makale, Reumannhof Binası’nın mimarisi ile Kızıl Viyana ideolojisiyle ilişkisini, sosyal demokrat görüşün işçi sınıfına vaat ettiği refahın temsiliyeti doğrultusunda incelemeyi amaçlamaktadır. Bu kapsamda, “işçi sınıfının sarayı” olarak bilinen ve Barok dönem yapısı Schönbrunn Sarayı’na göndermeler içeren yapı detaylı bir şekilde analiz edilirken, “Proletaryanın Bulvarı” olarak adlandırılan Margaretengürtel üzerinde ve yakın çevresindeki Metzleinstalerhof gibi benzer sosyal konut binalarına da değinilmiştir. Ayrıca, sosyal konut programı bağlamında öngörülen standartlaşma kriterleri incelenerek, Reumannhof’ta bu kriterlere yönelik uygulamaların (veya iyileştirmelerin/değişikliklerin) bulunup bulunmadığı araştırılmıştır. Dönemin politik ve sosyo-ekonomik koşulları bağlamında, refah düzeyini iyileştirecek çözümler sunan mimari tasarım, anaokulu, çamaşırhane vb. ortak kullanım alanları, avlular ve yapının önünde düzenlenen Haydnpark gibi yeşil alanlarla ilgili özgün yazılı ve görsel arşiv belgeleri, saha araştırması sırasında çekilen güncel fotoğraflarla birlikte değerlendirilerek karşılaştırmalı analizi yapılmıştır. Gessner tarafından çizilen genel kat planı esas alınarak, konutların mutfak, oturma odası+mutfak, oda sayısı ve işlevi gibi özellikleri incelenerek konutların tipolojisi oluşturulmuş, böylece sosyal demokrat ideolojinin vaat ettiği yaşam konforunun yansımaları sorgulanmıştır.

Sonuç olarak, konutların içerdiği mekânlar doğrultusunda üç ana konut tipi belirlenmiş, doğal ışık ve temiz havaya ulaşım sağlayan balkon, teras veya çıkma kullanımına göre alt gruplar oluşturulmuştur. Sosyal demokrat ideolojinin ilkeleri ve refah düzeyini artırmayı hedefleyen standartların, Reumannhof konutları ve teraslar, anaokulu, çamaşırhaneler gibi ortak tesislerinde çoğunlukla uygulandığı tespit edilmiştir. Yapıda, zanaatkârları ve farklı meslek gruplarını temsil eden seramik paneller, motifler ve heykeller gibi mimari ve sanatsal unsurların yalnızca sosyal demokrat ideolojiyi ve simgelerini yansıtmakla kalmayıp, aynı zamanda mimari tasarımı yeşil alanlarla bütünleştirerek işçi sınıfı için yeni yaşam ortamları yarattığı ortaya konulmuştur. Yapının hâlâ işçi sınıfı için ekonomik konut işlevini yerine getirmesi ve sosyal demokrat ideolojinin bir sembolü olarak önemini koruması çalışmada elde edilen bulguları desteklemektedir.

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A CASE STUDY ON THE URBAN SKYLINES OF ISTANBUL: DIMENSIONS OF VISUAL COMPLEXITY WITH FRACTAL ANALYSIS (1)

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INTRODUCTION

Cities, like any globalized phenomenon, undergo continuous transformation to accommodate evolving human needs. Each city possesses a distinct geographical appearance by its unique morphological structure. This complex structure mirrors the interaction among its constituent elements, a manifestation influenced by numerous socio-economic processes, both natural and man-made, which are limited and shaped (Attoe, 1981; Kostof, 1991; Lynch, 1990). Consequently, the resultant outcome becomes integral to the morphological evolution of the city landscape. Such settlements exhibit regular and irregular morphological configuration, constantly evolving within their spatial confines. As part of this evolutionary trajectory, cities may alter their boundaries over time and space, leaving imprints on their morphological structures (Ford, 1994). Structural change mainly manifest along two axes: vertical and horizontal. Vertically, there is a trend towards towering structures ascending skywards, while horizontally, urban sprawl defines the extent of spatial occupation.

An effective approach to interpreting the geography of cities and understanding the ramification of these dual processes lies in analyzing their appearance (Van Cleef, 1932). In other words, examining city silhouettes offers a straightforward method of identification (Heath et al., 2000). The skyline, punctuated by towering skyscrapers, minarets, spires, and other structures attest to the artificial elements that shape the appearance of cities (Booth, 2012). In addition to man-made elements, natural elements interact with the cityscape, reflecting the characteristics of the geographic environment in which a city resides. Present-day cities, unlike in the past, marked by technological enrichment, organizational structure, and architectural diversity, notably embodied by the construction of skyscrapers, have contributed to the emergence of different urban appearances and complexities that cities exemplify (Abu-Ghazalah,

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2007; Çobanlı and Ceylan, 2023; Gottmann, 1966). The more complex cities are in spatial terms, the more complex their skyline profiles are (Akdağ Girginkaya and Bostancı, 2013).

Yet, there is no consensus on the factors (for example, shapes, geometries, patterns, and structures) defining the complex appearance of cities, leaving to diverse studies of cities at different scales and with varied definitions and approaches. One point of divergence is city skyline profiles, or urban cardiograms, which are integral to urban morphology, reflecting cities' dynamics and constantly evolving structure (Bostancı, 2021; Gassner, 2009). The evolving manifestations of urban areas, contribute to this divergence. Despite numerous urban/city studies, few have underscored visual assessment, cityscape character, and structure. Since visual narratives such as panoramic views and city skylines shape contemporary city definitions, the components of urban landscapes are also studied within the framework of visual landscape assessment (Perihan and Aşur, 2020). In planning and design studies, "visual quality" significantly defines landscape components or their structure (Asur and Alphan, 2018). It encompasses various factors such as attractiveness, readability, comprehensibility, harmony, naturalness, complexity, and aesthetics (Ateş and Kiper, 2023; Bulut and Acar, 2017; Kiper et al., 2017; Daniel, 2001; Nadal et al., 2010; Nasar and Terzano, 2010; Ode et al., 2010; Forsythe, 2009; Tveit et al., 2006; Ulrich, 1986).

Complexity, as a vital component of visual quality, influences visual assessment since it entails the amount, diversity, configuration, and interrelationship of various elements, in a landscape (Kalın, 2004). One of the most debated aspects of urban appearance is visual complexity. While the complex structures and appearances of cities are sometimes considered problematic, there is no consensus on when cities attain complexity (Oku, 1990). It is within this discourse that fractal geometry emerges, exploring the complexity of natural and everyday objects for decades. The emergence of fractal geometry represents a significant shift in understanding the complex structures of cities (Batty and Longley, 1994). This geometry not only introduces cities to a mathematical dimension but also provides a viable framework for measuring spatial elements. It aids in understanding order and regularity within seemingly irregular or disordered parts. With a structure that allows us to explore the functions and processes shaping natural and man-made structures, fractal geometry refines our understanding reality more precisely.

Studies on the fractal geometry of skyline profiles has addressed several key areas. Firstly, it has focused on developing new methods for deriving horizon profiles for fractal analysis (Ayadi et al., 2016; Chalup et al., 2009; Chiu et al., 2016; Cooper, 2003; Hagerhall et al., 2004; Keller et al., 1987; Martinez-Sanchez et al., 2022; Stamps, 2002; Wang, 2016; Yang et al., 2024). Secondly, it involves evaluating the complexity and aesthetics of skyline profiles from a human perception standpoint (Oku, 1990). Thirdly, it includes interdisciplinary studies connecting skyline profile to other city components (Akbarishahabi, 2021; Cooper and Oskrochi, 2008; Cooper, 2005). The main challenge with these visual morphology studies lies in the lack of specific standardization. There is no consensus acquiring skyline profiles, considerations during their derivation, and the perspective and distance for observing profile that influences their shape and context. This complexity arises from cities being visual representation of numerous urban components that reflect their complex nature.

Like many other cities worldwide, Istanbul has evolved uniquely on account of its geographical structure. Particularly in the last two decades, it has undergone significant changes, influenced by neoliberal policies and globalization dynamics. This transformation process has altered and introduced new form on the city in addition to its historical appearance, significantly altering its skyline. The changes in urban space during the transformation process have produced new spatial contexts in the city (Görgülü and Kaymaz Koca, 2009). In particular, the increasing number of high-rise buildings has been a major factor in this transformation, rapidly changing Istanbul's geographical appearance profile within its fast-growing urban ecosystem. Over time, the architectural enrichment of the city has also changed its appearance. The skyline of Istanbul is now characterized by towers, mosques, historic buildings, modern structures, skyscrapers, and natural features. In this regard, the research aims to assess the extent to which these elements contribute to the complexity of Istanbul's skyline. Therefore, this study evaluate the visual morphological complexity of sky-level horizon lines that reduce the urban appearance to a single line in the case of Istanbul and to identify the structural elements shaping the city's appearance. Thus, the study contributes to the growing research on fractal analysis of urban skyline profiles and adopts a new approach. Istanbul serves as a case study, offering insight into the complex and dynamic nature of skyline profiles. Using skyline drawings from panoramic views taken from Beyazıt Tower were divided into equal cells for analysis. The analysis process compares the values of fractal dimensions to focus on the complexity levels of the structural elements that affect cell appearance, objectively demonstrating their impact on the urban skyline.

METHOD AND MATERIAL

In this study, current photographs of Istanbul, captured from the Beyazıt Fire Tower, were used to measure the fractal dimension of its urban skyline (**Figure 1**). Photographs, widely utilized in skyline and visual landscape studies, serve as the primary data source (Polat, 2022). The utilization of these data sources typically centers around two focal points: street-level imagery and sky-level imagery. This dichotomy emerges from the different perspectives through which the visual landscape can be perceived or modeled: the human (place) perspective, reflecting how people typically experience their surroundings (walking, standing, etc.), and the aerial perspective, projecting the landscape vertically from above (Misthos et al., 2023). Factors such as the size, depth, and clarity of the visible area informed the choice of the focal point. The Beyazıt Fire Tower was selected as a reference point in the study because of its unobstructed view of the relevant urban center of Istanbul and its elevated position, which makes it easy to have a comprehensive perspective of the cityscape.

The skyline drawings used in the study represent the outlines of the points where all natural and man-made elements in the urban space meet the sky (Hagerhall et al., 2004). All components, such as electricity poles, trees, antennas, flags, minarets, chimneys, and tower cranes, identified in the landscape as seen in the photograph are included in the skyline. Seven separate photographs, each with a resolution of 6000x4000 pixels, were used for generating horizon line drawings in the study (**Figure 1**). These silhouette drawings were created using Adobe Illustrator, a vector graphics editing software (**Figure 2**). The obtained photographs were processed in ImageJ software to prepare them for analysis, ascertaining



Figure 1. Sources of data used in the study

Figure 2. Process of creating city skyline profiles

data readiness (**Figure 3**). Within the scope of the study, 29 different horizon line drawings were created by segmenting the drawn horizon line profiles into uniform parts based on pixel values. To calculate the fractal dimension of the horizon line, ImageJ digital imaging software and the FracLac fractal analysis plugin were utilized to analyze the skyline profiles (Karperien, 2015; Schneider et al., 2012). Unlike other programs,



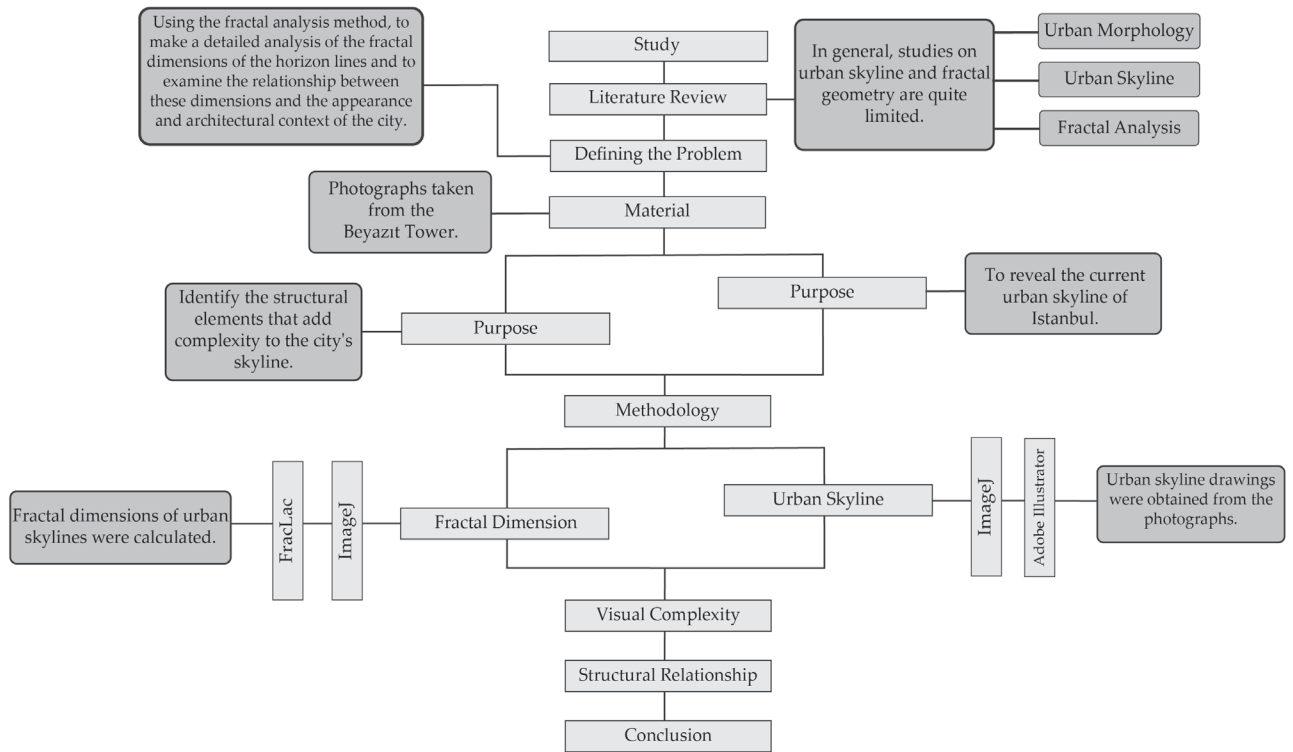


Figure 3. Study workflow

ImageJ offers several advantages for fractal analysis, featuring a user-friendly interface that accelerates the analysis process. Functions such as photo conversion to black and white (binary) format, background definition, and designing properties associated with the analysis process, are facilitated. Fractal analysis was performed using the box-counting method, well-suited for analyzing complex textures with varying degrees of self-similarity in studies of silhouette profiles across different scales (Oku, 1990). This mathematical technique is commonly used to measure the fractal dimension of horizon profiles (Chalup et al., 2009; Stamps, 2002; Cooper, 2003). Several factors including the black and white area, image position, line thickness, and image quality may affect the calculation process in the box-counting method. To rectify these, the available data were standardized before analysis (Ostwald and Vaughan, 2013).

The Fraclac plugin utilizes the box-counting method, with the grid scale set as the default sample size and the maximum box size limited to 40% of the horizontal profiles. To increase the results reliability, calculations were conducted at 10 different grid positions. The fractal dimension of horizon profiles was obtained by averaging measurements taken with different box sizes and grid positions. Essentially, the fractal dimension concept involves dividing the horizon into smaller grid boxes and counting the number of boxes intersected by the lines. The fractal dimension is then calculated based on the ratio between the number and the size of the obtained fields. The skyline's fractal dimension is calculated using the formula $DB = \frac{\log N_2 - \log N_1}{\log S_2 - \log S_1}$, where DB represents fractal dimension, N signifies the number of boxes intersected by the skyline, and S denotes the box size. This fractal dimension serves as a metric for the complexity of the skyline; with higher values indicating greater complexity and lower values suggesting less complexity.

THE ESSENCE OF FRACTAL GEOMETRY AND URBAN HORIZON LINES

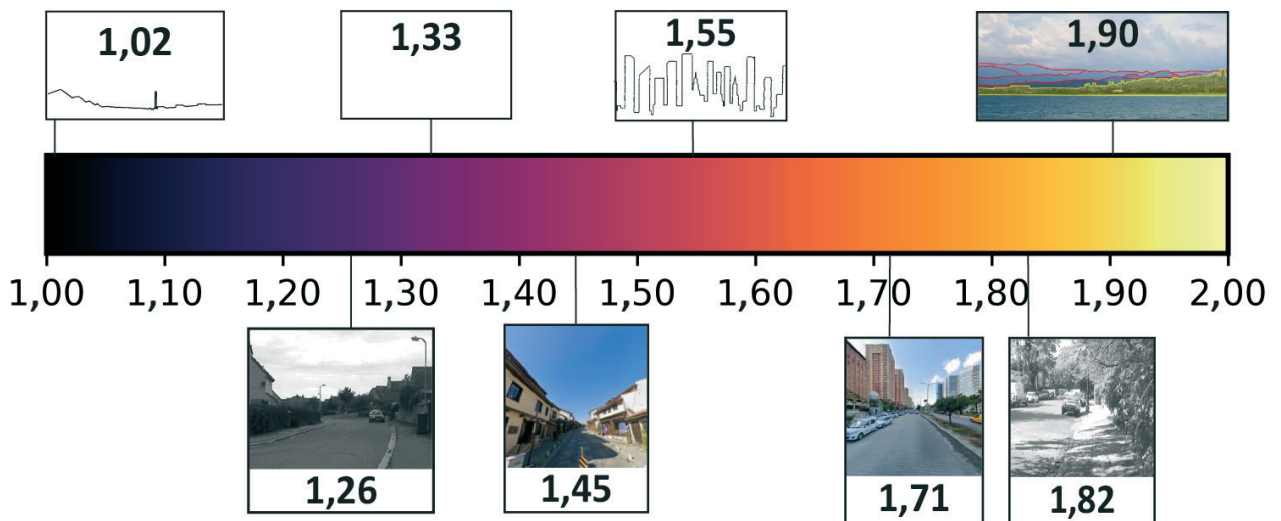
The fundamental understanding of fractal geometry, dating back to Mandelbrot, is based on the idea that while the physical surface of the world seems chaotic, discontinuous, and irregular, underneath lies an organized and infinitely complex order (Mandelbrot, 1989). The term “fractal,” from the Latin verb “frangere,” means broken and irregular (Mandelbrot, 1983). Fractals that closely follow the self-similarity rule at various scales are often observed in natural objects. The fractal dimension (D) allows the degree of irregularity of a shape or entity to be measured and represented, with values ranging between the Euclidean dimensions of one, two, and three. Unlike regular Euclidean shapes like squares and circles with integer dimensions, the non-integer nature of fractal dimension fascinates many mathematicians. The dimension, represented by D, is a fractional number that indicates how much a structure exceeds its base dimension to occupy the next dimension (Hagerhall et al., 2004). In essence, fractal dimension measure how effective an object fills the space it occupies (Cooper, 2003). Accordingly, the fractal dimension of a line ranges from above one to two, while that of a surface extend from two to three. Mandelbrot stated that fractal geometry closely relates to geography, as it involves the mathematical representation of natural features such as coastlines and mountain ranges (Mandelbrot, 1989). Subsequent studies have extended fractal geometry’s application, especially in urban geography since the 1990s (Batty and Longley, 1994). Fractal analysis serves as a mathematical technique that allows for the study of complex systems in urban and natural environments using quantitative measures. At its core, fractal geometry depends on self-similarity, wherein a shape or pattern appears similar across different scales. This concept is often used in urban studies, especially for analyzing systems that shows repetition and self-similarity, like branching patterns in trees or street networks in cities. The application of fractal analysis cuts across various urban research areas, including spatial distribution analysis, comparative studies of urban systems, assessment of urban density and complexity, and evaluation of aesthetic potential.

Fractal geometry finds several applications in urban geography, one of which is the measurement of fractal dimensions of skyline profiles, the focus of this study. While this approach offers a new method for measuring the appearance of cities, it also presents some implementation shortcomings. Regardless of its importance as a tool for assessing the visual complexity of urban landscapes, there is no common theoretical framework across studies. In essence, the development of urban skyline profiles reflects a significant component of both planned and unplanned urban growth, intertwined within spatial and temporal contexts, and visually represented through skyline profiles. The complex nature of skyline structures has made it difficult to understand their shapes, processes, scales, and forms. Fractal geometry offers a solution to this complexity by measuring the fractal dimension of the linear structures that form skyline profiles, taking into account their irregularity and diversity. Unlike traditional geometric approaches that assume regularity and simplicity, fractal geometry provides a better understanding of the complexity and irregularity of urban phenomena. In short, the fractal dimension assessed in this study is a quantitative expression of the irregularity or complexity of urban phenomena.

The horizon line of a city holds significant symbolic meaning, unfolding across generations. The morphological features of the city and the resulting horizon line are tangible reflection of the degree of urbanization. In other words, a city’s appearance, observed in its horizontal line, reflects its organization at a particular time and place, shaped by cultural processes, including social, economic, and political institutions, societal structures, technologies, and the values it holds. These lines, which represent cities, lend themselves to fractal analysis because of their structural characteristics. Fractal dimension serves as a useful tool for illustrating the complexity or roughness of horizon lines. Cities, with their different structures are unique, manifesting self-similar spatial organization. This common feature emerges between horizon lines and fractal geometry, both capturing the complexity and uniqueness of a city. While horizon lines serve as a visual representation of a city’s built environment, fractal dimension presents a mathematical measure of irregularity, roughness, and complexity. This measure allows for the evaluation of various cities and their horizon lines across temporal and spatial scales, enabling the assessment of cities with diverse spatial structures collectively. The relationship between horizon lines and fractal dimension demonstrates the role of mathematics in understanding the complex patterns of urban structures and highlights the importance of interdisciplinary approaches in the study of cities.

The box-counting method utilized in this study produces a fractal value ranging between one and two, indicating the fractal dimension. As this number approaches 1, it indicates the absence of fractal geometry, instead exhibiting simplicity, plainness, and similarity to Euclidean geometry, with low visual complexity. In contrast, as the value approaches 2, the depth and complexity of the features increase. In terms of richness of detail, a final value close to 2 indicates a texture with a highly and complex structure. However, a value close to 1 shows a simpler structure with low complexity (Turan, 2022; Aydın, 2016). In essence, as illustrated in **Figure 4**, the object becomes more complex and detailed as the fractal dimension increases linearly from 1 to 2 (**Figure 4**).

Figure 4. Relationship between skyline and fractal dimension according to different studies (Cooper, 2003; Güzel et al., 2021; Yılmaz et al., 2022)



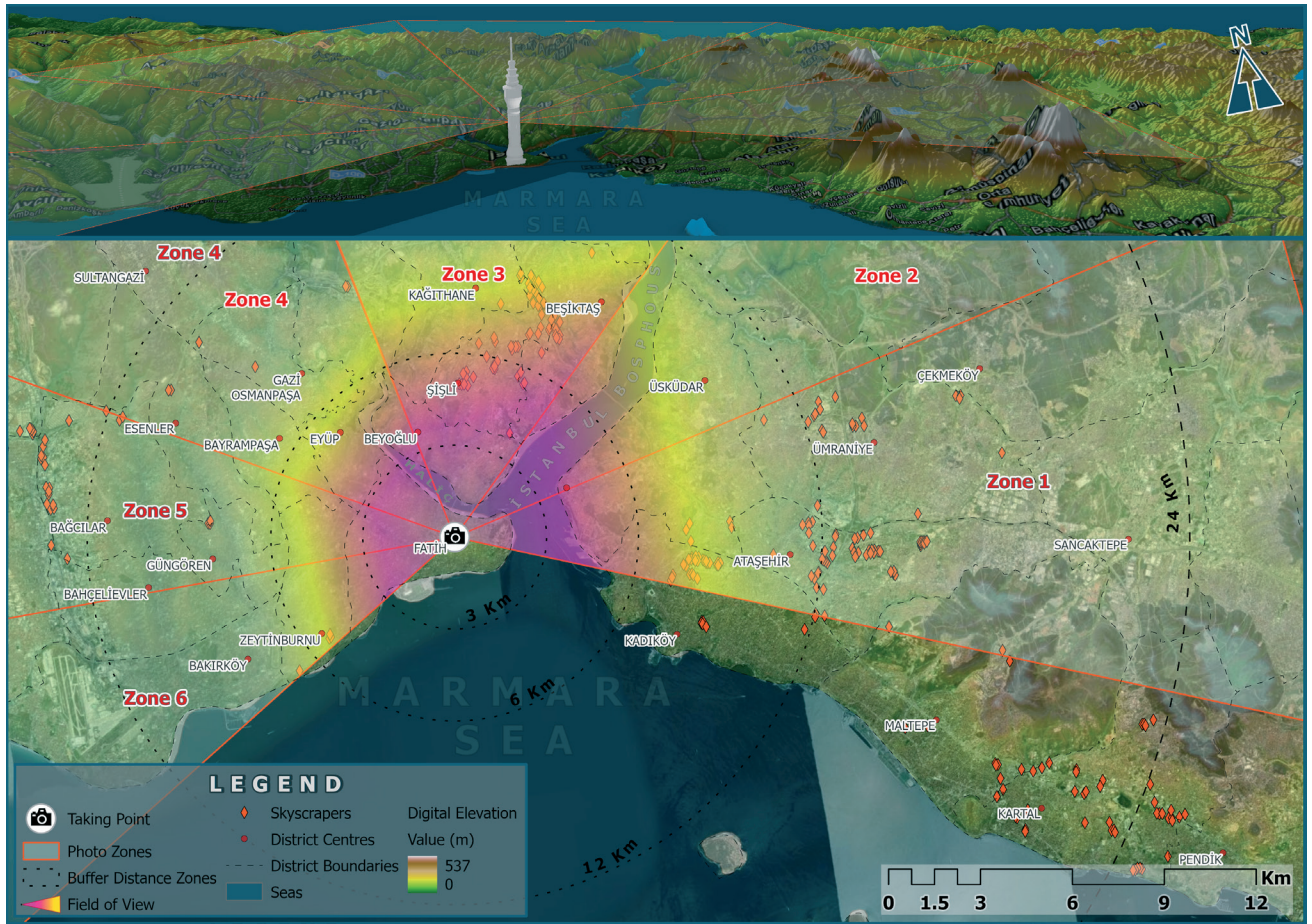


Figure 5. Location of the study area and photo zones

FRACTAL DIMENSIONS OF ISTANBUL'S URBAN HORIZON LINES

The exploration of fractal dimensions in urban horizon lines is still relatively limited but offers fascinating possibilities. In this regard, Istanbul, with its rich urban fabric and unique geography, presents a special urban setting for assessing these dimensions. This section focuses on the fractal dimensions of Istanbul's urban horizon lines, identified from the reference point of Beyazıt Fire Tower (Figure 5). The analysis of the urban horizon lines utilized box-counting method.

Table 1 presents the fractal dimensions of Istanbul's horizon lines and the corresponding photozones, where the horizontal lines were identified using the box-counting method. The fractal analysis performed revealed different fractal dimensions, ranging from 1.0731 to 1.2171 (Table 1). This information suggests that fractal dimensions and associated structural elements can be used to characterize the complexity and features of different city views in Istanbul, especially concerning architectural and natural features (Figure 6).

To assess the values of the obtained fractal dimensions according to their regions;

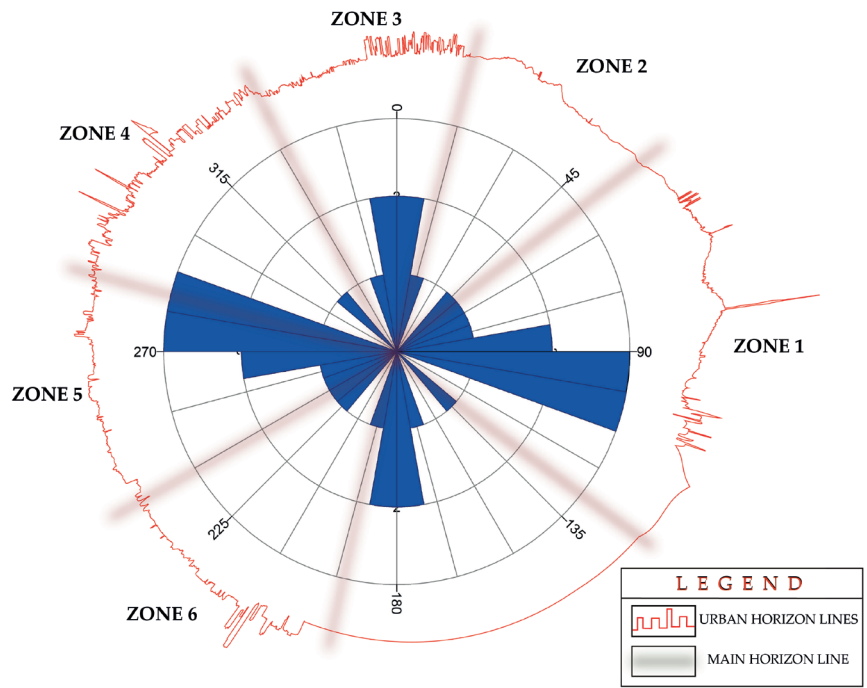
Horizon Line Zone 1

This zone encompasses both natural and human-made elements, resulting in a horizon line characterized by diverse elements. The fractal dimensions within this zone range from 1.0731 to 1.2171. The horizon lines here are

Main Horizon Line Zone	Lower Horizon Line Zone	Fractal Dimension (Fd)
1	1.1	1,1222
	1.2	1,1756
	1.3	1,1467
	1.4	1,0731
	1.5	1,1288
	1.6	1,108
	1.7	1,2171
2	2.1	1,1645
	2.2	1,1147
	2.3	1,1702
	2.4	1,1552
3	3.1	1,1767
	3.2	1,1609
	3.3	1,192
	3.4	1,1607
4	4.1	1,1521
	4.2	1,1555
	4.3	1,1755
	4.4	1,1303
	4.5	1,1614
5	5.1	1,0977
	5.2	1,1233
	5.3	1,135
	5.4	1,1303
	5.5	1,1181
6	6.1	1,0988
	6.2	1,1044
	6.3	1,1377
	6.4	1,1481

Table 1. Values of the fractal analysis for the zones of the horizon line

Figure 6. Urban horizon lines of Istanbul



shaped by various natural and human-made structural elements such as Çamlıca Tower, Çamlıca Mosque, skyscrapers in Ümraniye, Ataşehir, and Üsküdar, as well as natural geographical features like Kayışdağı and Aydos Mountains. The highest fractal dimension value recorded in the study is found in sub-zone 1.7, corresponding to the horizon line created by Çamlıca Mosque. The higher fractal dimension of the horizon line in the sub-zone 1.7 can be attributed to its architectural features characterized by sharper lines, its organic structure, and its location, all contributing to its dynamic appearance. Following closely are the horizon lines created by skyscrapers in Ataşehir, Ümraniye, and Üsküdar with the second highest (1.1756) and third highest (1.1467) fractal dimension values, respectively. These horizon lines follow the natural texture found in Çamlıca Hill. The fractal values within this zone are 1.1288, 1.1222, 1.108, and 1.0731. Natural lines in this zone represent areas with the least complexity in visual appearance, while the horizon line created by Çamlıca Mosque and vertical structures stands out as the most complex elements. Thus, contributing significantly to the dynamic visual appearance. This zone represents both the highest and lowest levels of complexity.

Horizon Line Zone 2

The fractal dimension values in Horizon Line Zone 2 range from 1.1147 to 1.1702 in this region, which is dominated by the natural environment. Most of the skyline lines in this zone are shaped by the slopes situated in Beykoz. The upward structures in Beykoz, explicitly the high rises, disturb the normal skyline line (2.1). Situated in a sloping region within the normal surface, these designs serve as the main human-made components that disturb the regular organization of the skyline line. Sub-zone 2.2, presents a level and smooth appearance formed by the geography, lessening intricacy. However, the variations in topography, including slopes and the inclusion of the Bosphorus Bridge on the horizon line, contributes to the complexity in sub-zones 2.3 and 2.4.

Horizon Line Zone 3

The fractal dimensions in this area are 1.1767, 1.1609, 1.192, and 1.1607. Skyscrapers constitutes the majority of the associated structural elements, with the vertical structures located in the middle section of the horizon line having fractal dimensions of 1.192 and 1.1609. Skyscrapers in Şişli, Kağıthane, Beşiktaş, and Sarıyer contribute to the visual complexity in this area, making it the second-highest visual complexity area after Zone 1 in the study. Despite interrupted vertical development towards the northwest in the visual composition, the city structures in this area, shaped by topography, create a more irregular appearance. Furthermore, the inclusion of natural landscapes in the northeast prevents an onward increase in visual complexity in this area.

Horizon Line Zone 4

The fractal dimensions in this area range from 1.1521 to 1.1755. Mosques located in the Historical Peninsula and the structures in Zeytinburnu, Esenler, and Bağcılar in the northwest contribute to shaping the horizon line. Particularly in the central section that forms the horizon line, the complex appearance created by structures with different heights is notable. In Zone 4.3, where the highest fractal dimension is observed, the flag in Edirnekapi, the minarets of Fatih Mosque, and the Tekstil Kent (Koza) Plaza in Esenler contribute to the complexity of the horizon line. Sub-zones 4.1 and 4.2 exhibits a complex visual composition created by structures of varying heights along the Basın Ekspres Avenue. In Zone 4.4, the decrease in complexity indicates a more stable horizon line, but in Zone 4.5, the presence of another vertical structure (Viaport Venezia) leads to an increase in the complexity of the horizon line.

Horizon Line Zone 5

The fractal dimensions in this area range from 1.0977 to 1.1303. Shaped by the structures in the Historical Peninsula and other districts in the northwest, this zone exhibits a dynamic horizon line. In Zone 5.1, the regular mass housing structure reduces complexity. On the other hand, in Zone 5.2, where a linear horizon line continues, the presence of minaret increases complexity. Zones 5.3 and 5.4 display a mixed appearance with a combination of mass housing and skyscrapers outside the city walls. In Zone 5.5, the minimal height differences between the structures along the horizon line result in a fractal dimension of 1.1181.

Horizon Line Zone 6

The fractal dimensions in this area range from 1.0988 to 1.1481. This zone, shaped by structures with varying heights throughout the city, experience a gradual increase in complexity from the southwest coastline to the inland. The lowest complexity (6.1) is observed in the appearance created by mass housing along the coastline. In Zone 6.2, the introduction of 16/9 skyscrapers alters the horizon. Zones 6.3 and 6.4 exhibit a dynamic horizon line formed by mass housing and other urban structures located outside the city walls.

DISCUSSION AND CONCLUSION

In the past century, humanity has experienced significant urbanization, with cities now hosting more than half of the world's population. This urbanization, has significantly changed, the appearance of cities, with

acceleration in vertical construction due to increasing population. Skyscrapers, as seen in Chicago and New York in the past, and currently prominent in Dubai, serves as concrete manifestations of urban vertical growth in Istanbul. Despite the growing importance of tall buildings in both local and national economies, there remains a deficit of understanding regarding how vertical development affects the visual appearance and horizon lines of cities. It is within this context that this study focused on the horizon lines of Istanbul and their level of complexity.

As cities experience growth and transformation, their horizon lines also evolve. This study illustrates, using fractal geometry and the example of Istanbul, that the horizon line is an effective tool for comprehending the intricate visual morphology of cities. Horizon lines also serve as representation of city's natural and human-made structures. The texture of these lines, which can range from simple geometric patterns to complex ones, reflects the complexity resulting from urban growth. The fractal dimension serves as a parameter for grasping this complexity and obtaining quantitative results. Using this approach, alterations in fractal values in Istanbul's horizon line have been associated with structural components in urban space.

One architectural elements that complicates Istanbul's horizon line is the Camlica Mosque, situated on Camlica Hill in the northern part of the city. Additionally, the highest (Zone 1.7) and lowest (Zone 1.4) fractal values were obtained in the first urban horizon line zone. This zone encompasses both natural and urban landscapes, including the highest morphological units of Istanbul, such as Kayışdağı and Aydos mountains. In this section where natural elements form the horizon line, complexity is at its lowest. The zones with highest fractal values are located in the north (Zone 3.3) and east (Zone 1.2) directions, containing the horizon lines formed by skyscrapers. Skyscrapers, being the highest products of vertical construction, serve as secondary structural elements that accentuates the complexity to the horizon line.

Understanding and evaluating the fractal dimensions of urban skylines in terms of structural components, as shown in this study, helps in perceiving the subtleties of visual morphological complexity of the city. This understanding is crucial because it allows us to comprehend the patterns and complexities that shape the built environment, thereby determining decisions concerning basic features such as building heights and spatial arrangement that affect the overall visual morphology of cities. This study evaluates the elements that complicate the urban appearance in Istanbul, aiming to enhance our understanding visual quality as a significant component. By distinguishing vertical spatial organization patterns and identifying the basic features and components influencing urban appearance, this evaluation contributes to urban architectural design and spatial planning processes. This is important for urban planners, architects, and urban geographers as it provides insight into the spatial organization and visual quality of urban environments.

The study has demonstrated, through a unique approach that fractal analysis effective serves as an analytical tool for understanding urban skyline patterns. The results of this method not only provide an analysis of the current state but also has the potential for comparing urban appearances and creating effective horizon lines or silhouette plans.

In urban planning and design, utilizing the nuances of the skyline can help create less complex urban vistas. Designers can consciously alter building heights, densities, and spatial configurations by understanding the fractal dimensions of silhouettes and the structural components of the city. This understanding can foster visual harmony and consistency. For instance, within the study's scope, could a design be developed for skyscrapers, such as the tallest examples of vertical architecture that blends seemingly with the existing skyline without adding further complexity to the city or region's skyline? Similarly, could an architecturally compatible design be created by considering the natural morphological features of the area, taking into account the skyline shaped by prominent landmarks such as the amlıca Mosque highlighted in the study? In line with these examples, an application-oriented approach could contribute to the development of less complex and sustainable urban landscapes by characterizing the morphological complexity of the urban skyline.

Among the study's limitations are issues pertaining data resolution, variations in urban shapes across different geographic zones, and the dynamic nature of urban landscapes. These factors make it challenging to accurately measure and interpret fractal dimensions over time. To overcome these constraints and challenges, drones can be utilized to capture primary source imagery. The precise control and flexible maneuverability offered by drones will enable comprehensive photography of urban areas at various scales.

For future research endeavors aimed at better understanding how horizon line analysis influence urban planning objectives, enhancing measurement resolutions, evaluating horizontal and vertical morphological development concurrently at street and sky scales, and incorporating additional variables such as socioeconomic factors could prove beneficial. Furthermore, integrating perspectives on issues such as sunlight exposure and access to clean air, arising from distorted urban development, could be incorporated into the study from various angles.

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FRAKTAL ANALİZ İLE GÖRSEL KARMAŞIKLIĞIN BOYUTLARI: İSTANBUL'UN ŞEHİRSEL UFUK ÇİZGİLERİ ÜZERİNE BİR VAKA ÇALIŞMASI

Kentsel ufuk çizgileri zaman ve mekân ölçeğinde değişen koşulları yansıttıkları için dinamik yapıya sahiptirler. Bu dinamik yapı aynı zamanda kentlerin görsel niteliklerini ve karmaşıklığını değerlendirebilmek için bir kentsel bilgi aracı olma potansiyeli taşımaktadır. Bu makale, fraktal analiz yoluyla gerçekleştirilen kentsel ufuk çizgileri çalışmalarına İstanbul üzerinden yeni bir metodolojik bakış açısı sunar. Son 30 yılda kentlerin morfolojik özelliklerini ölçmek için bir dizi hesaplama teknikleri geliştirilmiştir. Bunlardan en bilineni ve en yaygın olarak fraktal analiz, görsel veriler vasıtasıyla elde edilen kentsel ufuk çizgilerinin karmaşık yapısını analiz etmek için çalışma kapsamında kullanılmıştır. Çalışma, ilk olarak, İstanbul'un güncel kentsel ufuk çizgisini ortaya koymak ikinci olarak ise bu ufuk çizgisini şekillendiren unsurların görünümüne olan etkilerini fraktal geometri yoluyla ölçmeyi amaçlamaktadır. Bu amaç kapsamında kullanılan kutu sayımı ile ölçülen fraktal boyut, kentsel ufuk çizgilerinin karmaşıklığını açıklamak için kullanılan bir metriktir. Beyazıt Yangın Kulesi'nin referans noktası kabul edildiği bu çalışmada, kent panoramalarından elde edilen ufuk çizgilerinin fraktal boyutları ImageJ Programı ve FracLac eklentisi kullanılarak hesaplandı. Çalışma kapsamında gerçekleştirilen ufuk çizgilerinin fraktal analizi sonucunda 1,0731-1,2171 aralığında fraktal boyutlar elde edildi. Ufuk çizgileri ile eğilimleri gül diyagramı aracılığıyla sunulmakta ve fraktal analiz sonucunda şehrin görünümünü en fazla karmaşıklaştıran iki ana unsurun olduğunu göstermektedir: biri cami, diğeri ise gökdelenler.

