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Critical Perspectives On Media Architecture: Is It Still Possible To Design Projects Without Negatively Affecting Urban Nighttime Environments And Will The Future Remain Dynamic, Bright And Multi-Colored?

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ABSTRACT
Nowadays, due to advances in electrical devices, new digital media, lighting, information and communication technologies, cities are being used 24/7. The paper discusses critical aspects of Media Architecture in the context of public spaces as well as urban nighttime environments from the perspective of a practising lighting architect. The author examines recent issues of negative design approaches and presents proposals for improving future projects in the form of guiding principles. Additionally, to better illustrate the phenomenon, an attempt has been made to standardize terminology and to clarify the topic of Media Architecture in the context of artificial light used in the urban environment based on the author's practical and theoretical research work in the field.

Categories and Subject Descriptors
J.5 Arts and humanities: Architecture

General Terms
Design, Theory.

Keywords
Media Architecture, Environment, Exterior illumination, Urban lighting, Urban nighttime environment, Light pollution, Darkness, Lighting masterplan, Digital layer, LED, Media façade, LED display technology.

1. INTRODUCTION
The experiences of creating all kinds of illuminated advertisements played a significant role in the development of modern concepts of illumination of buildings, including Media Architecture. Already in the late nineteenth century New York's street frontages were overloaded with a decorative collage of words and images[1]. Most of them, however, were not visible after dark, until the advent of the first commercial electric advertisement on Broadway - a big sign welcoming people to the resort of Coney Island. A multicolored text made up of plain letters filled the greater part of the wall of the building. Newly invented electric flashers blinked six different lines of text composed of electric light bulbs in sequence. People were captivated by the format of this ad and surprised by the fact that they could see it from such a long distance[2]. The sign became a sightseeing attraction for both locals and tourists. For the first time media was "communicating" its message to the public in the physical surroundings of the streets and buildings of New York City. Within a few years, Broadway and Times Square were transformed into the most important American market of outdoor advertising[3]. Soon, to attract the attention of wealthy, well-educated passersby, traders were spending thousands of dollars to illuminate the name of their company[4]. Streets turned into centers focusing not only on trade and commerce, but also became a kind of cultural hub - theaters, concert halls and luxury hotels were adjacent to each other[5].

Time Square also became something of an ancient agora, a place of assembly, where news was awaited in the form of illuminated newspapers which reported on the results of the presidential election, baseball matches and the inauguration of the next New Year. Over the years, illuminated electric signs gave the town a unique visual identity and a new form of existence - exclusive nightlife. The street became an exciting place just after dark, a magical show of color and light. Advertising for Broadway shows "grew" over all facades and rooftops around the square[6]. Even on Sunday evenings, when the theaters were already closed, crowds walked up and down Broadway to look at the latest dazzling light shows that so strikingly resembled the cinema. These animated signs evoked a similar type of visual wonder and exaltation as the fireworks shows during the first World Fairs.

While travelling to New York in 1924, Erich Mendelsohn, one of the leading German architects of the modernist era, described his experiences and fascination with the lighting spectacle in Manhattan:

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"Uncanny. The contours of the building are erased. But in one's consciousness they still rise, chase one another, trample one another. This is the foil for the flaming scripts, the rocket fire of moving illuminating ads, emerging and submerging, disappearing and breaking out again over the thousands of autos and the maelstrom of pleasure-seeking people. Still disordered, because exaggerated, but, all the same, full of imaginative beauty, which will one day be complete"[7].

When electric bulbs, controlling devices and electric circuits developed with time (like LED light sources and illuminated "pixels" today) the production cost of electric signs became cheaper. This permitted architects and designers to create bigger and more complicated advertising signs with gradually more complex moving forms put onto the building façade.

To put it colloquially, today, "painting with light" requires highly specialized knowledge of many still developing disciplines. Considering light architecture as akin to media architecture, the standards that were once widely accepted and used are no longer allowed. An example would be the great illuminations New York skyscrapers implemented in the twenties and thirties of the twentieth century, which are completely unacceptable today. Then, a "shooting up" illumination amazed people and was something the designer could be proud of. Today, however, it would probably even cause embarrassment because the projects would be considered non-ecological, leading to excessive light pollution, and, in addition, consuming a lot of electricity.

Nowadays, a similar situation is being repeated. Many contemporary creators of Media Architecture (architects, artists, designers, interactive technology specialists etc.) do not consider at all the consequences that their actions may bring in the future. That is why it is so important at the beginning of this new, emerging field of design to start to pose the right questions about what its future and direction of development will be? Which criteria should be subordinated to the correct design solutions? Should there be an official body that would become the guardian of quality of created and delivered solutions for Media Architecture? This paper hopes to raise specific questions and find answers to challenges as well as present forthcoming possibilities.

2. DEFINITIONS

Most of the definitions associated with use of artificial light in urban environments and cited in literature, including Media Architecture, do not always reflect the full meaning of the terms used as this is such a new design discipline. There is a lack of established theoretical background research work, hence the effort to standardize terminology and to clarify the topic to better illustrate the phenomenon. The presented definitions are the author's proposals based on over 10 years of practical and theoretical research work in the field[8].

