Evaluating Urban Furniture in Historical Peninsula of Istanbul from Human Centered Design Approach

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Abstract
This study examines urban furniture in the historical peninsula of Istanbul in terms of suitability for human-centered design. Research for this study was conducted on two axes, the first of which was a field study to visually document the city furniture on the site. On the second axis, a questionnaire was carried out for the users of the documented furniture. The questionnaire aimed to identify user needs. Findings of research were analyzed from the perspective of human-centered design. The research revealed a need for opinions of professionals from multiple disciplines in order to ensure user satisfaction and design urban furniture matching with the urban texture of the historical peninsula. This study aims to determine the roles relevant actors should assume when they are involved in the lifecycle of urban furniture designed with suitability for human-centered design approach.

Keywords: Environment, Human-centered Design, Ergonomics, Urban Furniture, User Satisfaction

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İnsan Merkezli Tasarım Yaklaşımı Bakımından İstanbul'un Tarihi Yarımadasındaki Kent Mobilyalarının İncelenmesi

Öz

Bu çalışma, İstanbul'un tarihi yarımadasındaki kent mobilyalarını insan merkezli tasarıma uygunluk açısından incelemektedir. Bu çalışma için yapılan araştırma iki eksen üzerinde gerçekleştirilmiştir; bunlardan ilki, şehir mobilyalarını sahada görsel olarak belgelemek için bir gerçekleştirilen bir saha çalışmadır. İkinci eksende, dokümante edilmiş mobilyaların değerlendirilmesi için kullanıcılara bir anket yapılmıştır. Anket ile kullanıcı ihtiyaçlarını belirlemek amaçlamıştır. Araştırma bulguları insan merkezli tasarım açısından analiz edilmiştir. Araştırma, kullanıcı memnuniyetini sağlamak ve tarihi yarımadanın kentsel dokusu ile uyumlu kentsel mobilyalar tasarlamak için birden fazla disiplinden profesyonellerin görüşlerine ihtiyaç olduğunu ortaya koymuştur. Bu çalışma, ilgili aktörlerin insan merkezli tasarım yaklaşımına uygun olarak tasarlanmış kentsel mobilyaların yaşam döngüsüne katıldıklarında üstlenmeleri gereken rolleri belirlemeyi amaçlamaktadır.

Anahtar Kelimeler: Çevre, İnsan Merkezli Tasarım, Ergonomi, Kent Mobilyaları, Kullanıcı Memnuniyeti

Introduction

Human factor should be the first criteria to be considered in design. Human factor in urban furniture design falls under the research fields of multiple disciplines since city furniture feature various properties. When we examine these disciplines from the perspective of human-centered design, it is clear that humans should be taken as a whole comprising of physical, anatomic and psychological attributes. Awareness of physical, anatomic and psychological attributes that define a person and reflection of this awareness on design is critical when it comes to guaranteeing user satisfaction.

Components specified as 'urban furniture' are shaped as per factors and needs including recreation, entertainment, guidance, communication, safety, cleanliness, etc. However, they are diverse in terms of their functions. They also serve the purpose of encouraging use of public spaces and ensuring their efficient and proper use. In this context, urban furniture is composed of a harmonious combination of components that organize and govern urban life and make a city inhabitable.

Examination of urban furniture in Istanbul requires a look into Istanbul's topography and cultural richness. Urban furniture of Istanbul, which as a city has been home to numerous civilizations throughout centuries, has changed over time, in parallel with the changing socio-cultural and socio-economic structure of the city. It is this change and evolution that make urban furniture of Istanbul different from its contemporaries in terms of a series of characteristics, which resulted in specific design, production and use of furniture for the city of Istanbul. Planning, design, production and use phases of city furniture have changed, and taken final shape, in

parallel with user experience. Designs have been developed to address end users' changing and diverse needs and taken a form to achieve the goal of developing user-centered urban furniture.