A CASE STUDY ON THE URBAN SKYLINES OF ISTANBUL: DIMENSIONS OF VISUAL COMPLEXITY WITH FRACTAL ANALYSIS

Urban skylines have a dynamic structure because they reflect changing conditions in time and space. This dynamic structure also has the potential to be an urban information tool for evaluating the visual qualities and complexities of cities. This article presents a new methodological perspective on urban skyline studies through fractal analysis in Istanbul. In the last 30 years, several computational techniques have been developed to measure the morphological characteristics of cities. Fractal analysis, the most well-known and widespread of these, is used in this study to analyze the complex structure of urban skylines obtained through visual data. The study aims to first expose the existing urban skyline of Istanbul and then assess the influence of the factors influencing this skyline on its appearance by using fractal geometry. The fractal dimension, measured by the box count is used for this purpose and that is a metric used to describe the complexity of urban skylines. In this study, in which Beyazıt Fire Tower is accepted as the reference point, the fractal dimensions of the skyline obtained from urban panoramas are calculated using the ImageJ Program and FracLac plugin. As a result of the fractal analysis of the skyline, fractal dimensions in the range of 1,0731-1,2171 were obtained. The skylines and their trends are presented through the rose diagram, and fractal analysis shows that two main elements complicate the appearance of the city the most which are: mosque and skyscrapers.

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HOW STUDENTS PERCEIVE SCHOOL BUILDINGS?: A POST-OCCUPANCY EVALUATION THROUGH ZALTMAN METAPHOR ELICITATION TECHNIQUE (1)

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INTRODUCTION

"We shape our buildings; thereafter they shape us"
Winston Churchill

Especially in the recent decades, rapid changes across sociocultural, scientific, political, and economic aspects, have led to swift adjustments in educational paradigms to meet evolving workforce needs. Consequently, it has become necessary for learning environments to adapt to the emerging needs of modern society in both design and operation. As Lackney (2005) noted, learning environments possess the ability to either motivate or restrain students (and teachers) in their educational endeavors, highlighting the importance of recognizing this spatial effect.

Understanding the impact of space on users is a crucial area of research (Sánchez-Pantoja, Vidal, and Pastor, 2018). People, including children, possess deep knowledge into their own lives and experiences (Askins and Pain, 2011), with children offering unique perspectives on their environment compared to adults. This perspective allows adults to better understand the needs and interests of children (Sahimi, 2012). However, the diversity of children's experiences is often overlooked, and there remains limited understanding their daily encounters within school environment (Holloway and Valentine, 2005; Upitis, 2004).

The various physical dimensions of different environments may have distinct effects on children (Fein, Plotnikoff, Wild and Spence, 2004). Architecture is considered to have a pedagogical value based on the idea that the physical elements in the environment can provide clues for learning (Wilks, 2010). Therefore, the physical environment is conceptualized as a three-dimensional textbook or silent curriculum that influences learning experiences (Taylor, 2009, 25). In this regard, a child's immediate environment is deemed primary in the learning process (David

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and Weinstein, 2013). The design of physical spaces can provide a better understanding of the relationship with the environment (Wilks, 2010).

While a school building serves as a physical structure, it also communicates visual messages about appropriate emotions and behaviors within it. This communication can positively (or negatively) affect conditions suitable for learning and social dynamics (Veloso, Marques and Alexandra, 2014). According to Sanoff (2002), attributes such as shape, color, and layout help students and teachers in forming clear mental images of their environment. However, buildings and environments convey messages reflecting the inner life, activities, and social values their users. Students interpret these messages, form judgments, and act accordingly. Thus, any environment comprises not merely objective entities organized in space, but a collection of meanings (Daniels, Stables, Tse and Cox, 2019, 89).

School buildings greatly influence students' learning, impact academic performance (Villarreal Arroyo, Peñabaena-Niebles and Berdugo Correa, 2023). Studies indicate that well-designed school buildings correlate with various positive outcomes, including exam proficiency (Hong and Zimmer, 2016; Neilson and Zimmerman, 2014), attendance rates (Maxwell, 2016, Christle, Jolivet and Nelson, 2007), school climate (Uline, Wolsey, Tschannen-Moran and Lin, 2010), and general health and well-being (Walsemann, Fisk and Dues, 2020; Eitland et al., 2017). Conversely, inadequate building conditions drive teacher mobility, limiting students' access to quality learning environments and effective educators (Uline et al., 2010; Horng, 2009;).

In the 21st century, research now focuses on students' experiences and satisfaction rather than solely on student behavior or grades (Daniels et al., 2019). This shift aligns with Marmot's (2017) concept of the *sticky* campus, where students are drawn to learning environments they find attractive. A well-designed school building fosters a sense of value among students (Maxwell, 2016), which can be further enhanced through aesthetically pleasing buildings and classroom designs that encourage students to spend time on schools (Booth and Sheehan, 2008; Maxwell and Chmielewski, 2008). Design elements, such as spatial layout, furniture, and equipment significantly contribute to students' positive experiences (Walden, 2015). In the school setting, allowing students to personalize their spaces, such as arranging their classroom, yielding positive outcomes, including a heightened sense of self (Maxwell and Chmielewski, 2008) and stronger identification with the school (Killeen, Evans, and Danko, 2003). School commitment, reflecting a sense of belonging to the school environment, serves as a protective factor for children's health, education, and social well-being. It is widely acknowledged that school commitment and school a sense of belonging improve children's mental and emotional well-being (Bond et al., 2007; Hawkins et al, 2005), Shielding them from detrimental influences like substance abuse, violence, sex, and alcohol use (Bisset, Markham and Aveyard, 2007; Kliewer and Murrelle, 2007; Springer, Parcel, Baumler and Ross, 2006).

The school environment significantly impacts students' physical and mental well-being including emotional, psychological, and social aspect. Emotional well-being is defined by student's commitment to the school environment and it thrives when spaces cater to the diverse needs of students. Spaces that encourages interaction impacts social well-being, while adaptable learning environment impact psychological well-being

positively (Hughes et al., 2019). Finally, physical well-being is associated with increased physical activity and less sedentary behavior (Marmot and Ucci, 2015), suggesting the importance of outdoor spaces for sports activities in school designs (Stein, 2007). Overall, according to Hughes et al. (2019), a safe and energetic environment fosters physical well-being, while problem-solving and creativity enhance cognitive well-being. Social well-being is influenced by interactions and peer relationships, emotional well-being by feeling happiness and satisfaction, and, existential well-being by comfort at school.

In this regard, interpreting the effects of design on students' physical and mental well-being goes beyond examining student academic achievement (Anderson and Graham, 2016). This is because holistic well-being enhances learning efficacy, information retention and fosters social behaviors in children (Awartani, Whitman and Gordon, 2008). However, many school systems overlook the significance of school spaces in the learning process, often adhering to traditional architectural models with classrooms resembling shoeboxes along corridors. Architects, considering pedagogical value, can propose designs rooted in child development knowledge. However, meaningful change must primarily stem from the school community's desire for improvement (Hertzberger, 2008).

As Gifford (2014) suggests, beauty should be experienced not only by architects but also by non-architects. When it comes to school building, students are the primary users, and the design process should prioritize their needs over architectural trends (Schalz, 2015). Thus, schools should feel like second home for students (Daniels et al., 2019). Achieving this requires a deeper understanding and collaboration between those who use and design school buildings, moving away from conventional educational facilities (Rigolon and Alloway, 2011). Moreover, risks such as early school dropout rates, stemming from feeling of anonymity, alienation, and insignificance, can be mitigated by ensuring that students—the primary users of school buildings—are heard during the design and evaluation stages (Smyth and Fasoli, 2007). This is because architecture is a deep social practice (Daniels et al., 2019,156).

Despite the link between learning theories and space, there remains insufficient information regarding the use of school buildings (Franz, 2019), warranting further investigation (Daniels et al., 2019) through Post-Occupancy Evaluation (POE) (Olatunji, 2013). Over the past two decades, various definitions of POE have emerged. Broadly, the technical concept of POE can be categorized into three paradigms: evaluation of user's psychological satisfaction emphasizing environmental behavior, subjective evaluation of environmental performance focusing on the perception of the physical environment, and extensive performance evaluation (Huang et al., 2022). POE reveals the effects of school design on building functionality and student activities (Daniels et al., 2019). Additionally, as emphasized by Whyte and Gann (2001), POEs serve multiple purposes, such as enhancing design skills, improving user requirements, informing design guidelines and regulatory processes, and supporting stakeholders in achieving renewal goals.

Centering Turkey, during the Republican administration, schools which were established after the collapse of the Ottoman Empire adopted the same architectural language to create a nation-state in all public buildings (**Figure 1**).



A state school



A military building



A town hall



A community health center

Figure 1. Selected public buildings adopting the same architectural language in Turkey (Created by authors, 2024)

Examining Turkish schools reveals the significant influence of the nation-state concept on both education and architecture. Following the transition from the Ottoman Empire to the Republic, school buildings were designed in accordance with this paradigm. The current school system aligns with the standardised structure of mass compulsory education, a direct consequence of the modern nation-state paradigm. Consequently, school structures resemble other state-operated public buildings, lacking distinct educational features. Notably, large administrative offices and school corridors exemplify this trend (Karataş, Yaman and Bayrak, 2019; Kul, 2011).

Students, as the primary users engaging actively within the school buildings, play significant role in shaping the interpretation the school concept. As such, it becomes necessary to reconsider the traditional concrete-dominated architecture with multiple narrow windows, and classrooms facing each other opening to narrow corridors in light of student experiences as emphasized by Cole, Robinson, Brown, and O'Shea (2008) in promoting students expression through the POE process. Considering the importance of school buildings on well-being and performance, examining their environmental and design conditions is critical (Jiang et al., 2018). This study aims to gather student perceptions of existing school buildings, using the POE methodology.

METHOD

In this paper, our aim was to get the profound insights of students, the main users, regarding the complex issue of post-occupancy evaluation in school buildings. Using the ZMET method for the first time in the POE process, we considered the effectiveness of visuals and metaphors in engaging with child participants. Our aim is to contribute to the enrichment of the POE process by using a visual, entertaining, and tailored method that will reveal the deep thoughts of children based on their

experience while considering their cognitive characteristics within their age range.

Open inquiry, an approach that identifies factors and hidden information inaccessible to structured surveys, stands out as one of the best approaches for POE, especially for research necessitating multiple interviews with the same participants (Stevenson, 2009). However, using this unstructured method with children presents some difficulties. Researchers question the use of non-critical social science methods such as focus groups with children (Vogel, 2009), advocating instead for the development of 'child-friendly and tailored' approaches. In this regard, there is a preference for art-based methods, which rely less on verbal or written communication skills when studying with child participants (Hall, Jones & Thomson, 2011). In this study, we used the Zaltman Metaphor Elicitation Technique (ZMET) (Zaltman, 1996), to explore the deep feelings and thoughts of children, who serve as the main and end users of school buildings, regarding their experiences in these buildings. The necessity for a technique beyond verbal and written expressions to understand complex subjects such as design, environment, and architecture informed our choice of this technique.

The Zaltman Metaphor Elicitation Technique (ZMET), developed by Zaltman and Coulter in 1995, offers a unique and innovative approach to understanding student perceptions within school buildings. This method involves participants selecting images during interviews to explore complex issues using metaphors, allowing them to express their thoughts and emotions in a non-verbal manner. Subsequently, these images undergo analysis through various interview techniques, enabling a deeper understanding of participants' perspectives (Hancock and Foster, 2020). ZMET features participant-driven discussions, photo prompts, and interviews structured within a laddering framework, collectively facilitating a comprehensive exploration of perceptions (Ji and King, 2018). Zaltman emphasizes the success of ZMET, noting that it is a hybrid methodology grounded in various domains, including verbal and nonverbal communication, visual sociology, visual anthropology, literary criticism, semiotics, mental imagery, cognitive neuroscience and phototherapy" (Zaltman and Coulter, 1995, 47). This hybrid methodology aims to uncover the fundamental structures that shape individuals' thinking, providing valuable insights applicable in various contexts, including marketing and research. Through the utilization of ZMET created by Zaltman and Coulter (1995), a fresh and unconventional method is presented for obtaining in-depth student perceptions and understandings within school buildings.

ZMET enables participants to select images reflecting their thoughts and emotions, subsequently examined through various interview techniques. This method not only explore effectively explores perceptions but also draws from an arrays of disciplines to provide a holistic understanding of individuals' experiences and perspectives. Additionally, it acknowledges that social communication mostly takes place nonverbally, with thoughts usually emerging as images. According to ZMET, metaphors lie at the center of consciousness, ingrained in embodied experience, and accessing the deep structure of thought involves acting together with mind, emotion, and experience (Zaltman and Zaltman, 2008; 14).

Table 1. Distribution of students participating in the study

Participants' School	Age	Girls n=11	Boys n=10	Total N=21
Uluğbey Middle School	11-14	4	3	7 (Focus Grup 1)
Hürriyet Middle School	11-14	4	3	7 (Focus Grup 2)
Şehit Ahmet Oktay Günak Middle School	11-14	3	4	7 (Focus Grup 3)

As suggested by Coulter & Zaltman (1994), a ZMET typically requires 20-25 participants for reliability. Therefore, the study group consists of 21 student volunteers students from three middle schools (**Figure 2, 3 and 4**). Before commencing the study, the administrators of the relevant schools were informed. Upon receiving approval from the school administrations, we provided clarification to students regarding content and procedures, in collaboration with visual arts teachers and school counselors.



Uluğbey Middle School

Number of Floors Including Entrance	4
Number of Classrooms	24
Building Surface Area Including Garden	2138m ²
Location	City Center
Number of Students	1011
Number of Staff	40

Figure 2. School ID Card of Uluğbey Middle School (Created by authors, 2024)

Table 2. ZMET Process and its adoption to our study

Stages	Application of ZMET Technique	Adopting ZMET To Explore Students' Perceptions of School Buildings (What we did in our study)
Stage 1: Briefing phase	<p>According to Coulter, Zaltman and Coulter (2001) it is recommended that a cohort of 20-25 participants is essential for the credibility of a ZMET study. Participants should be briefed using a standardized script to maintain consistency. This script should outline the study's objectives, obtain participant consent, and address concerns like anonymity, confidentiality, and the right to withdraw. Moreover, the briefing should clarify the participants' tasks regarding the selection of images for subsequent discussion. Participants are given a week to choose images from various sources like personal photos, the internet, or magazines that best represent their perceptions on the topic.</p>	<p>We received the approval of schools for conducting the study and informed the volunteer students about the study. Following the briefing of students we allowed students one week to choose images from various sources like personal photos, the internet, or magazines that best represent their perceptions on the their school building</p>
Stage 2: In-depth interview	<p>Step 1 Storytelling: According to Zaltman (2003), this approach enables participants to spontaneously express their personal interpretation of the image. Through storytelling, metaphors inspired by the images naturally surface during the interview process, researchers prompt interviewees to explain the content, reasons for selection, and interpretations of elements within each chosen picture. When images serve as metaphors, interviewees are asked to elaborate on the relevance and connections of these metaphors to their personal experiences (Ji & King, 2018).</p> <p>Step 2 Missed issues and images: Zaltman and Zaltman (2008) recommend that researchers inquire about any images participants prefer not to share or were unable to find, along with the reasons behind these choices.</p> <p>Step 3 Triad task: Employing a 'triad task' enables the examination of the meanings and distinctions among the images selected by the participant (Zaltman, 2003). Encouraging participants to contrast the images can prompt additional profound reflections, leading to a more comprehensive understanding of the subject (Hancock & Foster, 2020) The researchers prompt interviewees to categorize their selected images into coherent groups (similar/different) according to their own logic. This process aids in identifying key themes that hold significance for the interviewees (Ji & King, 2018).</p> <p>Step 4 The metaphor probe: Zaltman (2003) asserts that a successful probe prompts the participant to contemplate the personal significance of the image. These probes should employ neutral language, avoiding any bias or influence from the researcher's perspective on the participant's interpretation of the image</p> <p>Step 5 Expanding the frame: Coulter (2006) recommends that in the probing phase, participants should be prompted to explore elements beyond the immediate content of the image. Participants are encouraged to consider what additional aspects might exist outside the boundaries of the current frame that are not depicted in the image.</p> <p>Step 6 Sensory (non-visual) metaphors: The researchers prompt interviewees to utilize all five senses (sight, hearing, taste, smell, and touch) to articulate the attributes linked to their experiences. For instance, researchers might inquire, 'Can you use a specific scent to depict your experience?' (Ji & King, 2018)</p> <p>Step 7 The vignette: Zaltman (2003) emphasizes the significance of participants crafting a narrative about the subject under investigation, aiming to sum their comprehensive thoughts and emotions.</p> <p>Step 8 The mind (consensus) map: According to Zaltman (2003), it is suggested that an individual's thoughts and emotions regarding a phenomenon are frequently intertwined. These interconnections can be symbolically depicted in a "mind map".</p> <p>Step 9 The visual executive summary/montage: Participants are tasked with generating a composite image or a 'collage' utilizing the images they have selected. This aids in constructing a comprehensive perspective of an experience that has been interpreted through the storytelling of individual pictures.</p>	<p>Although individual interviews are recommended in the ZMET, focus group interviews were conducted due to the fact that the students in the study group were between the ages of 11-14, they could feel more comfortable emotionally and mentally in group interviews, and they could trigger different thoughts during interaction (Rallis & Rossman, 2017). As mentioned by Zaltman (1996), deep and secret thoughts emerge as soon as they are recalled from memory.</p>
Stage 3: Transcription, data analysis and developing constructs	<p>Transcriptions of all interviews are completed, including observations of pertinent non-verbal cues. These records are combined with the participant's selected images, the visual summary (montage), and mind maps. This comprehensive dataset should be thoroughly analyzed to uncover metaphors and associated constructs, ultimately forming a "consensus map" that emphasizes prevalent themes arising from ZMET (Zaltman, 2003).</p>	<p>We transcribed all interviews and created the codes, categories, and themes. Then we got expert review (member-checking) and participant confirmation. We formed consensus map along with visual executive summaries (collage) in the final stage.</p>



Şehit Ahmet Oktay Günak Middle School

Number of Floors Including Entrance	5
Number of Classrooms	32
Building Surface Area Including Garden	1240m ²
Location	City Center
Number of Students	1041
Number of Staff	64

Figure 3. School ID Card of Şehit Ahmet Oktay Günak Middle School (Created by authors, 2024)

Following the first briefing, students who volunteered for the study were interviewed three to four days later. They were instructed to bring three visuals, either digital or printed, showing existing school building like classroom, corridor, playground, etc. The students were informed that there should be elements that evoke school buildings in the visuals instead of direct school buildings. A few sample images related to a different subject were shared with the students to clarify the requested. For example, images “money, diamond, and men’s suit” which symbolize statue and wealth, were paired with Mercedes-Benz. After this briefing, the students were given one week to prepare their their visuals and interviews commenced as soon as the visuals were ready. To ensure privacy and anonymity (Halai, 2006), students were coded as $S_1, S_2, S_3 \dots S_{21}$.



Hürriyet Middle School

Number of Floors Including Entrance	5
Number of Classrooms	32
Building Surface Area Including Garden	1876 m ²
Location	City Center
Number of Students	1122
Number of Staff	49

Figure 4. School ID Card of Hürriyet Middle School (Created by authors, 2024)

Despite that individual interviews are recommended in ZMET, focus group interviews were conducted due to the ages of the students (11-14), since they might feel more emotionally and mentally comfortable in group interviews and could motivate different thoughts through interaction (Rallis and Rossman, 2017). As mentioned by Zaltman (1996), deep and secret thoughts emerge as soon as they are recalled from memory. Following ZMET guidelines, approximately 2 hours of interviews were held with each focus group (n=7) in the first stage. The interviews started with the question “Why do you think this image reflects the school building?” based on the visuals brought by the students. During the interviews, students were asked whether they had missed images that they thought reflected the school building but could not find. The students responded that they had not missed any images.

Next, students were requested to group the images they brought and were asked “What is the difference between two images and the third one?” (triad task). This expanded the frame of the visual through metaphor probe questions. Additionally, to encourage students to use sensory metaphors (color, smell, taste, sound, touch) regarding the visuals they brought (Coulter, 2007), questions such as “What would you hear/smell if you were



Figure 5. An example of a montage

in this picture?" were asked. The visuals brought by the students during the interviews were displayed on smart boards for the entire group to engage with. Following individual comments, ideas were gathered from the whole group.

In the third stage, ICT teachers helped to prepare a collage (montage) from the visuals brought by the students as they desired (Figure 5).

Each student's three images were combined into a single collage. While creating the collage with the students, attention was paid to factors such as placement and size of the visuals. The position and size of each image in the collage created by the students provided additional insight into their preference. The visual that best summarised the participants' perception of the school building was allocated a larger space. For example, in the collage in Figure 5, more space was given to images reflecting the school building's crowdedness and the inconsideration of students' physical differences in the classroom. When working with children, the *vignette* stage of the ZMET was sidestepped in favor of child-friendly and tailored techniques. This consideration arose because the vignette stage could be challenging for the students' mental and cognitive stages and that storytelling through visuals, similar to the first step, were more effective.

Content analysis was used to interpret the data obtained from the interviews, representing a systematic and objective method for describing phenomena in qualitative studies (Schreier, 2012). Researchers took observation notes and identify meaningful words that provided clues

about school buildings. Focused coding (Saldana, 2016) was then employed to refine codes useful to the focus of the study hence, generating themes related to the evaluation of school buildings

Following comparison and discussion of the notes, both raw data and the created themes created were sent to a POE expert for review. Peer debriefing was conducted to strengthen dependability, feedback were provided to the students on the themes and interpretations created. Member checking was performed to determine the consistency between the researchers' interpretations and participants' statements. Finally, a consensus map (see Figure 6) was developed to outline the context, analysis units, and categories relevant for school building use.

FINDINGS

The study obtained data from this the students, the main end users of school buildings, using visual metaphors and interpretation. The data were categorized into three themes: a) ergonomics and comfort, b) individualization, and c) school atmosphere.

The number of students who brought visuals for each space (garden, corridor, and classroom) was denoted by *N*. For example, 9 students brought visuals about the garden. However, the frequency of the clue words expressed during the interview was represented by *f* within their

Figure 6. Codes, categories, and themes for school buildings: Consensus map.



Pic 1.



Concrete and ugly

Pic 2.



Students as flowers in jail-like school

Pic 3.



Colourful students in colourless building

Pic 4.



Poor air quality

Pic 5.



Bad smell

Pic 6.



Poor light quality

Pic 7.



Classroom windows

Pic 8.



Classrooms and corridors

Pic 9.



Feeling to be prisoner

Pic 10.



Burning in summer and freezing in winter

Pic 11.



The same facilities for everyone. Lack of ergonomoy

Pic 12.



Nonfunctional

Pic 13.



Corridors at break

Pic 14.



School garden and outer world

Pic 15.



School vomiting students after the courses

Pic 16.



The same concrete face everywhere. No identity.

Figure 7. The most reflective images of students' perception of the school building

respective theme. In accordance with the focused coding technique, the visuals provided by students (totaling 63 visuals) were grouped based on similarity. The visuals that best reflected the experience of school buildings were assembled into collaged (Figure 7) alongside their explanations:

Ergonomy and Comfort

The experiences of the students in the study group related to the existing school building were mostly categorized under the theme of ergonomomy and comfort, with a frequency of 93 ($f=93$). Considering the effect of school starting hours (7-8 a.m.), interpretation suggested that existing buildings had heating and lighting problems, especially during winter.

S_3 : In winter, we go to school in almost dark and the first lesson hours are spent in the unheated and dark classroom. We can't focus at all in the first hours, so I wish lessons like mathematics and science weren't in the first hours.

It was stated that insufficient ventilation and excessive heat negatively affects classrooms facing direct sunlight, particularly in April-May and June when the temperatures rise, especially in the Southeastern Anatolia region. This is due to the building structures and classrooms design. The consistent use of architecture and building materials across regions was considered to have effectively influenced this finding, regardless of the positioning and regional characteristics of the school buildings.

The uniformity of the desks and tables used classroom layout and design, depending on the teacher-centered approach based on the narrator-listener relationship, was negatively experienced by the students, regardless of height and weight. Additionally, the insufficient capacity of school restrooms (averaging 10-12 toilets per 1000 students), unpleasant odors caused by overcrowding, and the height of taps and sinks in the restrooms also contribute to negative experiences for students.

S_1 : The bench we sit on is both narrow and hurts our back. I am tall but my deskmate is short. I'm trying to pull the desk forward so that I can stretch my legs, and my deskmate is trying to pull it to himself/herself so that she can write comfortably. It is quite difficult for both of us to spend 7 lessons like this every day.

The inadequacy of classroom windows and the absence of a ventilation system in the classrooms were among the important factors that contributed to students' negative experiences. The classrooms were not sufficiently ventilated, as the windows were closed due to the cold weather in winter, while noise disturbance (such as traffic, etc.) were common around the schools during spring and summer.

S_{17} : Everyone is sweating, especially after Physical Education (PE) classes, and the classroom smells awful. I don't want to go to class after PE classes. Apart from these, everyone starts getting sick when someone gets sick in the classroom because we can't get fresh air.

Considering the school corridors, it was striking that they were narrow, with boards positioned at heights unreachable for students, and devoid of individual spaces. Additionally, the fact that school gardens were mostly concrete deprived students of comfort zone, emerged as important points regarding the ergonomics and comfort experiences of the students.

Individualization

A recurring theme expressed by students ($f=78$) with significant frequency regarding school buildings as a whole pertains to individualization

requiem). Furthermore, they express discomfort emanating from structural and cosmetic features, like feelings of crankiness, rust, dampness, stifling, and addled smell, pitch together with a sense of gloom (brown and gray). They regarded the school environment as merely compulsory rather than inviting (brackish herbal tea). In this regard, it can be interpreted that the inability of school buildings to respond to the needs and individual differences specified in the themes of ergonomics, comfort, and individualization contributes to a structure intertwined with the perceived school atmosphere.

DISCUSSION AND CONCLUSION

Based on the findings of this study, in generally, there were negativity surrounding experiences about the existing school architecture. The multi-story, concrete-dominated with inflexible structural elements of the school design were considered to be the determining factors of these experiences. The most reported experiences regarding the classrooms were related to overcrowded conditions, as well as concerns regarding the thermal, acoustic, and lighting characteristics. Insufficient natural lighting from classroom windows and a lack of ventilation circulation to maintain indoor air quality standard led students to describe classrooms as “unhealthy and smelly.” However, the fact that the benches-desks had a uniform structure disregarding the individual physical characteristics, limited different arrangements and resulted in two students sharing the same desk. These aspect played a part in the negative experiences among the students in terms of ergonomics, health, and comfort.

Indoor environmental conditions should be both functional and also support people’s needs (Vasquez, Rupp, Andersen and Toftum, 2022). As in Earthman (2004), the two building elements that impact student achievement the most are temperature control and air quality. In a built environment, maintaining temperature and ventilation within reasonable ranges is crucial element for thermal comfort. Studies reveals that unsuitable thermal conditions can decrease overall alertness and increase physiological stress (Zhang and Barrett, 2010). Therefore, thermal, visual, and acoustic comfort provided in physical spaces is recognized as the basic condition for creating a livable, healthy, and productive environment (Szokolay, 2012).

In general, a well-coordinated and integrated system of daylight and electric lighting benefits the students’ learning and well-being (Erwine, 2006). Besides, a recent study revealed that classroom illuminance affects students’ memories at psychological and neurophysiological levels (Castilla, Higuera-Trujillo and Llinares, 2023). Similarly, Juan and Chen (2022) revealed that changes in lighting, sound and temperature significantly impact students’ concentration level, and changes in light and sound more likely to affect students’ anxiety levels. However, it was observed that existing school buildings failed to consider east-west orientation to maximizing daylight use. As Zhang and Barrett (2010), emphasized, the main source of the amount of natural light in a space is the sky, making building orientation a fundamental factor for daylight control. To maximize daylight use and enhance natural light exposure, we suggest incorporating ample windows, skylights, and light wells. These elements will improve occupants’ well-being and reduce reliance on artificial lighting. Replacing traditional incandescent bulbs with energy-efficient LED lights is also suggested for longevity, energy savings, and improved

illumination. Additionally, we suggest using warm (yellowish) light in relaxation zones such as corridors and the canteen, and cool (bluish) light for active spaces like classrooms.

Indoor air quality is important for children's well-being and comfort and has an indirect impact on their academic achievement. Bad air quality can lead to sickness or discomfort, resulting in students' reluctance to attend school, reduced motivation to participate in learning activities, and decreased engagement with school (Batterman et al., 2017; Gifford, 2014; Evans, 2006). A recent study by Zhang et al. (2023) suggests that as indoor temperature increases, the outdoor air supply rate should be increased to ensure air freshness in classrooms, as calculated carbon dioxide emission rate by students increased by 0.54 L/h per person for every 1 °C rise in indoor temperature. To enhance indoor air quality (IAQ) and improve the comfort of occupants, we recommend installing mechanical ventilation systems capable of effectively replacing indoor air with clean outdoor air. For example, functional, easy to use and affordable heat recovery ventilators can be used in classrooms. Moreover, school buildings should be designed with operable windows or vents to allow natural airflow when weather is suitable. Existing school building can be modified to include these features.

In this paper, it was interpreted that the classrooms, corridors, and even the garden were crowded during breaks and, therefore inhibiting students from having effective and healthy course process or sufficient rest. According to Maxwell (2003), high spatial density is associated with lower academic achievement for girls and increased behavioral problems for boys. However, studies have revealed that chronically long reverberation time and high noise levels negatively affect phonological processing (speech perception), academic motivation (Klatte, Hellbrück, Seidel and Leistner, 2010), psychological health (Stansfeld et al., 2009), cognitive abilities, and auditory language processing abilities (Hollander and de Andrade, 2014). To address this, we recommend integrating natural wood elements for warmth and authenticity, as wooden floors, ceilings, and furniture can enhance the overall aesthetic. Besides, using cork for bulletin boards or wall coverings is beneficial as it is sustainable, sound-absorbing, and visually appealing. Student experiences in informal learning areas such as corridors and gardens were emphasize the need for more individualization and green space. The standardizing, formative, and heavily gloomy bureaucratic design does not allow for flexible and individualized spaces, resulting in the difficulty to responds to the socialization and play that students need most. The ignored aesthetic concern is in parallel with the message of the hegemonic power of the state. However, the aesthetic characteristics of a school can foster a strong sense of belonging, which in turn can create an enthusiasm for learning (Jarman, Webb and Chan, 2004).

To disperse the gloomy bureaucratic atmosphere of school buildings, using bright and lively colors such as blue, green, and yellow can be beneficial. Blue encourages tranquility and focus, green symbolizes nature and equilibrium, and yellow sparks creativity and positivity. The walls in shared spaces or classrooms can be accentuated with different colors to enhance visual appeal. Vibrant hues can energize certain areas, while softer shades can establish a calming atmosphere. Distinct colors can be allocated to different zones in the school (e.g., classrooms, hallways, recreational spots) for better color segmentation which aids student orientation and

fosters a unique identity for each area (Ma, Liu, Zhang & Li, 2023; Armaki and Farhadnia, 2021; Jonauskaitė et al., 2019; Hanada, 2018; Al-Ayash, Kane, Smith and Green-Armytage, 2016 Azad).

Green spaces in schools positively impact the physical, mental, social, and spiritual well-being of students (Bell and Dymont, 2008), and, therefore, decreasing contact with nature can lead to negative physical, social, and psychological consequences on children (Zhang, Goodale and Chen, 2014). To tackle this, new school buildings should be planned and design to have more green areas and playgrounds that connect students directly to nature. However, in existing schools, vertical gardens can be both functional and educational, allowing students to learn about different plant species and their care. Incorporating potted plants, hanging planters, or vertical gardens in classrooms, hallways, and common areas can serve as visual focal points and positively contribute to the overall atmosphere of school buildings. Informal learning spaces are defined as areas that offer students with opportunities for interaction and self-directed activities (Knapp, 2007), encouraging students' collaboration (Mutekwe et al., 2013). Self-directed activities of students develop their curiosity and desire for knowledge, and this happens more likely in playgrounds, school corridors, or under trees (Knapp, 2007, 16). These areas let children create their own comfort zone outside of formal learning spaces (Loyens, Magda and Rikers, 2008). The ability of children to individualize their space provide them with a sense of control, competence, and self-confidence (Maxwell and Chmielewski, 2008). Flexible spatial arrangements and furniture contribute to the psychological well-being of students during different learning practices. In addition, a school design supported by a student-centered pedagogical program positively affects students' social well-being by encouraging positive interactions (Kariippanon et al., 2018). According to Anderson and Graham (2016), school environments that allow students to individualize their spaces, socialize with their peers, and collaborate in sharing knowledge contribute positively to their mental well-being. In this context, using adjustable and tailored furniture catering to diverse learning styles and preferences can enhance individualization. Besides, creating separate areas in classrooms for different activities like silent reading, group projects, and practical experiments, and using outdoor spaces for interactive learning and sensory exploration, can further contribute to this. We also recommend to tailor spaces both in classrooms and in corridors to meet individual needs, allowing students to personalize their learning environment.

This study was conducted in Şanlıurfa province. Turkey. Conducting similar studies in different socio-cultural, geographical, and climatic regions would offer a more holistic perspective. On a large scale, we recommend that policymakers, decision-makers, and designers pay more attention to the perceptions of the end users in designing new school buildings. It is crucial to ensure maximum harmony between building design, pedagogy and environmental psychology.

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Anahtar Sözcükler: Okul tasarımı; ZMET; pedo-mimari; kullanım sonrası değerlendirme

ÖĞRENCİLER OKUL BİNALARINI NASIL ALGILAR?: ZALTMAN METAFOR ÇIKARIM TEKNİĞİ İLE BİR KULLANIM SONRASI DEĞERLENDİRME ÇALIŞMASI

Öğrenme teorileri ve mekân arasındaki ilişkiye rağmen, okul binalarının kullanımı hakkında yeterli bilgi bulunmamaktadır. Bu konunun Kullanım Sonrası Değerlendirme (KSD) yoluyla araştırılması gerekmektedir. Öğrenciler, okul binası sistemine en fazla sosyal katılımı olan ana kullanıcılarıdır. Bu nedenle betonarme ağırlıklı, çok sayıda dar penceresi olan, sınıfları birbirine bakan ve dar koridorlara açılan okul konseptinin öğrencilerin deneyimleri ışığında yorumlanması ve KSD süreci ile öğrencilerin okul binası hakkındaki yorumlarını ifade etmelerinin sağlanması gerekmektedir. Bu çalışmada Zaltman Metafor Çıkarım Tekniği (ZMET) kullanılmıştır. Çalışmanın katılımcıları üç ortaokuldan 21 gönüllü öğrenciden oluşmaktadır ve çalışmada derinlemesine veri elde etmek için görsel metaforlar ve aşamalı odak grup görüşmeleri kullanılmıştır. Elde edilen veriler ergonomi ve konfor, bireyselleştirme ve okul atmosferi temaları altında sunulmuştur. Çalışma, ergonomi, konfor ve bireyselleştirmenin algılanan okul atmosferiyle iç içe bir yapı oluşturduğunu açıkça vurgulamaktadır. Görseller, metaforlar ve odak grup görüşmeleri gibi çocuk dostu ve kişiye özel yaklaşımlar, öğrencilerin algılarının derinlemesine anlaşılması için bir fırsat sunmakta ve ZMET,

okul binası performans değerlendirmesi gibi karmaşık konularda veri toplamak için oldukça işlevsel olabilmektedir.

HOW STUDENTS PERCEIVE SCHOOL BUILDINGS?: A POST-OCCUPANCY EVALUATION THROUGH ZALTMAN METAPHOR ELICITATION TECHNIQUE

Despite the relationship between learning theories and space, there is not enough information about the use of school buildings. This issue needs to be investigated through Post Occupancy Evaluation (POE). Students are the main users with the most social participation in the building system. Therefore, it is necessary to interpret the school concept that is concrete-dominated, has multiple narrow windows, and has classrooms facing each other and opening to narrow corridors under the light of the experiences of the students and enable students to express their interpretations about the school building through the POE process. In this study, Zaltman Metaphor Elicitation Technique (ZMET) was used. The participants of this study consisted of 21 volunteer students from three middle schools. Visual metaphors and phased focus group interviews were used for deep understanding. The data obtained were presented under the themes of ergonomics and comfort, individualization, and school atmosphere. The study clearly highlights that ergonomics, comfort, and individualization create a structure that is intertwined with the perceived school atmosphere. Child-friendly and tailored approaches provide an opportunity for a deep understanding of students' perceptions and ZMET is very functional in gathering data on complex subjects like school building performance evaluation.

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CONTENT ANALYSIS OF THE "ARKITEKT" JOURNAL FROM HOUSING PERSPECTIVE: A DISCUSSION ABOUT SOCIAL ASPECTS OF HOUSING IN TURKEY (1) Ufuk KÜÇÜKYAZICI*, Yasemin ALKIŞER BREGGER**

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1. This paper is developed based on a proceeding titled "A Discussion about Social Aspects of Housing in Turkey: Evaluating the Changing Spatial Characteristics of Shared Places in Turkish Housing" which was presented by the first author at the conference ENHR 2022: "The Struggle for the "Right to Housing": The Pressures of Globalization and Affordability in Cities Today. Additionally, this paper and the proceeding were part of a PhD thesis titled "Social Aspect of Housing and Collaborative Housing: Public-Domestic Space Interaction in Residential Areas" completed by Ufuk Küçük yazıcı under the supervision of Yasemin Alkişer Bregger.

INTRODUCTION

The housing problem is a social phenomenon that is closely tied to both individual and societal needs, concerning the attainment of suitable living environment. While Turkey experienced industrial development later than European countries, similar housing challenges occurred due to the growing urban population and increased urban density. However, the definition of 'social housing' remains ambiguous in Turkey, despite the attempts to delineate related terms such as affordable housing, public housing, cheap housing, and mass housing (Keleş, 1980). These various definitions share common characteristics, primarily centered around providing affordable housing for a substantial number of people and facilitating the necessary spaces for community development. In the context of this research, the term social aspect of housing encompasses the intricate interplay between housing and the daily life habits. This perspective underscores the significance of shared spaces in residential areas in both ensuring adequate housing and optimizing the use of space in individual dwelling units. Shared spaces within residential areas serve as the interface for the interaction between private/domestic and public/social life, fostering the potential for the development of more sustainable residential areas. Consequently, the term social aspect of housing refers to housing types that contain the different levels of public-private hierarchy levels with various types of shared spaces and facilitate individual and society interaction in terms of their daily life routines which also identify the intertwined characteristics of most private living space and public uses in residential areas.

The objective of this research is to initiate a discussion on the social aspects of housing, particularly concerning the public-private sphere hierarchy in residential developments of Turkey. This examination is based on a content analysis of the *Arkitekt* journal, focusing on articles related to housing, and a spatial analysis of housing projects published within the

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journal. The choice of this journal is motivated by two key considerations. First, *Arkitekt* Journal primarily emphasizes the exposition of architectural events, buildings, and production, from the architects' perspectives (Sayar, 1980). Second, the temporal dimension is significant in the selection of this journal. It has been emphasized that in the Turkish housing history between 1923 and 1980, the number of qualified housing projects produced in the first years of the republic gradually decreased. (Alkişer and Yürekli, 2004). Therefore, the *Arkitekt* journal serves as a valuable resource for examining the social aspects of housing within the context of the built environment disciplines during these periods.

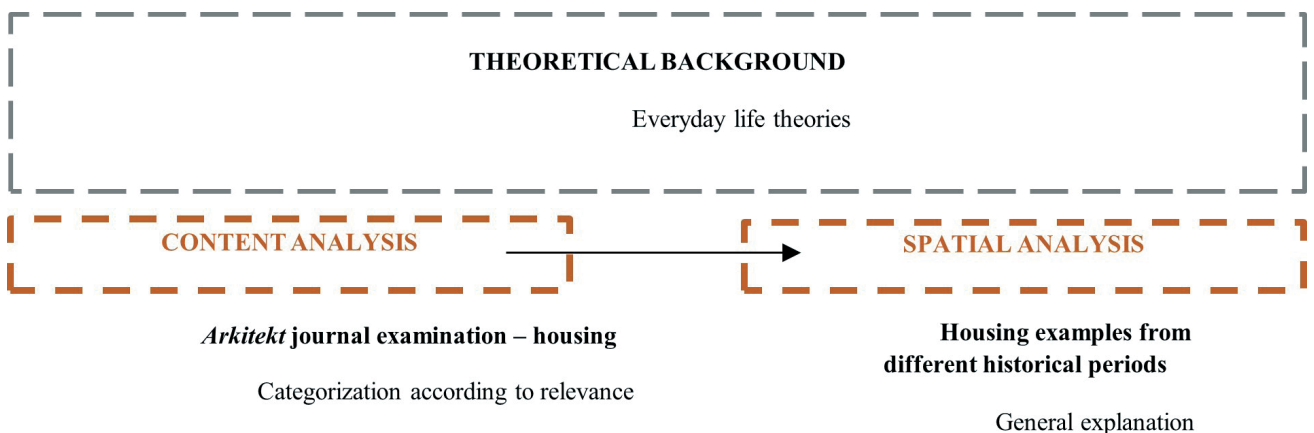
Methodology

This study about developing a discussion of social aspects of housing in the historical context of Turkish housing has three main parts as conceptual theoretical background, content analysis of *Arkitekt* journal and spatial analysis of housing examples selected within the content analysis. The conceptual background is based on the discussions about the public-domestic space hierarchy in residential areas, which emerges according to spatial characteristics of individual and society interactions. **Figure 1** shows the schematic structure of the research.