Exterior Illumination - deliberate use of artificial light originating or acting from outside in both the built and natural environment to achieve functional requirements and/or aesthetic effect.

Urban environment lighting - group of the outdoor urban elements (boundaries, gateways, nodes and places, districts, pedestrian and vehicular routes, buildings, structures, landmarks, soft and hard landscape elements, way finding, advertising, media architecture, light art as well as event lighting) illuminated by the means of artificial light at night These elements are part of the "mental map" which makes the nighttime environment recognizable and easy to navigate. Illumination helps to make the space/site understandable after dark and give it a unique identity. In order to define a comprehensive vision of exterior illumination for future developments of the whole or selected parts of the city an urban lighting masterplan should be put in place. Typically, this has the form of a document supported by graphics, tables and charts which serves as a guide for lighting designers, engineers, electricians, architects and other project team members. It provides detailed analysis of existing lighting conditions along with suggestions for improvement and proposals for saving energy. It also defines problems related to sustainability, ecology and environmental protection. It sets standards and criteria for implementing lighting, and organizes and creates a hierarchy of design priorities.
Project examples:
Lighting Masterplan for Trafalgar Square, London/UK[9], author: Speirs + Major;
Lighting Masterplan for Gardens by the Bay, Singapore/SGP[10], author: Kaoru Mende + Lighting Planners Associates;

Light Architecture (STATIC) - field within Exterior Illumination which officially began at the end of the 1960s with the establishment of International Association of Lighting Designers (IALD). Generally concerned with the permanent artistic illumination of new and historic buildings and structures emphasizing their aesthetic qualities via the projection of a light beam from a luminaire onto the surface. This is in contrast to the temporary use of lighting during events. Artificial light, being a technically difficult medium, requires mastery of diverse and constantly evolving disciplines. Similarly to architecture of buildings, it combines art and science and includes additional practical knowledge from disciplines such technology, ecology and business, going far beyond the aspects of visibility and horizontal illumination levels that were previously the domain of electrical engineers. Light Architecture is created both by lighting architects and architectural lighting designers.
Project examples:
The Louvre Pyramid, Paris/F[11], author: Claude R. Engle;
Erasmus Bridge, Rotterdam/NL[12], author: Lighting Design Partnership (LDP);

Media Architecture (DYNAMIC) - a new emerging field within Exterior Illumination, where dynamic graphics, text, image and spatial movement are displayed on elements of the built environment, usually architectural structures and buildings within public spaces. It has the capacity for adaptation and interaction with users by the application of modern digital technologies. The main function of media architecture is to "communicate specific information" in an active, dynamic and interactive form. Media façades and digital outdoor media screens emitting light are a vital component of media architecture and the digitalization of cities, forming part of original and intellectual enrichments of the urban environment with cultural, social and economic implications for the immediate surroundings. It is usually of permanent nature, but can have variable, temporary content.

Project examples:
The Chanel Ginza Tower, Tokyo/J[13],
author: Matthew Tanteri + Assocs., New York;
Kunsthaus Graz BIX Façade, Graz/A[14],
author: realities:united;

Light Art (STATIC / DYNAMIC) - a form of visual art where the main media of expression is an artificial light installation

inside the building, outside on its facade, or as an intervention in the landscape. The contemporary idea of light art developed with the progress of artificial light sources and experiments carried out by modern artists. This art form flourished in the 1960s and the work of artists such as Dan Flavin, Bruce Nauman and James Turrell, who formed light sculptures using linear fluorescent or neon lamps, were noticed internationally. Today, many artists use light as a medium in their artwork. Olafur Eliasson, Yann Kersale, James Turrell, Jenny Holzer and Keith Sonnier are just some examples. Light art can be used as content for media façades and Media Architecture.
Project examples:
Twilight Epiphany Skyspace at Rice University, Houston, Texas/US [15], author: James Turrell;
Nuit des docks, Saint-Nazaire/F[16], author: Yann Kersale;

Event lighting (DYNAMIC) - the purpose of lighting for temporary events varies from those of urban and architecture. Here the aim is that the performance will ideally leave a strong and long-lasting visual impression. There are various events that use lighting to enhance the emotional impact on the viewers:

• World Fairs - since their early beginning at the end of the XIX century, light shows and illumination of architecture have been a part of international exhibitions. These international events are typically held every few years, in varying parts of the world, and last a few months. The first World Fairs displayed technical inventions and advancements, including Edison's early light bulb. Later, their focus changed and they now cover everything from cultural exchange to national branding.
Project examples:
Panama-Pacific International Exposition San Francisco 1915[17],

• Son et lumière/Sound & Light Shows - is a form of nighttime entertainment that is typically presented in an open-air location of historic importance, where special projections onto the façade of a building, structure or ruin, a laser show and fireworks are synchronized with recorded or live narration and music to emphasize the history of the place.
Project examples:
Space of Freedom 2005, at the Gdańsk Shipyard/PL[18],
author: Jean Michel Jarre

• Urban Light Festivals - usually organized as annual event, often based on religious tradition. Many cities use seasonal darkness as an opportunity to celebrate light by holding festivals that last a few days and exhibiting beautiful temporary lighting installations. This includes illumination of buildings, light art and projections, recently as 3D mapping throughout the urban center allowing visitors and inhabitants to walk through the cities at night and experience them after dark in a completely new way.
Project examples:
The Fete des Lumieres (Festival of Lights), Lyon/F[19],
author: City of Lyon & annually invited artists;

• Open-air Music Concerts - considered to be large-scale concerts, featuring one band or different musical performers, sometimes including orchestras. They typically last from one to two or more days and attract very large crowds. With the development of new lighting technologies, employing stage lighting designers to "compose" an extraordinary, memorable music and light show on the stage became a must.