The aim of this research is to examine urban furniture in the historical peninsula of Istanbul from a human-centered design approach. It also aims to demonstrate, in terms of user satisfaction, the importance of properties such as technology, comfort, hygiene, durability and protection that are expected to stand out in the design of urban furniture. Hypothesis of the research is based on the thinking that "preference of human-centered approach in city furniture ensures user satisfaction." In line with this hypothesis, the research was conducted, with urban furniture in the city of Istanbul in broader framework, and historical peninsula in specific framework. Sub-research questions were prepared from the discipline of ergonomics. The impact levels of phycology and physiology – as the sciences ergonomics makes use of – on the form of city furniture were one of the questions of the sub-research on human-centered design approach, whereas the impact of ergonomic factors on users constituted another question of the research. Drawing on the hypothesis and sub-research questions, comfort level, aesthetic value, technological compatibility, meeting of universal design criteria, hygiene level and user satisfaction related with city furniture for the city of Istanbul were studied. The scope of the research covers the city furniture within the borders of the district specified. Urban furniture in other parts of the city was not included in the scope. Urban furniture examined was limited to seating elements, illumination elements, garbage bins and fountains (Fig. 1-7).

Fig. 1: Urban Furniture Examples From Historical Peninsula (C. Doğan – 2020)

Fig. 2,3: Urban Furniture Examples-Lighting Design (C. Doğan – 2020)

Fig. 4,5: Urban Furniture Examples-Trash (C. Doğan – 2020)

Fig. 6: Urban Furniture Examples (C. Doğan – 2020)

Fig. 7: Urban Furniture Examples (C. Doğan – 2020)

As the method of the research, combination of qualitative and quantitative methods was preferred. The research was composed of two axes. On the first axis, a post-occupancy evaluation questionnaire was prepared to collect data from users, while the current status of city furniture was documented on site during the research. The questionnaire prepared afterwards was conducted on local users with simple random sampling method, and data collected was analyzed with SPSS.

Key Definitions and Concepts

The science of ergonomics, which studies the relation between human and his surroundings, should be touched upon in order to understand human-centered design approach. Ergonomics, a Greek word, is a combination of 'ergon' meaning work, and 'nomos' meaning the laws of nature. Ergonomics is considered a discipline that aims to optimize product design for human use. Ergonomics as a concept is also defined as an applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely called also biotechnology, human engineering, human factor (Merriam-Webster Dictionary, 2018). International Ergonomics Association (2003) defined ergonomics (or human factor) as; "the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. Practitioners of ergonomics and ergonomists contribute to the design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with the needs, abilities and limitations of people."

The concept of "human-centered design," which has taken shape in the sphere of ergonomics, is based on the principle to develop designs by putting user in the center of design. With limitations and characteristics specified by standards, this concept is defined as follows in ISO 9241-210:2010(E) Introduction: "Human-centered design is an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, usability knowledge, and techniques. This approach enhances effectiveness and efficiency, improves human well-being, user satisfaction, accessibility and sustainability; and counteracts possible adverse effects of use on human health, safety and performance." Although the definition is highly clear, we encounter two similar concepts in the literature: Human Centered Design – HCD and User Centered Design – UCD. In practice, both concepts seem to be the same, but they differ from one another in theory. User-centered design (UCD) or user-driven development (UDD) is a framework of processes (not restricted to interfaces or technologies) in which usability goals, user characteristics, environment, tasks and workflow of a product, service or process are given extensive attention at each stage of the design process. User-centered design can be characterized as a multi-stage problem-solving process that not only requires designers to analyze and envision the way users are likely to consume a product, but also to validate their assumptions with regard to the user behavior in real world tests (Taylor, P. J., & Derudder, B., 2016: 128). These tests are conducted with/without actual users during each stage of the process from requirements, pre-production models and postproduction, completing a circle of proof back to and ensuring that "development proceeds with the user as the center of focus" (Henry, 2007:25).

Such testing is necessary as it is often very difficult for the designers of a product to understand intuitively what a first-time user of their design experiences, and what each user's learning curve may look like (Carr, S., Francis, M., Rivlin, L.G., Stone, A.M.,1992). User-centered design is common in the design industry and when used is considered to lead to increased product usefulness and usability (Vredenburg, Mao, Smith, Carey, 2002: 471-478).The chief difference from other product design philosophies is that user-centered design tries to optimize the product around how users can, want, or need to use the product, rather than forcing the users to change their behavior to accommodate the product. The users thus stand in the center of two concentric circles. The inner circle includes the context of the product, objectives of developing it and the environment it would run in. The outer circle involves more granular details (Henry & Thorp, 2004).