The origins of content analysis can be traced back to the early stages of language evolution in ancient civilizations, yet the formal conceptualization and integration of this method into scholarly discourse emerged notably post-Second World War. Despite its antiquated roots, content analysis has undergone substantive changes in both its objectives and methodological frameworks within contemporary academic discourse. Present-day iterations of content analysis are distinguished by three salient characteristics: empirical underpinnings, an exploratory modality, and a predictive or inferential orientation (Krippendorff, 2004, 16). This method finds frequent application in the comprehension of societal phenomena. However, its drawbacks include its labor-intensive nature, the inherent subjectivity involved in the analysis procedure, and the absence of universally recognized guidelines (Cho, Lee, 2014).

Content analysis, originally conceived as a quantitative methodology, has garnered recognition as a qualitative approach for systematically examining themes within written media, facilitating structured categorization and assessment. The primary objective for researchers while conducting content analysis is to extract insights from the determined materials and to elucidate and contextualize them within categories,

Figure 1. Methodology scheme (illustrated by authors)



leading to their classification within these categories using predetermined codes for the analysis. This analytical approach encompasses two fundamental methodologies based on code determination: deductive and inductive. In deductive approaches to content analysis, codes are determined based on pre-existing knowledge, and the aim is to identify these codes within written texts. Conversely, in inductive approaches, codes are derived from texts (Cho and Lee, 2014). In our study, a deductive approach was adopted to examine the societal dimension of housing in architectural literature, and for this purpose, an architectural journal *Arkitekt* is examined.

In the methodology of content analysis, various coding and categorization systems are contingent upon the nature of the information scrutinized and the disciplinary context. Disciplines such as psychology aim to uncover nuanced meanings embedded beyond textual symbols, whereas fields like politics and economics operate under the premise of clear and universally understood meanings within texts, consequently different coding practices occur in accordance with this assumption. (Krippendorff, 2004, 24). Within the sphere of built environment disciplines, content analysis extends beyond traditional publications to encompass diverse sources of information, including digital content, media materials, and newsletters. For example, Czischke, et. al (2020), undertook a comprehensive examination of publications concerning collaborative housing, employing content analysis alongside with thematic analysis to discern prevalent themes in contemporary discourse on the topic (Czischke, et. al, 2020).

Another application of content analysis in the built environment involves examining reports from Pritzker Prize juries. Researchers aim to identify shifts in jury discourse and the reasons behind their award decisions. Initially, researchers categorize jury members based on various factors such as individual characteristics, nationalities, dates, tenure, and frequency of participation. Subsequently, they categorize the reports according to focal points, values, and architectural elements. This investigation sheds light on the criteria for jury member selection and their tenure, as well as the relationship between these criteria and the architectural themes emphasized in the award deliberations (Mahdavinejad and Hosseini, 2019).

In this study, within the content analysis section, codes were established to identify the subjects emphasized in the content and to create categories for the purpose of elucidating the societal dimension of housing. The content analysis of the articles in the *Arkitekt* journal depends on chronological examination for identifying the housing development in Turkey between 1930 and 1980 on categories according to period, subject, location, building type and the relevance to the social aspects of the housing. The categorization of three main periods depends on the chronological examination of the differences in housing developments under the influence of cultural, political, and social changes. As Alkışer and Yürekli describes in the early years of the Turkish Republic until 1945, government support played a crucial role in promoting the creation of high-quality living environments. The period between 1945 and 1960 saw the encouragement of cooperative initiatives aimed at developing residential areas with social facilities and shared spaces. However, after 1960, there was a noticeable shift towards constructing apartment buildings, prompting discussions on the preservation of neighborhood life (Alkışer and Yürekli, 2004). The subject has two categories: project, and discussion according to their scope about analyzing the examples or providing

Keywords for housing articles		
House, home, dwelling, neighborhood, housing problem,		
Content categories	Social aspect of housing – selection criteria	
	Inclusion	Exclusion
Housing typology – apartment / detached / row / mixed	Multiple household typologies, affordable housing, cheap housing, cooperative housing, small living environment, housing problem, housing policy, rental housing, housing standards, urban development	Luxury housing, single-family detached housing, rural development-housing, traditional housing
Location scope – national / international		
Article scope typology – discussion / project		

Table 1. Key elements of content analysis

arguments about certain housing situation. The articles were divided into two categories, national and international for the location. The housing type consists of apartment buildings, row houses, single-family houses and mixed as the combination of these types. The relevance to the social aspect of housing is determined according to variation of public-private sphere hierarchy, potentials of shared space use for neighbor relations and community developments. In this context, multiple household residential areas, affordable housing, cheap housing, cooperative housing, small living environment, housing problem, housing policy, rental housing, housing standards, urban development keywords are determined as selection criteria in order to identify the articles which maintain the social aspect of housing content. **Table 1** summarizes the key elements of content analysis.

In the spatial analysis, examples are selected based on the content analysis of the *Arkitekt* journal, specifically from the project articles that exhibit intertwine public and private spheres hierarchy in spatial configuration, as well as contain the spaces designed to facilitate community interactions. The spatial configuration of each example is assessed according to the information published in the *Arkitekt* journal. The housing examples are analyzed in terms of their utilization of the public-private sphere through the creation of diagrams that depict the relationships between urban functions within the built environment, in the unit, building, and neighborhood scales. This spatial analysis aims to examine the spatial characteristics of the projects in relation to the intertwined boundaries between public and domestic life routines. The housing examples are evaluated according to their spatial characteristics into two categories as; the social environment, which is divided into three categories; as individual, household, and society and the built environment, which is divided into three different scales as unit, building, and neighborhood.

CONCEPTUAL BACKGROUND: SOCIAL ASPECT OF HOUSING and HOUSING DEVELOPMENTS IN TURKEY

The physical determination of geometric space is not enough to explain the (architectural) space in terms of individual/ society interaction and their daily life routines, due to the spatial aspects of the “dwelling” activities which also identifies the individual’s perspectives about identifying their own understandings of the world (Merleau-Ponty, 2005, 19-26). The meaning of space changes in terms of urban activities according to daily life, which is a phenomenon, does not only have spatial characteristics but also has social and temporal dimensions.

Social space is shaped by the complex web of daily life relations influenced by individual behaviors within society. The interactions between individuals and the public sphere have impacts on the spatial



Figure 2. Spatial analysis of public private sphere hierarchy for residential areas – contemporary housing developments with multiple-user typologies (illustrated by authors, based on discussion of Hayden, 1981; Ayata, 1988; Colomina, 2016; Gehl, 2011)

configuration, determined by the activities an individual engages in within the public realm (Lefebvre, 2014, 99). Consequently, social space embodies the interplay between the social and built environment and the use of public and private spaces. In contrast, the field of built environment disciplines has often leaned towards separating public and private spheres, owing to the influence of the modern architectural movement and its distinct categorization of urban functions such as living, working, recreation, and circulation (Gold, 1998). This division of urban functions has led to a misconception where outdoor activities are seen exclusively as public and recreational in nature (Gehl, 2011). However, while outdoor activities are typically associated with public spaces, there are instances where the demands of private life within residential areas extend to outdoor spaces, resulting in a blend of semi-public and semi-private areas where the boundaries of public and private spheres intertwine. Additionally, domestic life and public life are intertwined within residential areas, in terms of activities such as childcare, housing maintenance, commuting, housework, and recreation (Hayden, 1981).

According to changing lifestyle habits of metropolitan society and economic systems, consumption patterns—such as preferences and experiences during grocery shopping, errand handling, working habits, and recreational activities—play a pivotal role in shaping the production of space based on everyday life activities. These patterns also contribute to the creation of new spatial configurations within urban environments (De Certeau, 2008, 55-8). In terms of residential areas, individuals seek places that facilitate interaction among people from diverse social groups, either on an individual basis or within the community across various public-private spheres, resulting in a harmony between domestic space and public space despite the tendency for distinctive spatial definitions (Hayden D, 1984). Accordingly, the traditional perception of public-private space uses has changed under the influence of information technologies and

contemporary lifestyles. Additionally, the studies on characteristics of the Turkish apartment unit spatial organization show that the living rooms and kitchens have potentials not only for recreational activities with neighbors but also sharing domestic requirements with the neighbors (Ayata, 1988). **Figure 2** illustrates the characteristics of public and private spheres within residential areas, considering urban functions and spatial dimensions at three scales: the unit, building, and neighborhood. This figure demonstrates that across these scales, various spatial features are available, which have the potential to accommodate multiple urban functions. These functions, including living, working/education, and recreation, are also defined in terms of public-private sphere characteristics within these three levels of the built environment. The circulation function is inherently interconnected with the other functions. As a result, **Figure 2** serves as a medium for exploring urban uses in residential areas and determining a research framework for the examination of different housing examples concerning their social aspects.

After the foundation of the Turkish Republic, there was significant governmental control and support on housing production and the studies between 1930 and 1945 for promoting the developments in both rural and urban areas throughout the country (Bozdoğan, 2015, 243). Especially since the 1930s, the westernization process had rapid effects on the spatial organization of houses according to the changes in spatial requirements of different daily life routines (Bozdoğan, 1996, 314-6). In this period, Turkish architects tried to follow the international trends about the attempts for solving the housing problem in order to develop housing projects for Turkey (Mortaş, 1931; Saim, 1931). Aslanoğlu (1986) contends that during the early years of the Republic, Ankara maintained its focus on urban development and public infrastructure until the 1930s. This era signifies pioneering endeavors aimed at advancing urbanization in other cities and delineating a distinct Turkish architectural style. Furthermore, it is acknowledged that Ankara experienced vigorous construction activity during this period, particularly emphasizing the construction of detached dwellings (Cengizkan, 2022). On the other hand, in this period, the production of factories and surrounding residential areas became prominent in Anatolian cities in order to support the development plans of those cities (Dorukan Kopuz, 2018).

After the 1960's the emergence of the regulation about separate title deeds and the increase in urban population caused the increase the apartment building production to create more dense settlements (Özüekren, 1996). In this period, minimum space standards for affordable housing were determined by authorities in order to prevent quality issues in apartment buildings with small dwelling units to create more housing and "public housing standards" were published (İmar ve İskan Bakanlığı, 1964). Due to the emphasis on identification of minimum structural dimensions and spatial requirements of furniture, there were critics about the standards as neglecting the social dimension of housing problem and only creating the emphasis on the quantity (Mimarlar Odası, 1964). During this period, rural-urban migration intensified due to increasing job opportunities in cities and the decreasing economic viability of rural areas. In the 1950s, new settlements emerged on the periphery of cities. Factors such as urban migration, the decline in agricultural employment, and advancements in urban transportation significantly altered the population and social structure of urban areas. Balamir (1996) asserts that social structure and urban space mutually transformed each other during this period. Notably,

after the 1950s, the growing urban population led to the adoption of cooperative and mass housing approaches, which were commonly seen in Europe as solutions to the housing problem. However, unlike European practices, these initiatives in our country generally targeted the middle and upper-middle-income groups. Lottery houses, a distinct form of housing production during this period, were awarded as prizes in lotteries organized by banks to promote savings since the 1930s. These houses gained popularity in the 1950s and continued until they were banned in the 1970s. Designed by prominent architects, lottery houses played a significant role in addressing the housing shortage and provided notable examples of multi-user housing (Şumnu, 2014).

Since the 1960s, there has been a significant increase in the construction of densely populated apartment buildings in urban residential areas, attributed to legislation recognizing separate title deeds for different parts of the same building. During this period, urban development accelerated, particularly in housing production; however, this rapid growth also led to challenges in providing adequate resources to the housing sector (Balamir, 1975). In the 1960-1980 period, the apartment units had spatial configuration of public-private hierarchy in terms of interior space. Generally, the houses had two living rooms, one with a dining area for guests and one for daily life routine; daily meals took place in the kitchen and in addition, the kitchen was a place for daily visits of close friends of the family (Ayata, 1988). In this case, public-private hierarchy recreated according to Turkish culture and gained importance in terms of indoor space use in multi-user apartment buildings.

From this perspective, the following chapter discusses the social aspect of housing according to the content analysis of the *Arkitekt* Journal in order to provide information from the built environment disciplines perspective. Due to the tendencies in housing developments about creating sufficient residential areas with required facilities and services while providing multiple dwelling units in order to solve the housing problem.

THE CONTENT ANALYSIS OF HOUSING ARTICLES IN THE ARKITEKT JOURNAL

The housing articles of the *Arkitekt* Journal are categorized according to the period, location, housing typology, and subject. This research identifies the social aspect of the housing according to housing types, which points out the social production of space, accordingly, shows the features about community interactions and emphasis on shared spaces. Therefore, the archival research about the social aspects of the housing focuses on the multiple user residential areas such as row houses, apartment buildings, and settlements with multiple detached houses in the neighborhood.

According to chronological examination of *Arkitekt* journal articles and Turkish housing history **Table 2** shows the quantitative examination of *Arkitekt* journal in terms of three different periods. The first part of the content analysis provides the information in order to identify the articles about housing. The numeric examination shows that there are 3938 articles in the journal and 581 of them are related to housing. During the first period (1930-1945), each volume consistently included at least one article on housing. However, in subsequent periods, the focus on housing topics showed a relative decline. In the first period, housing articles accounted for 19% of the total number of articles, while in the second period, this figure

Content	1930-1945	1945-1960	1960-1980	Total
Total number of the volumes	48	48	81	177
The number of the volumes with the housing articles	48	44	61	151
Total number of articles	1528	1120	1290	3938
Total number of housing articles	292	167	122	581
Articles related to the social aspects of the housing	161	88	61	310
The ratio of housing articles to total articles	19%	14%	9%	14%
The ratio of articles relevant to social aspect of housing to total housing articles	55%	53%	50%	53%

Table 2. The content analysis according to number of volumes-articles of *Arkitekt* Journal in different periods

dropped to 14%. In the third period, housing articles represented only 9% of the total. Notably, approximately half of these housing articles in each period addressed the social aspects of housing (**Table 2**).

During the 1940's the housing discussions contain the ideas of international context and ways to create national solutions for newly experienced housing problem. Berkol (1945), explains that via the examination of international housing examples and debates, there are studies for creating solutions for housing problem in Turkey. After the 1940's the articles focused on discussion of the problematic issues of housing production in terms of the lack of affordable alternatives (Sayar, 1948) and unfair distribution of financial opportunities (Sayar, 1952a) not only among the construction companies but also among society (Zadit, 1948). The discussion articles after 60's critically point out the difficulties about production of affordable housing with the required shared spaces and facilities (Sayar, 1963, 1964) and underestimated subjects of dwelling requirements of ordinary people such as student accommodations (Anonymous, 1970b) and elderly housing (Somer, 1974). These discussions and project articles shed light on persistent challenges in recognizing the social dimension of the housing problem, as well as debates on how to create more livable environments with requisite facilities and shared spaces to foster community development and affordability. From this perspective, **Table 3** shows the examination about *Arkitekt* journal according to the predefined key elements of content analysis and the relevance to social aspect of housing. The next part of the paper explains the quantitative analysis about the content analysis and main debates of discussion and project articles about social aspect of housing.

Especially criticized in discussion articles of *Arkitekt*, there was the need for the production of affordable housing since the beginning of the foundation of the Turkish Republic according to the increasing urban population and the authorities identified the regulations about financial support for housing production. The investments of housing production focused on creating big dwellings with five or six rooms mostly as single-family detached houses. There was not strict control of loan opportunities for construction whether they were suitable for developing affordable housing. (Sayar, 1946a; 1952b; 1953; Evren, 1962). Furthermore, the project articles shows that there were attempts for development of large residential areas which contain facilities, recreational areas in relation to newly established factories in Anatolian cities (Arkan, 1935; Anonymous, 1944). The historical examination of Turkish housing examples shows that the new typologies

period	scope	Housing typology	Articles relevant to social aspect of housing				The other housing articles									
			project		Discussion		project		discussion							
1930-1945	national	apartment building	65	116	122	211	3	20	39	99	5	118	121	2	7	10
		detached house	37				2				109			2		
		row houses	7				2				3			-		
		Mixed	7				13				1			3		
	international	apartment building	1	6	122	211	1	19	39	99	-	3	121	-	3	10
		detached house	1				4				3			-		
		row houses	2				2				-			-		
		Mixed	2				12				-			3		
1945-1960	national	apartment building	14	25	40	211	4	31	48	99	2	44	59	4	14	20
		detached house	10				1				41			2		
		row houses	-				-				-			-		
		Mixed	1				26				1			8		
	international	apartment building	7	15	40	211	3	17	48	99	6	15	59	1	6	20
		detached house	3				3				9			1		
		row houses	2				1				-			-		
		Mixed	3				10				-			4		
1960-1980	national	apartment building	32	38	49	211	1	9	12	99	5	50	53	1	6	8
		detached house	-				-				44			-		
		row houses	1				-				-			-		
		Mixed	5				8				1			5		
	international	apartment building	10	11	49	211	-	3	12	99	-	3	53	-	2	8
		detached house	-				-				3			-		
		row houses	1				-				-			-		
		Mixed	-				3				-			2		

Table 3. The content analysis of the Arkitekt Journal articles in terms of the determined housing typology categories

were designed according to adapting the traditional housing to the current situation via detached houses (Uysal, 1944). For the 1930-1945 period, Table 3 shows that within the scope of social aspect of housing, the discussion articles focus on mixed housing typology in both the national (26 articles) and international (10 articles) scope. Even though the articles of international housing developments show that row houses or mixed typology with the row houses provide better solutions for affordability concerns, in the Turkish project examples the dominant building type was single-family houses for the development of the residential areas in general (Table 3).

In the 1930-1945 period, the project articles have a focus on mostly single-family houses, due to the slow increase in population, the considerable number of vast lands for construction sites and the opportunities for creating similar spatial organization to the traditional Turkish House (Anonymous, 1931; İhsan, 1933). However, especially in 1940's finding the capital for investments was one of the problematic issues for the

constructions due to the general economic crises, accordingly there was a problem with providing finance for dwelling units not only in terms of quality but also for quantity issues (Mortaş, 1944). The newly established state cooperatives were the main housing production source in terms of creating financial resources; however, the housing projects were based on single-family houses with gardens, unlike the cooperative settlements of western culture. The new dwelling projects were mainly the solutions for high-quality living environments for government employees at affordable prices. (Özüekren, 1996). The projects from this period later caused additional disagreements, in terms of expensive investment for a limited number of dwelling units (Sayar, 1946, a,b).

State control and support of the housing production had changed and during the 1945-1960 period, the authorities reduced the economic support for housing constructions (Sayar, 1948). Türkiye Emlak ve Kredi Bankası, a public institution that was providing the loans for cooperatives, was in charge of planning the government subsidies. After changes in the government in order to create new sources for the construction sector, new legal arrangements were planned for loan opportunities in order to encourage cooperative housing not only for government workers' dwellings but also for the general supply of housing. However, the problem of affordable housing started to appear despite the quantitatively considerable number of housing constructions (Evliyagil, 1950). In this period, cooperatives focused on construction of single-family housing while the European examples were mostly row houses. The main criticisms included the subjects about expensive housing developments as blaming housing authorities for not considering the requirements of society in general and not creating suitable financial opportunities for low- and moderate-income level groups (Sayar, 1953). Accordingly, the discussion articles criticize the expensive housing developments with low-density building typologies.

Instead of the row house typology for the multiple user housing development, the apartment building type was chosen as project numbers show that row house examples in the national context did not occur much among the articles. Despite increasing housing production in 1945-1960 period, the number of project articles in *Arkitekt* Journal decreased (**Table 3**). Similarly, architectural interest shifted from housing problems to developments in other areas despite increasing housing shortage. On the other hand, the international project explanations mostly contained the alternatives about apartment building typology.

For the 1960-1980 period, **Table 2** shows that the number of housing articles in the *Arkitekt* journal is 122 and the ratio of housing articles of this period is smallest with 9% (**Table 2**). The content of housing articles focuses mostly on the projects of single-family houses; however, the dominant building typology of this era was apartment buildings. On the contrary, the discussion articles show that the need for affordable housing opportunities was increasing even though constructions were also increasing. The problematic issue of that era appeared in terms of not addressing the loan opportunities for low-income groups (Evren, 1962), increasing housing prices even with the smaller units (Sayar, 1964) and neglected need for affordable and small dwellings (Sayar 1965). During the 1960's urban structure became denser with the apartment building construction in demolished single-family house lands, additional stories on single-family houses and new apartment building constructions (Sayar, 1963).

THE SPATIAL ANALYSIS OF TURKISH HOUSING EXAMPLES FROM ARKITEKT JOURNAL

Housing examples from the different periods show the characteristics of their eras in terms of housing tendencies based on building typologies and neighborhood life. Accordingly, from each period, two examples are selected for the analysis according to the relevance to the social aspects of housing and they are examined in terms of shared space use, which identify the relations about the public-private sphere interaction and relevance to social aspect of housing. For 1930-1945, Zonguldak Coal Mine Workers’ Housing project and İstanbul rental apartments in Fatih are selected among the 122 project articles which show social aspect of housing feature, due to the unique spatial characteristics of domestic and public sphere hierarchy in each example with diverse housing alternatives in different tenure type and shared spaces for various purposes. For the second period 1945-1960, the neighborhood development of 4 Levent from İstanbul and Ankara Saving Houses are depicted among the 40 project articles with the content related to social aspect of housing according to the project’s location referring to developments for urban expansion, neighborhood configuration with multiple dwelling unit construction for reasonable prices despite the economic problems for financing the constructions. For the third period 1960 and 1980, among the 49 project articles with social aspect content an iconic Turkish Modern Movement example Hukukçular Apartment Block and Yeşiltepe Cooperative Blocks are chosen for spatial analysis due to the spatial configuration of apartment buildings with the shared spaces and facilities. The context of the examples addresses different segments of the society; however, the examples are selected according to the changes of housing developments throughout time from the tendencies for creating multiple dwelling opportunities with shared places. The examples show that in each era there were attempts for providing the shared space use. **Table 4** summarizes the spatial characteristics of examples.

Table 4. Evaluation of the general characteristics of the examples

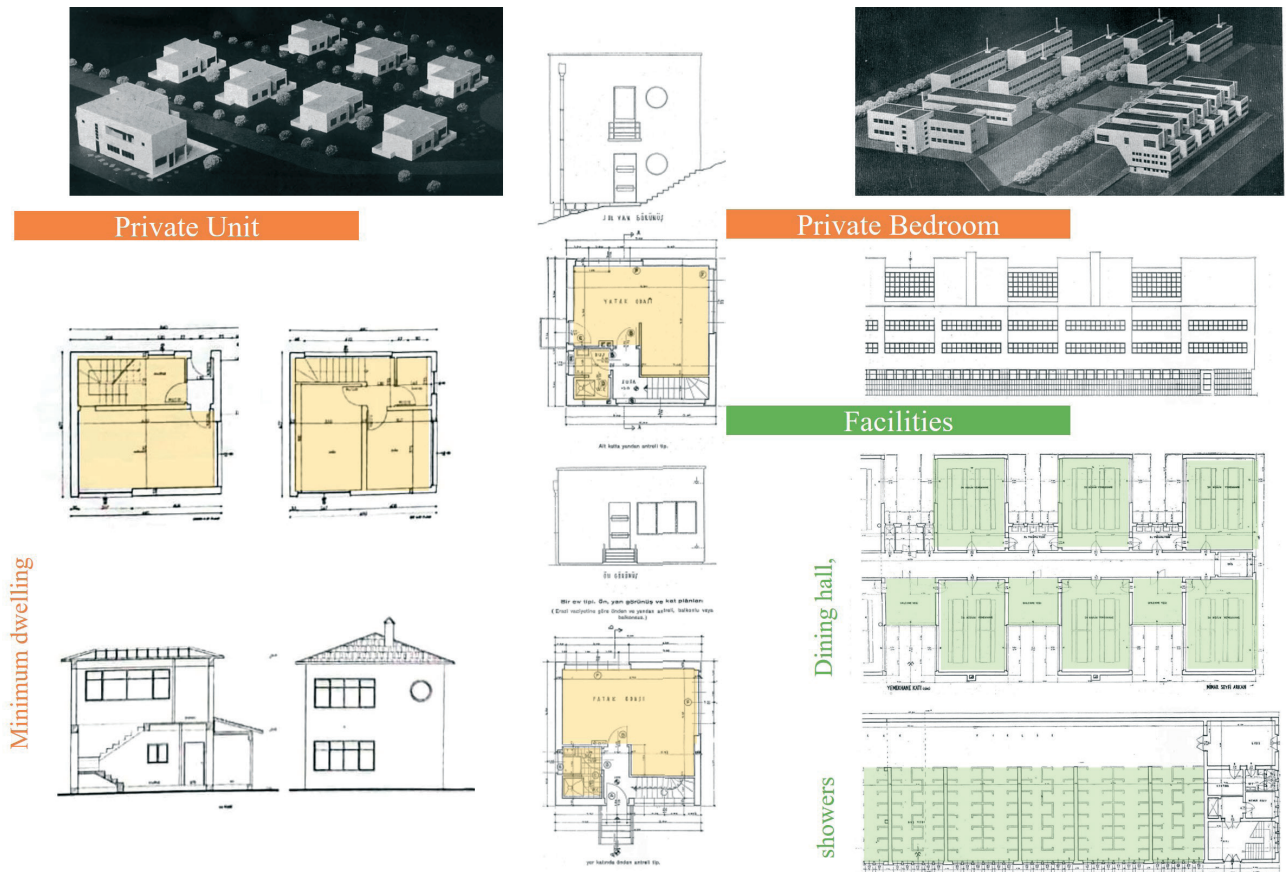
Example, publication time	Location, Construction time	Urban configuration, Building typology	Dwelling number and types	Shared spaces
Coal mine workers’ housing (Arkan, 1935, 1936)	Zonguldak, 1933-1935	Neighborhood scale mixed typology with detached, row houses	450 units, 1-2 room dwellings, 2 building types, 3 unit types	Facilities, laundry, dining room, cultural spaces, gardens, circulation
Rental Apartments in Fatih, (Mortaş, 1935)	İstanbul, 1935	Apartment building	6 units, 4-5 room dwellings, 4 unit types	Common room in the roof, laundry, storages, circulation
Saving Houses Ankara (Mortaş, 1948)	Ankara, 1944	Neighborhood scale, detached houses	62 units, 5-7 rooms, 6 unit types	Gardens, circulation
Levent 4 Neighborhood (Arü, 1956)	İstanbul, 1956	Neighborhood scale mixed typology with detached houses and apartment buildings	345 units, 4-5 room dwellings, 8 block types, 10 unit types	Facilities, gardens, cinema, gardens, circulation
Yeşiltepe Cooperative Blocks (Anonymous, 1969)	Ankara, 1967	Neighborhood scale apartment blocks	500 units, 6 rooms dwelling, 1 building type, 1 unit type	Circulation, terrace, garden, outdoor sports areas
Hukukçular Apartment Block (Anonymous, 1961, 1970)	İstanbul, 1967	Apartment block	66 units, 5-6 rooms dwellings, 3 unit types	Facilities, circulation, and service spaces

Coal Mine Workers' Housing, 1933-1935 Zonguldak

Between 1933-1935, for coal mine developments of Zonguldak, Seyfi Arkan prepared the urban planning for Kozlu Zonguldak Coal Mine Workers Housing in Üzülmez neighborhood to include a combination of social facilities and residential areas for coal mine workers. Even though the urban planning projects were not completely constructed in the area, the attempt for developing qualified living areas and the spatial configuration to combine public and domestic life is important in regard to innovative housing development in Turkish housing history (İmamoğlu, 2009). Accordingly, this project is analyzed based on the information published in *Arkitekt* journal. Seyfi Arkan designed a variety of residential units for diverse levels of workers and household types for Üzülmez. There were row houses, single-family houses, detached houses with a private bedroom with bathroom and single workers' apartment building as dormitory (Figure 3). The urban planning projects contained spaces for not only domestic life requirements such as common dining room, bathroom, kitchen, and laundry but also work education and leisure time activities such as educational, cultural, recreational buildings for workers and their families in terms of daily life routines (Arkan, 1935).

The drawings based on *Arkitekt* articles show that there were two types of dwellings as single-family houses and single worker's rooms (Figure 3). Figures 4 and 5 show the spatial characteristics of these two types of dwellings according to public-private sphere hierarchy and urban functions. As Figure 4 shows single workers room contain only the private space in the dwelling, conversely the shared facilities in the settlement

Figure 3. Zonguldak Coal Mine Workers' Housing Spatial Analysis – General Features (illustrated by authors based on Arkan, 1935)



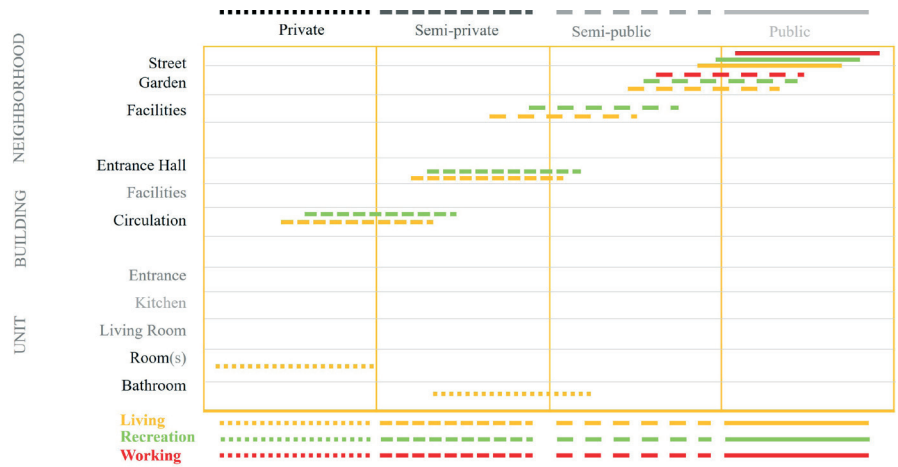


Figure 4. Zonguldak Coal Mine Workers' Housing Activity-Space Analysis – Single Workers' Room (private bedroom)

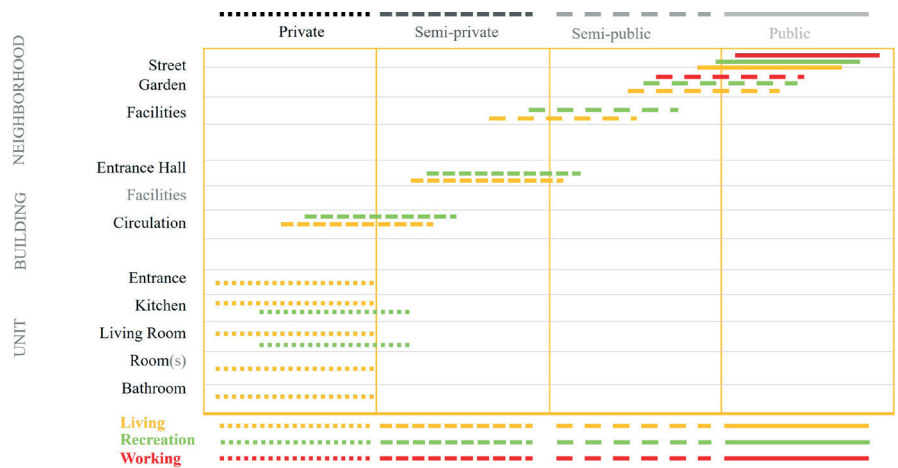


Figure 5. Zonguldak Coal Mine Workers' Housing Activity-Space Analysis – Single-Family House (private unit)

accommodate the domestic life requirements. In contrast, single-family houses consist of multiple rooms with both private and semi-private features; for example, living rooms and kitchens exhibit potential for recreational use, as depicted in **Figure 5**. This spatial configuration within the settlements illustrates a harmonious relationship between the individual and society, setting a unique precedent in Turkish housing history. In terms of social aspect of housing, laundry recreational areas show the potential uses of shared spaces for domestic life requirements and community interaction while providing more space in reasonable prices.

Rental Apartments in Fatih, 1935 İstanbul

This small apartment building, designed by Abidin Mertaş, comprising 6 dwelling units along with shared laundry and storage facilities, represents an example of the emerging rental housing options during the Early Republican period in İstanbul. In response to economic challenges and an increasing demand for housing, residents devised solutions, such as constructing apartment buildings on their own land (Mertaş, 1935). This approach allowed them to provide housing for the landowner while generating additional income through rental units. Additionally, these rental dwelling units offered affordable housing options in city centers. From a social aspect of housing perspective, this apartment building includes shared spaces, such as a communal laundry area, which fulfills domestic life requirements. Conversely, the existence of various tenure

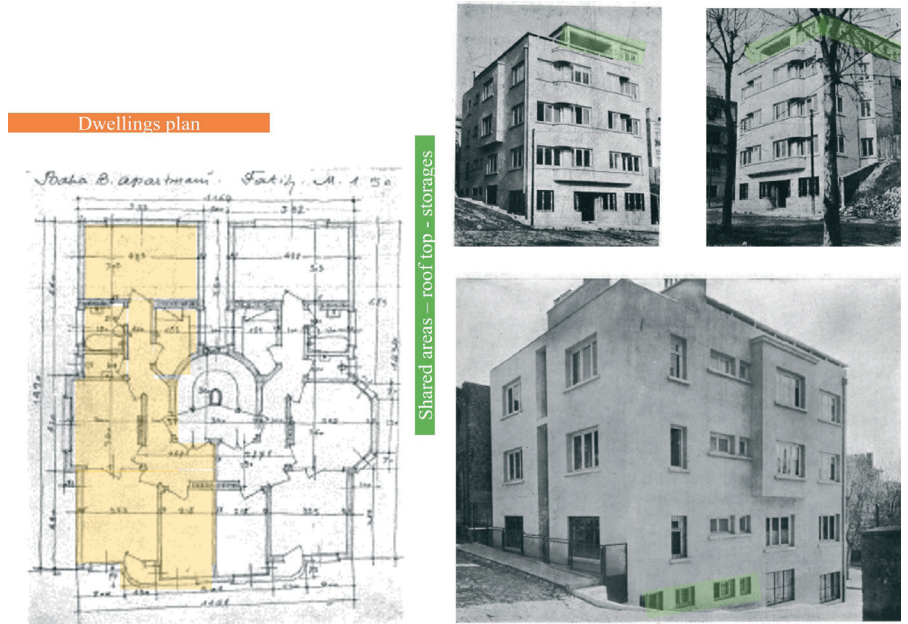


Figure 6. Rental Apartments in Fatih, 1935 İstanbul (illustrated by authors based on Mortaş, 1935).

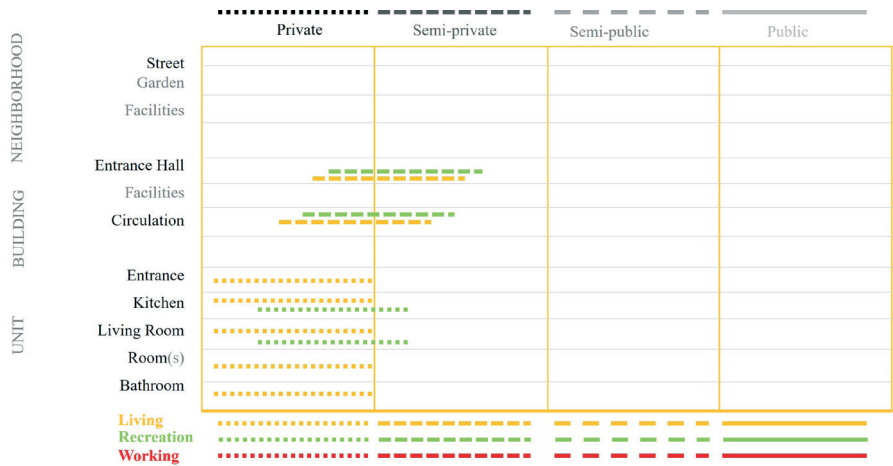


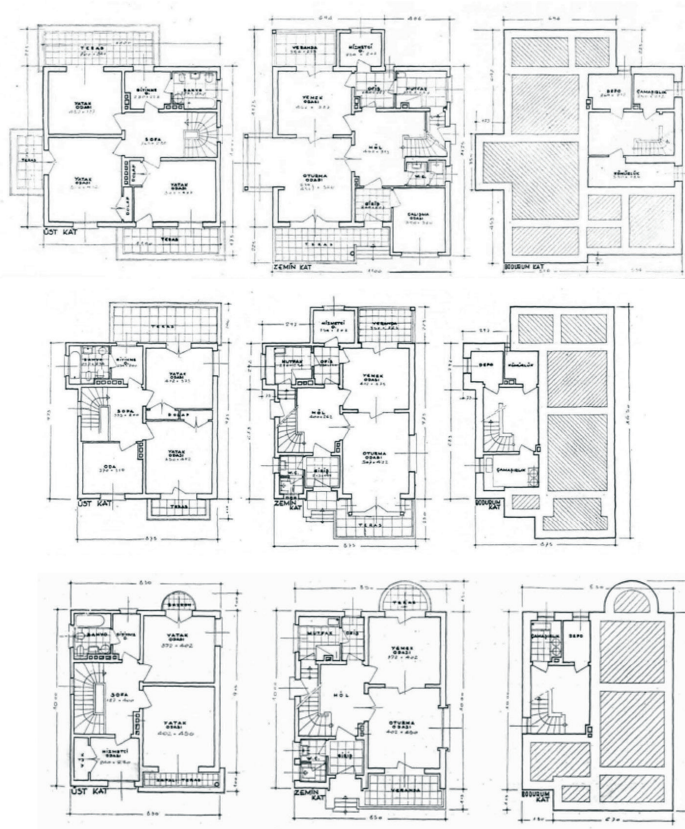
Figure 7. Rental Apartments in Fatih Activity-Space Analysis

types reflects the economic dimension of social aspect of housing, particularly in a period marked by housing shortages and affordability concerns. Figure 6 shows the spatial configuration of the apartment building. The diagram in Figure 7 illustrates the interactions between public and private spaces in this example.

Ankara Savings Houses, 1944, Ankara

Ankara Saving Houses was designed by Abidin Mortaş within the scope of Ankara Savings Houses Cooperative. Although it was originally planned to build 150 detached houses in this settlement, 62 housing units were completed in 1944. There are 6 different types of dwellings ranging from 5-7 rooms and their own gardens. This settlement is included in the analysis because they represent a unique type of housing design via cooperatives with economic concerns and fast construction techniques; thus, contributing to the creation of a critical perspective within the scope of the social aspects of housing (Mortaş, 1943; 1948). The fact that there are no shared facilities in this project shows that social interaction is not at the forefront of design decisions in the neighborhood configuration, and that increasing the number of housing units was a more important design

Dwelling plans



Neighborhood

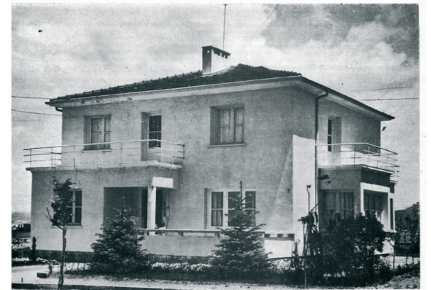
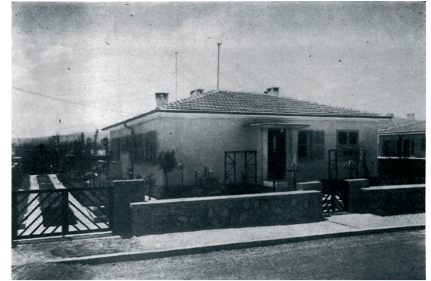


Figure 8. Ankara Savings Houses (arranged by authors based on Mortaş,1943-1948)



Figure 9. Ankara Savings Houses Activity-Space Analysis

factor. However, due to budget constraints, the first planned number of housing production could not be achieved. This situation shows an example of financing problems in housing production at that time. The general characteristics of Ankara Lottery Houses and analyzes regarding their use between public and private areas are shown in the Figures 8 and 9.

