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Parameters for designing media facades: A research toward different cases from Turkey and other countries

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Abstract

The media facades that provide an interactive communication structure for urban users have emerged in the modern period, and the use of these facades has become common. This paper aims to determine the parameters that will affect the process of designing media facades and discover how design-related parameters are distributed in the practices of designing these media facades. For the evaluation process, 14 sample facades that are universally representative and serve different functions in buildings located in Turkey and other countries (control group) were selected. Analyzing these facades is important to reveal the digitalization level and detailed know-how in this regard. Data were compared using the charts for the media facade formations reviewed through observation method. Examining the parameters regarding the designs of media facades through the comparative analysis method plays a key role in predicting the development of media facades in Turkey. According to the comparison results, the media facades in Turkey were not able to catch up with the recent developments. It was observed that the diversification of the use purposes of media facades and the differentiation of the parameters for design were insufficient. As a result, it is thought that the designers and practitioners will be guided by the results obtained through the examples of the media facades.

Highlights

- Design-related parameters for media facades design and application processes have been established.
- Media facades, which have found a new area of development in our country, have been discussed among international architectural samples.
- It has been emphasized that media facade information in architecture can develope with intellectual capital and digital transformation.

Keywords

Digital media; Media façades; Communication on architecture; Development of facades; Façade design

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Medya cepheleri tasarım parametreleri: Türkiye ve diğer ülkelerden farklı örneklemlere yönelik bir araştırma

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Anahtar Sözcükler

Dijital medya; Medya cepheleri; Mimarlıkta iletişim; Cephelerin gelişimi; Cephe tasarımı

Öz

Kent kullanıcıları için interaktif bir iletişim yapısı sağlayan medya cepheleri modern dönemde ortaya çıkmış ve kullanımları yaygınlaşmıştır. Çalışmada medya cephesi tasarlama sürecini etkileyecek parametreleri belirlemeyi ve ilgili parametrelerin nasıl değiştiğini araştırmak amaçlanmaktadır. Değerlendirme süreci için Türkiye'de ve kontrol grubu olarak diğer ülkelerde olan ve farklı fonksiyonlara sahip binalardan oluşan 14 örnek medya cephesi seçilmiştir. Bu cepheleri analiz etmek, dijitalleşme düzeyini ve bu konuda detaylı bilgi birikimini ortaya çıkarmak açısından önemlidir. Çalışmada gözlem yöntemi ile incelenen medya cephelerine yönelik çizelgeler kullanılarak verilerin karşılaştırması yapılmıştır. Karşılaştırmalı analiz yöntemi ile medya cephelerinin kullanım amaçları ve tasarımına yönelik parametrelerin araştırılması, Türkiye medya cephelerinin gelişiminde öngörüde bulunmak açısından önemli bir rol oynamaktadır. Karşılaştırmaya göre, Türkiye'de bulunan medya cephelerinin son gelişmeleri yakalayamadığı tespit edilmiştir. Medya cephelerinin kullanım amaçlarının ve tasarım parametrelerinin farklılaşmasının yetersiz olduğu görülmüştür. Sonuç olarak, medya cephesi örnekleri üzerinden elde edilen sonuçlarla tasarımcı ve uygulamacıya yol gösterileceği düşünülmektedir.

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Öne Çıkanlar

- Medya cepheleri tasarım ve uygulama süreçlerine yönelik tasarım parametreleri oluşturulmuştur.
- Ülkemizde yeni bir gelişme alanı bulan medya cepheleri, uluslararası mimari örnekler arasında yeri tartışılmıştır.
- Mimarlıkta medya cephe bilgisinin entelektüel sermaye ve dijital dönüşüm ile gelişebileceği vurgulanmıştır.

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1. INTRODUCTION

Different definitions of facades have been made throughout history. The concept of the facade was defined in the dictionary of architecture (Rationale Dictionary of French Architecture) published by Viollet-le-Duc in France in 1858 as follows: "…architectural arrangements on the side facing the street, outdoors or garden…" (Viollet-le-Duc and Ricker, 1858). Accordingly, facades are regarded as building parts that ensure visual communication in a built environment and play a key role in defining the private and public spaces. They are the first building elements noticed when perceiving and assessing buildings on a user scale, which reflects the importance of facade designing. The building facades have physical, sociological, and/or psychological representations. There are variables such as like, complexity, preferences, and impressiveness in the perception and interpretation of different facade systems (Arslan and Yıldırım, 2021). All these variables constitute a transinformation between the user and the building. In this sense, building facades are a communication tool in urban areas.

The latest periods of this century indicate that the number of commercial relationships has increased in accordance with globalization, which has consequently made media and digitalization two important concepts. The necessity of media has reached another level as users are filling urban gaps at high rates in their intense urban lives. Moreover, following the advanced and developed digitalization period, efforts have been made to transfer communicational elements from virtual environments to urban usage areas. A meta-materialist communication age has started in the 21st century, which is different compared to the physical areas on the streets. New materials as well as new technologies, advanced computer simulations, electronic systems, and visual and auditory sources have revealed media architecture (Civic-Tovaric et al., 2011). The most distinguishable impact of digital transformation, which has emerged following the last and current industrial revolution, in media architecture is the media facades. This transformation is regarded as the most basic factor regarding the architectural attitudes and innovations in the concept of the facade.

Media facades have held an important place in architecture from the past to the present time. They are used for different purposes and contain a great technological potential and social and cultural values in their backgrounds. They also provide an interactive communication structure for urban users (Mignonneau and Sommerer, 2008). While forming a communicational structure, various elements should be planned in a systematic manner. The data of the environment where media facades are to be designed, the content of the media elements and plans regarding the interaction

between buildings and facades are all a part of the system (Figure 1). Environmental factors consist of significant criteria for the media content to be accessed by users (Moere and Wouters, 2012).

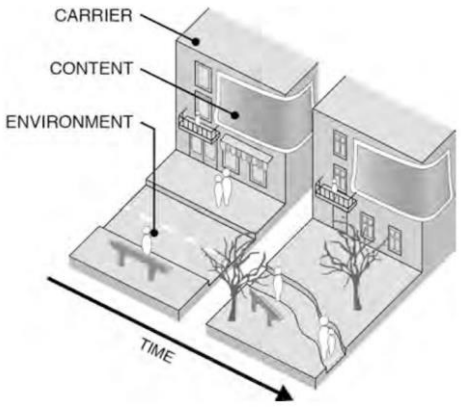


Figure 1 - Components of media facade (Moere and Wouters, 2012).