Human-centered design (HCD) is a design and management framework that develops solutions to problems by involving the human perspective in all steps of the problem-solving process. Human involvement typically takes place in observing the problem within context, brainstorming, conceptualizing, developing, and implementing the solution. Human-centered design builds upon participatory action research by moving beyond participant's involvement and producing solutions to problems rather than solely documenting them. Initial stages usually revolve around immersion, observing, and contextual framing in which innovators immerse themselves with the problem and community. Consequent stages may then focus on community brainstorming, modeling and prototyping, and implementation in community spaces (Handbook of Human-Centered Design Methods, 2012). Further, human-centered design typically focuses on integrating technology or other useful tools in order to alleviate problems, especially around issues of health (Matheson, Pacione, Shultz, Klügl, 2015: 472-479).

The following definitions may be provided for the concepts of city and urban spaces: Rob Krier defines a city as “a settlement compatible with the characteristics of the city that includes urban space or is structured together with it” (Krier, 1979: .143-155). According to Carr, Rivlin, Stone, Francis, “public spaces should respond to the needs, be democratic and relevant. Spaces that address the needs are those which can serve users’ needs and thus are designed accordingly. The most important needs in a public space are comfort, recreation, active/passive participation, discovery and human needs. These spaces are available to all segments of a society, enabling both freedom of movement and temporary ownership” (Carr, Francis, Rivlin, Stone, 1992). “Whereas architecture focuses on individual buildings, urban design addresses the larger scale of buildings, streets and public spaces, whole neighborhoods and districts, and enti re cities,basically the shaping of masses and spaces to make urban areas function al, attractive, and sustainable. It is an inter-disciplinary subject that unites all the built environment professions, including urban planning, landscape architecture, architecture, civil and municipal engineering” (Htin, 2013).

Research Method – Research Structure

A combination of qualitative and quantitative methods was deployed in the research in order to determine user satisfaction through analysis of post-occupancy evaluation questionnaires. A post-use evaluation questionnaire was prepared to collect data from users and the current status of urban furniture was documented on site in the first stage of the research. The questionnaire in the second stage of the research was applied to local users through simple randomized sampling method, with an SPSS analysis being conducted on the data collected. A questionnaire was provided to local users as seating elements in the research site were examined, and findings were compared with the data collected. Frequency analysis was carried out to determine the numerical distribution of the data.

Urban furniture with direct user contact designed as per ergonomic aspects and for which the local authority allocated a significant amount of budget were analyzed according to post-use satisfaction benchmarks. This analysis was based on the approach Stephan Pheasant put forward as a result of the studies he conducted.

The sample questionnaire was created in proportion of the size of the universe according to Yazıcıoğlu and Erdoğan. 250 questionnaires were distributed, assuming the 2017 population of 433,873 people in Fatih district (quote from Fatih municipality) was the universe, in proportion to the daytime population when the questionnaire was applied. The sampling error was assumed to be -/+0.10, and p/q variables were assumed to be 0.5.

Questionnaires were carried out in the form of one-to-one interviews with simple random users who accepted to answer the questions during the week and on weekends. The questionnaires aimed to determine users' satisfaction with seating elements in the district they were based in.

Demographics of participants were identified in the first part of the questionnaire. The second part had 10 questions on user satisfaction. Respondents were asked closed-ended questions. Answers were assessed in a computerized context by using SPSS 15 statistics program. The statistical relevance of the findings with the variables of age, educational attainment, profession and income level was identified by following One-Way Anova method. An arithmetic average of technology, comfort, hygiene, durability and safety criteria was taken to determine the main properties the design of urban furniture is expected to feature. The main material of this study is urban furniture in the historical peninsula within the borders of Fatih district of Istanbul. Urban furniture within the borders of the district specified was examined in the study, and urban furniture in other parts of the city was excluded from the scope of this study. Urban furniture examined through seating elements, illumination elements, garbage bins and fountains.