Levend Neighborhood, 1956, İstanbul

Kemal Ahmet Arü had designed 345 lodgings, 70 stores and a movie theater with a capacity of 580 people, a sports club, tennis courts,

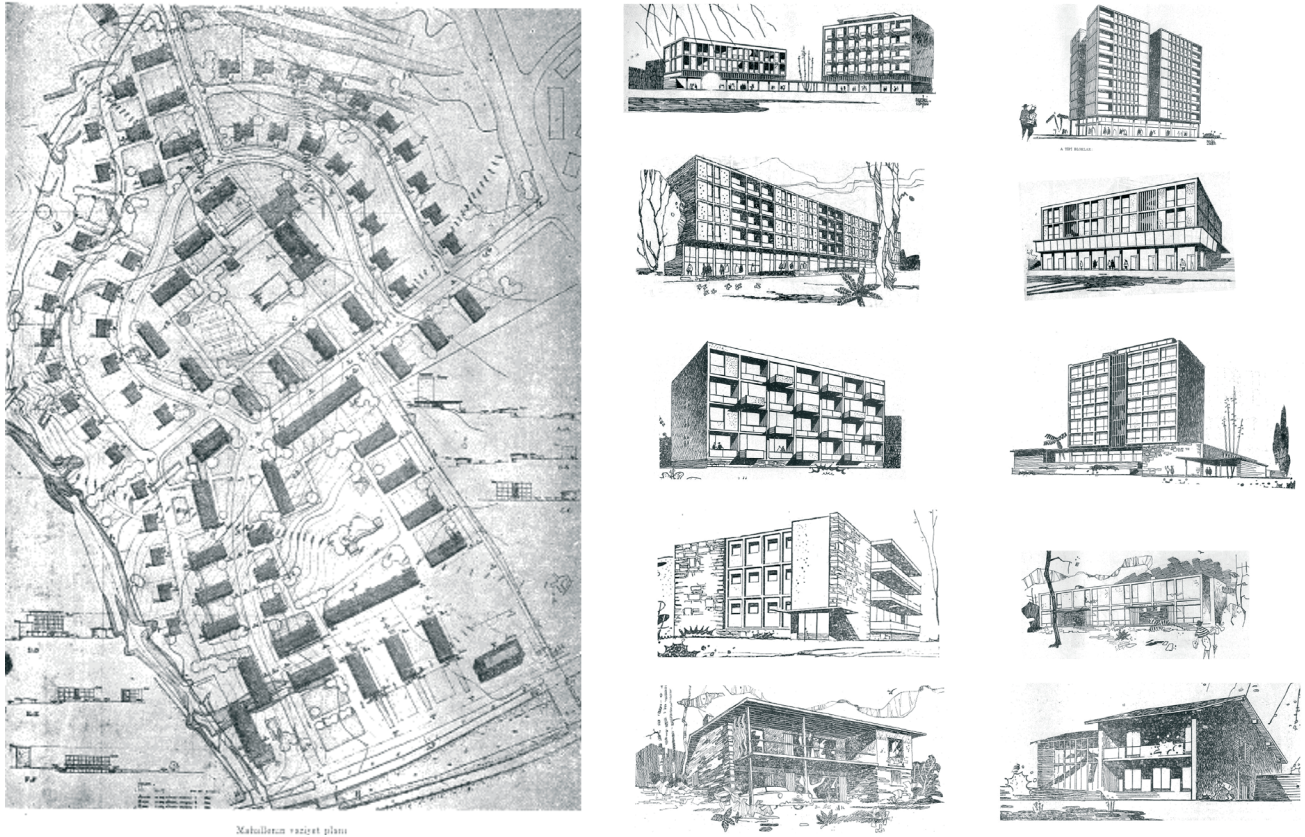


Figure 10. Levent 4 Neighborhood Site Plan and Perspective drawings (arranged by author based on Arü,1956)

swimming pool, casino, tea and coffee pavilions, nightclub, kindergarten, and children's playground, together with the administrative unit for the Levent 4 neighborhood. Eight different blocks were planned for different user types with different building types as apartment buildings and row houses. Each block was created for developing their own daily life configuration with the facilities. Additionally, there were two types of single-family detached house typologies (Arü,1956). Designing the ground floors of the buildings as a common area created social facilities such as bazaars and coffee houses, and socialization spaces where the residents of the neighborhood could come together (Alkişer-Bregger and Çiftçi, 2021). The structure of the housing blocks and the importance of gardens in the planning created common open spaces that could be used by the residents of the region and helped to form the social aspect.

The drawings from the articles showed that the dwelling units had similar characteristics for single-family uses; however, the size and relation to facilities changed (**Figure 11**). Therefore, the analysis depends on two types of dwelling units; one of them is dwelling unit block, and the other is dwelling unit block with facilities (**Figure 12 and 13**).

The facilities located within the buildings provide social interaction among the inhabitants of the neighborhood but also the inhabitants of the surrounding neighborhoods. Different housing types give opportunities for different segments of society accommodation alternatives. Due to these features this neighborhood design shows different dimensions of social aspect of housing while the inhabitants have the spaces for interaction and different housing options.

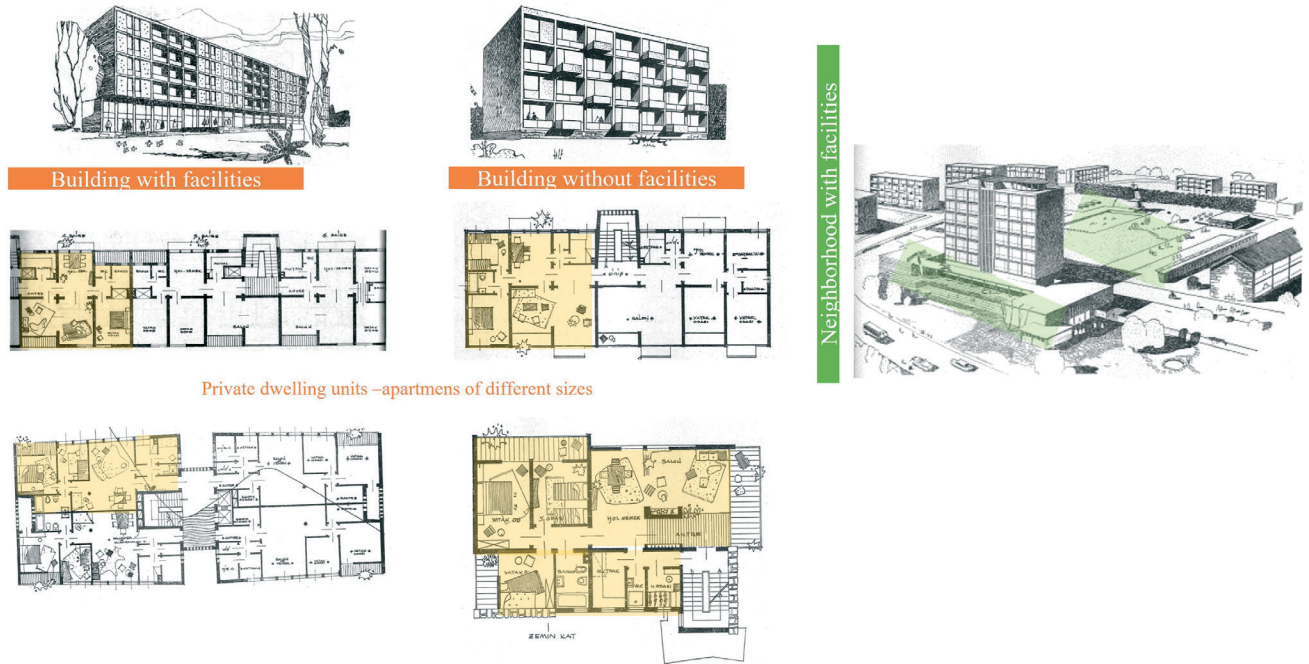


Figure 11. Levent 4 Neighborhood Spatial Analysis – General Features (illustrated by authors based on Artı,1956)

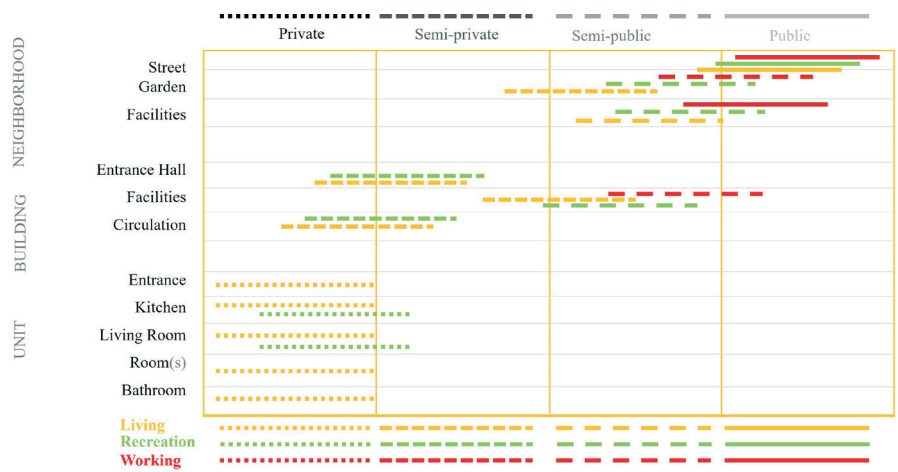


Figure 12. Levent 4 Neighborhood Activity-Space Analysis – Dwelling unit with facilities in the building

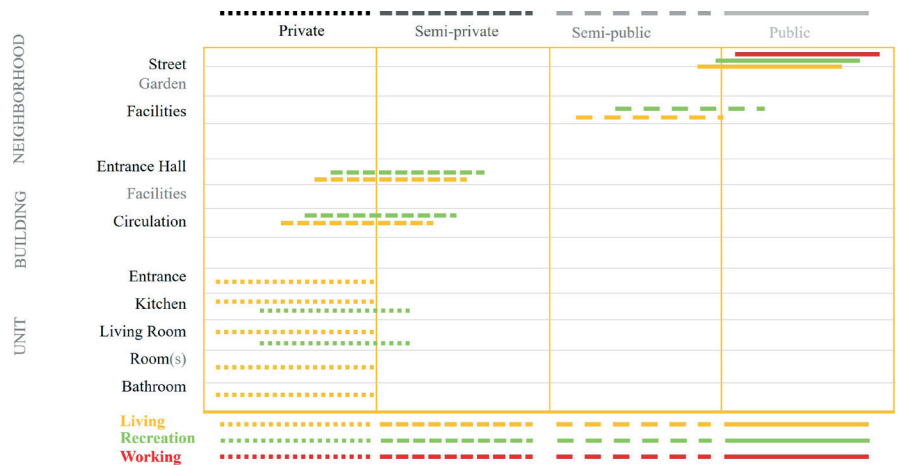


Figure 13. Levent 4 Neighborhood Activity-Space Analysis – Dwelling unit without facilities in the building

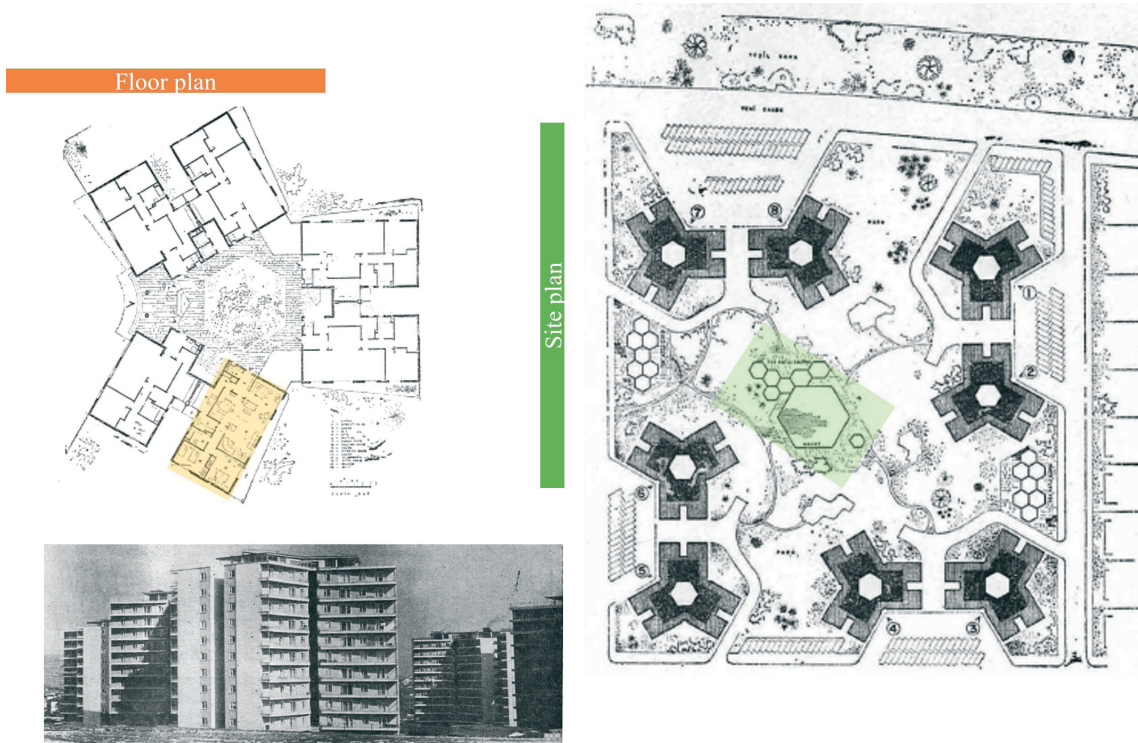
Yeşiltepe Cooperative Blocks, 1967, Ankara

Yeşiltepe Cooperative Blocks was initially designed in the 1950s but was not completed until 1967. It comprises eight identical apartment blocks, with 500 dwelling units in total sharing a same spatial organization. However, the partition walls were designed to offer flexibility, enabling residents to separate living rooms when additional space was required. Each apartment building features an inner courtyard for circulation and terraces on each floor to encourage social interactions. Furthermore, the rooftops were designed as playground areas and open spaces for the residents. This example represents the perspective of the social aspect of housing in quantitatively focused projects (Bediz and Kamçıl, 1969). During this period, the housing shortage, particularly for affordable accommodation options, was a significant issue. In this settlement, the cooperative facilitated the construction of a considerable number of housing units with limited shared spaces, while still fostering community interactions. The **Figure 14** shows the general spatial information about Yeşiltepe Cooperative and **Figure 15** illustrates the activity-space diagrams according to public-private sphere hierarchy.

Hukukçular Apartment Block, 1967, İstanbul

Haluk Baysal and Melih Birsel designed the Hukukçular Apartment Block. They were influenced by the Modern Movement ideas about residential areas. The housing development had sixty-six private dwelling units, social facilities, commercial units, and technical areas. Social facilities were intended to serve the residents and guests; a meeting hall, sports club, playground, and terraces were planned. The passage planned as the entrance of the building included entrances to commercial units and residential units. The first basement, ground and mezzanine floors were designed for commercial space (Anonymous,1970a).

Figure 14. Yeşiltepe Cooperative Blocks General Features (illustrated by authors based on Anonymous, 1969)



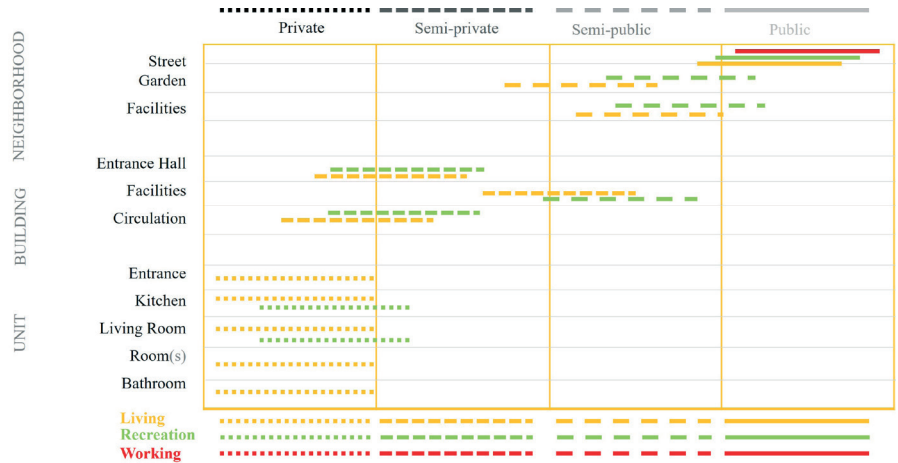


Figure 15. Yeşiltepe Cooperative Blocks Activity-Space Analysis

The drawings show that the building block contained both dwelling units and facilities (Figure 16). The spatial analysis of the Hukukçular apartment block explained the planned spatial configuration of the dwelling block in relation to urban function and public-private sphere hierarchy (Figure 17).

CONCLUSION

Based on a historical review of Turkish housing development and a critical analysis of articles in the Arkitekt journal, it is evident that general housing tendencies, approaches, and problems have undergone significant changes in three distinct periods. The early decades of Turkish Republican era were characterized by stringent state control and a notable housing shortage. The first period placed significant emphasis on advancing the provision of multiple-unit housing areas through the integration of new architectural attempts. During this period, development plans were initiated in the rural areas of Anatolian cities, aimed at enhancing the living conditions of workers in the newly established industrial zones. Simultaneously,

Figure 16. Hukukçular Apartment Spatial Analysis – General Features (illustrated by authors based on Anonymous, 1970,a)





Figure 17. Hukukçular Apartment Block Activity-Space Analysis – Dwelling unit without facilities in the building

efforts were made in urban centers to construct apartment buildings with mixed tenure typologies, offering both owner-occupied and rental options. Subsequently, following political upheavals and the aftermath of the Second World War, economic crises exacerbated housing shortages. Meanwhile, urban areas experienced increased population density, and a variety of user typologies, including mixed typologies that combined traditional values with evolving societal norms, became more prevalent. Due to the growing demand for a variety of housing units, mixed-type housing developments that combine detached houses and apartment buildings have emerged as prominent approaches in neighborhood design. After 1960, apartment buildings emerged as the dominant building typology, coinciding with a significant influx of migrants into cities, necessitating the development of more affordable housing options. From this perspective, three distinct periods have been identified for a comprehensive examination of housing trends within the scope of content analysis of the *Arkitekt* journal, which was published between 1930 and 1980.

Between 1930 and 1945, single-family houses dominated the architectural landscape. Zonguldak workers' housing serves as an exemplary model, demonstrating a design philosophy that combines single-family homes for affordability and community development. Simultaneously, the neighborhood layout presented opportunities for fostering interactions between public and domestic life through shared spaces, as domestic life necessities were strategically integrated into communal facilities. This characteristic stands as a unique aspect in the history of residential development within Turkish housing. During the same period, in city centers, attempts were made to introduce apartment buildings as a typology, as seen in the case of the Istanbul Rental Apartment building in Fatih. In this context, landowners designated sections of apartment blocks for their own residences while allocating upper stories for rental units, thereby supporting the financial well-being of the property owners. Furthermore, these apartment blocks incorporated shared laundry and storage areas, which represented innovative solutions for adapting to the evolving lifestyles of the Early Republican era. Levent 4 neighborhood development underscored the significance of social facilities and shared spaces within residential areas to enhance overall living conditions. The project sought to amalgamate traditional neighborhood habits with urban

living practices. Conversely, Saving Houses in Ankara did not incorporate shared facilities within the settlements due to financial constraints, and accordingly, planned dwelling units number was not accomplished. This situation underscores the tendency about social facilities to be neglected when financial limitations come into play. However, in this settlement, the gardens and porches of the houses played a pivotal role in facilitating spontaneous interactions among residents. The Hukukçular apartment block introduced a vertical neighborhood life concept within the building, highlighting the interconnected nature of urban functions—work, recreation, and daily living—within the context of everyday life requirements. The circulation spaces within the Hukukçular apartment block demonstrated the potential utility of shared spaces within residential areas, particularly for fostering random encounters and visibility. Yeşiltepe cooperative blocks exemplify a neighborhood design approach centered around apartment buildings. In this example, shared areas were integrated into the buildings, while also featuring outdoor communal spaces. These shared spaces within residential areas serve as a medium for investigating the production of space, considering their spatial characteristics that accommodate both social and built environment aspects, as well as the interaction between the public and domestic spheres.

Table 5 summarizes content analysis and spatial analysis of this study in order to identify the social aspect of housing according to the *Arkitekt* Journal. Examples show that shared spaces in residential areas possess the potential to foster community development and social interaction, while also offering opportunities for improved living conditions at reasonable prices. From a social environment perspective, individuals can discover opportunities to engage in community life, fulfilling domestic needs or participating in recreational activities in shared facilities and spaces. At both the household and societal levels, families have the chance to build solidarity with their neighbors. However, the level of participation plays a crucial role in fostering community relations among the inhabitants; residents should be willing to actively engage in community life. Therefore, chance encounters and shared space opportunities become increasingly significant. In terms of the physical environment, residential units typically offer limited shared spaces, such as semi-private areas like balconies, terraces, or entrance halls. However, living rooms and kitchens hold potential for recreational uses. Consideration of integrating social facilities for domestic life requirements at the building level, as well as neighborhood-scale interventions for social facilities, could further enhance these opportunities.

In this study, the combined utilization of two methodologies, content analysis and spatial analysis, identifies the exploration of studies concerning the social dimension of housing within both architectural literature and professional architectural practice. The content analysis examines the approaches emphasized in architectural literature regarding the social aspect of housing during the periods coinciding with the publication of the *Arkitekt* Journal. On the other hand, spatial analysis reveals the spatial characteristics of the examples discussed in the context of the social aspect of housing. Consequently, the integration of these two methods facilitates a comprehensive understanding of studies related to the social aspect of housing in built environment disciplines.

This research initiates a discussion on Turkish housing developments between 1930 and 1980, focusing on the social aspects of housing,


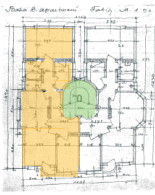
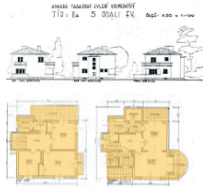


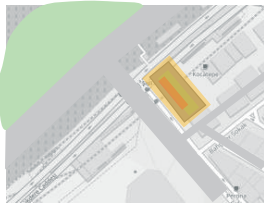
Example, publication time	Location, Construction time	Site Plan	Codes included in the article	Social aspect elements
Coal mine workers' housing (Arkan, 1935, 1936)	Zonguldak, 1933-1935		affordable housing, cooperative housing, small living environment, housing problem	Workers' housing with shared spaces and facilities for common use
Rental Apartments in Fatih, (Mortaş, 1935)	İstanbul, 1935		Multiple household typologies, rental housing	Rental housing alternatives in owner-occupied building, shared spaces for domestic requirements, storage, and laundry
Saving Houses Ankara (Mortaş, 1948)	Ankara, 1944		affordable housing, cooperative housing	Multiple detached housing units development in reasonable prices
Levent 4 Neighborhood (Arü, 1956)	İstanbul, 1956		affordable housing, cooperative housing	Residential development in neighborhood scale with facilities
Yeşiltepe Cooperative Blocks (Anonymous, 1969)	Ankara, 1967		affordable housing, cooperative housing	Residential development with shared spaces and facilities
Hukukçular Apartment Block (Anonymous, 1961, 1970)	İstanbul, 1967		cooperative housing	Residential block with shared spaces and facilities

Table 5. Evaluation of examples in terms of content analysis and spatial analysis

particularly shared space usage in multi-user housing types. The housing problem is a social phenomenon that relates to both individual and societal requirements in finding adequate dwelling opportunities, affecting all segments of society. Shared spaces play a significant role in the development of socially and economically sustainable residential areas, especially concerning adequate housing for everyone. Residential areas possess unique spatial characteristics where various urban functions fulfill everyday life requirements. Shared spaces accommodate diverse urban uses and facilitate public-private space interactions, serving as a medium to discuss the reciprocal relationships among individuals, society, and space.

Within the scope of this research, the potential of shared spaces in residential areas to create socially and economically sustainable housing developments, along with affordability concerns, forms the central discussion on the social aspect of housing. An examination of *Arkitekt* journal highlights the necessity for affordable housing opportunities that include required shared spaces and facilities, despite the increasing number of housing constructions, due to the lack of regulations related to the social housing system. Debates have arisen regarding the potential of shared spaces for affordable housing developments. Economic concerns have gained prominence as housing examples have increasingly focused on structural systems while neglecting the social aspect of residential life. To explore housing developments in Turkey, the term social aspects of housing offers opportunities to identify different factors that influence the social and built environment characteristics of residential areas, in terms of shared space/facility use for domestic life requirement, community interaction among the inhabitants and relatively economic housing options in well qualified living environments.

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Anahtar Sözcükler: Ortak mekan; konut; gündelik hayat; Türkiye'de konutun tarihsel süreci; Arkitekt

ARKITEKT DERGİSİ İÇERİK ANALİZİ ÜZERİNDEN KONUTUN TOPLUMSAL BOYUTU KAPSAMINDA BİR DEĞERLENDİRME

Konut alanlarındaki ortak alanlar, birey-toplum-mekân ilişkisinin özel/ev içi alan ve kamusal/toplumsal yaşam etkileşimi için ortam oluşturmaktadır; aynı zamanda daha sürdürülebilir konut alanları geliştirme potansiyeli yaratmaktadır. Bu bakış açısına göre, konut problemi, yeterli barınma olanaklarının bulunmasına ilişkin hem bireysel hem de toplumsal gereksinimlerle ilgili toplumsal bir olgu ifade etmektedir. Bu araştırma kapsamında, konutun toplumsal boyutuna dair bir tartışma oluşturulmakta ve bu perspektiften Türk konut tarihi analiz edilmektedir.

Araştırmanın kavramsal arka planı, günlük yaşam rutinlerine göre birey ve toplum etkileşiminin mekânsal özelliklerine ve yerleşim yerlerinde kamusal-özel (ev içi) mekân hiyerarşisine ilişkin konuları içermektedir. Bu çalışmada içerik analizi ve mekânsal analiz olmak üzere iki analiz aşaması bulunmaktadır. İlk olarak Arkitekt Dergisi'nin içerik analizi ile incelenmesi sonucunda Türkiye'deki konut gelişimindeki değişimler tarihsel bağlamda açıklanmaktadır. İkinci aşama analizlerinde, içerik analizine göre belirlenen dönemlere ilişkin Türk konut örnekleri Arkitekt dergisinden seçilerek, genel özellikleri ve kamu-özel alan hiyerarşisi ile mekânsal olarak analiz edilmektedir. İncelenen konut örneklerin mekânsal özellikleri sosyal ve yapısal çevre özelliklerine göre değerlendirilerek yerleşim alanlarındaki ortak mekân kullanımına yönelik potansiyeller incelenmektedir. Çalışmanın temel tartışma konusu, Türk konut tarihinde farklı dönemlerde görülen konut örneklerinde ortak kullanım alanlarındaki değişimlere ve dönemlerinin konut üretim biçimlerindeki yaklaşımlarla ilişkisine bağlı olarak geliştirilmektedir. Türkiye'deki konut tarihçesini incelemek için, konutun toplumsal boyutu terimi kullanılmakta, böylece yerleşim alanlarının sosyal ve yapısal çevre özellikleri üzerinde etkisi olan farklı faktörler ve sosyal olarak sürdürülebilir konut geliştirmeleri ile ilişkisi incelenmektedir.

CONTENT ANALYSIS OF THE "ARKITEKT" JOURNAL FROM HOUSING PERSPECTIVE: A DISCUSSION ABOUT SOCIAL ASPECTS OF HOUSING IN TURKEY

The shared spaces in residential areas identify the medium for private/domestic and public/social life interaction of the individual-society-space and create potentials for developing more sustainable residential areas. Accordingly, the housing problem is a social phenomenon, which is related to both individual and societal requirements about finding the adequate dwelling opportunities. This research creates a discussion about social

aspects of housing and analysis of Turkish housing history from this perspective.

The conceptual background includes the subjects about spatial characteristics of individual and society interaction according to daily life routines and the public-domestic space hierarchy in residential areas. This research has two analysis phases: content analysis and spatial analysis. Firstly, the changes in the housing development in Turkey is explained in the historical context via the content analysis of the Arkitekt Journal. In the second phase of analysis, Turkish housing examples which were selected according to the content analysis are spatially analyzed with general features and public-private space hierarchy. The spatial characteristics of examples are evaluated according to social and built environment characteristics in order to explain the impact of shared spaces in residential areas. The main discussion is developed according to the changes in shared space use of different periods in relation to housing decisions of their era. In order to examine the housing developments in Turkey, the term social aspects of housing provides the opportunities to identify the different factors, which have effects on social and built environment characteristics of the residential areas and the relevance to socially sustainable housing developments.

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ARCHITECTURAL DISRUPTION IN THE AGE OF COMPUTATION: A CRITICAL REVIEW ON DIGITAL ARCHITECTURE

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INTRODUCTION

This paper investigates whether digital architecture qualifies as disruptive innovation comparable to modernity's transformative impact. It contextualizes digitality by analyzing exemplary digitally designed projects across structure, form, and materiality. The goal is to define what architectural disruption looks like in the age of computation, focusing on the mentioned threefold conceptual framework.

According to Kenneth Frampton (1995), structural logic and construction techniques are central to the poetics and aesthetics of architecture across history. Similarly, Mario Carpo (2013) has noted that digitally-enabled variability in geometrical form constitutes a key innovation, differentiating digital architecture from rigid modernism. Greg Lynn (2013) highlighted the parametric derivation of complex surfaces as a departure from rectangular modernist orthodoxy. Zeynep Mennan (2008) revealed that formalist methodologies used in computational design broaden architecture from a standardized to a non-standardized realm. By synthesizing these insights, this paper addresses this triad of structure, form, and materiality through a systematic critical analysis.

The research questions guiding this study are:

1. What are the conditions for architecture to be considered disruptive in the age of computation?
2. How does digital architecture challenge the standards set by modernism or postmodernism in terms of structure, form, and materiality?
3. What are the conceptual reorientations and possibilities that computation opens up for the future of architectural design and practice?

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To conduct this research, the authors have critically analyzed the so-called digital architecture, trying to identify features and characteristics that make it a differentiated niche within contemporary architectural trends. Even though current architectural production is facilitated through the use of computers, not every contemporary practice can be regarded as either disruptive or digitally conscious. The latter could be defined as digitally designed architecture whose output would be impossible to achieve without the tool itself, benefiting from different forms of computational design. However, the purpose should not be confused with the means. Although the tool may be a determining factor, it is the design itself what should concern architectural criticism, not the fact of its accomplishment through the tool.

This research tries to identify the transformative changes that information technologies, computation and digital culture have introduced in architectural practice, challenging the standard set by modernism or postmodernism. An increasingly wide array of software tools contributed to advancing architecture in the first decades of their irruption. However, it is the computational logic of the design that allows the creation of conscious forms for optimized environmental and structural behavior within a new computational design paradigm.

The research methodology involves an in-depth literature review of over 50 sources, papers, and books. Additionally, the case selection has been mostly made by searching for keywords and disruptive practices in the threefold conceptual framework of structure, form, and matter. Consequently, these examples are critically addressed to establish the conditions of disruption in the age of computation. As Carpo (2013) suggests, digital architecture requires being assessed on its conceptual reorientations more profoundly than on its superficial stylistic features enabled by new tools. Accordingly, the authors have observed the effect of these tools on architectural language and the changes introduced in the way we think, design, and build architecture. What began as a mere optimization of the design processes with the use of computers has now achieved a truly disruptive advancement in the design and production of architecture, genuinely affecting architectural language itself. Thus, part of the aim is to provide a critical historiographical contextualization for this architecture.

A thorough reflection on the term disruption itself and the conditions necessary for architecture to be considered disruptive is followed by a dialectical discussion comparing the disruptive qualities of modern architecture as well as the parallels and divergences with contemporary digitally conscious architecture. The review dwells on well-known examples, and the original contribution of the paper lies in the critical analysis and synthesis of these examples across the triad of structure, form, and materiality, establishing the conditions of disruption in the age of computation.

Going beyond just analyzing current digital practices, the paper reflects on how computation enables new ways of conceiving and fabricating buildings by managing complexity, simulating building behavior, and integrating design and manufacturing. This study argues for a digitally conscious architecture that harnesses the generative and optimizing potential of computational tools while still engaging architecture's humanistic foundations. The paper maps out an open-ended trajectory for the ongoing developments on digital disruption.

The paper is structured as follows: Section 2 discusses the concept of disruption and its relation to modern architecture. Section 3 examines the conditions for digital disruptive architecture. Sections 4, 5, and 6 analyze disruptive tectonics, aesthetics, and materiality, respectively, through case studies. Finally, Section 7 concludes by synthesizing the findings and outlining future research directions.

DISRUPTION

Apparently, there is a certain contradiction between the terms discipline and disruption. The problem relies on considering tradition as an established standard of any creative discipline while obviating the course of history with regard to a time perspective. Of course, even well-established styles are not a perfect set of unchanged rules during a precise time span. Changes appear as language evolves and settles through repeated practice in leading figures of the period which are then spread by others. Yet, the style is always impersonal as it is referred to a collective disciplinary practice. Architecture has its own history and, therefore, its own creative tradition, a sort of “accumulated knowledge of all previous architectures”, in the words of Eisenman (1999, 37), who refers to it as architecture’s anteriority.

As aforementioned, classical language in architecture was reinterpreted for almost five centuries. Benevolo (1978) defines the span of Renaissance architecture from the onset of this historic period to 1750, when a group of artists decided to work inspired by the remains of Roman architecture, while Frampton (1985) dates neoclassical architecture in a time span comprised between 1750 and 1900. However, it is obvious that Renaissance architecture differs from Roman architecture; in fact, it was quite different from Mannerism or Baroque (Wölfflin, 1964). Yet not every change is certainly disruptive; not even a change of style is necessarily disruptive. That is the reason for Benevolo or Summerson referring to “Renaissance architecture” or to “the classical language of architecture”, respectively, although the time span of their analysis runs through several centuries and different styles. The question to be posed should then be: to what extent can any change be considered genuinely disruptive?

The term disruption was originally used in academic circles within the field of business management regarding innovative practices and business models. It was used to point out situations of rapid intense change in previous business models and focuses on the emergence of new ones indebted to accelerated processes of development, commercialization as well as to the use of innovative products or services. Christensen and Bower (1995) coined the term “disruptive technology”, a concept that was later analyzed more in depth in the book *The Innovator’s dilemma* (Christensen, 1997), where it was redefined as “disruptive innovation”. The concept of disruptive innovation began in this way a process of accelerated diffusion in all fields related to creative innovation although frequently misunderstood, as the authors themselves stated in a more recent article (Christensen and McDonald, 2015).

According to the original framing of disruption and extrapolating it to architecture, it could be stated that it involves a rapid transformation due to emerging technologically innovative changes displacing existing models. Thus, the evolution of architectural language is produced slowly throughout history based on successive variations introduced through

disciplinary practice and only, on few occasions, a sudden significant innovative alteration occurs involving not only a change in architectural language itself, but the replacement of a well-established tradition. According to this, Gothic revival in the nineteenth century could not be regarded as disruptive. It wasn't then innovative as Gothic surely was in relation to Romanesque when it first emerged as a truly disruptive style in the twelfth century.

Disruption involves change, but not any kind of transformation. It implies substantial innovation which does not only affect the stylistic appearance, the ornamentation repertoire and the like. Disruptive innovation is a "mindset" rather than "a tactic in itself" (Williams, 2016). In architecture, disruption implies a transformation in tectonics influenced by a novel conceptual framing which altogether introduces a significant alteration of architectural language itself.

The most significant disruptive changes in the history of architecture are indebted to the alterations of the topological relationships established between the supported and the supports, allowing different kinds of spatial possibilities and architectural form. Giedion (1971) refers to three stages in the conception of architectural space throughout history. The first two can be exemplified by the architecture of Greece and Rome, respectively, while the third emerges with the dismembering of structure and enclosure once the tectonics of steel and reinforced concrete freed walls from their loadbearing function. Frampton (1995, 365) has reflected extensively about the major importance of tectonics in his consideration of architecture as the "poetics of construction" and on the significance of the construction technology in the conformation of architectural modernity. The early stages of digital architectural design and the solely formalistic approach characterizing the so-called blobitecture initially received harsh criticism esteeming it as unrealistic or counter-tectonic (Picon, 2004).

Summarizing, disruption involves innovation and radical transformations in architectural syntax, changes that can embody a new *zeitgeist* while setting a novel framework that eventually displaces the existing. Although the most genuinely disruptive changes in architecture are indebted to tectonics, as these greatly affect its syntax, topology and materiality, alternative possibilities to address disruption are also possible regarding other disciplinary aspects that refer not only to structure, but also to aesthetics, ideation, materiality, utility and optimization.

Digital architecture can claim to be disciplinary disruptive in many ways and has proven to be a genuine avant-garde within architectural practice at least over the last three decades. We must also bear in mind that not all disruptions necessarily come hand in hand through technological innovations. Ideas can be more disruptive than digital tools; eventually, the embracing of these may recall previous periods, such as the so-called digital crafting.

The term disruptive is increasingly trendy in the field of digitally designed architecture. The influence of a series of new paradigms in the design process could also be considered disruptive within an innovative architectural context characterized by the emergence of new formal sensibilities, the crisis of the concept of stability and the challenging of Vitruvian categories (Picon, 2010).



Figure 1. Source: (Zaha Hadid Architects, 2013). Zaha Hadid Architects, Morpheus hotel (digital rendering), Macao, 2013-2018.

DISRUPTION AND MODERN ARCHITECTURE

Giedion (1964) addressed the idea of constancy and change in his famous sequel of *The Eternal Present* dedicated to architecture. He studied the architecture of Egypt and Sumer identifying the basic elements that define architecture and the principles that have inspired architectural production ever since. Egyptian architecture with its colossal proportions set the basis for permanence as a disciplinary attribute. Architecture evolved enriching the scope of functions although this genuine attribute remained. Thus, architecture has been “conventionally conceived in a dimensional space of idealized stasis, defined by Cartesian fixed-point coordinates” (Lynn, 1999, 10).

Despite this idea of permanence, architecture is subject to changes, interpretations, and variations. All of these, produced in the course of time, progressively generate a history, a practice based on a recorded tradition which combines strategies of difference and repetition (Deleuze, 1994) along the dialectic course of history (Hegel, 1977).

Classical architecture was typologically driven: models were repeated and reinterpreted thus contributing to set a style. An architectural style is a collectively agreed way of designing during a given period of time. This remained so until the crisis of the styles in the nineteenth century debating itself between eclecticism and revivalisms (certainly not disruptive) trying to find in the past the justification for architectural practice. In part, these were the genuine intentions of Renaissance architects, endeavoring to vivify a classical glorious past: a language to be preserved. This illusion proved to be so successful that for a period of no less than five centuries classical language was reinterpreted relentlessly (Summerson, 1966, 7).

Traditionally, art historians have dealt with formal changes, especially focusing on ornamentation and the articulation of the physical limits themselves rather than the space confined by them (Zevi 1974). They have

underestimated the relationship between matter and space and the way in which this is achieved through tectonics. Thus, the Romans were classical because they kept using the ornamental repertoire of the Greeks, but they were, in fact, disruptive in the way they substituted post and lintel architecture for vaulted construction, certainly not because they added Tuscan and Composite orders. Remarkably as it may seem, Vitruvius never “mentions arches or vaults, which were already a major achievement of Roman engineering” in his treatise (Carpo, 2017, 1). It was the relationship between matter and space, between exterior, enclosures and interior what clearly implied a breakthrough in the course of architecture. Only, thereafter, did architectural space achieve an effective leading role within the discipline. Surprisingly, it was not until the nineteenth century when Schmarsow (cit. Van de Ven, 1978) began to consider space a key aspect in architectural theory.

The polarity between tradition and modernity is the driving force of progress in any creative discipline; every artist is bound to position his work with regard to valuable precedents in order to defy them, to imitate them or, simply, to produce variations over them. Innovation does not magically appear by chance nor is it a mere product of inspiration. Paul Ricoeur (2003, 23) wrote to this regard: “In the same way that each writer writes ‘after’, ‘according’ or ‘against’ something, each architect determines himself in his relation with an established tradition”. Creativity sparks out of a critical reading of disciplinary precedents, on the one side, and a conscious positioning with regard to them, on the other. It is the poet who affirms the difference “overturning all orders and representations” instead of repeating what he has been taught or uncritically following the pre-existent models within the discipline (Deleuze, 1994, 53).

The architectural controversy of the *querelle des anciens et des modernes* probably transcended the circle where it was held, *l'Académie royale d'architecture*, because it is a good example of the tension between tradition, personified by Blondel, and disruption, on the side of Perrault, magnified by subsequent criticism (Gerbino, 2010).

Perrault's modernity relies on his questioning of the absolute and permanent embodied in the classical orders uncritically reinterpreted for centuries and on the value given to materiality, functionality and comfort. His approach served as an inspiration for Cordemoy, Laugier or Milizia as the brave innovators in architectural theory with the emergence of rationalism, contributing to set the basis of modern principles and the constructive logic of tectonics.