The concepts of carrier, content, environment (context), and time capture draw attention as significant criteria for building media facades:

- Regarding the concept of the carrier the systems to which media facades can transfer their loads appropriately should exist.
- Regarding the concept of content, feelings and messages conveyed by media facades should be clearly reflected to the users. Moreover, correct instruments should be selected and processed for these contents.
- Regarding the concept of environment, the environment and social structure where media facades are built should receive messages and provide feedback, and
- Regarding the concept of time, the process should be managed in accordance with the density of urban users while building media facades (Dalsgaard and Halskov, 2010).

There are alternatives in forming media facades. These alternatives include front projection facades, back-projection facades, display facades, window animations, illuminant or light-transmitting facades, and mechanical facades (Abdou et al., 2017; Weithoff and Gehring, 2012). In this study, especially the most used display facades in Turkey and illuminating or light-transmitting facades are focused on.

The research problem of this study is to determine whether there is a homogeneous distribution in the designs of media facades in Turkey. Design-related parameters were reviewed as sub-problems to shed light on solving the main problem and to contribute to the process of inferring. The historical development of media facades was conceptually examined, and the information about the parameters regarding the designs of these facades was provided with an extensive literature review. Owing to the potential of making predictions about the case in Turkey with the common relevant practices, a comparative approach was adopted to assess the differing orientations/practices regarding the media facades in Turkey and other countries (control group). Accordingly, control group samples from the countries, the pioneers in the literature of media facades and relevant samples from Turkey, and contain reliable information, were compared in the

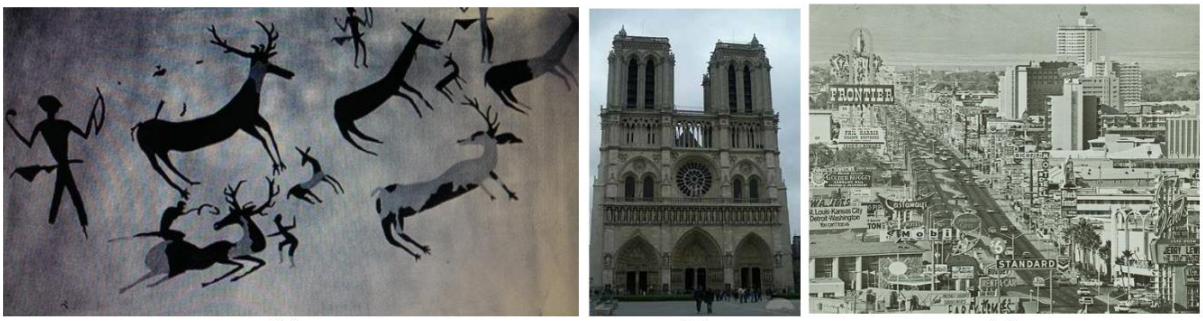
evaluation phase. Assessments regarding the use of media facades in Turkey were made at the end of the study.

2. EVOLUTION OF MEDIA FACADES FROM PAST TO PRESENT

The building facades have been the instruments of communication in the history of architecture. What was written on stones, concrete blocks, and wooden items or glasses can be currently conveyed through digital media which has become an integral part of the architecture in the information society of the present time. The modern facade systems built in different manners are significantly different compared to the systems of the past (Stojšić, 2017). Facades were initially used to communicate, and early facade examples contain walls with pictures and letters on them. The decorations and ornaments from the classical periods of architecture indicate certain cultural values, icons, and images (Figure 2-a). Especially, decoration has been an important way of creating meaning and communication through images (Akalin et al., 2010).

The use of facades as instruments of communication can also be seen in the Gothic Period. Sculptures, frescos, and stained glasses were often used in that period (Erkayhan and Tekin, 2016). Elements used during the Gothic period were created to convey religious stories to people (Figure 2-b). Following the industrial revolution, a relationship between the materials and facades was established to show that buildings were the items of strength thanks to the use of new materials. The concept of transparency gained significance with the use of new materials, and the communication between indoors and outdoors became important (Aydoğan, 2009). After the emergence of modern architecture, a pure and simple style was sought after for building facades. However, building facades reflected certain messages as modern architecture followed the functions of forms as an ideological approach. Cases such as the use of functions as input and the emergence of different structures, such as lower floors and upper floors played a key role in shaping the facade designs.

Wall paintings from the previous periods, decorations on the facades, sculpture motives, and illuminated visual billboards are all important for the formation of media architecture in the present time. Billboards built independently from buildings had an important place in the urban pattern in the past. Urban areas became inadequate as sizes and ratios of board elements and the need for urban usage areas increased (Figure 2-c). Facades initially planned to be wide and/or high considering the urban settlement were later used as board elements. Communicational elements used to be hung for people but following the technological advancements, illuminated elements are now used. The illumination of buildings and environments drew attention to buildings and increased people's perception. As a result of using board elements and illumination, media facades emerged (Okur and Karakoç, 2019). Media facades emerged with some technical background outputs and a combination of software and hardware interfaces played a key role in urban communication and interaction (Bergemann et al., 2013). The design of the systems on which the software information is loaded in the background and the outputs obtained with this design need to be transferred to the urban users via a hardware tool through the facade of the building. Media facades are making great changes and transformations with new research and unlimited design ideas day by day.



(a) (b) (c)

Figure 2 - (a) Wall painting in the Prehistoric period (Durukan, 2014), (b) A church in the Gothic period (Altunöz Yonuk, 2012), (c) A view from Las Vegas (Venturi, Brown and Izenour, 1977).

Types of media facades have increased in line with technological advancements, and the use of different materials and systems has become more common. The entrance facade of the Chanel building in Tokyo was designed as a media facade by Peter Marino, an American architect. Chanel products and ideological orientations of fashion designers were reflected on this facade, and a commercial use was ensured in this regard. (Figure 3-a). Seven hundred thousand embedded light-emitting diodes (LED) on the facade provide a screen at a perceivable resolution. This building is located on the Marronier corner of Chou Street, a location that is busy and intensely used by people (Tscherteu, 2008). In Turkey, the entrance facade of Iyaşpark Hotel in Isparta has a media facade design which was added later to the building (Figure 3-b). This facade design with the panel elements consisting of 2648 meter LED is a remarkable work capturing attention in the urban centre. The materials used and the system are resistant to external environmental conditions (URL-1). Iluma Shopping Centre in Singapore, designed by WOHA Architects, has a systematic matrix composition and media facade structure generating pixels in appropriate forms (Figure 3-c). Crystal-looking tubes were formed and supported with LED systems (Fritz, 2009). Considering these three modern examples, preferences and uses for the advertising and marketing sectors as the reflection of digital transformation on architecture are interesting. The building facade acting as an instrument of communication serves the purpose of stressing building function and plays a key role in introducing the building to the urban users.