The research site was chosen as the historical peninsula in Fatih district of Istanbul. Istanbul, historically known as Constantinople and Byzantium, is the most populous city in Turkey and the country's economic, cultural, and historic center. Istanbul is a transcontinental city in Eurasia, straddling the Bosphorus strait (which separates Europe and Asia) between the Sea of Marmara and the Black Sea. Its commercial and historical center lies on the European side and about a third of its population lives on the Asian side (Un'yu, S., Kenkyū K.,2004: 281).

The city is the administrative center of the Istanbul Metropolitan Municipality (coterminous with Istanbul Province), both hosting a population of around 15.O20.231 million residents (Turkish statistical Institute, 31 December 2017) Istanbul is one of the world's most populous cities and ranks as the world's 7th-largest city proper and the largest European city. Istanbul is viewed as a bridge between the East and West. Founded under the name of Byzantion on the Sarayburnu promontory around 660 BCE, the city grew in size and influence, having become one of the most important cities in history. After its reestablishment as Constantinople in 330 CE, it served as an imperial capital for almost 16 centuries, during the Roman/Byzantine (330–1204 and 1261–1453), the Latin (1204–1261), and the Ottoman (1453–1922) empires (Çelik, 1993:15). was instrumental in the advancement of Christianity during Roman and Byzantine times, before the Ottomans conquered the city in 1453 CE and transformed it into an Islamic stronghold and the seat of the Ottoman Caliphate (Masters & Ágoston, 2009:114-115).

The city's biggest attraction is its historic center, partially listed as a UNESCO World Heritage Site, and its cultural and entertainment hub can be found across the city's natural harbor, the Golden Horn, in the Beyoğlu district. Considered a global city (GaWC, 2012), Istanbul has one of the fastest-growing metropolitan economies in the world (Berube, 2010:1-21).

Istanbul is located in north-western Turkey within the Marmara Region on a total area of 5,343 square kilometers. Istanbul has 39 districts, 25 on the European side, 14 on the Asian side.

Fatih district, chosen as the research site, is a popular tourist destination on the European side of the city, housing the historical peninsula. "It has a population of 433,873 people, spanning an area of 15.59 square kilometers. Population density is 27,830 people per square meter" (TSI, 2018).

Findings and Evaluation

Design for human is confined to the physical human characteristics and abilities. Studying individual characteristics and abilities on numerous people enables a generalization of physical and anatomic characteristics. Demands and needs discovered through analyses of data collected should serve as criteria in human-centered design approach.

User-centered design can be characterized as a multi-stage problem-solving process that not only requires designers to analyze and envision the way users are likely to consume a product, but also to validate their assumptions with regard to the user behavior in real world tests (Taylor, P. J., & Derudder, B., 2016: 128).
As a result of the work done in line with this information;
Demographics of participants were identified in the first part of the questionnaire which was prepared to analyze post-occupancy evaluation of urban furniture. Participants of the questionnaire were composed of males by 53.2% (133) and females by 46.8% (117). 37.2% of the respondents were 26-35 years of age, %25.2 36-45 years of age, 25.2% 18-25 years of age, and 12.4% 46-55 years of age. A look into respondents' educational attainment reveals that the rate of primary education levels is significantly low. The associate degree holders represent the highest majority with 32.4%, followed by high school graduates with 27.2%, university graduates with 26.4%, postgraduate-degree holders with %12.8, and primary education graduates with 1.2%. 52.8% of respondents were single, 47.2% married. 61.6% of the respondents did not have children, 38.4% had children.
As can be seen in the table below, the majority of respondents in the group of users which constituted user data derived through simple random sampling method were in a relatively young age group (below 45), had high educational attainment levels, married and do not have children (Figure 8, 9).