Modernity, in a broader sense, could be identified with disruption provided it is opposed to tradition and driven by a progressive spirit of innovation. Modernist architecture should be, accordingly, considered a brilliant moment of disciplinary disruption even if it ended up establishing its own architectural canon (Miranda, 2005).

Considering all of the above, disruption in the context of architecture can be considered so provided several conditions are observed. Thus, it could be defined as a major change rapidly driven by innovative practices affecting both tectonics and the conceptual framing of the discipline itself, merged to embody what could be referred to as a new practice that succeeds to displace a preceding established tradition. If digital architecture is to be considered truly disruptive, all these conditions have to be met.

A question then naturally arises: which architectural style if any, should digital architecture challenge?

CONDITIONS FOR A DIGITAL DISRUPTIVE ARCHITECTURE

Although visionary Cedric Price's Fun Palace 1964 project and the collaboration of Gordon Pask in the design is regarded as one of the first noteworthy steps in the integration of architecture and cybernetics (Mathews 2005). It is probably the 1980s the decade when we may consider that digital architecture's foundations truly began (Lynn 2013). At the time, rampant pseudo-classical historicist postmodernism was living its glorious moment, boldly confronting modernist principles. Probably, the least disruptive change in the history of the discipline as it superficially repeated a formal repertoire taken from classicism (only in a literal ornamental sense), however building with reinforced concrete and steel. Thus, it completely undermined the tectonic sense and its relationship with geometry and structural types; moreover, it was certainly not innovative. Historicism is a "mode of operating" based on repetition strategies rather than a stylistic problem as Somol (1999, 10) has wittily noted regarding the pretended modernity of the late works by Richard Meier: his repetitive design strategies have undermined the modern to become historicist itself.

In 1931, Henry Russell Hitchcock and Philip Johnson were commissioned by the MoMA to curate an exhibition on the incipient architectural modernism which exhibited early works of the main figures (Wright, Le Corbusier, Mies van der Rohe, Aalto, Gropius, Oud). The title of the catalogue, *The International Style*, proved to be so successful that it eventually coined the name for the emerging architecture (Hitchcock and Johnson, 1966). Wright's organic architecture did not fit in the rigid canon set by both curators and was, therefore, censored in the catalogue. The canon, greatly indebted to Le Corbusier's five points of architecture, as admitted by Hitchcock (1951) years later, identified three principles. The first, "architecture as volume", actually meaning the dismembering of architecture in skeleton and skin (consistent with Corbusean first point: construction on pilotis, from which the rest of them basically stem). The second, "regularity", is in part an aesthetical feature somewhat derived from the repetition at regular distances of the supports. This feature displayed architecture's order while also ensured "that strains may be equalized" presenting characteristic gridded façades (Hitchcock and Johnson, 1966, 56). The third was dictated as the "avoidance of applied ornament" and was the very metaphor of constructive sincerity, thus evidencing the tectonic logic while avoiding false impressions. Architecture's materiality ought to appear bluntly, as it represented the truthfulness of the constructive system. If we were to categorize the three principles the first would deal with tectonics, the second with aesthetics and the third with materiality: structure, form, and matter.

In 1988 the MoMA held another exhibition titled *Deconstructivist Architecture*, curated by Philip Johnson again and Mark Wigley. A relatively heterogeneous group of architects, most of which were later to become world famous (Eisenman, Tschumi, Libeskind, Coop. Himmelblau, Zaha Hadid, Koolhaas and Gehry), exhibited their production at the time which, according to the exhibition catalogue's claims, shared "striking formal similarities" (Johnson and Wigley, 1988), even if the exhibited works were rather diverse and the claim too bold. Although some of them have been

relatively critical with the digitally driven shift in architecture, others have, in fact, pioneered it, as may be the case of Gehry, Eisenman or Zaha Hadid.

Furthermore, it is necessary to note that many other noteworthy architects took different paths that lead to alternative interpretations and positionings with regard to modernity. Architects such as Foster, Piano or Rogers relied on technology while others such as Mendes da Rocha, Vilanova Artigas, Niemeyer or Candela further exploited the expressive possibilities of reinforced concrete to a larger scale in their architectural production. The Smithsons, Stirling, Neutra, Saarinen, Holl, Nouvel, Siza, de la Sota, and many others would further extend modernity with different nuances. However, neither of them could be considered part of the historicist postmodern trend nor did they use digital tools to consciously follow a digital disruptive approach.

According to this time-frame, digital architecture commenced its disruptive road map through the work of a few. From this perspective, deconstruction in architecture (if there was ever any such a common program as Tschumi (2012) himself has admitted) could not be part of the displaced style but the first manifestation of the new. Genuine disruption may only be achieved if digital architecture manages to effectively challenge modernist architecture (the only valid and valuable established canon at the emergence of the digital turn), something that implies looking innovatively into the future and working on a digitally conscious design basis (Carpo 2013, 10).

In 2003 another exhibition took place curated by Frédéric Migayrou and Zeynep Mennan titled *Architectures non standard* at the Centre Pompidou. It showcased a series of architectural practices (Asymptote, dECOi Architects, DR_D, Greg Lynn, KOL/MAC Studio, Kovac Architecture, NOX, Objectile, Oosterhuis, R&Sie, Servo, UN Studio) that addressed the shift of paradigm introduced by customized mass production through CAD-CAM tools replacing the industrial and modern ideals of serial production for non-standard modes of production (Carpo, 2005). This exhibition delved into multiple references that included mathematics, physics, philosophy, architecture and art alike, setting up the stage for a rich intellectual background of the digital realm (Migayrou, 2003). It is therefore worth analyzing the hallmarks of digital architecture with regard to structure, form and matter to gauge the sort of disruption that it has brought.

The introduction of CAD, digital 3D modeling, visual programming languages (VPL), and BIM, along with the concept of digital twins, has undoubtedly improved architectural representation. However, these advancements primarily focus on representation and do not extend beyond it. It is the integration of a computational logic into architectural design over the past fifteen years that has profoundly revolutionized the discipline in the realm of digital architecture.

Traditional graphic representation's role is not only questioned but also completely transformed. The use of code as a means to generate instructions, prototype forms subjected to performance criteria through generative design approaches, genetic algorithms, and iterative methods that mimic nature's evolutionary model, have fostered a new mindset. Instead of solely focusing on form-making, architects now emphasize form-finding, or as Carpo (2017) aptly puts it, "form searching." Architectural geometry, now deemed advanced or intelligent, has been rethought to explore the interplay between form, material, and computer tools,

employing a wide array of approaches that showcase the generative potential of digital techniques (Pottmann, 2014).

This newfound integration with the digital realm is reshaping tectonics through material and form simulation and optimization, thereby introducing structural considerations (Oxman and Oxman, 2014). The emergence of digital tectonics has shifted priorities between architectural and structural elements, giving rise to novel representation and generation methods through strategies like “digital morphogenesis,” which emulate the evolutionary capabilities of natural systems (Leach, 2009). These generative processes are digitally interconnected, spanning from conception to materialization, and seamlessly integrated into the logic of material manufacturing. This seamless integration of processes (generation, materialization, and manufacturing) defines the core characteristic of the new digital design/information paradigm in architecture.

These new tools offer architects the ability to mediate with tectonics, bridging the gap between information and matter. Form-finding processes are guided by three principles (Oxman and Oxman, 2014): the differentiation processes inherent in natural systems, informed or integrated tectonics, and continuity from design to production by incorporating material logic into the parametric approach.

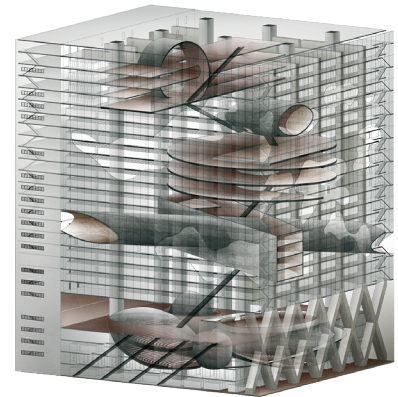
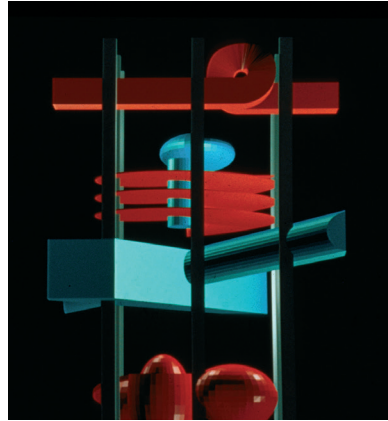
The concept of open form, parametrization in designs, algorithmic possibilities, and form-finding strategies aimed at optimization along with the convergence of construction and manufacturing processes, represent a significant disruptive leap in architectural practice. Through computational logic, architects can now enhance and improve their designs with a focus on optimization rather than form. Architectural geometry is no longer dictated by a top-down approach but, instead, follows a bottom-up logic based on form-finding strategies (Leach, 2009, 34).

DISRUPTIVE TECTONICS. STRUCTURAL RELEVANCE

An extraordinary competition entry for the French National Library designed and submitted by OMA in 1989 (**Figures 2a, 2c**) was discarded not without polemics as the decision was finally taken by president Mitterrand himself (Sudjic, 2006). As for most architectural practices at the time, digital tools were only timidly used, although they were in this case. Most of the models made for this project were, however, physical, something which has been a standard of OMA’s design process ever since they commenced their practice. Although it cannot be regarded as a digitally conscious design, it could be ventured that the subtractive strategies typical of Boolean 3D modeling set the conceptual disruptive framing of the building’s overall conception: “the major public spaces are defined as absences of building, voids carved out of the information solid” (Koolhaas and Mau, 1997, 616) (**Figure 2a**).

Cecil Balmond, a former Ove Arup structural engineer, collaborated in the conception of one of the most disruptive building structures in the century: enormous deep-beams (walls 100 meters high), spanning 70 meters within the cube, capable of supporting gigantic perforations to host five thematic libraries inside the information solid (Koolhaas and Mau, 1997, 673). In fact, Balmond has significantly contributed in other OMA projects but has also collaborated with other well-known architects such as Stirling, Libeskind, Toyo Ito, Moneo, Siza, UNStudio, to mention a few. In the past decades, he has been working at the intersection of architecture and

Figures 2a. OMA's proposal for B.F.N., Paris, 1989. Sources: (OMA, 1989) Digital Visualizations. Original conceptual 3D model. **2b.** (Oscar Rubio, 2015) Axonometric view by showing in transparency the structure and the five thematic libraries.



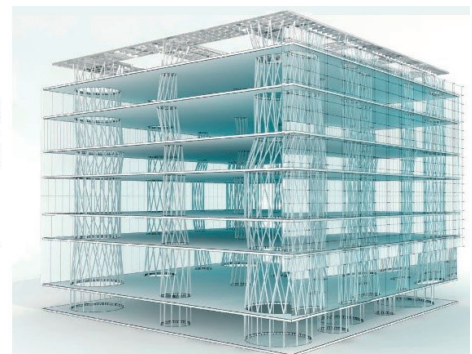
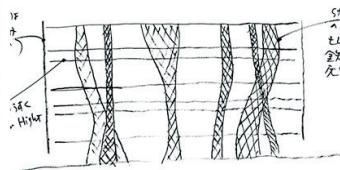
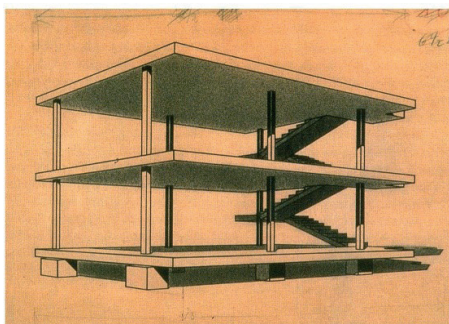
structural engineering. His mastery in the field of tectonics has contributed to the development of complex geometries and the feasibility of their construction, an initial limitation during the 90s of blobitecture and the emerging folding architecture (Mallgrave and Goodman, 2011, 170).

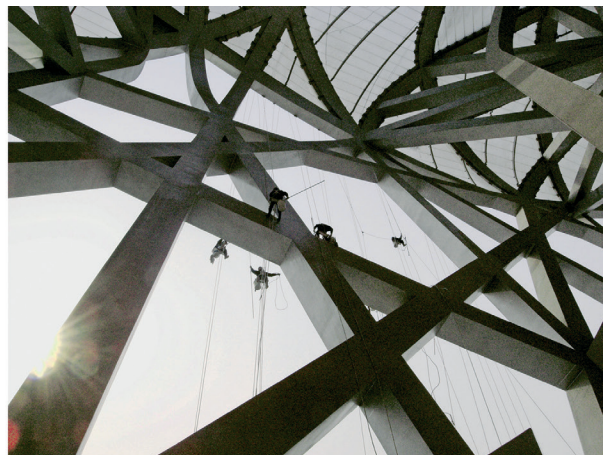
Sendai Mediatheque (**Figures 3b, 3c**) designed by Toyo Ito is an example of truly digital tectonic disruption. It is apparently similar in conception to Le Corbusier's Domino (**Figure 3a**) structural scheme of slabs and columns. However, instead of regularly placing the latter in accordance with a fixed grid, the columns here are concentrated around circular openings in the slabs with different diameters slightly misaligned, so that the characteristic verticality indebted to guarantee the necessary continuity in the transmission of stresses is stepped over thanks to this new topological relationship (Ferré and Sakamoto, 2003).

What was originated as a metaphor of seaweeds in Toyo Ito's conceptual design (**Figure 3b**) proved to be even more relevant from a structural design point of view. This geometric disruptive approach has a significant tectonic influence in the structural behavior of the whole building as its resistance to horizontal stresses is greatly enhanced due to the increased rigidity of the composed vertical supports (the light-wells made-up with the columns irregularly skewed). This design feature proved to be providential during the earthquake that Sendai underwent in 2011, leaving the building relatively unscathed despite the 9.0 magnitude of the seismic catastrophe resulting in the Fukushima's nuclear accident.

Figures 3a. Le Corbusier, Domino houses structural scheme, 1914. **3b, 3c.** Toyo Ito, Sendai Mediatheque, 1995-2001. Inception drawing and structural scheme. Sources: (Le Corbusier Foundation, 1914; Desigboom, 2012; Shaowen Wang, 2011, respectively).

The National Stadium designed by Herzog & de Meuron for the 2008 Olympic Games (**Figures 4a, 4b**) could well be considered another example of tectonic differentiation and relevance regarding modern precedents





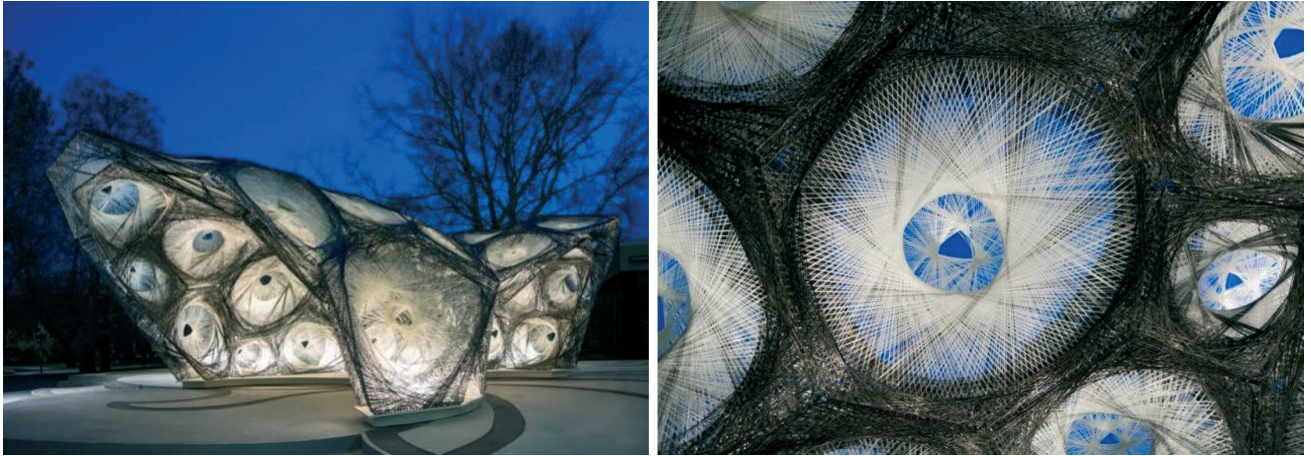
Figures 4a, 4b. Herzog & de Meuron, Beijing's Olympic Stadium, 2003-2008, Source: (Herzog&de Meuron, 2011).

in which the structure is typically an undifferentiated grid of pillars and beams. The extraordinary geometrical complexity of the hyper-static nested structure of the stadium would have been impossible to calculate without the computerization potential of digital tools and finite elements calculation methods, something for which computers greatly surpass human capacity. From its inception to its construction, the stadium could have not been conceived or built without computerizational aid.

A significant number of projects digitally developed make use of a conspicuous relevance of structure of which exoskeletons are notably some of the most evident. Projects such as Zaha's Morpheus in Macao (**Figure 1**) is a good example of this design strategy which, in this case, is also part of an improved design feature to counteract the climatic particularities of the location (the recurrent typhoon exposure). The building's exoskeleton was designed to support the extraordinary strong winds produced by the endemic typhoons, something which could be considered as a contemporary digital reading of critical regionalism.

Digital tectonics defines a new relationship between structure and materiality balancing the focus between space and structure (Oxman and Oxman, 2014). Structure recovers the prominence it used to have in Gothic architecture, thus contributing to the configuration of architectural space in some of these buildings. Although there is no material equivalent to reinforced concrete or steel which contributed to shape architectural modernism, disruptive tectonics have also explored the use of alternative materials such as carbon fibers as Achim Menges has been able to achieve "at the juncture of structural design, design and digital production" (Picon, 2022, 67).

Some research projects are delving into the prospect of applying the principles found in biological fiber systems to architecture, offering a fresh perspective on reinforced fiber structures to which Achim Menges refers to as "fibrous tectonics". The various proposals for the ICD/ITKE Research Pavilion exemplify a comprehensive approach to biomimetics (Pawlyn, 2016, 62-5), computational design, digital simulation, and robotic manufacturing, all aimed at creating structures of exceptional lightness and optimal material efficiency (**Figure 5**). Drawing inspiration from the morphological principles observed in arthropod exoskeletons, this pavilion serves as a platform for exploring innovative spatial designs through diverse textile methodologies, filtering various biomimetic design principles to establish a new tectonic repertoire. The digital fabrication



Figures 5a, 5b. Institute for Computational Design (ICD) and Institute of Building Structures and Structural Design (ITKE) of the University of Stuttgart, ICD-ITKE Research Pavilion 2013-14, Stuttgart. Source: (Archdaily, 2014)

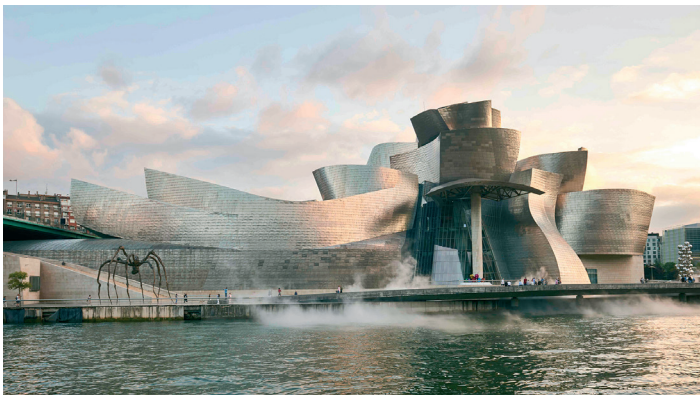
process relied on robots tasked with executing the “coreless robotic filament winding process,” enabling the construction of “construction-scale composite structures on a simple linear framework” (Menges, 2015, 45). These remarkably lightweight tensile structures explore geometries and techniques that transcend traditional architectural practices, drawing from a range of disciplines and trades.

DISRUPTIVE AESTHETICS. IRREGULARITY AND COMPLEXITY

The possibility to deal with complexity in unprecedented ways thanks to information technologies has allowed architects to displace the modern canon of regularity, based as it was on simplicity, to that of irregularity, something to which Balmond has referred to as the informal. It is characterized by three main features: “local, hybrid and juxtaposition”, characteristics that may be considered as “active ingredients of an animate geometry that embraces the linear and non-linear” (Balmond, 2002, 217-27).

After its construction, Gehry’s Guggenheim (**Figure 6a**) soon became the icon of digital architecture (despite it is only half digital). At the time of its completion no other building similar in size or shape had ever been built. The irregularity characteristic to its complex surfaces made of it an extraordinary novel design imbued by the new aesthetics of complexity and irregularity. It could probably be regarded as the first sound attempt to build large scale complex surfaces within the archaeology of the digital. Although Gehry’s architecture has often been criticized for the use of irrational forms (not without reason), he has also explored the use of

Figure 6a. Frank O. Gehry, Bilbao Guggenheim Museum, 1992-1997, Source: (Bilbao Guggenheim Museum, 2024). **6b.** FOA Architects. Yokohama Port Terminal, Yokohama, 2000-2002 Source: (Archdaily, 2014).



ruled surfaces in some of his projects (Lawrence, 2011). Gehry's firm has enormously contributed to the expansion of digital culture in architecture developing its own software (Gehry Technologies) to be able to deal with a level of formal complexity that conventional software was incapable of addressing (Iwamoto, 2009, 6). Unfortunately, probably inebriated by their early success in Bilbao, their repetitive design imaginaries have somewhat been disappointing.

FOA's Yokohama Port Terminal (**Figure 6b**), for instance, is another example of this aesthetics of irregularity dealing with unparalleled geometries within the history of the discipline which clearly differs from modern simplicity and regularity. In this case, it is unmistakably indebted to software commands such as 'sweep' or 'loft' for the generation of surfaces. The geometric control derived by the assistance of CAD tools has proved to be decisive in the achievement of this kind of architecture; the building's own conception as a topography to walk on is disruptive too.

The increased performance of these tools together with an ever-growing variety of tasks carried out by software applications have made sceptics doubt regarding the real value of architecture developed with these tools. Greg Lynn has analyzed some early digital practices by Eisenman, Gehry, Hoberman or Yoh in the *Archaeology of the Digital*, in which their pioneering is indebted to their "treating the digital not merely as a tool but as a new creative medium that is integral to and an extension of their design process" (Lynn, 2013, 12). The tools are just that, instruments that help us to perform different tasks. Nevertheless, the tool is not innocent; it has an effect in the outcome; beyond its instrumentality, it is a medium in itself. The way to conceive architecture and the consistency of the approach is what truly counts. Digital tools can be regarded as the bearers of a new creative media that some architects have managed to deal with, achieving results which would not have been possible to attain without the computers' assistance (Jencks, 2013).

These tools have enhanced architectural ideation in unique ways, from the emergence of the virtual three-dimensional space (changing the relationship of architecture and its representation) to the unlimited possibilities derived from scripting languages applied to architectural design. That is: the codification of geometry replacing forms by parametrized formal structures or to what could be referred to as open forms.

The spatial conception, for instance, is no longer static or perspectival. This irregularity and complexity of architectural space is, undoubtedly, one of the hallmarks of digital architecture as can be seen, for example, in Morphosis' design for the Cooper Union's enlargement in New York (**Figure 7a**).

Open form addresses architectural configuration of space in a totally novel way, allowing architects to experiment with form-finding strategies dependent on the variability of the parameters introduced in the design in what could be referred to as digital typologies. Parametric design has allowed to produce extraordinarily complex architectures geometrically codified. The characteristic volume and façade work in Zaha Hadid's Jockey Club Innovation Tower (**Figure 7b**), is a good example of the complex geometries achievable through parametric design that go beyond the over-abused Voronoi patterns. This design shows how to conceive and deal with complexity in uncharted paths until the advent of IT.



Figures 7a. Morphosis, Cooper Union new academic building (lobby), New York, 2004-2009, (Source: Carlos L. Marcos, 2010). **7b** Zaha Hadid Architects, Jockey Club Innovation Tower, Hong Kong, 2007-2014, (Source: Zaha Hadid Architects, 2014).

true that expressionist architecture (i.e., Hans Scharoun, Frederick Kiesler) could also be considered a realm of complexity in architecture and a formal precedent (Mennan, 2008). Deconstructivism is certainly more closely related to this ‘expressionist’ trend of the modern than it is to the international style. However, the level of complexity differs from non-standard modes of architectural production and the inner logic of irregularity characteristic of digital architecture.

Digital tools enable the modeling of geometry and inform design decisions based on spatial, social, cultural, and technological information. Computational design can incorporate data abstraction to optimize the final form, thereby altering the architect’s role in defining geometry while digitally exploring relationships between material, structure, and form. This genuinely computational design can incorporate data abstraction to improve the performance of the final form, significantly altering the architect’s role in defining geometry while digitally exploring existing relationships between such triad.

One example of this optimized design is found in the projects of Marc Fornes/THEVERYMANY, which blur the line between art installation and architecture. For instance, the structure “Under Magnitude” at the Convention Center in Orlando, Florida, continues the “Structural Stripes” series, aiming to integrate surface, structure, and space to create a distinctly three-dimensional and complex architectural topology (Fornes, 2016a).

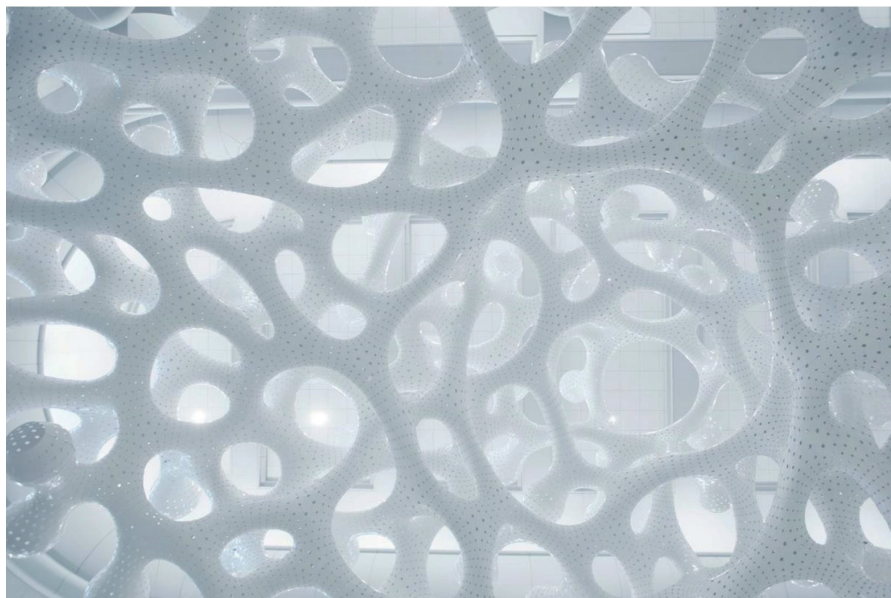


Figure 8. Marc Fornes/THEVERYMANY, Under Magnitude, Orange County Convention Center, Orlando (Florida), 2016
Source: (Marc Fornes/THEVERYMANY, 2017).

This design relies on extensive curvature and Frei Otto's bubble patterns to achieve resistance through intense curvature, resulting in characteristic coral-like structures of tubular curved branches obtained by very precise laser-cutting of an ultra-thin 1 mm thick aluminum sheet (**Figure 8**). Here, data serves as a constraint imposed on the geometry to maximize structural integrity and minimize weight (Fornes, 2016a). This formal strategy makes it possible to achieve structures of a surprising scale despite the extraordinary lightness of the whole. As pointed out by Robert Le Ricolais, the tectonic efficiency of built form lies in where to place the voids rather than in where to distribute the material (Juárez, 1996).

Additionally, parametric and generative designs embody a degree of openness, where the architect programs form rather than shaping it directly. The open form generated from scripts defines a parameterized typology of potential forms within a range of parameters. Visual Programming Languages (VPL) and scripting languages facilitate the translation of scripts into 3D models, opening new paths for algorithmic or parametric architectural design. For example, the Loophole pedestrian bridge proposal by R&Sie in collaboration with THEVERYMANY demonstrates how geometry is codified in a script stepping over the limitations of traditional architectural representation.

Patrik Schumacher has claimed that parametricism has constituted a new global style (Schumacher, 2009). Although it is to be doubted if it may be so, it may be admitted that parametric designs have become one of the most conspicuous trademarks of digital architecture, and certainly, their appearance is the result of what Carpo has coined as the second digital turn.

DISRUPTIVE MATERIALITY. NEW MATERIALITY AND NEW PHENOMENOLOGY

The extraordinary potential to handle complex geometries before they could actually be built in the early 90s led to criticism. Frampton's work *Studies in Tectonic Culture* published in 1995, notwithstanding its undisputable value, could be interpreted as an implicit criticism in relation



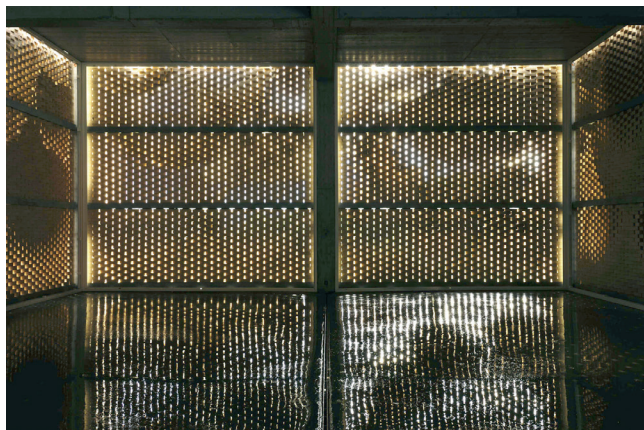
Figures 9a, 9b, 9c. Thom Faulders, Airspace Tokyo, 2007, (Source: Thom Faulders). The façade design is an example of irregularity and customized mass production of singular elements.

to this lack of constructability or sense of realism of the first digital era, as Picon (2004, 114) has suggested. However, as predicted by the latter, much has been achieved since within the context of digital architecture as to continue to ignore its importance.

An emerging new materialization digitally borne through the convergence of CAD and CAM is now stemming from a truly digitally conscious approach. Digital architecture has found in CAM the counterpoint to CAD, merging the virtual and the physical with the accuracy attained by computers, thus allowing architects to vivify the master builder's tradition of getting involved in the physical production of architecture itself, something which Renaissance architects neglected (Kolarevic, 2003). Digital fabrication has established a new relation in the way we engage materiality, counterbalancing the bold imaginaries digitally borne.

Airspace Tokyo by Thom Faulders (**Figures 9a,9b,9c**) exemplifies this new materiality that addresses complexity through sensible architectural design with new tools. The site was previously occupied by a dense layer of vegetation which had to be replaced by the façade as the program had been significantly increased. The result is a contemporary digital façade design that evokes the pre-existing tree canopy (Iwamoto, 2009, 54).

Even traditional building materials such as brick may find opportunities for a new understanding of ceramics. In 2006 Gramazio and Kohler, worked with their students in a design studio called 'The Programmed Wall' at the ETH in Zurich. The idea was to work on the new possibilities that an old construction material had to offer through a truly digitally conscious design. Thus, the walls were defined with algorithmic design tools and fabricated by robots. Each brick was laid according to particular orientation in space through which complex visual patterns and curvatures could be accomplished. This digitally conscious design illustrates what Carpo has addressed in his work *The Second Digital Turn*. It implies a shift in the digital paradigm from planar geometric information and projections to consistently three-dimensional geometries not reducible to flat elements, thanks to the use of digital fabrication tools. Accordingly, mass



Figures 10a, 10b. Winery Gantenbein. Gramazio & Kohler + Bearth & Deplazes, 2006. Revolving bricks Serai façade, Farhad Mirzaei, Arak (Iran), 2015. Sources: (Bearth & Deplazes 2013, Archdaily, 2015).

customization (of each brick's position in space) is achieved and enhanced by the control of big data (Carpo, 2015). This is one of the reasons for a distinct differentiation from expressionist or deconstructive architecture, and the cause for irregularity to become a hallmark of the digital.

Beyond the latticed façade of the Swiss winery designed by Gramazio and Kohler in collaboration with Bearth & Deplazes Architekten, further developments on similar ideas have been recently built taking advantage of this CAD-CAM convergence (Figure 10a). Such is the case of the latticed façade of the building *Revolving bricks Serai* by Iranian architect Farhad Mirzaei completed in 2015 (Figure 10b). This permeable skin is superimposed to the more conventional façade contributing to define a new approach to ceramics enhancing another reading of critical regionalism. Glazed façades are not feasible in countries where strong solar radiation has to be faced; this kind of parametric latticed façades are a revealing sign of the growing interest and concern of architects addressing sustainability issues (Guitart, 2022). At the same time, it is a sensible way in which to use brick walls freed from their traditional load-bearing purpose. The revolving brick façade sincerely conveys its condition of a permeable enclosure freed from tectonic requirements.

The possibility to customize every single element in the design through parametric design finds in *mass customized production* its effective materialization thanks to digital fabrication, thus allowing the machinic to step over mechanical industrial mass production: laser cutters and robots work alike independently of the irregularity of the geometries involved allowing non-standard modes of fabrication. This provides architects expressive means but also enables them to address levels of complexity which may also work, for instance, to enrich the effects of transparency in latticed façades with varied degrees of visual permeability (Figure 11a).

New frontiers in architecture are reached through extraordinary innovative practices based in the cross-disciplinary. The Mediated Matter Group at the MIT led by Neri Oxman is a good example of a new way to address materiality merging architecture and the natural sciences (Oxman, 2014). Moreover, digitally conscious architects typically approach architecture blurring the traditional disciplinary boundaries. In Chandler Ahrens (2016, 314) own words it implies "the superposition of theory and practice, displacements between representation and object, and overlapping rigorous scientific reasoning and aesthetic desire". The swiftness of computation has accelerated changes in architecture at a pace that is

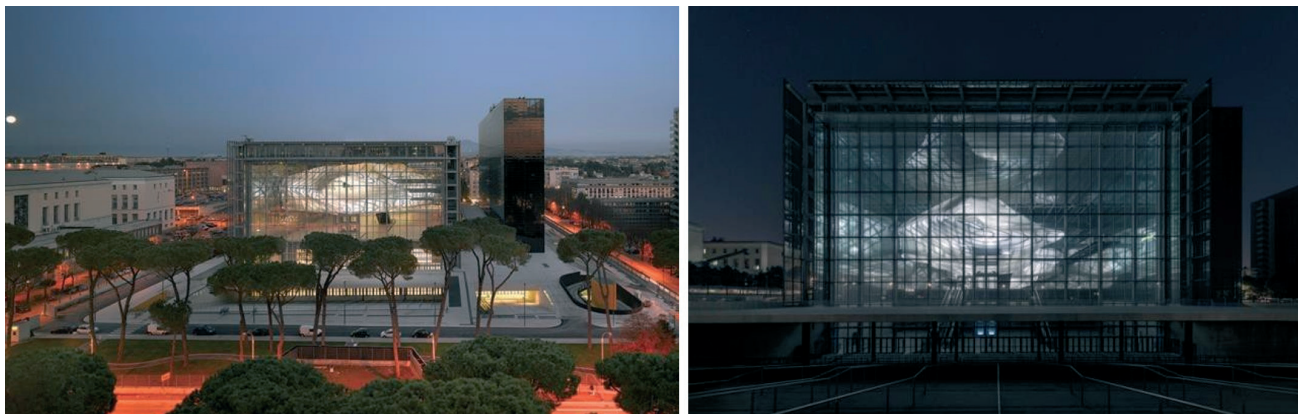


Figures 11a. Architectkidd, Façade detail. Street Ratchada in Bangkok, 2017 Source: (Architectkidd, 2017). **11b** GreenPIX, Simone Giostra & Partners and ARUP, Beijing, 2008. **11c.** Facade night view and glazing (detail), Source: (Giostra & Partners, 2008).

difficult to follow, entailing, in some cases, deep alterations of well-established relations within the discipline.

A fruitful cross-disciplinary collaboration between Simone Giostra & Partners, ARUP, Schucco and SunWays led by the architectural firm produced one of the finest examples of smart-façades, the GreenPIX façade (**Figure 11b**). The curtain wall was built with polycrystalline photovoltaic cells laminated within the glazing. These were distributed with varying densities over the building's phenomenological façade producing different patterns on the façade, thus shedding a certain appearance of irregularity. The photovoltaic cells that trap solar energy contribute to reduce heat gain by solar radiation because of their opacity while transforming it into energy for the *media wall*. These digital media walls are also another disruptive way in which to address materiality and enclosures. While their external materialization — basically a glazed façade — is relatively conventional, the image displayed on them opens a new way in which to engage temporality in architecture and defies the appearance of glazing itself.

According to Kwinter's (2001) metaphor of the surfer's dynamism, the designer is required to develop a great capacity for intuition and innovation that may allow him to establish a deep relationship with the ever-changing environment he dwells. It is a disruptive mental landscape, marked by connections, intersections and flows which need a reinvention of the concepts that define the disciplinary framework. It requires to operate at the confluences of cross-disciplinarity so that, surfing the disruptive wave, digitally conscious architecture may give an adequate response to this new reality. Its value may only be critically pondered in relation to the way in which architects are able to adapt to this deep conceptual and instrumental dynamic transformation while surfing the wake of history in the age of computation. Massimiliano Fuksas finished the completion of the Cloud (EU Convention Center in Rome) where, in



Figures 12a, 12b. Massimiliano Fuksas, 'the Cloud' — EU Convention Center, Rome, 2016. Source: (Roland Halbe, 2024; Archdaily, 2024, respectively).

collaboration with Rimond Consulting (specialized in digital design and manufacturing for the fabrication of non-conventional architectures), managed to establish a sound dialogue between the characteristic modernist gridded building and the informal cloud apparently floating in the colossal atrium, only made possible through the convergence of CAD-CAM technologies (Figures 12a, 12b).

Only now are we beginning to see the extraordinary advancements that AI is bringing to every field. Architecture is not alien to this new computer driven revolution. AI may easily and convincingly simulate extremely complex imaginaries reducing it to simple words or instructions — prompts— thanks to what is known as Generative Adversarial Networks (GAN), which has been a turning point in architectural graphic narrative and the creation of generated imaginaries through artificial intelligence (Goodfellow et al., 2014). It is only now commencing to show its full potential in the co-creation of human-AI design, where authorship, a traditionally exclusive human role, is now being transformed (Mancini and Menconero, 2023).

CONCLUSIONS

This study argues that digital architecture constitutes a disruptive force, challenging modernist principles across the interrelated domains of structure, form, and materiality. By examining innovative digitally designed projects, it demonstrates how computation enables previously unfeasible geometries, surpassing modernist limitations.

Addressing the first research question, the paper establishes the conditions for architecture to be considered disruptive in the age of computation: rapid transformation, displacement of pre-existing canons, innovative tectonics, novel conceptual frames and architectural languages. In investigating the second research question, the study delves into the various ways digital architecture challenges the standards set by modernism across the intersecting domains of structure, form, and materiality.

Tectonically, the paper highlights how digital tools enable innovative structural logics and complex geometries that diverge from modernist principles. In terms of materiality, the study emphasizes the shift towards engaging the material world through the convergence of computer-aided design (CAD) and computer-aided manufacturing (CAM). This paradigm shift in materiality moves beyond the mere emergence of new materials,

focusing instead on the novel ways in which architects can engage with and manipulate matter through digital means.

Aesthetically, the paper highlights digital architecture's embrace of irregularity, complexity, and plurality, which subverts modernism's emphasis on regularity, simplicity, and a unified aesthetic vision. The introduced projects showcase intricate, non-repetitive geometries and fluid, organic forms, made possible by advanced computational tools and algorithms. Furthermore, the paper also highlights the role of parametric design and scripting in enabling architects to create open-ended, adaptable design systems that can generate a wide range of formal variations based on input parameters. This approach challenges the conception of the architect as the sole author of a fixed, predetermined design, instead promoting an iterative design process that embraces contingency and collaboration.

Future research can develop the framework of digital disruption and the triad of structure, form, and materiality using perspectives from philosophy, sociology, sustainability and technology studies. The impacts of parametricism, generative design, and automation in architectural theory require further examination from this lens. The AI logic of design is only starting to show its extraordinary potential to accelerate and enhance architectural computational design. By elucidating disruption's manifold dimensions, architectural discourse can navigate the potentials and shortcomings of the digital to meaningfully inhabit our computational world in transformation.

Architecture is required to look to its past and to valuable precedents in order to face the future as much as it needs to fly on the wings of its time. Accordingly, this computational architecture goes beyond the exploration of form for its own sake, introducing design approaches that are capable of the optimization of form in relation to structural, thermal, wind, seismic, acoustic, and even energy efficiency instances. This smart design approach is necessarily beyond human grasp and is shaped following a computational logic.

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Anahtar Sözcükler: Yıkıcı değişim; dijital mimarlık; dijital dönüşüm; sıradışılık; karmaşıklık.