(a) (b) (c)

Figure 3 - (a) Chanel Building (Barahona, 2011); (b) Iyaşpark Hotel (URL-1); (c) Iluma Shopping Centre (URL-2)

3. DESIGN-RELATED PARAMETERS OF MEDIA FACADES

Processes of designing, practicing, and using were examined in regard to forming the parameters for designing media facades. Indoor comfort conditions arising from users' needs and assessment of the criteria regarding the urban users should be assessed. Formation of the parameters regarding the design in media facades and building facade systems through the parameters yields important results for users' health, sustainability, and cost-efficiency. Appropriate analysis of designing parameters increases the efficiency achieved from media facades and emerges as the output of a facade design suiting its own targets. The designing team that is responsible for generating the most convenient detail-based solutions on the media facades should include the designing parameters related to media facades in the aesthetic-functional solutions.

3.1. Purpose of Use

A city is a holistic experimental area with its built architectural environment and visual forms (Jang and Kim, 2014). Building digital screens and consideration of television systems transform the modern architecture into the media-performance visuals. Displayed formation should be generated for various purposes, and architectural integration should be arranged appropriately. There are usage forms with targets based on commercial, public service, social communication, artistic and amusement-related, and facade solutions (Brykova and Sbytova, 2019) (Figure 4).

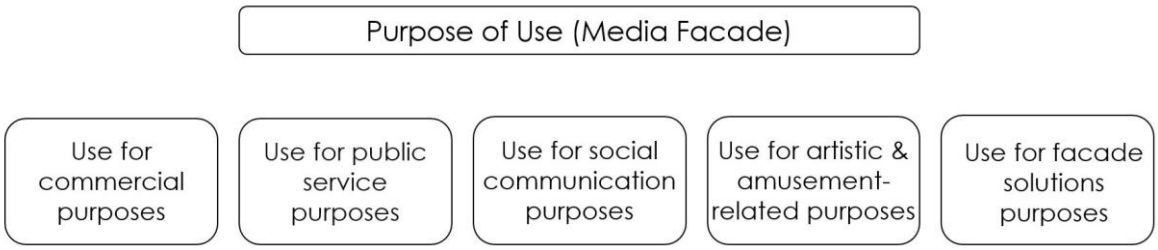


Figure 4 - Classification of media facades according to their purpose of use.

- Use for commercial purposes: Media facades are commonly used for advertisements on an urban scale. These media facades have the systems that work by reflecting certain marketing-related values of shops and malls on facades in the globalized world (Herr, 2012).
- Use for public service purposes: This type of use includes media facades which help urban users be informed about various topics and encouraged to participate in life more. Activities on the urban scale, time (hour and calendar), weather, traffic and transportation information are reflected in this context.
- Use for social communication purposes: Architectural facade surfaces constitute the channels of communication to transfer information. Momentary data transfer is ensured via facades, as well as computation systems and advancements in conveying messages (Moghaddam and Ibrahim, 2016).
- Use for artistic and amusement-related purposes: Media facades as digital art forms provide a different perception to buildings' facades. Gaming-based uses can also be seen in media

facade system formation. People are integrated into the systems, and social unity occurs in the use of media facades for artistic and amusement-related purposes.

- Use for facade solutions purposes: Facade designs should be in a manner to answer user comfort parameters expected from the facades. The facade system should be built at the detail scale in a systematic manner.

3.2. Positioning of Facade

The relationship between the message and urban users is important for the formation of media facades. Based on the message to be reflected, delivering the messages to as many urban users as possible is an important criterion. Using media elements in the appropriate parts of facades and generating program areas provide data for filling urban gaps.

Positioning of the media facades was classified by Civic-Tovaric et al. (2011) as follows: (i) only on a facade surface, (ii) only on a certain facade surface, (iii) at a hierarchical level based on building height, and (iv) on all facades (Civic-Tovaric et al., 2011). Such positioning activities should be performed considering the building and urban data, and plans should be made accordingly. The street and its data, surrounding buildings, media facade designs, illumination, heights of trees, reflective surfaces and building usage function should be considered (Schoch, 2006).

3.3. Geometry

Media facade limits, sizes, and ratios are among the important parameters regarding media facade designs. Correct formation of the relationship between the perceptibility of the message, media facade, and the recipient is proportional to the size of the media facade. The limitations in sizing media facades can be flexible. Media facades can be used as two or three-dimensional. Although two-dimensional facades are mainly related to surfaces, three-dimensional facades are formed through the geometry of buildings. These facades have planar, unidirectional, or bidirectional alternatives via the inclined surfaces obtained through the geometry of buildings and facades. However, with the technology of the present time, the three-dimensional quality of media facades is formed through the structure of kinetic and mechanic elements. The third dimension added to the two dimensions increases urban users' perception level.

MegaFaces, designed by Asif Khan for Sochi Winter Olympic and Paralympic Games, is a media facade example with a three-dimensional structure and movement form (Figure 5). The purpose behind its design was to form a monumental value for the athletes as an equalitarian approach. The media facade of this building was structured to be eight meters in height in a way to reflect three portraits in each display. The building has a 3500% magnification rate compared to the face of The Statue of Liberty in the United States. The facade can have a 2.4 meters depth (maximum) as its three-dimension ratio (Khan, 2014).