Demographics		**n**	**%**
Gender	Female	133	53.2
	Male	117	46.8
Age	18-25	63	25.2
	26-35	93	37.2
	36-45	63	25.2
	46-55	31	12.4
Educational Attainment	Primary education	3	1.2
	High school	68	27.2
	Associate degree	81	32.4
	Undergraduate	66	26.4
	Graduate degree	32	12.8
Civil status	Married	118	47.2
	Single	132	52.8
Children	Yes	96	38.4
	No	154	61.6

Fig. 8: Demographic Information Table

Research Questions	**Yes**	**No**
Do you know anything about urban furniture concept?	%36	%64
Do you find existing urban furniture useful?	%12	%88
Do you find urban furniture hygienic?	%1	%99
Do you think urban furniture reflects the fabric of the city?	%14	%86
Do you find urban furniture aesthetically sufficient?	%21	%79
Are you satisfied with the design of urban furniture?	%29	%71
Do you think urban furniture is on part with today's technological developments?	%2	%98
Is urban furniture accessible for disabled and elderly citizens?	%40	%60
Would you like urban furniture to reflect historical and cultural aspects of the city?	%7	%93

Which properties would you like to see most in urban furniture?				
Technology %36	Comfort %21	Hygiene %14	Durability %13	Protection % 16

Fig. 9: Research Questions

According to the data derived during one-to-one interviews with the local users in the research site, the proportion of respondents without knowledge of the concept of urban furniture is unquestionably high (64%). 88% do not find existing urban furniture useful, with only remaining 12% finding them useful. Hygiene stands out to be the most urgent problem with urban furniture for 99% of the respondents, demonstrating that almost all respondents consider hygiene as a problem. The rate of those who do not consider urban furniture reflect the fabric of the city is considerably high (86%) compared to the respondents who consider the contrary. This has a negative impact on users' spatial memory, loyalty and belonging. 79% find the existing city furniture aesthetically insufficient, causing users to dislike existing urban furniture. The rate of respondents finding existing urban furniture insufficient in terms of design is also considerably high with 71%, which suggests that design features considered to be insufficient are impacted by aesthetic features.

Rapidly changing and evolving technology has the potential to make existing urban furniture more technological. This study reveals that existing urban furniture is considered as properties failing to adapt to technology. Moreover, existing urban furniture does not address society as a whole, being considered unfit for use by the disabled and elderly. Almost all the respondents express the need for urban furniture to be designed in a way to reflect the history and culture of the city. When asked about the features they would like to see most in city furniture design, majority of the respondents pointed to that fact that urban furniture should be technologically equipped. When asked about the features they would like to see most in urban furniture design, majority of the respondents pointed to that fact that urban furniture should be technologically equipped. (Fig. 10)