BİLGİSAYARLI HESAPLAMA ÇAĞINDA MİMARLIKTA YIKICI DÖNÜŞÜMLER: DİJİTAL MİMARLIK ÜZERİNE ELEŞTİREL BİR İNCELEME

Her yaratıcı çaba gibi mimarlık da insan yaratıcılığının yönlendirdiği değişime tabidir. Yıkıcı dönüşüm (*disruption*), mimarın tasarlanma ve inşa edilme biçimlerinde önemli yenilikçi değişiklikler olması ve önceden var olan ilkeleri yerinden etmesidir. Yakın tarihte dijital dönüşümler, disiplini farklı şekillerde ve derecelerde etkilemiştir. Otuz yılı aşkın dijital mimarlık deneyiminden sonra dijital mimarlığın önem ve anlamlarını eleştiren bu makale, dijital mimarlığın, modernizmin dönüştürücü etkisine

benzer şekilde yıkıcı bir yenilik olup olmadığını araştırıyor. Çalışma, strüktür, form ve malzeme açısından örnek dijital projeleri analiz ederek dijitali bağlamsallaştırıyor ve modernist ilkelerden teknik-estetik sapmaların izini sürerek önemli dönüşümleri ortaya seriyor. Dijital yapısal mantıkları, dijital araçlarla üretilen biçimsel karmaşıklık ve düzensizlikleri ve bunların nasıl modernist ortodoksiyi yerinden ettiğini tartışıyor. Makalede sunulan örnekler gösteriyor ki, bilgisayar destekli tasarım ve üretim (CAD/CAM) yakınsaması, kitlesel ve özelleştirilmiş üretim yeni bir materyal kültürü doğuruyor. Bu değişiklikler, enerji verimliliğini artırmak, karbon ayak izini azaltmak, güneş koruması veya doğal havalandırmayı iyileştirmek gibi amaçlarla yapıyı, malzemeyi veya formu optimize etmek için hesaplama, parametrik ve algoritmik tasarım araçlarının kullanımıyla gerçekleştiriyor. Makalede bu gelişmeler sentezlenerek, dijital mimarlığın tektonik ilişkiler, biçimsel düzensizlik ve materyal deneyler ile modernizmi kendi şartlarında nasıl sorgulayıp genişlettiği ve estetik vizyonunu nasıl çoğullaştırdığını ortaya koyuyor. Yıkıcı dijital mimarlık uygulamalarının bu şekilde sistemik olarak ele alınması, devam eden bir evrimi ortaya seriyor. Sonuç olarak dijital tasarımı ilerletmek için öneriler veren bu çalışma, bunun sadece yeniliğin peşinden koşmakla değil, insani anlamı ve yaşanmış deneyimleri (lived experience) bütünleştirmekle olacağını savunuyor. Dijital yıkıcılığın etkisini tartışmak, teori, teknoloji, kültür ve çevre genelinde gelecekteki araştırmalar için yeni soruların ve eleştirilerin ortaya çıkmasına da öncülük etmektedir. Bu araştırma, yapı, form ve materyaliteyi kapsayan bir yıkıcı değişim kataloğu olmaktan öte hesaplama çağının getirdiği sarsıntılar ve olasılıklar aracılığıyla mimari söylemin disiplini nasıl yeniden yönlendirebileceğini açığa çıkarmaktadır. Dijital mimarlığın yıkıcı değişim yaratmasının ön şartı, mimari tasarım ve inşa için yeni yöntem ve yaklaşımları kullanmanın ötesine geçerek tasarımsal karmaşıklığı eşi benzeri görülmemiş dijital araç ve yöntemlerle yönetebilmektir. Gerçek anlamda bilinçli tasarımlar, dijital araç ve yöntemlerin yardımı olmaksızın gerçekleştirilemeyecek binaları tahayyül etmemize olanak sağlamalıdır. Eğer dijital mimarlık eleştirel bir değere ulaşacaksa disiplinin kurucu ilkelerinin göz ardı edilemeyeceği de akılda tutulmalıdır.

ARCHITECTURAL DISRUPTION IN THE AGE OF COMPUTATION: A CRITICAL REVIEW ON DIGITAL ARCHITECTURE

Architecture, as any creative endeavor, is subject to ever-changing progress driven by human inventiveness. Disruption is achieved within the discipline during moments of substantial innovative changes in the way buildings are conceived and built, displacing pre-existing canons. The so-called digital turns have disrupted the discipline in varied ways and to different degrees. After over three decades of digital architecture, it is time to critically ponder their importance and significance. This paper investigates whether digital architecture qualifies as disruptive innovation comparable to modernity's transformative impact. It contextualizes digitality by analyzing exemplary digitally designed projects across structure, form, and materiality. Tracing technical-aesthetic divergences from modernist principles, significant transformations are surfaced: digitally-enabled structural logics emerge, formal complexity and irregularity generated through digital tools displace modernist orthodoxy, and a new materiality arises from CAD/CAM convergence or mass-customized production. These changes are consistent with the use of computation, parametric and algorithmic design tools to optimize

structure, matter, or form to enhance energy efficiency, reduce the carbon footprint, solar protection, or natural ventilation, to mention a few. Synthesizing these developments, digitality seems to question and expand modernism on its own terms, through tectonic relevance, formal irregularity, and material experimentation while pluralizing its unified aesthetic vision. This mapping of disruptive digital architecture practices reveals an ongoing evolution still unfolding. Advancing digital design requires integrating humanistic meaning and elevating lived experience, not just pursuing novelty. Elucidating digital disruption's impact triggers critiques highlighting unsettled questions for future inquiry across theory, technology, culture, and the environment. This disruptive catalog across structure, form and materiality unfolds future directions by which architectural discourse can reorient the discipline through the upheavals and possibilities in the computational age. Digital disruptive architecture requires new ways of conceiving and fabricating buildings, benefiting from the computational potential of digital tools to manage complexity in unprecedented ways. Truly digitally conscious designs should allow us to design buildings that could not have been so without their assistance while benefiting from their potential to simulate the designed building's behavior and, accordingly, improve the design itself based on requirements. Yet, if digital architecture is to achieve critical value, we ought to bear in mind that the founding principles of the discipline cannot be neglected.

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DISCUSSING THE PRODUCTION OF TOURIST SPACES AS THE TOOL OF CAPITALIST PRODUCTION RELATIONS: THE CASE OF KYRENIA (1)

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INTRODUCTION

Architectural space is a social product that reflects societies' cultural, political, ideological, and economic realities. Understanding space production and its dynamics requires the exploration of different aspects of society. On this basis, space is a material product that affects social relations, while simultaneously being a consequence of them (Gottdiener, 1993). Henri Lefebvre (1991) presents the dialectical connection between society and space via a socio-spatial theory conceptualised as a spatial triad: spatial practice, representation of space and space representation. Spatial practices reflecting daily life, is the perceived space. The space of representation refers to the social relations in the city, known as lived space. The representation of space or conceived space, is defined as the space of power, knowledge, and ideological aspects. Conceived space is a fundamental component of capitalist societies, since its production process, which maintains distinctive signs, codes, and oppositions, depends on the advantages of the capitalist system (Avar, 2009). By examining conceived space, this study attempts to understand contemporary space production influenced by capitalist economic systems and profit-oriented actors such as entrepreneurs and governments.

Spaces are the "ineliminable elements" of the capitalist economic system (Castree, 2007). There is a consensus that capitalism survives by occupying and producing spaces, treating them as commodities within capitalist production relations. During the production of built environments, spaces reflect capitalist social relations, including residential, leisure, and commercial spaces, while simultaneously reproducing these social relations daily (Saunders, 1989), in a way that supports capitalist structures. One of the main components in the sustenance of capitalism is its ability to reconstruct socio-spatial relations (Lefebvre, 1976). The built environment is organised and produced to meet the needs of economic capital, by creating the necessary conditions that support capital accumulation and

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profit (Harvey, 2001). Thus, space production is positioned significantly in the plans for modern societies developed by policymakers and investors due to its positive economic effects.

Modes of production and production relations undoubtedly key factors in the formation of spaces in a capitalist society. Space itself is the knowledge or action of the existing mode of production, and is organised to support surplus production as part of the modern capitalist production system (Lefebvre, 2009). Each mode of production produces and reproduces convenient spaces that align with the demand of economic capital (Harvey, 2001). The modern-day built environment therefore physically reflects the needs of capitalist production relations (Zieleniec, 2007). Compendiously, capitalism requires unique spatial strategies and production modes to sustain itself.

The modes of production and the production of space are continuously reorganised through novel approaches, especially during cyclic crises of capitalism. Following the global economic crisis from the late 1960s to the mid-1970s, a significant shift occurred in urban and architectural spaces as the economy transitioned from manufacturing to service industry. During this period, the service industry gained particular importance for local and central governments as they integrated into the process of economic capital circulation. This transition in production modes created new types of production, and employment opportunities, providing a renewed sense of hope for cities long-affected by deindustrialisation (Sassen, 1991) and for societies that had not previously progressed in the manufacturing industry. During this period, cities, as “geographic nodes” of capitalism, gained significant importance in the capital accumulation process by introducing new spatial practices via emerging service industries (Kratke, 2014).

Meanwhile, the tourism industry, a niche sector created by capitalism to organise and commoditise leisure time, has developed in cities and become integral to national economic strategies within the capital accumulation process. Accordingly, the tourism industry significantly impacts the built environment by providing tourist spaces that offer desired leisure services and by utilizing natural or historical resources.

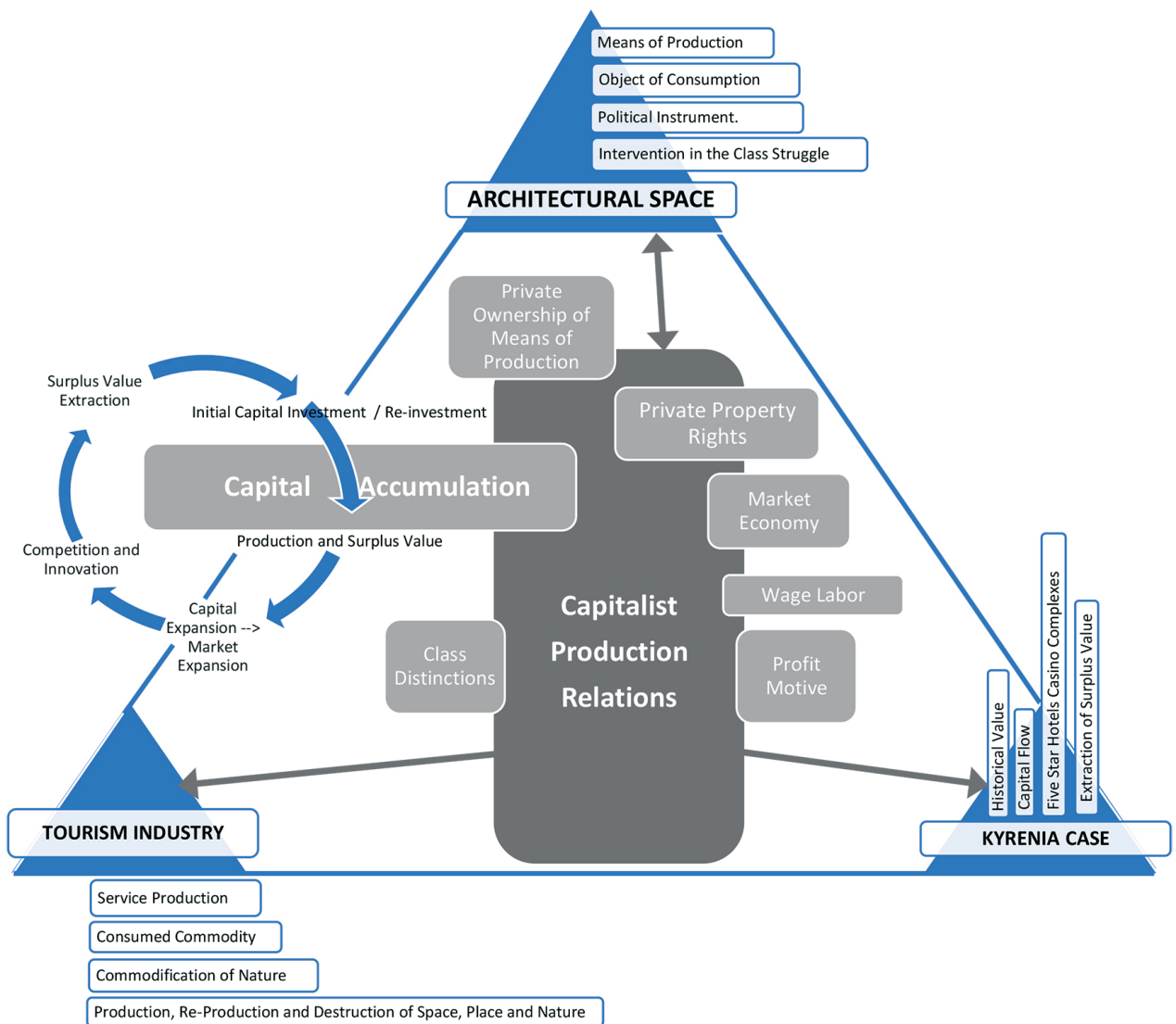
In particular, Small Island states with limited resources and weak manufacturing industries often rely on tourism as the key to their economic development plans (Bishop, 2010). The Mediterranean Region, with its favourable climate and natural and historical wealth, has become a popular leisure destination for advanced-industrialised European countries that have experienced long working hours since the mid-20th century (Lefebvre, 2009). Therefore, the capitalist organization and production of space in Mediterranean Islands like Cyprus is inevitable.

The main focus of this research is Kyrenia, a popular tourist destination in Cyprus located in the Mediterranean Basin, attracting visitors from various countries. Since the beginning of the 2000s, the city has experienced intense and problematic socio-spatial development driven by capitalist investors in the tourism, higher education, and construction sectors. This development has led to increased urban density, driven by the rise in tourist attractions and ancillary service spaces.

This study aims to examine how capitalist production relations shape social and architectural space and how capitalism incorporates architectural spaces into the capital accumulation process through the tourism industry. As seen in **Figure 1**, the study focuses on three interconnected domains

related to capital accumulation: the tourism industry, architectural space, and the case of Kyrenia. The tourism industry, from a capital accumulation perspective, manifests attributes such as service production, commodity consumption, and the commodification of nature as well as the production, re-production, and destruction of space, place, and nature. Simultaneously, the production and utilisation of the architectural space exemplifying both investment property and service value, plays a strategically significant role in the cyclic process of capital accumulation. It entails capital investment and facilitates the production of services and goods to generate surplus value. This process contributes to capital expansion and market growth, incentivising competition and innovation, thereby generating surplus value and facilitating the prospect of re-investment. From a Marxist perspective, the study highlights Lefebvre four functions of architectural space: Means of Production, Object of Consumption, Political Instrument, and Intervention of Class Struggle (Lefebvre, 2009, 188). Using these functions, the study systematically examines Kyrenia’s historical and cultural significance, capital flow, and the extraction of surplus value,, focusing on five-star hotel and casino complexes.

Figure 1. The scope and the essential research components



In this sense, this research adopts an empirical field study approach, and opens a discussion specifically through thirteen five-star hotels & casino complexes selected in Kyrenia. These architectural developments serve as essential cases for an in-depth analysis, offering insights into the intricate relationships between capitalism, architectural space, and the tourism industry. The study employs a combination of qualitative and quantitative techniques for data collection, presentation and analysis.

POLITICAL ECONOMY OF TOURIST SPACES

The tourism industry became noticeable during the mid-twentieth century, as a “growing feature of European cities” (Shoval, 2018), coinciding with widespread factory-based production and long working hours. It emerged as a service industry when capitalism sought new production and consumption forms to overcome the economic crisis and market stagnation in the 1970s. During this period, leisure-focused industries and the construction sector became the pillars of capitalism, displacing the manufacturing industry (Saunders, 1989).

Hence, tourism is a globally integrated fundamental constituent of advanced capitalist economies, acting as a typical feature of consumer culture that commodifies leisure and vacations (Britton, 1989; Featherstone, 1990; Santos, 2019). As such, it occupies a significant position within the capitalist economic system, as “an important vehicle of capitalist accumulation”, encompassing the production of many tangible and intangible forms of commodities (Britton, 1991). Tourists are offered a wide range of services and an array of souvenirs, emphasising the industry’s role in commodity production and distribution.

Despite being primarily based on service production, the economic importance of tourism goes beyond the production of commodities and services. It has a significant role in the economic development process of countries, as it triggers the development of various sub-sectors, such as the construction sector, ancillary services, sales, and transportation (Camilleri, 2018). Tourism is encouraged by governments due to its potential to accelerate and spread economic development and create employment opportunities (Vehbi, 2012). Thus, the tourism industry is dominated by various actors, including local and central governments and private enterprises, all seeking to integrate themselves into local and global capital flows. This makes tourism an indispensable component of the political economy of cities.

On the other hand, as a consequence of the flexible production and service industry, tourism requires specific spaces to manifest itself. Accordingly, tourism should simultaneously be viewed as creating its own “spatial ecosystem” (Santos, 2019), where tourist spaces reflect capitalist relations by commodifying leisure time alongside working hours (Saunders, 1989). By organising certain spaces, the capitalist economy effectively extends its influence over private life and leisure activities (Elden, 2007). This intervention has created two distinct division between work and leisure time, establishing a “spatiotemporal duality” between industrial cities and tourist destinations, separating leisure and working hours (Santos, 2019).

Tourist spaces become a part of the capitalist economic system, both as a factory of service production, and a consumed commodity. The capitalist society produced the notion of industrial space or industrial city; however, with the development of the tourism sector, new spatial approaches

emerged from the simultaneous exploitation of leisure time and natural spaces. In clearer terms, capitalism transforms natural spaces into commodities through tourism, integrating them into the exchange system. It continues by re-organising spaces through the burgeoning industries of leisure and culture (Lefebvre, 2009). Firstly, mountains, seas, and forests become new merchandise for global capital, accelerating, expanding, and intensifying surplus value extraction. Secondly, spatial production and organisation, particularly in cities, occur to accommodate tourist activities.

The integration of tourist spaces into the production chain makes them crucial for economic development strategies by governments and entrepreneurs. Thus, the production of tourist spaces is dominated by economic capital and decision-makers aiming to maximize profit. Here, the tourism industry plays a vital role, particularly in the economic development programs of non-industrialised geographies (Bianchi, 2011). Due to limited resources, government policies, and the growing leisure industry, tourism continues to gain prominence for small island economies (Hampton and Christensen, 2007; Seetanah, 2011). The sector has the potential to become the backbone of these economies, providing foreign exchange, tax revenues, and creating income and employment opportunities (Pratt, 2015).

Even though Small-Island Developing States prioritise tourism in their economic development strategies, Bishop (2010) emphasises both the rewards and significant challenges. Particularly, economic gain often come at the expense of built and natural environments, as well as socio-spatial structures. In addition, governments may adjust rules and laws to attract tourism investments and related sub-sectors. Santos (2019, 32) pointed out that tourism is a part of urban development strategies that impact the “rules surrounding accommodation and commercial activities” and “public urban facilities”. The industry also drives property and land speculation, causing a rapid increase in land prices around tourist areas and affecting the construction sector and general urbanisation (Lefebvre, 1991).

Consequently, the tourism industry is crucial for developing societies and small islands like Northern Cyprus, which faces economic challenges and limited global recognition. This study will focus on Kyrenia, a coastal city in Northern Cyprus, discussion the capitalist production relations and the role of tourist spaces from a political economy perspective.

METHOD OF THE STUDY

This empirical study approaches tourist spaces from the frame of spatial political economy, linking capitalist production relations with space production. The political economy of space focuses on the spatial distribution of economic activities and the spatial strategies of capital. It serves as a “meta-language” of “meta-narrative” (Cuthbert, 2006), entailing production relations, modes of production, and the relations among actors during commodity production. Likewise, it explores how spaces shape the nature of politics, economics, and society within the capital accumulation processes (Hassan, 1999).

This study aims to create a meta-narrative by examining the production of tourist spaces through Lefebvre’s functional categorisation of capitalist space in the capital accumulation process. According to Lefebvre (2009, 188), space in capitalism functions as a means of production, an object of consumption, a political instrument, and an intervention in class struggle.

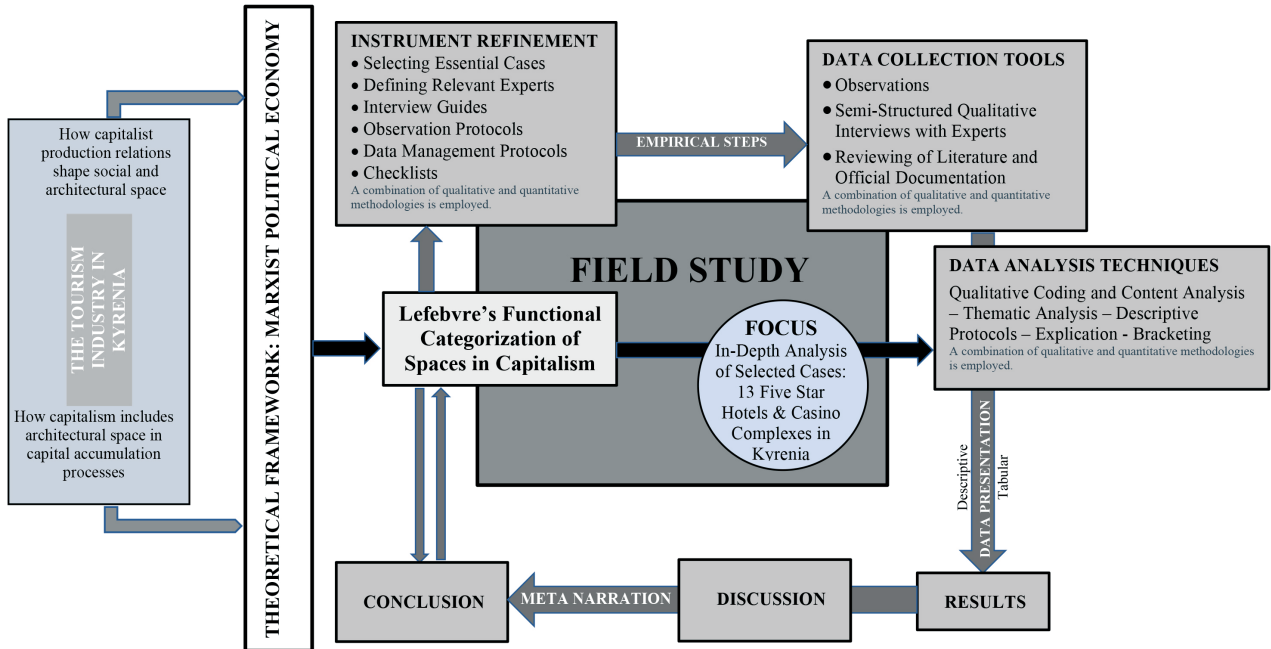


Figure 2. Research design and methodology

From this point of view, this research integrates these functions into its design and methodology, using Lefebvre's approach as a core idea.

As previously noted, the main research question, outlined in **Figure 2**, guides this exploration. The tourism industry in Kyrenia, known for its vibrant characteristics, provides an ideal apposite context to study the interrelationship between capitalism and architectural space. The theoretical framework is based on Marxist economic policy, providing a broad understanding of the socio-economic structures shaping the interaction between capitalism and architectural space. After defining the research question, scope and theory framework, the study focuses on Lefebvre's functional classification of spaces in capitalism. This conceptual framework, based on Marxist thought, offers a structured approach to examining the various functions of architectural space.

To conduct a systematic exploration, this research adopts a field study approach, concentrating specifically on thirteen five-star hotel and casino complexes in Kyrenia built between 2000 and 2019. This period marks the beginning of large-scale touristic activities in the city, extending up to the onset of the Covid-19 pandemic, which globally decelerated tourist activities. An in-depth analysis examines the physical, economic, and social structure of these developments, considering their facilities and their role in surplus value extraction in the capital accumulation process. To ensure precise data collection, the research instruments were carefully refined. This includes selecting essential cases, identifying relevant experts, creating interview guides, establishing observation protocols, and developing data management protocols and checklists. Accordingly, **Table 1** lists the selected cases and provides an overview of the content analysis of official documents. A group of 15 experts was selected for the interviews (2).

Subsequently, various data collection tools are employed to empirically capture the interaction between architectural space and capitalist accumulation. Direct observations, semi-structured qualitative interviews

2. This group includes the president and former president of the Chamber of Turkish Cypriot Architects, four architects who own design firms where projects are implemented in Kyrenia, one urban planner, two academics, two local government officials, two ministry officials, and two high-level bureaucrats with strong knowledge of legislation.

The principles for semi-structured interviews were determined and a framework was created for researchers to examine the structure in detail and observe the users. It was planned to control and manage the data in the process and ensure operational continuity, and checklists were made.

3. A qualitative exploration approach is elucidated by identifying a group of experts and professionals competent in their respective fields for interviews. During the interviews, their opinions were sought to investigate the presence of tourist spaces in relation to capitalist production, their impacts on the economy, and to clarify how they operate in terms of conflicts and intermediations within the realms of production, consumption, and capitalism. To explore this, interview transcripts were created, and coding was performed to identify the level of functional quality of space within the context of capitalism. This determination was achieved through the interrater reliability process using a Likert scale, focusing on the four functions of space that form the foundation of the research. The resulting levels were marked as seen in Table 2. The inter-rater reliability process was implemented to ascertain the consistency and dependability of the coding results across different researchers, thereby augmenting the overall validity of the study. The achieved percentage, surpassing 85 for matching, signifies a high level of agreement among the researchers involved in the coding process. Averages for each parameter group for the identified functions are presented in the table.

4. Mainly based on written primary sources that consist of books, articles, and texts, about the tourism industry in Kyrenia, data from the Ministry of Tourism, Culture, Youth, and Environment, and State Planning Organisation.

5. Net tourism income increased from \$302.2 million to \$954.4 million, and the ratio of net tourism income to the trade balance rose from 23.2% to 63% between 2006 and 2019. This data highlights the substantial growth in the tourism industry's contribution to the national economy (gross national product), which reached 22.2% in 2019. (Statistical Yearbook of Tourism, 2021, p.64).

6. North Cyprus has 165 tourist facilities -five-star hotel-casinos, apart-hotels and boutique hotels-, and 79 of them are located in Kyrenia (Statistical Yearbook of Tourism, 2024).

(3) with sectoral experts, and a thorough review of literature and official documentation (4) contribute to obtaining a comprehensive dataset in this research. A combination of qualitative and quantitative methodologies is employed throughout the data collection, analysis and presentation stages. The analytical backbone of this study includes qualitative coding for interviews and content analysis of government reports, coupled with thematic and descriptive analysis techniques for observations assessment of the physical environment and social and cultural conditions. Statistical summaries and numerical data are presented as needed (Figure 3 and Figure 7). Findings are presented using both descriptive and tabular methodologies and are discussed and interpreted in relation to the research question in the conclusion section. Consequently, this assessment suggests a methodological approach for future studies on architectural spaces within the framework of Lefebvre's functional categorization of spaces in capitalism.

DISCUSSING TOURIST SPACES AS THE TOOL OF CAPITALIST PRODUCTION RELATIONS IN KYRENIA

The tourism industry plays a substantial role in the economic growth of Mediterranean Island of Cyprus, particularly in northern region. The geographic and social division caused by the 1974 War ushered in numerous challenges for the country, including lack of international recognition and economic embargoes. Accordingly, the tourism industry has emerged as a cornerstone of economic development for Northern Cyprus economic development after 1980, helping sustain an economy (Katircioğlu et.al, 2010) otherwise hindered by political isolation (Ismet and Abuhjeeleh, 2016). During this time, Northern Cyprus economy witnessed a shifted from a production-based economy to a service-based economy, encompassing sectors such as tourism, higher education, and banking. Among these service industries, tourism holds a significant share in the country's National Gross Domestic Product (5).

Northern Cyprus's has been shaped by capitalist spatial organization and production relations over a long time. Particularly, luxury hotel-casinos and resorts serve as one of the main contributors to economic growth, since the spatial reorganisation of the country is driven by capitalist regime and production relations (Özdemir, 2020). Kyrenia, known as the tourist capital of north Cyprus, exemplifies these capitalist production relations where spatial production relies on economic profit and the interests of capitalist actors. The city host a significant share of tourist facilities in Northern Cyprus (6), accounting for a substantial 55% (Figure 3). Following closely is

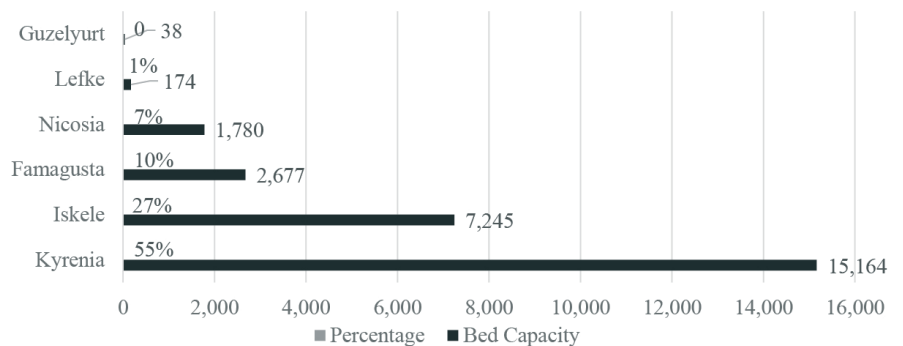


Figure 3. Distribution of total bed capacities of tourism facilities in Northern Cyprus by districts, 2024.

7. "The Sea View lacked not only the latest tourist facilities such as en-suite bathrooms, trained staff, and refrigerators but also running water. The hotel's staff carried water upstairs to the rooms in barrels and cans, wine and beer were cooled in an outside well, and meat was roasted in the kleftiko oven. With the help of a British entrepreneur, Catsellis upgraded his establishment, and the Sea View, Provided with the latest facilities, was reopened in 1926" (Wiblinger, 127-128).

the İskele District, which has recently attracted the attention of both local and foreign investors, boasting a commendable rate of 27%.

Today, Northern Cyprus boasts of 24 five-star hotels with a total bed capacity of 16,886. Kyrenia has the dominant share, with 15 hotels offering 9,176 beds, accounting for 54% of the total capacity (SYT, 2024). These statistics underscore the pivotal role that Kyrenia plays in the country's tourism industry.

Development of Tourism Industry in Kyrenia

Kyrenia has become a popular tourist destination due to its location, unique natural beauty, pleasant climate, and remarkable historical wealth, dating back to its time as a British Colony. The arrival of the British Empire in 1871, as one of the early capitalist nations, marked the island's introduction to capitalism.

The spatial interventions of the Empire started by analysing the harbours, considered gateways to capitalism. In 1886, the Empire sent a company named Coodes Co. of London to evaluate the harbours (Yetkili, 2013). Larnaca and Limassol Harbours were classified as offshore harbours, while Famagusta's was emphasised for significant transformation activities. However, due to its geographical characteristics and location, Kyrenia's harbour was deemed unsuitable for large-scale transportation and designated primarily for fishing. This decision may have paved the way for Kyrenia to develop into a humble tourist city.

In 1914, the island officially became a British Crown Colony, triggering an intensive influx of visitors and marking the advent of conventional tourism in Kyrenia (Wiblinger, 2016). This period which can be interpreted as. This period saw the emergence of capitalist activities occurred alongside tourism, such as taxi services, souvenir shops, and an increase in accommodation facilities. Due to the intensive tourist flow, numerous residences were converted into pensions and boarding houses to meet growing demands. The first hotel 'Akteon' was built by the sea, followed by "Coeur the Lion Hotel" to accommodate tourists' needs (Kastelli, 2023). In 1922, the first modern European-style hotel, the Sea View, was built without major hotel services (7) by a Greek Cypriot Costas Catsellis, who had previously worked in the hotel industry in New York and New Jersey.

Following the success of Sea View Hotel, Catsellis opened the Dome Hotel in 1932, designed by architect William Douglas Caröe. It became one of the most renowned hotels of the British Empire at the time rivalling international establishments like Raffles, The Crescent, Shepherds, and The

Figure 4. (a) The Sea View Hotel, postcard. (Ebay web site) (b) A Postcard of the Seaview and Dome Hotel by Daphne Mawby, 1934. (British Forces in Palestine web site)





Figure 5. Dome Hotel and its surroundings in 1950 and 2020. (Reno Wideson, Cyprus Drone)

Phoenicia (Wiblinger, 2016, 128). Today, the Dome Hotel remains one of the city's most significant buildings, retaining its symbolic meaning.

Kyrenia became a favourite tourist destination for British citizens during that time. After World War II, the increasing number of hotels made the city an ideal holiday spots for both local and foreigners, attracting many British citizens to settle there permanently (8). In the early 1970s, there was a significant increase in hotels and tourists, driven by the construction of a new road connecting Kyrenia to Nicosia from the eastern side. Simultaneously, this period also saw a notable expansion of cultural and traditional activities in the city (Katselli, 2023) (9).

After the 1974 War and subsequent social division, tourism development in Northern Cyprus slowed due to political isolation, transportation problems, and economic embargoes. Although a few new hotels were built, many of the hotels from the early 1970s have remained untouched. In the 1990s, there was an effort to market Kyrenia as a conference tourism centre, leveraging the increase in the number of universities and their prospects. However, this attempt could not achieve the expected success (Warner, 1999). Even so, many hotels still offer facilities for meetings, conferences, and various events.

8. Nowadays, British visitors are still among the top foreign tourist flows, ranking fourth after Turkish, Iranian, and German citizens (SYT, 2022). Indeed, the city's coastal location and unique features have made it a popular tourist place.

9. "... Other than the many traditional cultural and religious fairs and festivals annually celebrated, flower shows, yachting races, concerts and theatre performances were organised." (Katselli, 2023).

From the 2000s onwards, Kyrenia underwent a remarkable physical and social transformation alongside the growth of service production and tourist complexes. Özdemir (2020) attributed this development to Annan Plan, which opens up opportunities for growth in the construction sector, resulting in the built environment besides tourist facilities. In this sense, Kyrenia experienced spatial progress aimed at attracting tourists and, local and foreign investments. This include the development of hotels, hotel-



Figure 6. Distribution of five-star hotel-casinos in Kyrenia between the periods of 2000-2019.

casinos, holiday villages, holiday homes, and other auxiliary service spaces such as cafes and restaurants.

The remainder of this study will focus on tourist accommodation spaces, particularly hotel-casinos (**Figure 6**), and using Lefebvre's functional classification of tourist space to examine capital accumulation processes and surplus creation through qualitative and quantitative research techniques.

Tourist Spaces as a Means of Production in Kyrenia

Urban and architectural spaces are considered components of economic capital, serving as means of production (Lefebvre, 2009). The importance of a produced commodity lies in the contribution of the surplus value generated through the exploitation of labour in production and the income from marketing the product. Considering the tourist spaces, the services and other parameters (10) offered under the umbrella of establishments function both as marketed commodities and surplus value generators.

Kyrenia is a spatial agglomeration of various service spaces, influenced by the tourism industry. Hotel complexes, cafes, and the real estate market, driven by residential tourism, cater to both foreign and local visitors, shaping the coastal city's physical organisation. The tourism sector considerably contributes to employment and capital flow through the production and consumption of various services. Regarding accommodation facilities, Kyrenia boasts 79 tourist establishments (11), including 13 five-star hotel-casinos, built between 2000 and 2019, as listed in **Table 1 (12)**. These spaces not only provide employment but also drive economic activities and capital flow.

Hotels produce services marketed as intangible commodities, such as accommodation and dining. Each bedroom or restaurant in a hotel serves as a production area, enabling the production of these services, thus, directly impacting the quantity of marketed commodities and economic profit. Interviewees noted that this potential for increased economic income might occasionally lead investors to prioritise quantity over quality to

10. See Table 2, Section A

11. Including five-star hotel-casino, 4*, 3*, 2*, 1*, special class hotels, boutique hotels, holiday villages and bungalows, holiday homes and tourist guesthouses.

12. The spatial information presented in the table was collected from the pertinent architects and business owners. In cases that we could not contact architects or authorised officials, we reflected partial information taken from the official website of hotels.

	Name of the tourism facility	District	Opening Date	Type of Capital	Bed Capacity	Total Campus Area	Total Building Area	Additional Services			Employment Capacity		Architect	Picture
								Casino	Convention	Spa/Wellness	Hotel	Casino		
1	Merit Crystal Cove Hotel & Casino	Alsancak	2000	Turkish	632	40,000 m ²	39,000 m ²	3,650 m ²	2,068 + circulation	1,500m ²	388	564	Ziya Necati Özkan + Mustafa Dinçer (additional building)	
					349 rooms			9.3%	5.80%	3.84%	40.7%	59.3%		
2	The Arkan Colony Hotel & Casino	Girne	2003	Local	236	4,133 m ²	7,944 m ²	627 m ²	130 m ²	250 m ²	192	333	Ziya Necati Özkan	
					94 rooms			7.9%	1.6%	3.1%	36.6%	63.4%		
3	Acapulco Resort Convention Spa	Çatalköy	2005	Local	2,597	120,000 m ²	*	*	14,000 m ²	4,700m ²	823	251	Harun Kağansoy	
					850 rooms			*	*	*	76.6%	23.4%		
4	Merit Park Hotel & Casino	K/oğlu	2006	Turkish	580	50,000 m ²	33,200 m ²	4,380 m ²	1,28	2,000 m ²	342	472	*	
					286 rooms			12.9%	4.2%	%6,9	42%	58%		
5	Chamada Prestige Hotel & Spa	Çatalköy	2007	Local	342	42,680 m ²	26,850 m ²	3,500 m ²	1200 m ²	650 m ²	373	349	Osman Sarper	
					187 rooms			13.03 %	4.4 %	2.4 %	51.7%	48.3%		
6	Vuni Palace Hotel	Girne	2007	Local	352	25,702m ²	18,851m ²	*	3256m ²	500m ²	6	256	Pınar Göymen	
					176 rooms			*	17,20%	2,60%	2,3%	97.7%		
7	The Savoy Ottoman Palace	Girne	2008	Turkish	256	18,000 m ²	10,000 m ²	1,500 m ²	*	*	148	534	Nazif Çataloğlu	
					117 rooms			15%			21.7%	78.3%		
8	Cratos Premium Hotel Casino Port Spa	Çatalköy	2010	Turkish + Local	820	200,000 m ²	*	4,000 m ²	1,510 m ²	*	302	282	Mustafa Bladanlı	
					410 rooms									
9	Grand Pasha Hotel & Casino Spa	Girne	2013	Local	256	6,691m ²	10,518m ²	*	2,530m ²	1,000 m ²	173	244	Pınar Göymen	
					128 rooms									
10	Merit Royal Hotel	Alsancak	2014	Turkish	508	38,500 m ² 50,000 m ²	87,092 m ²	13,380 m ²	7,220 m ² + circulation	3,500 m ²	597	1194	Mustafa Dinçer	
					125 rooms			2300m ² (2022)	21.8%	8.5%	5.7%	33.3%		

Table 1. Five-star hotel-casino complexes in Kyrenia opened between the years 2000-2019.

maximise profits. Accordingly, expanding hotel campuses to maximise bed capacity or floor number can sometimes result in problematic consequences for the fragile urban fabric of this small-scale coastal city.

On the other hand, core services such as accommodation insufficient for generating significant income for investors and competing in the global tourism market. Functioning as means of production, these facilities attract consumers by offering a multitude of additional services, as outlined in **Table 1**. Within these conceived spaces, tourists can purchase luxury add-ons services as, augmenting their experiences. The variety and the number of services offered can be positively associated with consumers' satisfaction and the preference rate of the facility. Having spaces such as spa, casino, convention facilities, and diverse restaurants increase the profit capacity of establishments by catering to both visitors and locals. Most of the hotels highlight their spa, wellness, convention and casino services in names and advertisements to attract visitors seeking a comprehensive and luxurious experience. These services also boost the tourist preference rate in a competitive market.

Additional services create profit opportunities, especially during off-seasons, however, they also affect the spatial organisation of campuses and the urban context since each mode of production requires its own spatial counterpart to function, engendering physical growth of tourist campuses. These spatial diversity, catalysed by product diversity, affects architectural decisions from design concept to the building size. In the examined examples, the total area allotted to additional services ranges from 12.6% to 35.7% of the overall total building area.

Spa facilities generally include a many sub-spaces that have distinct spatial requirements. The richness of services offered corresponds to the diversity and specialisation of space, such as Turkish baths, saunas, therapy/massage rooms, and personal care rooms. These areas are specifically designed and crucial in architectural decisions, serving both as service production sites and surplus value generators due to the necessity for specialised personnel. In the examined hotels, spa facilities occupy between 4% and 20% of the total building area.