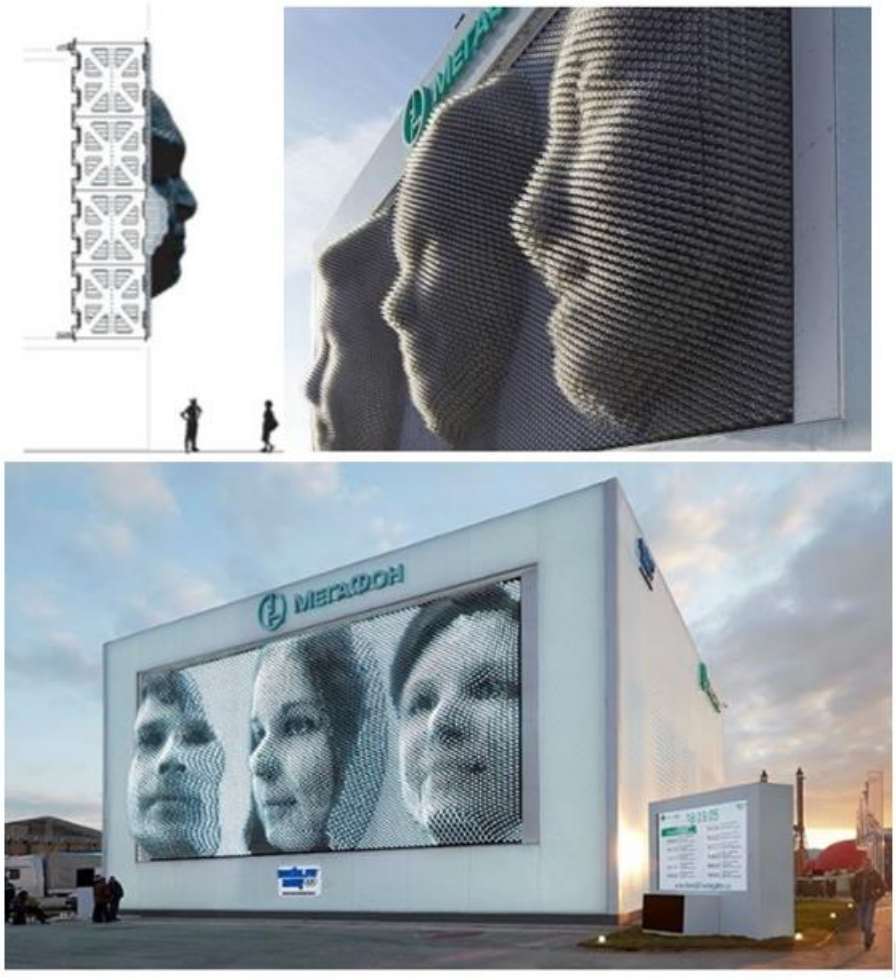


Figure 5 - MegaFaces media facade (Brykova and Sbytova, 2019).

3.4. Building Integrations

Designing formations should be generated considering the content, context, and time-related concepts of the building integrations regarding the media facades. The appropriate detailed solutions and data regarding visual perception are important for the practice. Building integrations should be assessed in the first stage of designing media facades (Schoch, 2006). Media facade-building integrations have three different approaches:

- These are the systems that are generated in a form to have their own carrier systems which are independent of the buildings. Within these systems, the focus is on visual perception regardless of the facade performance criteria.
- The systems established as the second layer on the facade cover the system working as curtain walls or double skin facades. Load transfer is ensured through the building carrier system.
- This system is used as the structure that is totally integrated into the building and forms the external envelope of the building. In addition to being structured as the whole facade

element, this system can be built by the parapets, opaque, or transparent walls. Load transfer is ensured through the building carrier system.

3.5. Effectiveness

The effectiveness of media facade designs shows great parallelism to the urban users. However, external factors such as the organization of the relationship with daylight, the occurrence of weather events such as fog, etc. during seasonal transitions, the relationship with the elements around, and the dominant seasonal conditions alter the effectiveness of media facades (Civic-Tovaric et al., 2011).

Media facades create an area of interaction in their contexts. Delivering the message in the area of interaction formed on media facades is an important criterion. Regarding the structuring of the interaction area, results may vary based on the effectiveness of media facades.

- Temporary media facade formations, special days and nights
- Permanent media facade formations at certain times of the day (those that are open only during night or daytime)
- Permanent media facade formations at all hours of the day (those that are open during night and daytime)

3.6. Illumination and Visual Comfort Data

Daylight factor is an important parameter for the creation of architectural spaces. The use of natural light in indoor areas should be considered the most fundamental requirement. Artificial illumination elements are used in places where natural lighting is not present or insufficient. However, such use increases energy consumption and building expenses. While creating the indoor comfort quality of media facades, light permeability should be focused on. In cases when daylight is required for indoor areas, transparent media facade formations should be considered. Based on the effectiveness of media facades, different media facades can be built in different terms as transparent, semi-transparent, and opaque.

The media facade of the Lagotronics building in Venlo (Netherlands), which forms a transparent surface during daytime, was designed in a manner to benefit from daylight at the optimum rate. At night, the media facade turns into a colourful surface and becomes opaque (Figure 6).

Figure 6 - Lagotronics media facade (URL-3).

Regarding the media facade designs, ensuring the balance between visual density and users' ability to obtain information (transinformation) is a significant parameter. A study by Lee and Sul mentions the impacts of visual intensity on media facades. Urban users may be disturbed by a certain level of visual intensity and have negative ideas about messages and communication in this regard. High visual intensity may create problems for building plans in terms of energy use and economy concerning sustainability. Accordingly, it becomes possible to establish a correlation between visual intensity and information transfer (Figure 7). Otherwise, failure in ensuring clear information transfer results in insufficient media facade performance (Lee and Sul, 2017).

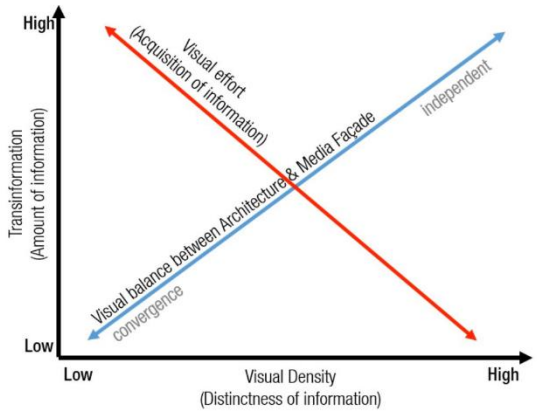


Figure 7 - Relation between visual density and transinformation (Lee and Sul, 2017).

Regarding the media facade illumination, neighbouring buildings, instruments, other illumination elements, water, and reflective surfaces are all important. Mutual illumination impact may be dazzling and cause the perception of impact. Transparent surfaces of other buildings on intense traffic axes may be dominant over the media facade illumination. In such cases, positioning regarding the visual illumination on media facades becomes an important design criterion. The perceivable environment of the media facade should be set, and factors that may harm the illumination system should be avoided. The data from the relevant literature indicate that the optimum distance to the media facade is expected to be set as 50 m - with the pixel rates of 750 x 19 (Lee and Sul, 2017) (Figure 8).

Figure 8 - The visual impact area of the media facades (Lee and Sul, 2017).