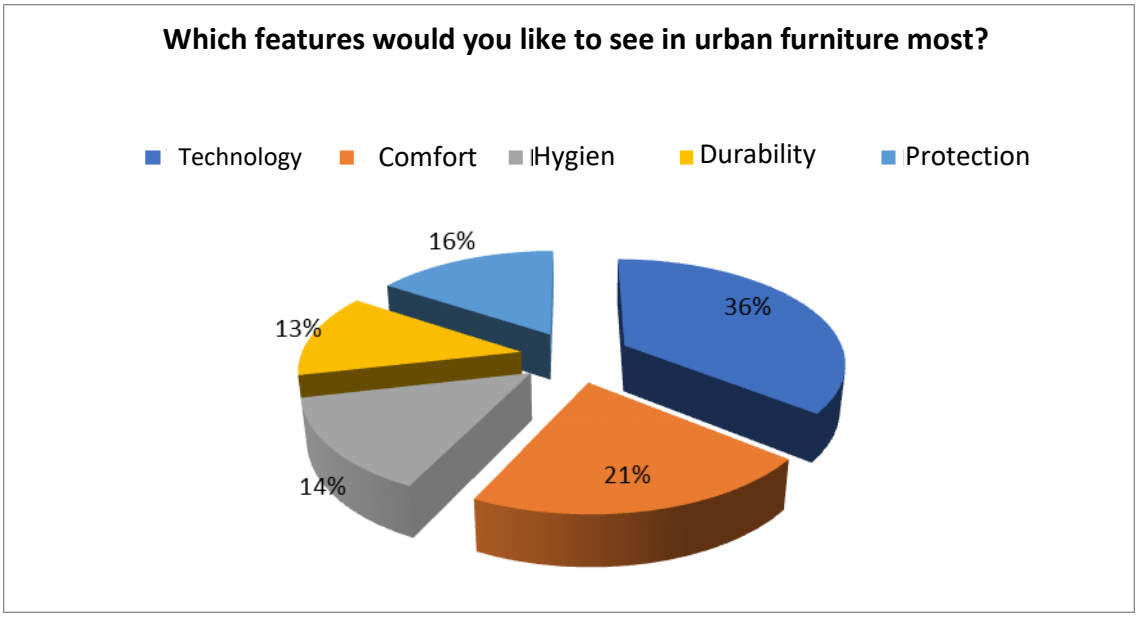

Fig. 10: Responds of urban furniture users about the features.

Conclusion

Urban furniture in the vicinity of historical areas should be designed with a specific approach in order to address users' needs and for users to adopt them. Human-centered approach could also increase user satisfaction. In an attempt to put urban fabric to the fore, urban furniture does not get the utmost focus, as the findings of the study show. Opinions of professionals from different disciplines would be critical to ensure user satisfaction and design urban furniture that matches with the urban fabric. Users' answers to the questionnaire help us deduce that concepts such as aesthetics, comfort, technology – which have a decisive role in urban space, quality and social memory – are insufficient in current designs of urban furniture. In order to improve these concepts, a study should be carried out involving designers, local authorities and end users. All actors with a responsibility for urban furniture design should assume a role in such study. As these actors have an impact on the lifecycle of urban furniture, they should take into account user satisfaction in terms of human-centered design.

Standards and norms should be identified for the design first to achieve the goal of designing human-centered urban furniture. As part of the efforts to determine such standards and norms, best practices from abroad and studies carried out in the country should be evaluated as a whole in order to reach optimum results. Determination of universal design standards and norms is undoubtedly a top priority to achieve the goal of designing human-centered urban furniture.

City planners, local authority, designers and manufacturers should act in collaboration to identify the districts in need of urban furniture, while taking into account macro and micro plans of a city. The extent to which such furniture is needed should be identified based on the topographical structure of the district. Urban furniture layout plans should be developed in light of the efforts undertaken. Following the layout plan residents of the district, and their socio-cultural and socio-economic status should be identified by following multiple methods. An examination of the cultural and economic status of residents who will be using urban furniture should be followed by an analysis of anthropometric characteristics. Inclusion of all these analyses into the data repository is essential to increase user satisfaction. Once a data repository is established in light of scientific studies and data analyses, designers and manufacturers should be selected.

Design and production processes should be monitored at certain intervals to check compliance with specified norms and rules. Urban furniture, which will be the end product of all these efforts, should be placed in accordance with the plans the local authority developed. If the product is infrastructure-reliant urban furniture, then it should be made available to the users after necessary infrastructure work is completed.

Services including cleaning and maintenance and repair of urban furniture should be provided by the local authority subject to the plans already in place. Timely cleaning and repair and maintenance services are important to maintain user satisfaction with human-centered designs, as this study indicates.

Timely renewal of city furniture with expired lifecycles and recycling or disposing old furniture with focus on sustainability factors are also among the tasks of the local authority.

Designs should be developed by focusing on the user profile, user needs and expectations identified through research the local authority undertakes or commissions. Human-product relations should be examined from an ergonomic point of view, supported by psychology and physiology, in developing human-centered designs. Natural conditions of the environment where the end product will be placed should be examined to select the best material for the furniture.

In order to protect human health in city furniture, formal measures should be taken at the phase of design and suitable materials for human well-being should be selected. Products should guarantee hygiene, they should be easy to clean and be able to maintain cleanliness for long term.

Measures taken at the phase of design should enable easy assembly of the furniture, which should be equally easy to dismantle when its lifecycle ends.

Collaboration with the local authority and the organizations assigned by it is important while determining the design criteria for human-centered products. It is also important for users to consider the urban furniture their own property and avoid them from any harm.

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