Convention facilities are another important service that has potential to generate economic income is. Considering the rise in education industry in Northern Cyprus, convention spaces are ready to serve educational activities such as congress and academic meetings. These flexibly designed spaces can also offer a wide range of services such as cocktails, exhibitions, company dinners, and wedding, generating income for the hotels across different seasons. Within this wide range of service opportunities, convention spaces are typically designed as multifunctional areas that can be combined or separated according to organisation and activities. This flexibility, observed in the selected hotels, support the production of various services. Both spa and convention spaces serve hotel visitors and temporary users who purchase services without staying in the hotels.

Nevertheless, in geographies such as Northern Cyprus, which are not economically developed and independent due to political embargoes, capturing a share of global capital may not be possible solely through luxury and variety of services offered. In such cases, to participate in global capital accumulation and attract capital flow from the global market may require some special niche sectors like gambling (13) which is an

13. Gambling is a 'coercive commodity,' in that its consumption is reorganised by consumers in a way that goes against their interests, even though they are aware of the potential negative consequences. (Young and Markham, 2017).

indispensable element of economic development strategies for both the state and entrepreneurs.

In addition to the profits gained through labour exploitation, gambling effectively generate surplus value through various tactics such as diverging sale price from value, taking advantage of a monopoly, and encouraging consumption by exploiting self-control issues (Young and Markham, 2017). Its high profit potential makes gambling a key service in tourist facilities in Kyrenia. Consequently, the development of spaces catering to gambling is a highly expected outcome within the capitalist system.

In the five-star hotels examined, as the surplus production areas, a total of 10,521 people are employed; 4,979 (47.3%) in hotel services and 5,442 (51.8%) in casinos (Figure 7). These figures indicate the importance of casinos as a commodity, that is, service producers and surplus generators.

The importance of gambling as a major profit generator is evident in the total square metres allocated to casino spaces. Casinos can occupy up to 22.5% total tourist facility. In the hotels examined, casino areas are generally located in the basement, having different gambling areas including VIP lounges for special plays that generate higher income. While these areas are housed within hotels, some casinos are operated independently from hotel management. This division provides extra profit for hotel owners.

In addition to benefiting private investments, gambling generates significant income for the state, acting as a state-led means of production. Gambling licences and permits are an important source of profit for local and central governments. For instance, each tourist complex is required to pay a non-refundable fee of 550,000 euros for to obtain gambling permission, renewable every three years. In addition, each casino pay 10% of its gross earnings from gambling activities monthly (Ekici and Caner, 2018).

Moreover, state intervention through legislations have redirected the production focus of tourist spaces, establishing conditions necessary for obtaining gambling permits. For example, a law enacted in 2009 mandate that hotels must meet certain criteria to qualify for a gambling permit. According to the law (Item 7), only 5-star tourist establishments or first-

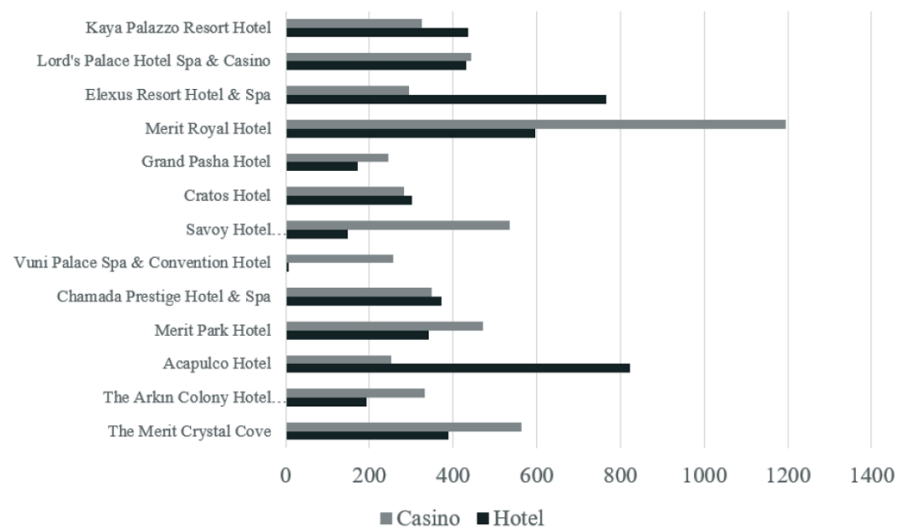


Figure 7. Distribution of five-star hotel casino employment capacity in Kyrenia. Data has been taken from the Kyrenia Tax Office.

class holiday villages with a minimum capacity of 500 beds are eligible for these permits. This regulation incentivises investors seeking to capitalise on gambling services to invest in large-scale tourist complexes instead of small-scale developments more suitable to the modest scale of this coastal city.

The rapid increase in the number of hotel-casino facilities in Kyrenia since the early 2000s can be interpreted as the result of socio-economic factors driving growth in region's the tourism industry. Although gambling has become a remarkable contributor to the national economy, its impact on the physical environment warrants careful consideration. For example, the substantial economic return from casino services makes the produced service more important than the tourist space where it is housed. Besim et al. (2010, 118) drew attention to this issue, noting that "the significance of the casinos is proven by local signboards and newspaper advertisements which display a stronger emphasis on casinos than on the related hotels."

Intrinsically, tourist spaces in Kyrenia reflect the characteristics of capitalist spaces, primarily serving as venues of leisure activities and gambling services. This profit-oriented approach has engendered expansion of widespread and large-scale hotel complexes, allowing the production of more commodities, independent from the city's scale and context. This attempt generally approaches tourist space merely as containers, potentially neglecting the need for healthy physical and visual communication with local values, thereby risking destruction to natural, cultural and memorial assets.

Official records and numerical data serve as indicators of the impact of tourist spaces in Kyrenia, functioning akin to smokeless factories that profit from service delivery. In addition to the data gathered from observations, literature and content analysis of official documents, expert assessments are detailed in **Table 2**, Section A.

The establishment of 5-star hotels and casinos in Kyrenia significantly impacts diverse economic activities at a national level, creating employment opportunities and occasionally resulting in an overextended workforce during peak periods due to abundance of services. Furthermore, tourist spaces function as a means of production, producing core services like accommodation and restaurants, additional services like spa facilities, convention centres, and casinos, and auxiliary services including transportation, marketing, promotion, and retail.

Additionally, interviewees offered valuable insights into the economic significance of tourism properties as essential infrastructure that not only provides services but also bolsters the tourism sector. Their perspectives clarify the substantial contribution of these establishments to the broader tourism industry, supported mainly by government initiatives and preferred by capitalist entrepreneurs.

Thus, in addition to the descriptive analysis, it was generally observed that the function of capitalist space as a means of production was prominently emphasised in the evaluations of the fifteen interviewees across the seven parameters underlined in the interviews and outlined in **Table 2**, Section A.

Tourist Spaces as an Object of Consumption in Kyrenia

The basis of capitalist space production and organisation is to support and increase capital accumulation through production and consumption

INTERVIEWER		FUNCTIONS OF TOURIST SPACES in KYRENIA															Average assesment(*)	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
SECTION A Tourist Space as a Means of Production	Fostering a variety of economic activities	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Employment creation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Surplus production which contribute to job creation indirectly	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Production of core services *	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Production of additional services **	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Production of auxiliary services***	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Tourism supporting Infrastructure and buildings	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
General opinion of interviewers about 13 five star hotels & casino tourist spaces in Kyrenia functions as a means of production																	Very favourable	
SECTION B Tourist Space as an Object of Consumption	Expenditure of Visitors****	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Consumption of natural resources	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Consumption of historical wealth	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Consumption of architectural objects*****	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Consumption of city	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
General opinion of interviewers about 13 five star hotels & casino tourist spaces in Kyrenia functions as a n object of consumption																	Very favourable	
SECTION C Tourist space as a political instrument	Providing profit for local and central government from tourist investments	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	The manipulation of laws and bylaws for increasing touristic investments	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Encouraging foreign capital for tourist investment by incentive laws *****	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
General opinion of interviewers about 13 five star hotels & casino tourist spaces in Kyrenia functions as a political instrument																	Favorable	
SECTION D Tourist space as an intervention in the class struggle	Working class and the capitalist class	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Conflict between local people and tourists / Local People and employees	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Exclusion of local residents and workers from tourist facilities	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Prevention of the use of the environment	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Increase in second home developments for locals due to the facility prices	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Increase second home developments for tourists and create cultural diversity	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Cultural differences regarding international workers and local people	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
General opinion of interviewers about 13 five star hotels & casino tourist spaces in Kyrenia functions as an intervention in the class struggle																	Favorable	
* Bedroom units, restaurants ** Spa facilities, convention facilities (conference, meetings, weddings etc.), casino-gambling, kid clubs *** Transportation centers, tourist information centers, marketing and promotion areas, events and festivals ****Spending time, money and energy to receive satisfaction from experiences of all kind of touristic facilities as customers: Entertainment and casino facilities, leisure and recreation, culinary experiences, spa and wellness facilities, exclusive amenities and services etc. *****The diversity of aesthetic interpretations in architecture, themed environments, interior design. *****High dependency on Turkey investigators due to political embargoes.																		
(*) . x Not at all favorable . Slightly favorable • Moderately favorable ● Favorable ● Very favorable																		

Table 2. Interview explication

activity, with commodities serving as fundamental drivers of this process. Until the mid-20th century, space primarily served as physical container for capitalist production relations. However, under capitalism’s influence, which commodifies everything, space and land have evolved into object of consumption. This transformation is particularly evident in tourism facilities that require substantial investment and consumption of both tangible and intangible values (14).

14. See Table 2, Section B

15. Kyrenia is home to the unique historical 7th-century Byzantine Kyrenia Harbour and Castle, the ancient Shipwreck Museum, 12th-century Bellapais Abbey and village, and the St. Hilarion Castle, which is said to be the inspiration for the Walt Disney Castle. With the advantage of climatic conditions, beautiful beaches are visited by many local and international tourists each season. The city is commercialised as a commodity by various advertisements, newspapers, and brochures, which include various images of those natural and historic spaces.

Within the Kyrenia context, the city functions primarily as a consumable commodity within the tourism industry. Vehbi (2012) claimed that the viability of the tourism industry depends on the availability of natural and/or built resources that tourists demand, expect, and are willing to pay for. From this point of view, Kyrenia, with its rich coastal setting, historical and natural values, represents a marketable object (15). Thus, making it a valuable asset exploitable by capitalists seeking profits through the tourism sector. Harvey emphasises the importance of symbolic capital in the investment processes of cities, where qualities appealing to this demanding sector attracts economic capital for new investments. The natural and historical wealth serves as important symbolic capital, especially for attracting both foreign and domestic investors.

The city's wealth, as pointed out by Santos (2019), influences spatial, functional, and social changes in cities with significant historical heritages. Each value in Kyrenia can be accepted as a symbolic capital –architectural and natural heritage- that attracts local and foreign tourism investors keen on getting a significant share from city's potential. In addition, the governmental efforts to promote the city further increase both tourist arrivals and investments as well. Thus, Kyrenia has been capitalised by investors, through the tourism industry and the construction sector, despite constraints on foreign capital flow due to its unrecognized status. The number of Turkish investors is considerable, since Turkey is the only country that recognises Northern Cyprus. Of the thirteen five-star hotel-casinos, seven were invested by local investors, seven by Turkish investors, and one jointly invested by local and Turkish capital (**Table 1**).

Each tourist facility produced also functions as an object of consumption, serving both local residence and tourists in functional and visual capacity. To be consumed as a commodity, these tourist places and buildings must have a symbolic meaning/value that convinces consumers of their worthiness. Thus, the symbolic language of architectural objects comes to the fore, because the architectural style of a building can become a symbolic capital in attracting the attention of the consumer. Urry (1995) states that there is a direct relationship between the consumption of space and goods, highlighting a relation between the consumption of the services produced by tourist spaces and the attractive tourist places with high symbolic value. Therefore, tourist spaces should have visual/ symbolic attractions capable of enticing tourists to visit and consume the services provided.

Examining selected hotel-casinos reveals a diverse architectural language in tourist facilities/objects, manifesting eclectic design approach that include postmodern facades. These design however, do not necessarily align to the island's architectural memory and context (**16**). It is not surprising to find a Venetian Palace on one street and a postmodern breeze near a humble neighbourhood of the coastal city. It can be said that these consumption-led places are designed with the aim to attract consumers by promising a luxurious life and executive services. However, consistent with this design strategy, as it was emphasised by Vehbi (2012), the production of tourist spaces may cause some problematic consequences in traditional environments, by altering the physical appearance of coastal cities. Inskip (1991) also criticized poorly designed tourist facilities and hotels that do not harmonize with local architectural style. In Kyrenia, as the interviewees mentioned (**17**), the large scale and use of inappropriate building materials on external surfaces cannot be integrated into the fragile natural environment of the coastal city, both in scale and architectural style. Kyrenia has a complex and problematic production of tourist spaces that needs to be questioned and discussed, especially considering its unique natural and historical texture. Therefore, the integration of produced tourist spaces with the local context should be reconsidered, taking into account the existing historical, architectural, and natural patterns, as well as public memory.

16. Also Besim et al (2010) mentions these buildings are mostly designed in the figurative classicism and postmodern classicism styles, which present contradictions with the city texture in terms of both scale and architectural language.

17. The interviewees, specifically the president and the former presidents of TRNC Chamber of Architects, emphasised this fact. The fourth and fifth parameters in Section B in **Table 2** includes these interpretations.

The commodities produced by the tourism industry are not limited to buildings and the natural environment. For instance, public beaches have become commodities marketed even to local citizens, often controlled by private enterprises, as an extension of accommodation facilities. The local community are required to pay to use most of the beaches which are occupied and reorganised by luxurious tourist facilities in Kyrenia. The

18. From the documents obtained from the Deputy Chairman of Cyprus Turkish Building Contractors Association. Besides, issues between the years of 2005-2019 of Propertync, which is a reputable real estate magazine in North Cyprus.

19. From the interviews with president and former president of TRNC Chamber of Architects

20. See Table 2, Section C

industry may also affect and commodify the surrounding lands, creating speculative prices, and providing extinction through the commodity. This commodification, as Vehbi (2012) mentioned, notable impact upon land prices, further affecting housing cost and overall living cost. In Kyrenia, land prices have increased dramatically, rising from 15,000 to 100-120,000 English Pounds (18) between 2003 and today. This increase, particularly evident, after the Annan Plan period, marked a turning point emphasized by many interviewees, as it opens avenues for new investments. There is a general opinion that this plan, which also triggered an increase in tourism investments, encouraged investors, especially of Turkish origin, to invest in this geography, since it possesses the potential to become a European Union territory (19). This perspective underscores Annan Plan's (2004, 100) role to in stimulating tourism investment, which emphasises the possibility to own the land through investment in the Article 14 "the owner of a significant improvement to an affected property may apply to receive title to that property considers the ownership of an affected land".

Correspondingly, the interviews reaffirm the characterisation of tourist destinations as consumption object, viewed from two distinct perspectives. Firstly, this pertains to consumption, wherein tourists expend their financial resources, time, and energy to acquire experiences and leisure. Secondly, there is a consumption of the natural, historical, architectural, and urban attributes of the local as an object. The average evaluation of the parameters explained in **Table 2**, Section B further corroborates this designation of the place as a consumption object, describing the destination as "very favourable."

Tourist Spaces as a Political Instrument in Kyrenia

Tourism is an economic activity influenced and moulded by political forces (Henderson, 2003). It not only benefits private enterprises but also provides economic and political outcomes for states. The development of tourist activities generally relies on the government's policies and strategies in accordance with Henderson's claim. Tourism serves as a multifaceted political tool, vital in the capital accumulation process on both the local and global scales. Accordingly, the incentive, planning, and expansion of tourist spaces, are in the strategic program of central and local governments. In the Kyrenia context, tourist spaces are included in the capital accumulation process by local and central governments through three main approaches (20).

According to Özdemir (2020), in capital accumulation processes, state intervention is mandatory for the continuous flow of economic capital. This market alliance manipulates and (re)interprets legal frameworks, presenting a capital-oriented attitude in Northern Cyprus. In Kyrenia, central and local governments tend to intervene and rearrange laws and regulations, in order to trigger tourism-oriented investments, ensure domestic and foreign capital flow, and support related sub-sector investments.

One legislative regulations that plays a pivotal role in attracting local and global capital and accelerating tourism investments is the Tourism Incentive Law. Enacted under Act no.47/2000, the State Planning Organisation has been evaluating tourism investment projects since 2001 and issuing incentive certificates accordingly. In line with this law, 80.79% of the 625 incentive certificates issued have been for tourism investments (Investment and Incentive Guide for Investors, 2020). These incentive

certificates offers various advantages, especially in tax exemptions, aimed at encouraging foreign capital to invest in landed development. At the same time, the state allows tourism investors to lease public land for extended periods and grants easement rights for infrastructure development, in favour of the public institutions that will establish the infrastructure. Investors seeking to establish a touristic accommodation or auxiliary facilities on public land can apply for long-term rental agreements through the ministry (Özbil, 2019). In addition, the Development Plan Law 55/89 government provides an opportunity to promulgate decrees for the privatisation of public land and buildings, further stimulating investment in Kyrenia's tourism sector (Özdemir, 2020). According to the Development Law Act no.16.5.c, Kyrenia is allowed to have up to 23,000 bed capacity (Tourism Development Law, 2021). Today, the city has a 16,340-bed capacity, signalling opportunities for new investments in tourism sector (SYT, 2022).

The laws and enactments serve as tools for local/central governments to vitalise the industry. On the other hand, the lack of a comprehensive city master plan leads to arbitrary decisions regarding tourism and city planning, resulting in a scattered urban pattern while the laws and enactments serve as tools for local/central governments for utilising the industry. As emphasised in the semi-structured interviews, these decisions, usually motivated by economic profit, include relaxed regulations to attract more investors, the rental of public properties and the unplanned distribution of tourist facilities throughout the city. Accordingly, this unplanned and inevitable spatial development creates many problems in terms of lack of infrastructure, deterioration of neighbourhood context/texture, inconsistent building heights, and zoning permits.

In another respect, political relationships between countries, which are one of the important determinants of tourism patterns, has a strong influence on tourism planning in cities (Katircioğlu, Arasli, and Ekiz, 2007). Due to the unclear political conditions, the industry has a high dependency on the Turkish government in many ways, in terms of the tourism market, financial issues, and as a link to the world (Ismet and Abuhjeeleh, 2016). This dependency partly explains the increase in hotel-casino after 2000, following Turkey's ban on gambling and casino in 1999. Consequently, Kyrenia's tourism sector shifted its focus. Additionally, a strong demand has developed from the south side of Cyprus after April 2003, where gambling is also forbidden, with the opening of the border between the two Cypriot communities. Thus, hotel-casino tourism has become an important component of Northern Cyprus's economy (Scott, 2003), while simultaneously heightening dependency on Turkish tourism due to political embargoes (Altınay and Bowen, 2006). This situation has also paved the way for Turkish investors to invest in Northern Cyprus's tourism industry making them key actors in directing the sector and shaping space production in Kyrenia (**Table 1**).

It can be inferred that the development of the tourism industry in Kyrenia is contingent upon the political decisions by administrative bodies, particularly concerning infrastructure enhancements and new investments. Experts discussions, as seen in **Table 2**, Section C, broadly suggest that both local and central administrations benefits from tourism-related investments. There is a prevailing consensus that legislative frameworks are often manipulated to increase tourist investments, deliberately

21. See Table 2, Section D

encouraging foreign capital through tailored regulatory measures to foster growth in the sector.

Tourist Spaces as the Intervention of Class Struggle in Kyrenia

Class struggle refers to the conflict between different social classes, typically between the working class and the capitalist class. The state and investors direct and accentuate class struggle to benefit the capitalist system (Lefebvre, 2009). The physical reflection of this struggle between these two groups shows itself in the production and organisation of spaces.

In Kyrenia context, there is a notable struggle among various groups, including the working class, capitalists, locals, tourists, international workers, and residents, driven by the tourism industry. This struggle shows itself through a socio-spatial distinction between tourist facilities and their surroundings. The emergence of class conflict triggers capital accumulation through seven main parameters (21) related to tourism industry.

Tourism negatively impacts the social and cultural environment, leading to alienation and social tension as local residents are excluded from tourist facilities in Kyrenia (Gunce, 2003). Hotel-casino complexes, in particular, create an invisible wall between the tourist space and local citizens. The production of tourist spaces is often designed to maximise benefit for investors and the state, which may not align with the interest of the local people.

Moreover, tourist campuses can create significant pressure on the artificial and natural environment as well. Enclosed tourist facilities, offering a dream world to tourists with plethora of services, restricts local residents from accessing beaches, which is a fundamental right. These invisible barriers not only prevent physical interaction, but also prevent social interaction between the locals and guests. Particularly, gambling-focused tourism widens the distance between the two poles. The negative impact of gambling/casinos on the local society has been emphasised by different authors (Ekici and Caner, 2018; Altinay and Bowen, 2006; Gunce, 2003). According to Altinay and Bowen (2006), Turkish tourists, often gamblers, typically seek short-term accommodation and hotel-related activities, and generally require fewer services outside the complex. While this maximises benefits for capitalist entrepreneur, it severs the connection between local people and tourists.

Besides, gambling service is exclusively produced for tourists, as they are forbidden for locals. Although many produced services like gambling appears accessible, they are economically inaccessible for the workers who produce them and are not intended for local benefit. In particular, five-star hotels target foreign markets with their prices instead of locals. As noted by interviewees (Table 2), this approach causes locals to invest in holiday homes for personal use or rent.

It is important to mention residential tourism in terms of class/social conflict, and the production of tourist spaces in Kyrenia. Residential tourism is an economic activity that concentrates on constructing, developing, and selling housing (Bru Giner, 2012), which is used either as holiday accommodation or as permanent/semi-permanent residences away from the owner's usual place of residence. This trend is a response to the contemporary modes of mobility that are prevalent in advanced societies. However, second-home developments often differ from the

22. The statistical data from the year 2015 up to today can be reached in the web site of TRNC Tourism Planning Department.

spatial habits and activities of the local people, encouraging different space production characteristics. Periodic users tend to construct residential units in accordance with their own spatial activities and living patterns, potentially changing the urban layout. Vehbi (2012) highlights these spatial effects of tourism due to second-home developments in the coastal city. While this market increases investor profits and provides income for both state and local/foreign investors, the socio-spatial texture of Kyrenia has been changing since the beginning of the 2000s.

In this sense, Kyrenia attracts Turkish citizens as well as British, German, Iranian and Russian people (22), who want to invest in this tourist area. This influx has significantly impacted the real estate market alongside residential tourism. The increase in foreign settlers has driven up land and housing prices, excludes local people from the target customer group. Interviewees noted that high foreign demand restricts locals' access to real estate. When we look at the real estate sector's public announcements in foreign languages, it is clearly observed that they target foreign demographic (Figure 8). The market, which progresses in this

Figure 8. Different advertisements from the real estate sector in Kyrenia, 2024.



direction, offers residences consisting mostly of studios and, 1-2 bedroom apartments, catering to holiday and short-term rental needs, which do not meet the requirements of traditional Cypriot families and contribute to urban density.

The increasing number of foreigners and tourists has led to the growth in demand for other service spaces in Kyrenia. The city now has a great number of auxiliary service spaces such as bars, restaurants, coiffures, and local gathering spots that appeal and cater to this new social group. This demand has engendered the emergence of a cosmopolitan neighbourhoods within the city. The social diversity brought by the settling tourists has resulted in frequent destinations that appear randomly within the urban fabric and are generally preferred by people from similar nationalities. As emphasised by interviewees, a pub preferred by British citizens, a cafe preferred by Iranian people or a cafe frequently used by local people can be located in the same neighbourhood without any physical distinction or a pronounced difference in architectural language. Thus natural socio-spatial distinction can be observed in one street which is divided by invisible borders.

In line with this argument, interviews with experts and professionals (Table 2, Section D) generally emphasised that the establishment of hotel and casino establishments in Kyrenia has restricted public access to the sea, beaches, forests, and recreational areas, requiring fee for entry. Consequently, instead of staying in expensive hotels, local residents opt to own or rent holiday homes, leading to a conceptual and physical separation from these facilities. Moreover, overcrowding and inadequate infrastructure make it challenging for locals to access services. These restrictions on environmental usage hinder locals from freely enjoying their natural and cultural resources, leading to dissatisfaction and a sense of injustice. This situation can create conflicts between the local population, hotel and casino owners, and indirectly, tourists.

Additionally, due to high prices, some tourists prefer to reside in neighbourhoods where they can express their own identity rather than in hotels. This has resulted in different ethnic groups congregating in specific areas of the city, driving up real estate prices for the locals. Furthermore, the presence of multinational hotel employees, who possess socio-cultural backgrounds distinct from the local population, has resulted in the emergence of discernible social clusters.

CONCLUSION

This study examined the impact of the tourism industry on the urban and architectural space production within the framework of the political economy of space. Within this context, the dynamics underlying the production processes of tourist spaces, particularly five-star hotel-casinos in Kyrenia, a touristic coastal city, were discussed through the four functions of space in capitalism defined by Henri Lefebvre. This investigation into the function of architectural space within the framework of capitalist production relations has revealed compelling insights into the complex interplay between capitalism, architectural space, and capital accumulation, particularly within the dynamic context of the tourism industry.

Ultimately, the findings of this comprehensive field study, focused on thirteen five-star hotels and casinos in Kyrenia, employing various data

collection methods including observation, interviews, and document review, underscore the significant role of the tourism industry in the economy of Northern Cyprus, particularly concerning spatial production. The study reveals that tourism spaces are intricately designed to align with the imperatives of economic capital, aligning with Lefebvre's conceptualization of space within capitalist frameworks. The results adversely highlight the organised nature of these spaces, which operate under the influence of decision makers driven by the pursuit of economic gain. Likewise, the evaluations of experts frequently underscore a range of issues, including the lack of compatibility of tourist facilities with the local context, their inability to integrate with the fragile natural environment, resulting in infrastructure insufficiency, and their propensity to create speculative effects by driving up land prices. Furthermore, discussions highlight the control exerted by tourist facilities over natural and physical spaces, often necessitating local residents to pay for their use. These developments often diverge from the spatial needs and habits of the local population, potentially fostering the creation of spaces at odds with the local identity. Thus, this dynamic contributes to a transformation in the socio-spatial fabric of Kyrenia.

This research has generated data that subsidies result in two main areas. Firstly, it established the relationship between the process of capital accumulation and touristic architectural space in a general sense, within the framework of Marxist political economy. The theoretical basis was established, and the research design is developed accordingly within this framework.

Secondly, it specifically scrutinised this relationship within the context of Kyrenia tourism spaces: In Kyrenia, tourist spaces are vital tools in the economic system, enabling capital accumulation and profit maximisation. These spaces, as per Lefebvre's functional classification, primarily serve as a means of production, generating various types of services such as core services (accommodation) and additional services (convention, spa, gambling). In most cases, additional services are dominantly highlighted in the marketing process to capture the attention of consumers, serving as the profit drivers particularly during off-peak seasons. The additional services causes' physical growth trend, making tourist spaces an absolute abstract container. The aim of increasing the profit margin and appealing to more tourists by offering more functions and services has created physical problems such as incompatible, and out-of-scale buildings within the context of this small coastal city.

Moreover, tourist spaces in Kyrenia serve as a consumable object within the framework of capitalist production relations. The city itself is positioned as a consumable tourist space, readily available for investments, and to be consumed by visitors. It attracts a vast number of capitalists for investing in new tourist spaces, often transforming natural and traditional spaces and generating spatial production opportunities through the tourism industry. Besides, the city host many tourist spaces that visitors can consume both visually and functionally. However, it evident that five-star hotel-casino complexes threaten the coastal city's context due to their incompatible architectural language. The sector cannot produce a common architectural language suitable for the coastal city spirit, with the aim of marketing the "luxury" image and insensitivity to the context. Considering the fact that tourism has an economic contribution to developing countries, central and local governments and investors should develop political strategies that

support investments offering and marketing a coastal city life with small-scale tourist areas in line with the traditional texture of Kyrenia.

Further observed is that tourist spaces are part of the political strategies of governments in Kyrenia. Due to the recognition issues and economic underdevelopment, the sector is a profit generator for central and local governments as well. Thus, the production of tourist spaces directly depends on the economic capital strategies of profit-oriented governments besides entrepreneurs. The political interventions carried out via the changes in laws, has rendered the spatial formation of the city suitable for new touristic investments. The industry became a state-led activity, not only in Kyrenia, but across Northern Cyprus. The state supports space production both for attracting the new local and global investments and increasing the income deriving from tourist activities. At this point, the state should be aware of its potential in the global market and it should prepare laws and by-laws to preserve the coastal city life in terms of its natural, historical, and built environment.

Finally, the profit-oriented industry plays a significant role in shaping the socio-spatial dynamics of Kyrenia. It leads to a socio-spatial distinction, particularly between the two prominent social groups -tourists and local people-. The foreign customer market-oriented policies, that exclude local people, produce spaces in this direction. In this regard, new investments threaten the socio-spatial fabric via the new trend of residential tourism, which causes dense housing with an unsuitable spatial typology for the local society. However, it creates a great profit opportunity for investors, targeting foreign users demanding short-term touristic residential spaces. Additionally, the increase in service spaces such as restaurants, cafes and entertainment facilities primarily targets tourists and foreigners, making an invisible spatial distinction between locals and foreigners.

Consequently, space production under the influence of the capitalist economy is constantly evolving within changing framework of production modes, restructuring to supports the current economic system. Tourism, a striving industry today, creates its own ecosystem where governments and investors play crucial roles. The production of space thus becomes an integral part of the political economy of cities. This capital-oriented approach transforms spaces into abstract tools that is ready to be continuously reproduced, aim to increase economic profit. However, without comprehensive spatial strategic plans, as seen in the case of Kyrenia, this approach can lead to problematic environmental results in societies.

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Anahtar Sözcükler: Mekan üretimi; turizm endüstrisi; mekansal politik ekonomi; Girne

TURİSTİK MEKAN ÜRETİMİNİN, KAPİTALİST ÜRETİM İLİŞKİLERİ ARACI OLARAK TARTIŞILMASI: GİRNE ÖRNEĞİ

Bu çalışma, kapitalist üretim ilişkilerinin mekan üretimi üzerindeki etkisini tartışmayı amaçlamaktadır. Kapitalizmin sermaye birikim süreçlerinin bir aracı haline dönüştürdüğü mekansal üretimi tartışırken, gelişmekte olan toplumların bu süreci yerel ve küresel sermaye akışını desteklemek için nasıl kullandığına odaklanmaktadır. Bu doğrultuda, kapitalist hizmet sektörünün bir ürünü olarak turistik mekanlara odaklanarak, mekansal politik ekonomi perspektifinden bir tartışma açmaktadır. Çalışma, Kuzey Kıbrıs'ın Girne kentinde, kapitalist üretim ilişkileri ile turistik mekanların üretimi arasındaki ilişkiyi irdeleyen bir saha çalışması sunmaktadır. Çalışma Lefebvre'nin sunmuş olduğu mekanın kapitalizmdeki dört temel işlevi üzerinden bir meta-anlatı sunmayı hedeflemiştir. Bu doğrultuda, Girne'deki turistik mekanlar bir üretim aracı, bir tüketim nesnesi, siyasal bir araç ve sınıf mücadelesinin müdahalesi olarak irdelenmiştir.

Sonuç olarak tartışmalar, Girne'deki turistik mekan üretiminin, kapitalist yatırımcıların ve hükümetin yönlendirmesiyle, ekonomik sermayeden yararlanabilecek bir şekilde geliştiğini göstermiştir. Ancak sermaye

odaklı bu tutum, ekonomik kâr artırma hedefi doğrultusunda mekânları sürekli yeniden üretilmeye hazır, bağlamdan kopuk soyut bir araca dönüştürmektedir. Girne özelinde bu yaklaşım, güçlü bir mekânsal stratejik plana sahip olmayan bir toplumda sorunlu sosyal ve çevresel sonuçlara neden olmuştur.

DISCUSSING THE PRODUCTION OF TOURIST SPACES AS THE TOOL OF CAPITALIST PRODUCTION RELATIONS: THE CASE OF KYRENIA

This study aims to open a discussion in relation to the production of space, under the effects of capitalist production relations. It primarily focuses on how developing societies utilise the production of space, as a tool of capitalism, for their articulation into local and global capital accumulation in a theoretical framework. In doing so, it concentrates on tourist spaces as a product of the capitalist service industry, thus opening a discussion via the perspective of spatial political economy. In this respect, the study presents a field study in Kyrenia, Northern Cyprus, investigating the relationship between capitalist production relations and the production of tourist spaces. The study intends to constitute a meta-narrative via Lefebvre's functional categorisation of space. Accordingly, tourist spaces in Kyrenia were scrutinised as a means of production, as an object of consumption, as a political instrument, and as the intervention of class struggle.

As a result, the discussions indicated that the production of tourist spaces in Kyrenia develops with the guidance of the capitalist investors and government, in a manner where economic capital can be benefited from. However, this capital-oriented situation turns spaces into an abstract tool that is ready to be constantly reproduced, in line with the aim of increasing economic profit. Within the Kyrenia Context, this approach has caused problematic social and environmental results in a society that does not have a strong spatial strategic plan.

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FRITZ JANEBA AND KINDERGARTEN OF DESIGN (1) Baykan GÜNAY*

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1. A different version of this viewpoint was published in 2020 as a chapter in a book titled, "Bauhaus_100+TR", edited by A.Derin İnan and Ali Cengizkan. In the previous paper titled "Fritz Janeba ve Tasarımın Anaokulu", an in-depth analysis was made concerning Janeba's professional and educational performance in Austria, Australia and Turkey, also commenting on his relations with the Bauhaus.

"-What is your school called?
Friedrich thought for a moment, and then it came to him:
-My students are like flowers in a garden, each is different,
but together they are beautiful.
So I will call it the garden of children: kindergarten."
(Froebel-Parker, J., 2013, 9)

INTRODUCTION

Middle East Technical University Architecture and City Planning students had the chance to take the basic design course from Fritz Janeba, who was appointed as a visiting professor through UNESCO in the 1960s. Basic design education enabled students as well as teaching staff to be introduced to new concepts and methods, and contributed to the formation of a rich literature on the education, research and application processes related to the content of the design process.

Fritz Janeba developed a new method of education which he initiated in Melbourne where "a hybrid Bauhaus-inspired program that had at its basis Fritz Janeba's so-called "Kindergarten of Design", which he, in turn, would refine and offer at METU in Ankara" (Goad, 2019, 225).

The basic design studio in the 1963-64 academic year left deep traces in the minds of students who completed their secondary education with verbal culture and laid the foundations of how a visual world could be created. Approximately 50 years later the author discovered Fritz Janeba's report submitted to the UNESCO titled *Art and Architecture at the Middle East Technical University*. It was then that the concept of Kindergarten of Design was discovered.

Later, in 2015, a second source the author accessed was a publication made after Janeba's death as an end product of an exhibition prepared by the Vienna School of Applied Arts (*Hochschule Fur Angewandte Kunst In Wien*, 1985). The publication, besides Fritz Janeba's charcoal, watercolour

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and pastel works, and, architectural projects again explained the basic principles of Kindergarten of Design.

According to the sources accessed, Fritz Janeba did not have a direct relationship with the Bauhaus School as claimed by some scholars in Australia and Turkey. During the period when the school was active, he was studying in Vienna and when it was closed, he was engaged in a master class with Clemense Holzmeister, who was very well known in the city of Ankara. Since Holzmeister prepared the architectural projects of many buildings in Ankara between 1927 and 1938, Fritz Janeba undoubtedly had knowledge about the city.

FREDERICK ALOIS (FRITZ) JANEBA (1905-1983)

Fritz Janeba, born in 1905 entered the Vienna School of Arts and Crafts in 1925, graduating in 1930. Later he attended the Vienna Academy of Fine Arts Master's Program conducted by Professors Dr. Clemens Holzmeister and Peter Behrens between 1930 and 1933 earning the title of Master of Architecture. Between 1933 and 1938, Janeba worked as a freelance architect, winning awards in competitions he participated in. Fritz Janeba lived in Vienna until 1939, when he and his wife fled to Australia after Germany took Austria under its sovereignty (*Anschluss*), since Fritz Janeba's fiancée at the time, Kathe, was Jewish.

Melbourne Period (1939 – 1962)

In Australia Janeba family worked in the Koornong Experimental School which aimed to promote children's development. The school was active between 1939 and 1946, aiming to educate a mature child by using the natural environment as a laboratory, claiming that such an approach strengthened the links between the mind, emotions and body. (2)

Philip Goad values the Koornong School experience in two respects. First of all, a progressive understanding of education was tested and this process was supported by the spaces and architecture of education. In the process carried out between 1939 and 1947, the psychoanalysis method was getting popular and the whole environment was used as a laboratory. "In the history of Australian modernism, Koornong School represents a rare meeting of local and émigré educators, artists and architects in the unspoilt setting of the Australian bush. Space and place became key elements of an educational venture that brought together the multiple strands and international ambitions of New Education in the first half of the twentieth century" (Goad, 2010, 731).

Fritz Janeba, who grew up in Central European architecture and art, including the Bauhaus influence, came to a different world, continued his existence there, and was intertwined with a new world. In 1947, he was offered a job at the Faculty of Architecture at the restructured Melbourne University. After he started working at the university, he continued his architectural activities, but he is now in the academic world and will direct his efforts to the master's program. He became a permanent faculty member after 1950. In 1953, he earned his Master of Science in Architecture degree from Melbourne University with his work *Elements of Design: An Approach to Architecture*, and subsequently obtained the right to practice architecture in the state of Victoria.

His discovery of the kindergarten of design idea is not accidental. Janeba is interested in regional problems on the one hand, and he also tries to

2. The educational programs of the Village Institutes established in the same period in Turkey show similar characteristics, and students are shown how to do things in practical courses as well as theoretical courses in line with the main objectives of the Republic of Turkey. The difference between the practice in Turkey and Koornong is that the former is established and managed by the state, while the latter is carried out by private individuals.

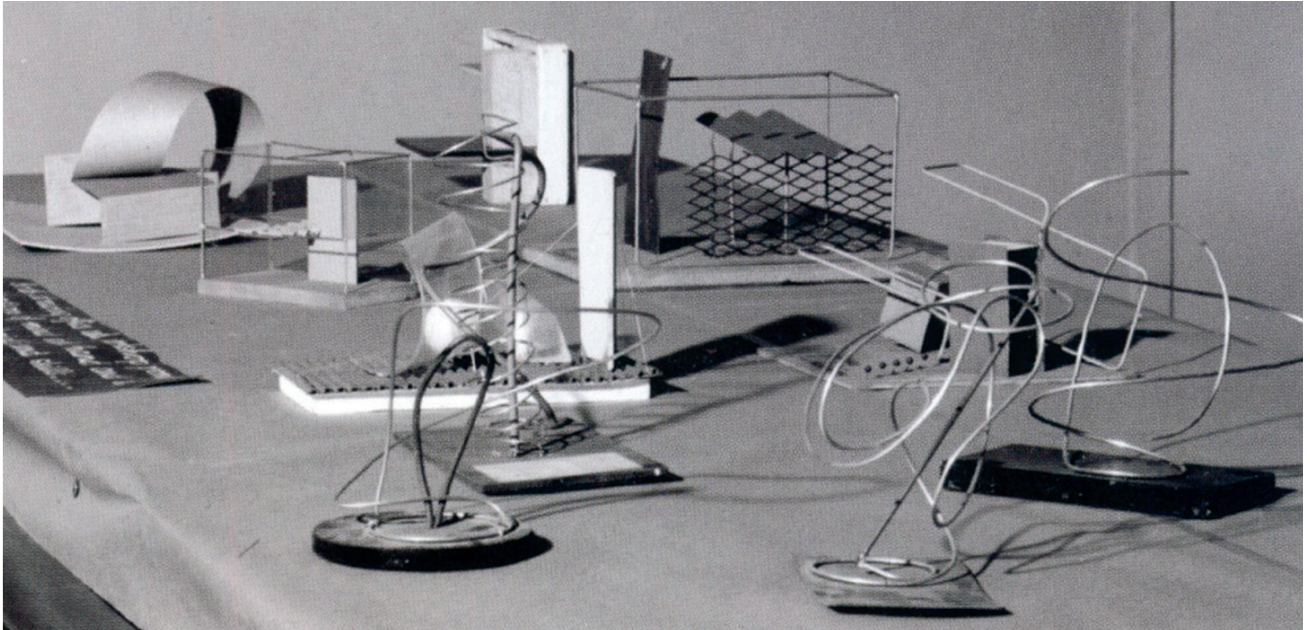


Figure 1. First-year exhibition stand featuring the work of students taught by émigré architect Fritz Janeba, School of Architecture, Special Collections, Architecture Faculty, University of Melbourne, 1950, (GOAD, 2019, 221).

recapture the foundations of architectural education. On the way to this approach, Fritz Janeba is confronted with a new picture of the world. The Koornong School's educational approach and emphasis on local architecture and the experiences enabled him to meet a different world from the Central European settlement patterns and architecture.