3.7. Physical Environment Control Components

Performing physical environment controls is an important criterion for media facade designs. Media facades constitute an artificial environment formation through their specific designing parameters. Accordingly, efforts should be made to ensure that the media facade does not affect the comfort conditions for users, and media facade components work appropriately in the building life cycles.

Media facades provide visual and auditory data by using electrical energy. Consequently, a certain amount of heat emerges while providing the data. Based on the effectiveness of the media facade, the amount of heat may be a problem for the energy conservation of the building. Moreover, reducing the impact of heat energy seen in hot climatic regions requires a great deal of effort. Excess heat causes inconvenient results for the comfort on an urban scale and the emergence of the urban heat island. High rates of heating cause problems that affect the performance of LED elements.

The presence of auditory formation on media facades can be regarded as a source of sound by the urban and building users around. Even if media facades are formed at appropriate sound pressure levels, users who may like to stay indifferent may be disturbed by the undesired music. While planning the media facade formation, urban users should be analysed, and sound propagation analyses should be performed for the building envelope. Assessing media facades formed on the buildings such as libraries, hospitals, working offices, sound recording studios, performance centres, and houses in terms of noise should be regarded as a critical criterion for auditory comfort. It is necessary to design and implement solutions that comply with the regulations and legal requirements.

A common use of electricity on media facades and the presence of electrical hardware on these facades is a risk for fire safety. Electrical hardware should be made using resistant materials and checked regularly. Avoiding the use of flammable materials on facade layers is among the most fundamental fire safety solutions. Forming the illumination elements on media facades by using polymer materials (flammable materials) is an issue for fire safety. Toxic gases and fumes emitted by facade materials when burned are the points to be considered. Use of these materials should be permitted following the regulation analyses (Yaman, 2020).

3.8. Sustainability

Two criteria come to the fore when media facade designs are reviewed about sustainability. One of them is to prefer sustainable materials, elements and systems used to form facades, while the other is to minimize the use of energy while using media facades. Because electricity use is at high levels on media facades, energy generation should be conducted through facades, or energy consumption should be minimized. As a passive designing principle, benefiting from daylight on media facades is regarded as an important design input. The use of the illumination with daylight in media facade designs as a homogeneous source of light in indoor areas as a result of certain procedures should be considered as a passive designing parameter. Forming dynamic elements, generation of double skin elements, presence of photovoltaic panel systems, and taking steps to improve the indoor comfort quality of climatic parameters reflect the value of media facades in terms of sustainability

(Abdou et al., 2017). In addition, in line with the principles of sustainability, the integration of technological advances into building life cycle phases has gained importance with the drive to overcome climate change and achieve the goals of reducing critical global energy consumption. The cost reduction in sensor detection and activation technologies and the widespread use of building automation systems make them usable and easily accessible for the built environment (Topak and Pekeriçli, 2021). This situation facilitates the use of media facades for sustainability and adapting them to architectural projects with holistic design approaches.

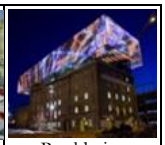
4. METHODOLOGY OF MEDIA FACADES STUDY

The fact that media facades are new in the field of architectural designs and practices makes the process of designing facades more difficult. The main purposes of this study are:

- to determine the parameters that will impact the process of designing media facade procedures which are irreplaceable in the digital age and will play a role in practicing these procedures,
- to discover how design-related parameters are distributed in the practices of designing media facades in Turkey through the control group (other countries),
- and to assess the analysed data and make relevant predictions to ensure that the media facade practices of the future can be guided.

This study employed the case study method, a qualitative research method where a single case or event is deeply and longitudinally examined, data are systematically collected and what occurs in real-life context is investigated. A literature review was conducted for media facades and designing-related parameters that will enlighten the designing and practicing periods were examined. Then the study population was determined using the criterion sampling method, following the determined goal. Criterion sampling consists of people, objects or events that have the relevant qualities for the examined problems and will provide a wealth of information (Büyüköztürk et al., 2012). Accordingly, a mixed sampling group with different building types was formed to sufficiently represent the media facade practices. Chanel Building, Allianz Arena, Dexia Tower, GreenPix, Kunsthalle Wien, Illuma Shopping Centre, and Rockheim were selected among the global samples mentioned the most with the concept of media facade. Regarding the case in Turkey, the samples were selected from the ones practiced in line with the reliable information obtained by manufacturing companies. Images, locations, years of buildings, and building functions regarding the media facades from Turkey and the control group which was examined in this study are presented in Table 1.

Table 1 - Media facade samples of control group and Turkey.

Media Facades Samples (Control Group)	**Building - City/Year - Building Function**							
		Channel Building C1	Allianz Arena C2	Dexia Tower C3	GreenPix C4	Kunsthalle Wien C5	Illuma SC* C6	Rockheim C7
		Tokyo/2004	Munich/2005	Brussels/2006	Beijing/2007	Vienna/2009	Singapore/ 2009	Trondheim/ 2011
		Commercial Building	Sport Building	Office Building	Assembly Building	Assembly Building	Commercial Building	Assembly Building
Media Facades Samples (Turkey)	**Building - City/Year - Building Function**							
		Kanatlı SC* T1	Viaport Outlet T2	Piazza SC* T3	MarkAntalya SC* T4	Atlas Park SC* T5	Iyaşpark Hotel T6	Mahall Ankara T7
		Eskisehir/2007	Istanbul/2008	Samsun/2013	Antalya/2013	Istanbul/2015	Isparta/2015	Ankara/2016
		Commercial Building	Commercial Building	Commercial Building	Commercial Building	Commercial Building	Hotel Building	Housing and Office Building
*SC: Shopping Centre								

Observational method was used to obtain detailed information about the media facade formations in this study. Being used as the first source of information for the criteria, this method is employed as a data collection method that is systematically prepared beforehand, sets its targets clearly, and observes a formation with relevant senses by using charts and/or scales (Kozak, 2001). Decisions on designing and using media facades were observed on 14 buildings, seven from Turkey and seven from the control group. Parameters regarding the design observed on the sampling were reviewed under the titles of the purpose of use, facade positioning, geometry, integration to buildings, effectiveness, illumination and visual comfort data, physical environment control components, and sustainability (Table 2).

5. EVALUATION OF MEDIA FACADES SAMPLES AND RESULTS

Researching and analyzing media facades through the sample groups from Turkey and the control group is important to reveal these countries' digitalization level, detailed know-how, and intellectual capital in this regard. The detailed designing parameters regarding the media facade formations, which are systematically prepared beforehand, whose purposes under specific titles are known, and which were examined through reliable literature are presented in Table 2.