"When Janeba was offered a teaching position at the Middle East Technical University (METU) in Ankara, the couple immersed themselves in the local Warrandyte scene. Janeba taught in architecture at the University of Melbourne, formulating a highly influential first- year 'Kindergarten of Design' program based upon a hybrid of his Viennese educational background and the teaching methods of the Weimar Bauhaus" (Goad, 2019, 222).

THE IDEA OF KINDERGARTEN - FRIEDRICH FROEBEL

Friedrich saw that each child was different.
He thought, they are like the flowers in Thuringia.

One liked to draw, another liked to sing,
some were good at mathematics, others were good at writing.
(Froebel-Parker, J., 2013, 9)

One of the fundamental issues that Fritz Janeba focuses on in the basic design education process is the idea and practice of kindergarten (Janeba, 1966, 7).

"The Kindergarten is the most important, the most formidable period in the development of a young human being. By playful means are the educational methods tied together. The young ones learn to do things individually, they learn teamwork, they listen to advice, form opinions, and will accept somebody else's point of view when convincingly presented. In these impressive years, the personal idiosyncrasies are developed and settled and the behaviour pattern is pushed into certain channels. Children acquire knowledge and the visual, tactile and audial senses receive lasting cultivation".

3. The page number refers to the location of the quote in the Kindle edition of the cited publication.

German educator Friedrich Froebel (1782-1852), is known as the initiator of the concept and application of kindergarten, which he developed for the education of 4 and 5-year-old children. Froebel, who studied architecture for a short time in 1805, gained sensitivity to subjects such as artistic perspective drawing and symmetry, and used these skills in the design of gift sets (*gabe*) that could be used in the kindergarten environment.

Between 1808 and 1810, Froebel learned the approaches of Swiss educator Johann Heinrich Pestalozzi (1746-1827) and developed his own methods; accordingly, everything can be taught to the child through play. The child needs to play for both mental and physical development, and play is essential for both to be healthy. During the game, the knowledge and experiences gained through drawing are better placed in the child's mind. Harris (1898, k.e. 25) (3) compares Pestalozzi and Froebel's approaches:

“Unlike Pestalozzi, Froebel was a philosopher. The great word of the former is immediate perception (*anschauen*). Pestalozzi struggled to make all education begin with immediate perception and abide with it for a long period. Because, say his followers, sense-perception is the source of all our knowledge. Froebel and his disciples would defend the great educational reformer by saying that by beginning with immediate perception education is sure of arousing the self-activity of the pupil”.

A parallel argument is advanced by Raleigh (1968, 286); “Froebel held to the mystic unity emanating from divine energy. Through his educational version of German transcendentalism, Froebel saw the educator helping the student to find his own spiritual unity,” hence “to designate Froebel's educational schemes or Itten's as ‘learning-by-doing’ is misleading for neither poused as social-naturalistic theory of object training as did Pestalozzi”.

The above discussion also distinguishes between educating versus demonstrating ways of learning approaches. According to his findings, “there are two selves in the child—one is peculiar, arbitrary, capricious, different from all others, and hostile to them, and is founded on short-sighted egotism. The other self is reason, common to all humanity, unselfish and universal, feeding on truth and beauty and holiness. Both of these selves are manifested in play” (Froebel, 1898, k.e. 25).



Figure 2. Froebel gift set (Friedrich Fröbel-Construction kit, Wikipedia).

As an extension of these ideas, Froebel has designed a series of gift (*gabe*) sets and occupations (*beschäftigung*) to be used in kindergartens. The gifts are called the basic forms by Froebel where they represent both physical appearances and concealed imaginary meanings. Gifts that bring children together with basic concepts also aim to improve their consciousness.

“As a series, the gifts began with the simple undifferentiated sphere or circle and moved to more complex objects. Following the idealist principle of synthesis of opposites, Froebel’s cylinders represented the integration of the sphere and the cube. The various cubes and their subdivisions were building blocks that children could use to create geometrical and architectural designs. Using the sticks and rings to trace designs on paper, children exercised the hand’s small muscles, coordinated hand and eye movements, and took the first steps toward drawing and later writing”. (Gutek, G. L., 1999)

Fritz Janeba also emphasizes this issue: “The idea was to influence the more grown up, but still undeveloped minds, by similar methods. The idea of the Kindergarten of Design emerged. We taught design principles, all activities; all work and efforts were directed towards Architectural Education” (Janeba, 1966, 8).

Froebel clearly expresses his belief that “there is no other power but that of the idea; the identity of the cosmic laws with the laws of our mind must be recognized, all things must be seen as the embodiments of one idea” (Froebel, 1898, 3). Within the framework of his views, Froebel argues that every child has a spiritual essence and seeks self-improvement activities to express it. “Therefore, it is so important that boys and adults should go into the fields and forests together striving to receive into their hearts and minds the life and spirit of nature, which would soon put an end to the idle, useless, and indolent loafing of so many boys” (Froebel, 1898, 164).

In *The Education of Man* (1898), Froebel also touches on the education of form and colour, which would later form the foundations of basic design. “Form, and whatever may depend on form, reveals in various ways inner spiritual energy. To recognize this inner energy is a part of man’s destiny; for thereby he learns to know himself, his relation to his surroundings, and, consequently, absolute being. It is, therefore, an essential part of human education to teach the human being, not only how to apprehend but also how to represent form” (Froebel, 1898, 288).

Gabe (gift) – Beschäftigung (work)

The word *gabe*, which is translated into English as gift and Turkish as *armağan*, also means skill, talent and mastery. According to Froebel, gifts must help the child to find the unity between *Gabe* and *Beschäftigung* which means work, occupation, employment, and profession.

The gifts are intended to give the universal characteristics of the outside world in a way that suits the development of the child and works provide the necessary materials for the development of skills. Hence anything that provides sufficient flexibility within the child’s supervisory power falls under Froebel’s concept of occupation. On the other hand, the form and material of the gift is a universal stage that will develop the child’s perception and should be determined according to the period in the development process in which the gift will be presented to the child.

The roots of Fritz Janeba’s idea of kindergarten of design, which he developed with his own experiences on the Melbourne-Ankara-Vienna axis, is an extension of Froebel’s concept and practice of kindergarten

where Janeba adopted an educational method that develops the sensory, spiritual and intellectual abilities that can create the architectural object.

Johannes Itten and Basic Design Education

The roots of the phrase Basic Design also require attention. During the establishment of the Faculty of Architecture of Middle East Technical University, the first course taken by architecture students in 1957-1960 was called Basic Design. The name of the course in the second semester is Architectural Design. In 1961, just before Fritz Janeba's arrival, the name of the course was changed to Techniques and Fundamentals of Design.

It was as if basic design was something that was known naturally, and we were always using it under the same meaning and for the same purpose. According to Denel (1979, 9) "The idea of formulating theories concerning vision and human behavior toward visual phenomena in conjunction with a desire to relate materials, patterns and industrialized technologies to answer for tomorrow's needs in design induced the creation of basic design as a 'course'. All of this was implemented within the context of formal education in the Bauhaus".

Observations and research have proved that, the phrase "Basic Design" is not used in the Bauhaus School, but the word *Vorkurs* was included (Whitford, 1985, 103).

"The ideas behind the *Vorkurs* at the Bauhaus were indeed not new, and some other schools in Germany had already insisted on a probationary period for all students during which their suitability for final admission could be tested. What made the Bauhaus preliminary course — both before and after Itten's departure — unique was the amount and quality of its theoretical teaching, the intellectual rigour with which it examined the essentials of visual experience and artistic creativity".

It is probable that it was the American and European faculty members who worked as visiting professors in the initial years of the Middle East Technical University who brought the "basic design" phrase to Turkey. Fritz Janeba, on the other hand, uses this phrase in the report he submitted to UNESCO. In my opinion, the following statement indicates that Janeba has rediscovered and implemented the *Vorkurs* process:

"I expected the new Basic Design Course to be an inspiring affair. It should make the students aware of, and capable of comprehending three dimensional structures, imaginative forms, space and the function of the colour, to find the spiritual and material basis of rhythmic creation according to certain intrinsic and definite laws, to form and awaken the mind and educate their senses" (Janeba, 1966, 6).

These ideas of Janeba coincide with the principles sought by Bauhaus education. The primary course of the Bauhaus was compulsory for all students before attending the workshops. For some students, it was a whole new world of seeing and thinking. We are also informed that "in traditional art schools, studying was often a matter of copying Old Masters and life drawing; at the Bauhaus, the *Vorkurs*'s first teacher, and the charismatic Johannes Itten, aimed to unleash the creative powers of the learners" (Ambler, 2018, 19). As a result, *Vorkurs* aimed to train people who could work independently, free from all kinds of habits and train learners according to their inclinations and abilities.

It is known that Itten developed the concept of *Vorkurs* from the thoughts of Froebel (1898, 288) for whom "it is in man's destiny to know his own

energy, so that he becomes aware of himself, establishes relations with his surroundings and acquires an absolute being”.

There is no evidence in Fritz Janeba’s own life story that he had a relationship with the Bauhaus during his Austrian and European years (1925-1939). On the other hand, it is seen that he discovered kindergarten of design idea in his educational activities (1947-1977) in the Melbourne - Ankara - Vienna cluster. Although it would be misleading to identify Fritz Janeba with a Bauhaus Style; we can conclude that what he called Kindergarten of Design referring to Frederick Froebel has a lot of common denominators with the Vorkurs of Johannes Itten (Günay, 2020).

FRITZ JANEBA’S ANKARA PERIOD (1962 – 1966)

METU was established and started education in 1957. Especially in the foundation years, the faculty is supported by UNESCO. Fritz Janeba was appointed to the staff at a time when the university was preparing to move to the new campus of the Middle East Technical University. For one year (1962-63) he attended classes in the barracks on the grounds of the Grand National Assembly of Turkey, and in the following years, he worked in the new campus.

In the words of Fritz Janeba, the assignment process consists of tasks defined by METU and the United Nations:

“In 1962, I was appointed as a Professor of Art and Architecture at the Middle East Technical University in Ankara for the basic design course. In addition, I was asked by the United Nations Organization to work as a technical assistance specialist in a study program called “Life in the Village” and to develop related program studies. This was a task that would be described as environmental design today” (Hochschule Fur Angewandte Kunst In Wien, 1985)

In the 1950s there had appeared a “new spirit of international cooperation and social reconstruction underpinned the desire for Bauhaus inspired ideas in the visual arts” and that such practices were receiving “support from the United Nations Educational Scientific and Cultural Organization (UNESCO) which acted as catalyst for promoting universal literacy and progressive educational debate” (Stephen, 2019, 131).

Undoubtedly, Fritz Janeba’s main interest is design, and when he left Melbourne University, the Basic Design Course was commissioned to his assistants. The experience he gained in Australia was conveyed to the METU Faculty of Architecture while preparing for the program of Basic Design education. The background of the kindergarten, which Fritz Janeba implemented during his four academic years at Middle East Technical University, was created as a result of the processes described above.

METU Faculty of Architecture First Year Course (Basic Design)

In the Middle East Technical University’s 1957-1960 Catalogue, the name of the course given in the first semester of the first year of the Department of Architecture is Basic Design and described as; “by means of experiments and discussions, the student is familiarized with fundamental conceptions of space, form, materials and structure”.

In the second semester, the course is called Architectural Design and within the scope of the course “Basic environmental problems of the Middle East are investigated, and based upon a correlation and interpretation of social,

economic and physical data, the student is brought to the understanding of an approach to architectural problems" (METU, 1960).

Prior to Fritz Janeba, the first-year course of the METU Faculty of Architecture was initially called Basic Design and then changed to Techniques and Fundamentals of Design. It was stated that the aim of the course was "to arouse interest in students about the basic orders of architecture and to enable them to understand the discipline" and it is assumed that "in this way, students will develop their ability to think and express their thoughts in plastic and graphic form" (METU, 1969).

As a person who took the basic design course from Janeba in the Department of Urban Planning, it is difficult to judge whether the courses given in the previous semester and described above are similar to the Basic Course (vorkurs) given by Johannes Itten in the first period of the Bauhaus. The names of some courses are the same but their content may vary. To some extent, this depends on the instructors who teach that course.

Before moving on to Fritz Janeba's Kindergarten of Design practice in the Faculty of Architecture we may take a look at the Bauhaus experience in Vorkurs and the education of the child and kindergarten since Froebel. According to William Smock; (2004, k.e. 624)

The Bauhaus introductory course was taught by painters who were especially interested in that possibility (of optical illusion) - at various times Johannes Itten, Paul Klee, Wassily Kandinsky, Josef Albers, and Laszlo Moholy-Nagy. Children's art seemed like a good place to learn this visual language. Since they were unschooled, it was assumed that children must be using the inborn vocabulary of visual communication.

In his assessment, Smock argues that Euclidean approach of using lines and regular geometric forms—square, triangle and circle affected Bauhaus designers who would "assume that Euclidean shapes and pure, strong colors are the vocabulary of visual language. (Smock, 2004, k.e. 642).

Friedrich Froebel's concept and practice of the "Kindergarten undoubtedly was an Enlightenment idea: education should not pump knowledge into children's heads, but help them use what they already know... To help them make creative use of their innate abilities, he designed wooden blocks, packs of colored sticks and paper shapes." (Smock, 2004, k.e. 642).

Undoubtedly, directed activities are the foundation of Kindergarten education. Games and songs, small cultivated gardens, stories told and co-produced stories, and indoor and outdoor exercises are features of this type of education. Fritz Janeba, who lived in the Waldviertel forests in Austria to the Warrandyte forest (bush) in Melbourne, and the geography of Oceania, including the islands of Fiji and Bali, added Anatolia to his world picture, that all contributed to the idea of the kindergarten of design.

Kindergarten of Design Idea at METU Faculty of Architecture

In his report to UNESCO, Fritz Janeba first made a general assessment, but only presented examples from his last period at METU, 1965-1966. In his general evaluations, he made serious criticisms of the First Year Basic Design Course given before him.

"The First-Year Design Course needed a complete overhaul. I have not observed any improvement or breakthrough in the work of the students in the last few years. The teaching staff and students were dissatisfied with the fatigue and stagnation that spread over long periods. Foreign trainers and Turkish instructors were trying different methods". (Janeba, 1966, 5)

As a continuation of these complaints, Janeba underlines that the students do not understand the basic design patterns and the necessary preparations are not made to learn to think. The students learned formulas. "They learned some methods of presentation and as a final effort, an architectural problem was pushed down their throat. Nobody thought to search for principles; no striving for a philosophy took place" (Janeba, 1966, 5).

According to him, architecture is a belief, the process of expressing visual, tactile and auditory effects through materials. Designers had to learn to use and develop their imagination, which is the dynamic force. In this process, the functionalist approach and economic requirements should undoubtedly be at the forefront. However, the various branches of the visual arts should not be under the control of technical approaches that try to control everything.

In the process mentioned above, Fritz Janeba wishes to establish a balance between the idealistic and the rational sides of the human being. With the definition of Fritz Janeba, the idea of the kindergarten of design was put to influence the still undeveloped minds. The curriculum of the course can be compared to the education that children receive at an early age in Kindergarten.

In Fritz Janeba's opinion, an intense study, discussion and design activity was initiated, a wide variety of ridiculous and serious solutions were produced, and the students worked enthusiastically in a cheerful environment. The design's kindergarten functioned like Froebel's kindergarten. Colourful and exciting workshops that developed the students' thinking power were carried out with joint discussions.

The most obvious phenomenon observed at this stage is that students are now greatly influenced by abstract concepts and visual qualities of the material. Progress has been made in solving planning problems and dealing with architectural diagrams. Presentation techniques are not an obstacle. Progressive and creative ideas were encouraged, but order and discipline were not compromised.

Fritz Janeba introduced his students to the intellectual world. Unconscious and conscious patterns of behavior supported the experimentation of dual concepts such as utility and beauty, form and force. There were reactions to this approach at first, but he observed that it was accepted over time. In his own words, he was very happy indeed and it gave him great satisfaction to see these ideas develop and become established. He also hoped that it would continue in the same spirit.

KINDERGARTEN EXPERIENCE OF DESIGN 1963-64

METU Department of City and Regional Planning was opened in 1961 and the undergraduate program started education in 1962. Eventually, between 1962 and 1966, when Fritz Janeba worked at the Faculty of Architecture at METU, city planning students also took the first-year studio course called Techniques and Principles of Design. At one point in his report to UNESCO, Fritz Janeba mentioned that urban planning students also took the course, emphasizing that it was a valuable experience for both groups.

Between 1962 and 1966, about 40 or 45 urban planning students took the Techniques and Principles of Design studio from Fritz Janeba. The examples that Fritz Janeba included in the UNESCO report belong to the

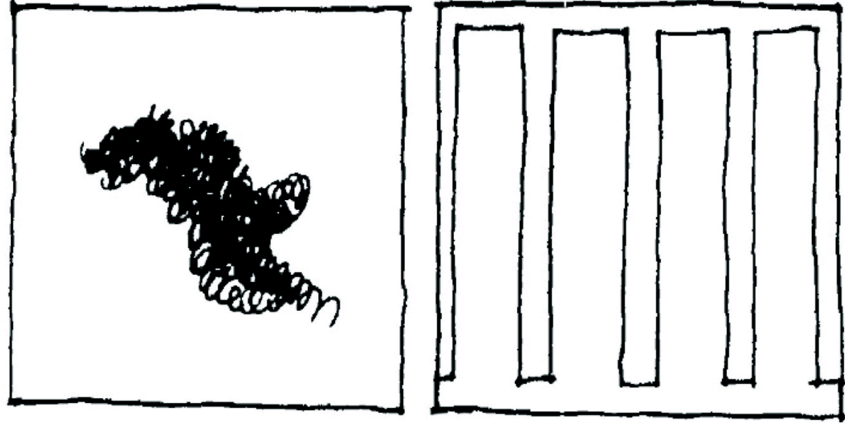


Figure 3. Unconscious, playful, an exercise of relaxation - Doodling, against the conscious drawing effort: designing – process; and a drawing composed of perpendicular and horizontal lines changing direction in the right angle, (Janeba, 1966, 10).

1965-1966 academic term, which reflect his last period. It is the period of 1963 – 1964 that shall be conveyed as the author’s own experiences.

For many years, I interrogated the reasons behind the students’ experiences without understanding what they were doing and why. Now it is clear that we were actually trained in the kindergarten of design, revealing gifts (*gabe*) and jobs (*beschäftigung*) that we had hidden in the depths of our brains. To further explicate this incidence, the gifts and works we did in the period 1963-1964 within the framework of the educational stages that Fritz Janeba designed in his mind for the Kindergarten of Design shall be elaborated. With these aims in mind, the teaching programme applied by Fritz Janeba shall be scrutinized under four headings he has formulated.

The Introductory or Exploratory Stage

In the first phase students are inquired to be aware of unconscious and conscious behaviour patterns. They learn to distinguish between these two different endeavours and they are given the opportunity to experiment this. The first exercise is doodling followed by practicing orthogonal lines.

Unconscious and Conscious

“It is a phase in which they learn to relax, to put the mind at rest which is a difficult task for a beginner. The exercise of doodling is a practice for relaxation. This behaviour, an unconscious drawing expression may be considered the Artist’s prerogative. In this process of experimentation, the unconscious mind can achieve playful interesting results which are often products of emotional value”. (Janeba, 1966, 10)

The big question in the minds of adolescents was why they were doing this exercise. Although doodling is defined as an unconscious act, eventually it turns into real relaxation and then very often urges you to start a project, an artwork, etc. I am still continuing to start the basic design course with doodling where the students are asked to free their minds and hands on a black or white sheet (combining colors if needed). This unconscious drawing exercise looks easier at first glance but has always been a difficult task for the beginner. It requires the student to learn how to relax the hand and how to put the mind at rest simultaneously. The results have often been experimental, creative, emotional, and unconventional.

Frame of Reference

Another starter was a composition by letters. Then I had seen an agro-chemical industry’s booklet in which the letters were arranged vertically. It challenged me and since we were asked to use 5 letters I added the “o”

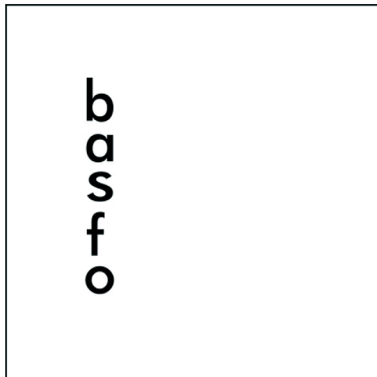


Figure 4. Composition by Letters (reproduced by the author).

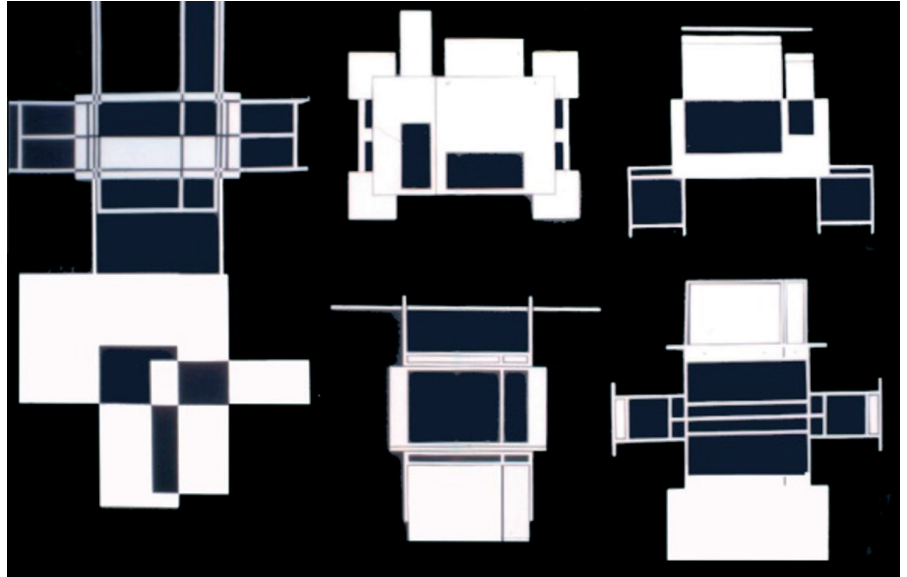


Figure 5. Drawing tables reinterpreted (Author's archive).

and I started to ask questions to myself. What characters, on which part of the blank sheet, how to relate letters to each other? Later I realized that we were given a problem not only concerning composition but to putting in our minds the notion of frame of reference.

The Discerning Approach

Exactness and Perfection

In the second phase, Kindergarten of Design introduces the notions of, in Janeba's words, "mass-production, and the existence of machine-made articles and concept of exactness. The drive to make these articles as perfect and as functional as possible became a necessity in our mechanized and highly competitive society" (Janeba, 1966, 17). To this end, we were asked to make axonometric drawing of our drawing tables, coloured by using a ruling pen (trilin). We have to be keen on exact measurements and also a good analysis of the product. Since I do not have any documentation of my product I am presenting a set of similar studies performed at METU City and Regional Planning Department First Year Studio instructed by Argun Evyapan and the Author in the 1980s.

Such a study would also provoke the students' capacity in two-dimensional presentations, making it easier to move to the three-dimensional world.

Three Dimensions

We were introduced to the concept of frame of reference in two dimensions followed by two dimensional studies. Then we are asked to design a cube divided into volumes by the use of planes, which should be legible on all its sides. The cube had to be a composition of volumes. We were introduced to thinking in three dimensions by combining volumes.

I had a chance to access Suha Özkan's volumetric work. Janeba insists that basic design "should make the students aware of, and capable of comprehending three dimensional structures, imaginative forms, space and the function of the colour". As for myself, my work was found an orderly arrangement though not very creative.

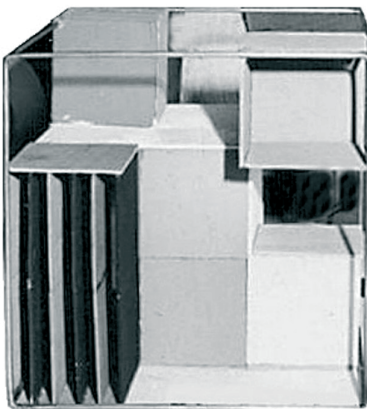


Figure 6. Three-Dimensional volumetric study by Suha Özkan, 1964, (Çelik, Kocabiyikoğlu, 2019).

Striving for an Intellectual and Technical Background

Janeba observes that striving for an intellectual and technical background is enthusiastically received by the students. The next move intends to familiarize the young brains with process design and we go back to Froebel's *Gabe* (gift) and *Beschäftigung* (work). In the process the following works have been accomplished by the use of different gifts:

1. Make a composition employing the three basic forms; square, triangle, circle and carve it on plaster of Paris (gypsum) cast
2. Make a papier-mâché form of the composition using the plaster of Paris cast and dry
3. Present the relief with achromatic colours
4. Construct the design using wire (brass frame and copper structure) attached by soldering (many of us tasted 220 volts from electricity plugs embedded in the floor)
5. Fill every segment of the composition with a different material
6. I do not recall the details of the 6th work.

Under this heading, we came across a composition with the three basic geometric forms of Johannes Itten (whose name we did not even know at that time) and its representation in different materials and forms. Unfortunately, because I did not own a camera, I do not have documents related to the work I did at that time. Coincidentally, the photograph presented to me by my classmate Gürkan Ertaş includes the design we made using three basic geometric forms (*gabe*) and other works (*beschäftigung*) accomplished.

It was a very surprising retreat for us. First, a composition was requested with three basic geometry elements (square, triangle and circle). Our design was followed by carving the elements on plaster casting and making them three-dimensional, and the mould work we produced with paper pieces and pulp. Then we painted our design achromatically.

We did not know when it would be finished, and then we were asked to arrange the composition as a structure that combines thin copper wires and

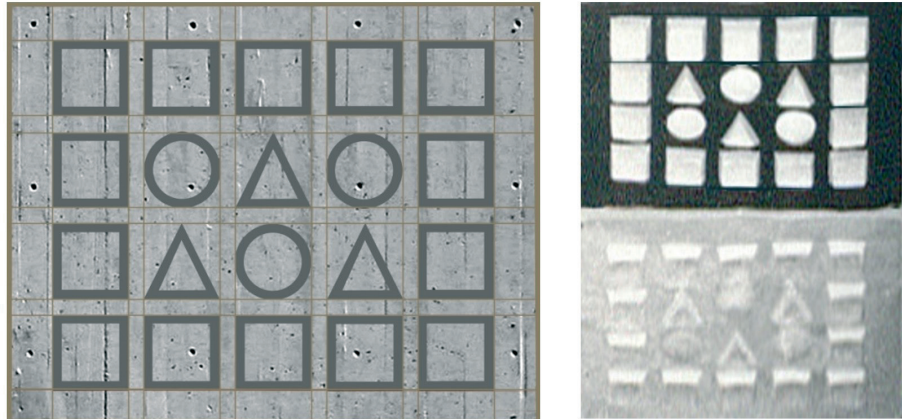
4. The works framed by red lines belong to me. I am not in the picture. My dear friend Gürkan Ertaş, who provided the photo, is defending his work. Thanks to him that I have been able to write this article.



Figure 7. METU Faculty of Architecture First Year Studio Jury (1963-1964): My works are indicated by the red lines (4).

Figure 8. The main idea of the design sits on the grid (reproduced by the author; the background photo represents the METU architecture building's exposed concrete walls).

Figure 9. Papiér Mache mould and achromatic painting (author's archive).



thick brass rods by soldering method (**Figure 11**), and then the resulting split shape was drawn on a cardboard and we had to use a different material in each compartment. I think I was able to complete this task by finding or producing around 180 materials (**Figure 12**).

When I look back 60 years from today, the first thing I see is how I started from a grid. In the background of my works (*beschäftigung*), products that are made more deliberately, and even more professionally built on form relationships, draw attention (**Figures 7 and 13**).

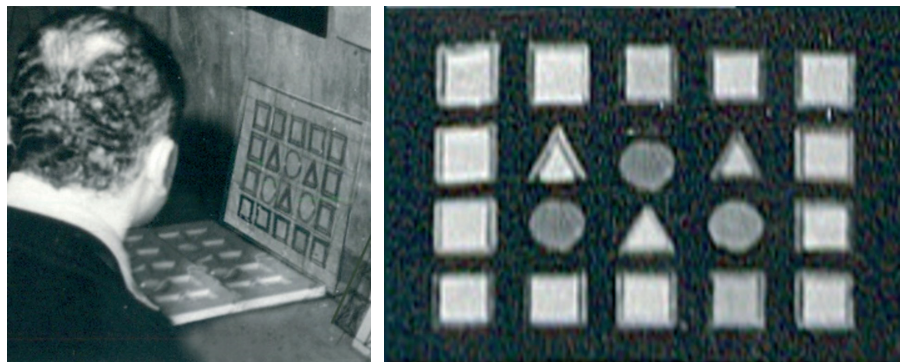
Perhaps unconsciously, I based my composition on the grid, which is the most basic structure produced by the human mind. As far as I remember,

Figure 10. METU Faculty of Architecture First Class Studio; Plaster Casting and Paper Pulp Mould; 1963-1964, (author's archive).



Figure 11. Gypsum Casting, thick brass frame and thin copper wires (author's archive).

Figure 12. Brass frame in fact contains 180 materials; unfortunately the photo does not display them (author's archive).



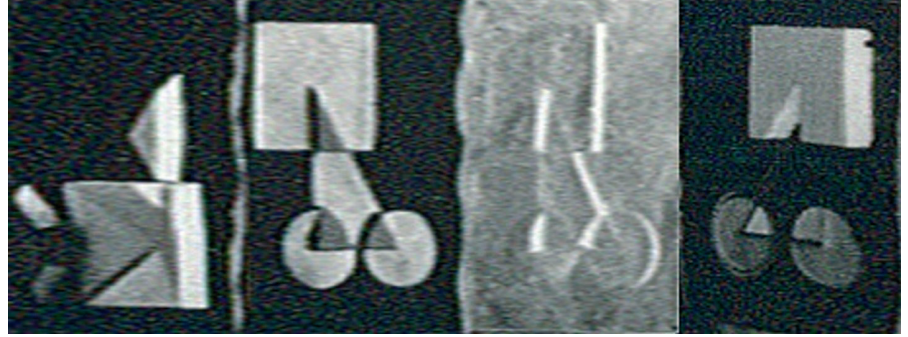


Figure 13. More elaborate forms (author's archive).

although Janeba did not find my work very creative, he did not find the order in it strange and even found it positive. It was the second time that my work was being considered orderly. The UNESCO report also affirms the concept of order in certain places. Gestalt theory, also mentions two categories; order and meaning; the first directs the functioning of inorganic nature, and the second controls the values and meanings of human beings (Günay, 2007, 94). The slogan that quantity and quality should be in balance for every gestalt was also one of Fritz Janeba's basic ideas.

The Architectural Vision

The most exciting façade of any design studio is that you always have a new combination of *Gabe* (gift) and *Beschäftigung* (work)- as also described by Janeba, (1966, 36), "Each year a programme has been prepared in accordance with the time available and appropriate to the maturity of the class. Such a programme took always care of a local site; a site which was easily accessible to everyone".

Our final assignment in the first year studio was to plot the measurements and drawings of the Ankara Aslanhane Mosque. At first glance, it appeared to be a technical job that did not involve design. When we got into it, we saw that it was a much more complex problem area. We took the

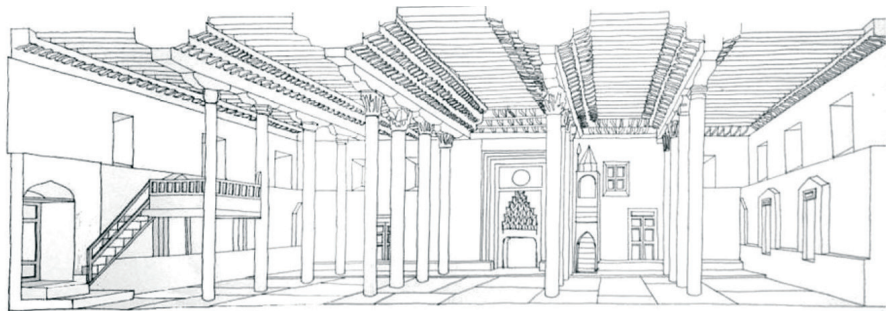


Figure 14. Interior space of Aslanhane Mosque; Wooden structure and Greco-Roman column heads; Perspective by Fevzi Yalım, 1964 (Çelik, Kocabıyıköğlu, 2019); Photo (Author, 2023).

measurements in small groups. Site plan, plans at different elevations, sections, facades, wooden columns and beams, different partitions in the interior, parapets, mihrab and pulpit, different window sections, and decorations covered our gifts and works.

On the outside, the minaret and the doors suddenly drew us to the problems of what is a building, how it is different from a structure, and how to draw it. Kindergarten indoctrination has been replaced by precise drawings and measurements that need to be done with serious care. I think that the drawings we made with graphos at a time when we did not know the rapidograph yet trained our patience as well.

The first-year Fundamentals and Techniques of Design course covered valuable processes for me in which I developed craft skills. We went through a process where we learned not only to use drawing tools such as pencil, triline, graphos, rapidograph, but also to use paint materials such as acrylic paint and tile ink, as well as skills such as plaster casting, carving, papier-mâché, soldering techniques, and elements such as structure and materials. It does not seem easy to me to explain the changes and challenges that all of these fundamentally created in my mental structure to adolescents who have not experienced them.

Fritz Janeba's UNESCO report of 1966 covered a different topic than my class's experience where the next year students were asked to design the habitat of a dragon by travelling in time.

“Our dragons are members of the particularly ancient family of the “Draco Ancyraeus”. Their pre-historic ancestors came from Anatolia. They roamed the country-side when Mount Erciyas ejected lava and tuffs over Cappadocia. At this time the atmosphere was still saturated with the sulphur fumes of the surrounding volcanos. Later on in historical times our pair visited the district of Ankara again. They were very much liked by the Phrygians, the Romans and the Galatians, and the Seljuks became particularly attached and great admirers”. (Janeba, 1966, 27)

What we learned in the Kindergarten of Design was never restricted to any time interval. I have consolidated this approach in my teaching experience both in Middle East Technical University and TED University (5). This approach was adopted by other members of both departments and in my opinion, successful results were obtained. I have endeavoured to carry the principles I have learned to the urban and rural settlements as well. The morphology of the city and its environs were investigated and produced with concepts such as frame of reference, foreground-background, balance, spontaneous or orderly, organic and mechanic, gestalt rules, interface, abstraction, environment, human circulation, unit of life, cluster, society, space gradation. An article summarizing city planning practice and gestalt rules interrogates these bonds (Günay, 2007).

CONCLUSIVE REMARKS

Fritz Janeba returned to Austria after nearly 30 years and in 1967 was appointed director of the master's program at the Vienna Academy of Applied Arts. In 1973, an exhibition prepared by graduate students at the Museum of Applied Arts, a unit of the University, was later turned into a publication. From the document, we understand that he used the Kindergarten of Design approach at the master program, while in Melbourne and Ankara he practiced it in the first year basic design class.

5. At the Middle East Technical University, visiting an antique site has become a cultural trait for the first year students. At TED University we have travelled in time to design an international community, a garden and an industrial city in 1930s. Lately we redesigned Roman Ankyra, and at present Ottoman Angora is under scrutiny.

In the modern view, the kindergarten was developed for the life cycle called Early Childhood which covers ages 3-6 and is characterized by playfulness:

“According to early childhood research, play develops social skills, increases cognitive functioning, stimulates creativity, and improves a host of other laudable and socially valued skills. However, young children’s play is something far more profound than an activity to help kids better adapt to the world around them. Play is as much about remembering as it is about adapting.” (ARMSTRONG, 2007, k.e. 1456)

Fritz Janeba however has used an Early Childhood method for more grown students who enter their high education adventure towards the end of adolescence and get their education in the very initial years of early adulthood. Thomas Armstrong (2007, k.e. 2538) marks that part of the life cycle between ages 12-20 as “spiritual passion”.

“If there’s one thing you can say about teenagers, it’s that they’re passionate. They’re passionate about their clothes, their music, their love interests, their friends, and their ideals. The biochemical tide that surges through their brains and bodies during puberty virtually ensures that ardour and zeal will express themselves in some tangible way between the ages of thirteen and twenty.”

Any educator should well be aware of this fact. In the first two years of undergraduate university education, the students are full of passion and enthusiasm and they are ready to be given shapes and their brains are open to be reformatted. They are full of enthusiasm for themselves and their communities.

This study is the expression of Fritz Janeba’s views on survival, personality and most importantly his method of education, which the author met as a first-year student of the Department of City Planning at METU in the 1963-1964 academic year. While doing this, documents were often relied on, and sometimes feelings and thoughts were brought to the fore.

Based on the idea of kindergarten of Design basically developed by Frederick Froebel, the relationship between the gifts (*gabe*) and the depictions of works (*beschäftigung*) and the kindergarten were judged.

Fritz Janeba left his profession at some point in his life under the influence of the different world pictures he lived in and devoted himself to education. It is clear that the concept and name of the kindergarten of design he started in Australia originated from Frederick Froebel. It is also impossible for Janeba not to know this course as it was taught by Johannes Itten at the Bauhaus. I think in Australia, Frit Janeba discovered Froebel with the *vorkurs* idea and set up this process under the heading of basic design.

This work has given me the opportunity to recall what I received from Fritz Janeba in the early 1960s. It is very recent for me to learn the concept of kindergarten in design. It was also exciting to find Frederick Froebel and Johannes Itten under this training. The education that Fritz Janeba put into practice in Australia, Ankara and in his own school in his final years was undoubtedly based on the *Vorkurs* experience. The author of this text, on the other hand, perhaps as an extension of the kindergarten education of design in the subconscious, saw this worldview designed for architecture as an extension of geomorphology and urban morphology, and based his educational philosophy in the last more than 40 years on these

perspectives. The first period of basic design education is based on Froebel - Itten and the second half is based on Froebel-Janeba.

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Anahtar Sözcükler: Tasarımın anaokulu; Frederick Froebel; temel tasarım; tasarım eğitimi; oyun

TASARIMIN ANAOKULU

Tasarımın Anaokulu, Fritz Janeba tarafından oluşturulmuş bir eğitim yöntemidir (yaklaşım, uygulama). Janeba'nın Melbourne, Ankara ve Viyana'daki eğitimciliği sırasında geliştirdiği tasarımın anaokulunun temelinde oyun etkinliği yatmaktadır.

Fritz Janeba'nın eğitim yaklaşımı aşağıdaki adımları kapsamıştır:

- Temel olarak duyumları yakalamak, eldeki tasarım probleminin canlılığını, düzenini ve yapısını anlamak, değerlendirmek, tanımak ve bunları sunmak.
- Disiplinin entelektüel, yaratıcı ve teknik yönlerini izleyerek, yaşadığımız mekânların yaratılması için gerekli formları geliştirmek ve buna hâkim olmak.
- Sonunda bir yapım projesi geliştirmek için gerekli araştırma, keşfetme ve yaratmanın tüm aşamalarını bir tasarım görevi olarak yerine getirmek. Bu süreçte, insan doğasını ortaya çıkarabilecek her şey; neşe ve coşku, doğal oyun içgüdüleriyle birleşecektir

Anaokulu düşüncesinin kökleri Alman eğitimci Frederick Froebel'e (1782-1852) kadar uzanmaktadır. Janeba, Tasarımın Anaokulu uygulamasını Orta Doğu Teknik Üniversitesi Mimarlık Fakültesi'ne temel tasarım eğitimi altında aktarmıştır. Dersin programı, bir çocuğun anaokulunda aldığı erken eğitim uygulamasına benzetilmektedir.

THE KINDERGARTEN OF DESIGN

The Kindergarten of Design is a method (approach, practice) originally established by Fritz Janeba. He has established the kindergarten of design as a basic course of architecture, which developed gradually during

Janeba's teaching in Melbourne, Ankara and Vienna. Janeba claimed that in the foundation of design teaching lays the play activity.

Fritz Janeba's education approach depended on:

- Basically capturing of sensations, moreover understanding, assessing, recognizing vitality, order and structure of the design problem at hand and presenting them.
- Conquering the design problem by pursuing intellectual, creative and technical aspects of the discipline and developing principles of merging of forms, for the creation of spaces.
- Eventually developing a construction project, fulfilling a design task with all phases of surveying, discovering and creating. In this process Joy and enthusiasm are coupled with the natural play instinct - anything that can bring out the human nature.

The roots of the idea of the Kindergarten goes back to German educator Frederick Froebel (1782-1852) The Austrian Fritz Janeba developed the idea in Melbourne / Australia. Later he transferred the Kindergarten of Design Studio to the Faculty of Architecture at the Middle East Technical University, under basic design education. He compared the program of the course to the concept of the early schooling a child receives in the Kindergarten.

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