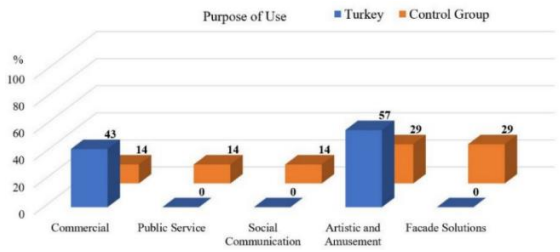


Figure 9 - Evaluation of purpose of use.

Table 2 - A comparative analysis of selected media facade samples.

		Purpose of Use					Positioning of Facade				Geometry		Building Integrations			Effectiveness				Illumination and Visual Comfort Data					Physical Environment Control Components						Sustainability	
																Temporary	Permanent			Light Transmission			Visual Density		Overheating		Auditory Comfort		Fire Risk			
		Commercial	Public Service	Social Communication	Artistic and Amusement	Facade Solutions	Only on a facade surface	A certain facade surface	A hierarchical level	All facades	Two-dimensional (2D)	Three-dimensional (3D)	Independent	Double Skin	Integrated	Temporary	Only Day	Only Night	Day and Night	Transparent	Semi-transparent	Opaque	Low	High	Yes	No	Positive	Negative	Yes	No	Use of Materials	Produce of Energy
Media Facade Samples / Control Group	C 1	✓						✓			✓		✓	✓					✓		✓			✓		✓		✓		✓		
	C 2			✓						✓	✓			✓	✓			✓				✓		✓	✓		✓		✓			
	C 3		✓					✓	✓	✓	✓			✓	✓			✓			✓			✓		✓	✓		✓		✓	
	C 4					✓	✓				✓	✓		✓					✓			✓		✓	✓		✓		✓		✓	✓
	C 5					✓		✓				✓			✓			✓		✓			✓			✓		✓		✓	✓	
	C 6				✓			✓				✓		✓				✓				✓	✓			✓	✓			✓	✓	
	C 7				✓					✓	✓				✓				✓		✓			✓	✓	✓	✓		✓		✓	
Media Facade Samples / Turkey	T 1	✓					✓				✓		✓						✓			✓	✓		✓		✓	✓	✓	✓		
	T 2	✓						✓			✓			✓					✓			✓		✓		✓	✓	✓		✓	✓	
	T 3				✓			✓			✓			✓				✓				✓		✓		✓	✓		✓	✓		
	T 4				✓			✓			✓			✓				✓				✓		✓		✓	✓		✓			
	T 5	✓			✓			✓			✓			✓				✓				✓	✓	✓		✓	✓		✓	✓		
	T 6	✓			✓			✓			✓		✓	✓					✓			✓	✓		✓		✓		✓			
	T 7				✓				✓		✓		✓					✓				✓	✓			✓	✓		✓			

Design-related parameters were reviewed in the form of the following articles by performing relative grading activities on the sampling group selected for the analysis:

Purpose of use: Results indicated that the media facade samples seen in Turkey were preferred for commercial, artistic and amusement-related purposes, and there was a balance distribution between the different intended uses seen in the samples from the control group. (Figure 9). Such a difference seen in the control group was found to have arisen from the difference in designing and practicing information at the intellectual capital level. Stewart defines intellectual capital as, "The intellectual material that can be included to the use to create value; in fact, it is information, intellectual property, and experience" (Stewart, 1997). The absence of different usage cases in Turkish samples indicates that media facade use does not occur within the context of intellectual capital. It is deemed necessary to review the media facade use in Turkey from a broad perspective rather than from the context of intense use solely in the fields of commercial, and artistic and amusement.

Facade positioning: The rate regarding the orientation to position the media facades used in Turkey solely on a surface was found to be high (72%), and the examples where all facades were positioned on a specific section at a specific height were found. In addition, there were differences regarding the positionings in the control group, and density was on a facade with an equal distribution (43%) with a direction covering all facades (Figure 10). What was found to be common as a result of this comparison was the common use of media facades preferred on the entrance facade and positioned on a single facade of the buildings. The important factor in the positioning media facades in the reviewed examples is that the purposes of the use of facades were appropriately organized with architects' aesthetic concerns.

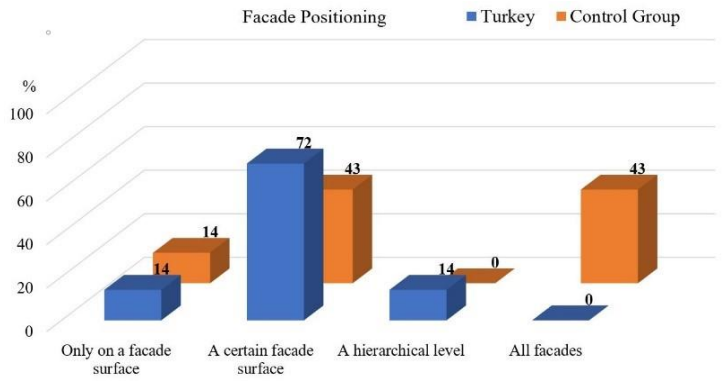


Figure 10 - Evaluation of facade positioning.

Geometry: All media facades from Turkey reviewed in this study were used as two-dimensional. However, regarding the examples from other countries, two and three-dimensional uses were more closely distributed, and two-dimensional facades were used more (Figure 11). Three-dimensional practices require information in terms of building information modelling systems. The creation of material and system designs should be enabled. There is a common belief that the use of three-dimensional examples will increase after the digital transformation in the architecture in Turkey is completed. The use of three-dimensional systems from two-dimensional systems greatly affects the principles of interior lighting/ventilation and media facade carrier. In this situation, the purpose of use and the dimensions of the building facade are effective. Additionally, media facades with an

inter-dimensional (2.5 D) system are also used today. (Tscherteu, 2008). Developing two-dimensional systems for Turkey and transforming them to the three-dimensional will be accompanied by the development of media facades.

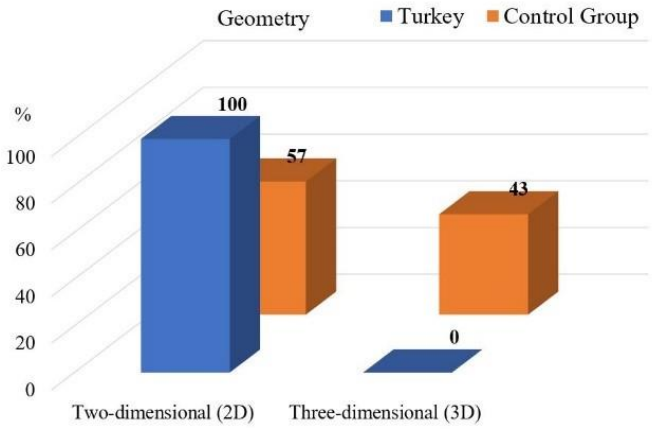


Figure 11 - Evaluation of geometry.

Building integration: Media facades used in Turkey were mainly used as the double skin (72%) and independent from the building (28%), and no integrated facade examples were found. Regarding the use in the control group, close rates were found in the facades designed to be double skin and integrated into their essences (Figure 12). Integration of media facades requires considering the relationship between the facade elements and buildings in the process of designing. Orientations regarding the building integration systems should be supported in generating the integrated design of media facade formations in Turkey.

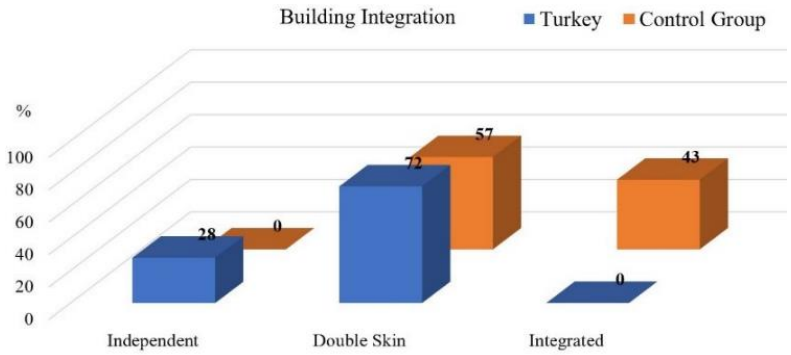


Figure 12 - Evaluation of building integration.

Effectiveness: Samples of media facade indicate night-day time and only night-time effectiveness (Figure 13). When the efficiency obtained from the media facades in terms of the transinformation in the lighting conditions is examined, it is noteworthy that the most appropriate period of time is used only night and day and night. This situation is observed in all samples and is supported within the scope of the literature review (Civic-Tovaric et al., 2011).

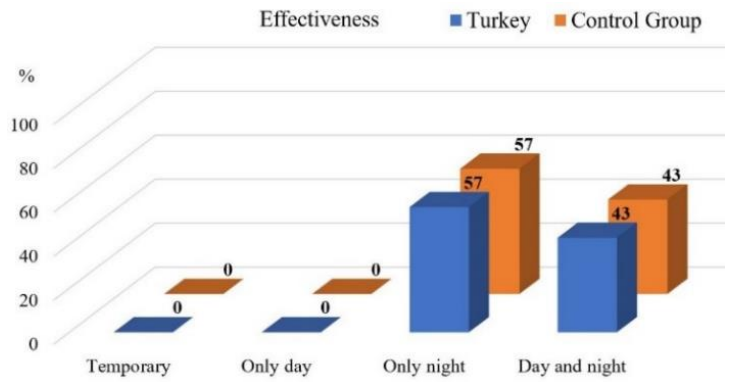


Figure 13 - Evaluation of effectiveness.

Illumination and visual comfort data: A review of the media facades used in Turkey indicated that visual intensity was almost distributed in a balanced form and media facades in other countries contained styles with higher visual density. High visual density increases the perception level and the users' attention. Concerning light transmission for illumination and visual comfort, only opaque examples were seen in the media facades in Turkey. Transparent, semi-transparent, and opaque forms displayed more proper distribution in the examples from the control group (Figure 14). The relationship between the media facades and building integration impacts the light transmission of media facades, and the formation of transparent media facades for integrated use is desired in terms of visual effects and illumination. Accordingly, the distribution in Turkey indicated that supporting the building integration systems was also effective in this parameter. With the developing lighting technologies (LCD-LED-OLED systems) and the colour syntheses (CMYK, RGB etc.) used, the light transmission and visual density on media facades are changing. This situation affects the visibility of media facades and affects the perception levels of city users (Gasparini, 2010). Turkey needs to use innovative materials and elaborate research on media facades.

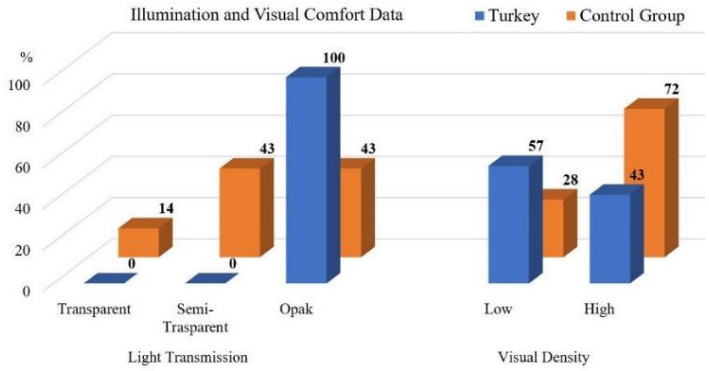


Figure 14 - Evaluation of illumination and visual comfort data.

Physical environment control components: Generation of the comfort conditions for facades in the lifecycles of buildings should be ensured with the most convenient analysis of facade details. A relevant review of the sample group indicated that the number of problems with extreme heating was limited, and these conditions were positive considering the outdoor noise level and indoor noise level of the integrated building (Figure 15). In the assessment of fire risks, materials'

flammability levels and the system's quality of accelerating the spread of flames and fume in a potential fire were investigated. Factors such as the used facade materials, facade geometry, and air-flow were analysed and evaluated in the context of the risk (Yaman, 2020). Accordingly, reducing the risk of fire on media facades is a primary target, and it is important to review and assess all physical environment control components as a problem.

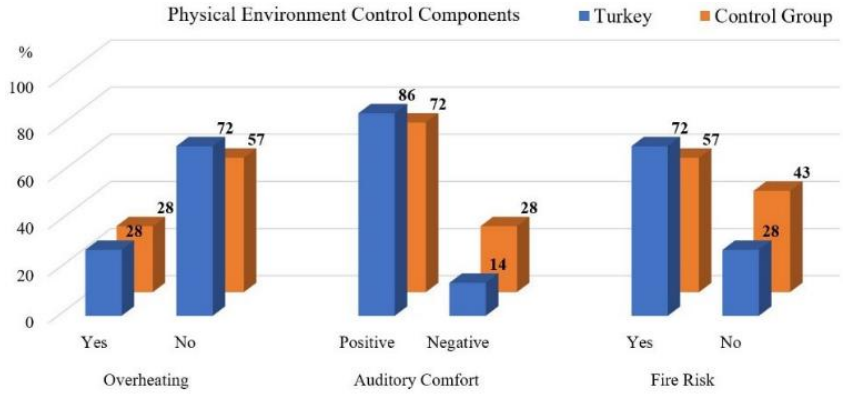


Figure 15 - Evaluation of physical environment control components.

Sustainability: The sustainability of media facade examples was examined under the topics of material selection and energy generation. Moreover, samples from the control group indicated that material use was common for ensuring sustainability, and the number of practices aiming to generate energy was quite limited, which supports the results achieved by other studies from the relevant literature (Abdou et al., 2017). However, regarding the examples in Turkey, approaches to sustainability were at a lower degree compared to other samples from the control group (Figure 16). Raising awareness of sustainable media facades in Turkey is important for the designs and practices.

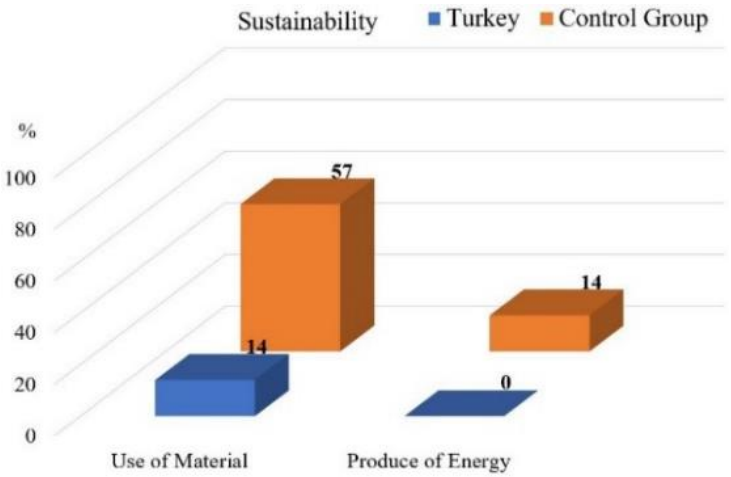


Figure 16 - Evaluation of sustainability.

As understood from the comparative analysis method performed in line with the parameters for designing media facades, MarkAntalya Shopping Centre and Iyaşpark Hotel display modern

attitudes in terms of media facades. The years of construction for the samples, which were deemed modern in the assessment, were found to be quite close to the present time. Moreover, this study creates intellectual capital and awareness to contribute to the development of media facades in Turkey and makes predictions on the transformation and development of media facades.

6. CONCLUSION

Building facades have been used as the instruments of communication throughout history, and with the developing technologies and computer systems, media facades have become one of the final points in terms of the intersection between the facades and instruments of communication. Media facades, which have advanced samples in developed countries, have constituted a great design input in modern architecture where a great digital transformation has occurred. The concepts of carrier, content, context, and time are important for the media facades that serve their intended use. The parameters of facade positioning, building integration, illumination, visual comfort data, physical environment control components, and sustainability, which are effective in the designs and practices of facades, should be decided at the stage of designing the building. The summary of the analysis results, the relevant data, and items are as follows:

- The commercial use and artistic and amusement-related content are present in the systems solely formed to capture attention, which is their purpose of use. As a result of the advancing technologies and studies on the concept of media facades, it is deemed necessary to improve media facades and generate intellectual capital in this regard.
- The most appropriate approach to positioning media facades and determining their geometry is to include media facades in the designing process. The integration between the buildings and media facades should be formed in the best way possible, and such integration should be assessed as a part of building integration systems.
- Care should be taken to ensure that the visual and auditory message is of appropriate quality and quantity. Suitable messages should be delivered to the necessary environmental areas and attention should be directed to such areas. Accordingly, architects, artists, engineers, communication experts, and sociologists should work together in generating the formation of media facades.
- It is very important for the building and urban users to establish the design parameters of the media facades under the physical structure of the building. Keeping the parameters regarding the indoor comfort conditions at the optimum values is particularly important for achieving efficient and regular results.
- Samples from the control group indicate that the systems integrated into the building have increased, innovation studies have been performed, and experimental samples have been found. Regarding the field of media facades, Turkey falls behind other global countries. According to the analysis of media facades in Turkey, systems that are subsequently added to buildings are dominant, and there are samples that are not present in the process of designing. The main reasons in this regard are that media facades are a fairly new field in Turkey, literature review and know-how about media facades are insufficient, and the formation of use and building integration systems does not have a planned form.

- Financial solutions should be generated as an additional rational design to the designing parameters of media facades. With the added value to be provided by media facades to buildings, cost analyses and long-term efficiency assessments should be performed.

The results of the comparative analysis conducted in this study showed that the parameters of effectiveness and physical environment control were similar in the samples from Turkey and the control group. However, assessments indicated that Turkey was at the beginning level in terms of other parameters compared to the control group. In the upcoming periods, it is expected to produce digitalization and technology-based solutions following the parameters of media facade designs following the developing technologies in the discipline of architecture in Turkey. Steps of designing and practicing media facades have been recently taken in Turkey. Formation of innovative designs, generation of designs integrated into buildings as systems, and occurrence of the next phases are among the possibilities. With the increase in the number of experts in the field, building integration systems and the generation of intellectual capital, and the rate of using media facades will increase in Turkey.

Conflict of Interest Statement

There is no conflict of interest for conducting the research and/or for the preparation of the article.

Financial Statement

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Ethical Statement

All procedures followed were in accordance with the ethical standards.

Copyright Statement for Intellectual and Artistic Works

In the article, copyright regulations have been complied with for intellectual and artistic works (figures, photographs, graphics, etc.).

Author Contribution Statement

A. Fikir / Idea, Concept	B. Çalışma Tasarısı, Yöntemi / Study Design, Methodology	C. Literatür Taraması / Literature Review
D. Danışmanlık / Supervision	E. Malzeme, Kaynak Sağlama / Material, Resource Supply	F. Veri Toplama, İşleme / Data Collection, Processing
G. Analiz, Yorum / Analyses, Interpretation	H. Metin Yazma / Writing Text	I. Eleştirel İnceleme / Critical Review

AUTHOR 1: A/B/C/E/F/G/H
AUTHOR 2: A/B/D/G/H/I

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