Project examples:
The Rolling Stones - Hyde Park/US[20],
author: Patrick Woodroffe;

• Openings and Closing of Olympic Ceremonies - through a well-choreographed visual show with music, dance, an artificial light show, fireworks, performances and digital projections, the opening and closing ceremonies invite the spectators to learn about the culture of the country in which the Games are taking place.

Project examples:
Opening and closing ceremonies for the London 2012 Olympic GamesLondon/UK[21],
author: Patrick Woodroffe;

3. CRITICAL ASPECTS OF MEDIA ARCHITECTURE

The following critical aspects of Media Architecture have been identified in order to highlight recent issues of negative design approaches and present proposals for improving future projects:

3.1 Lack of regulations and guidelines concerning brightness, motion and use of colour in the media architecture elements in urban spaces.

Throughout history a public space has been a flexible area open to diverse uses for communities to gather for historical, religious, social and cultural occasions or events. As soon as designers creating Media Architecture were given the new wonder of LED technology, which allowed them great flexibility and freedom in the use of this innovative medium, we found our cities awash with digital movement and colour in a way that creates a visual cacophony after dark and brings to mind a scene reminds sequence from a futuristic film. The affordability of technology has led to a new nocturnal experience of the XXI century city with a transformed urban nightscape with enormous media presence, often independent of the architecture and function of the urban area.

Due to the fact that this is such a new creative field and the complexity of the issue and the number of factors involved, there are, as yet, no regulations concerning motion and use of colour in media architecture in Europe. The problem of brightness has been addressed by the international community and currently all 28 member countries of the European Union should apply standard: "EN 12464-2 Light and lighting. Lighting of work places. Outdoor work places". Unfortunately, however, this document provides guidance rather than specific solutions, which means that the designer has total freedom to explore new techniques and use innovative equipment. This standard includes important recommendations on how obtrusive light can be limited in order to keep our night sky free of light pollution and includes a definition of Environmental zones. In addition, recommendations for good lighting practice to meet the needs for visual comfort and performance and all usual visual tasks are considered. Sadly, in practice, assessment of exterior lighting installations based on the environmental zones and the enforcement of standards in design practice when evaluating intrusion of light and approving lighting installations rarely takes place.

3.2 Impact on urban settings - nocturnal experience of a city

There is a long tradition of debate on the aspects of legibility in the urban settings. This change in the way of understanding the city which was initiated in the sixties turned out to be the key to today's concepts of lighting masterplans. As cities are highly complex urban organisms which are divided into districts (highlighted areas in the city due to the morphological structure or way of use). This reinforces the need to apply a strategy that will enhance the legibility not only by day but also after darkness. Well-designed and intelligently applied illumination has tremendous visual power. It can assist in revitalising urban environments[22] by signaling animation and activity and by enhancing existing perceptions of locations or buildings. At night, artificial light can make a city safer and more secure. But it also has an important aesthetic function. Often, as the starting point for contemporary projects of nighttime illumination of the city, Kevin Lynch's work is used[23]. According to his theory, when creating guidelines for nighttime illumination, elements which order the space, such as edges, paths, nodes, landmarks and districts, should be taken into account in a lighting masterplan. Lighting designers complement his approach with some additional elements like gateways, routes, landscape, location of a building in the urban and historical context, existing lighting and use of space/patterns of activity. Nighttime illumination of all these elements, which can be seen as connected "layers of light", influences the perception of urban space as well as the atmosphere and quality of life in the modern metropolis. They are part of the "mental map" (a generalized mental picture of the external physical world) which makes the environment familiar and easy to navigate. Therefore illumination should clearly articulate their form and highlight their visual identity.

Although the nocturnal landscape of the city is based on the composition of lit urban forms, the essence of a well-designed lighting masterplan is its continuity. The designer of single building illumination must, therefore, move away from thinking in terms of an isolated object. According to Lynch:"Nothing is experienced by itself, but always in relation to its surroundings" [24].

Selectively and sensitively illuminated buildings and the vistas to and from them can be enlivened and celebrated for their design and layout. But without a proper strategy in the form of a lighting masterplan this power can never be sufficiently controlled. An example being downtown area of the city of Baku/Azerbaijan, were there is complete lack of visual hierarchy as every façade of a building is illuminated in the similar manner with the same colour temperature and brightness[25]. Until these guidelines are formulated, the imbalance between the various elements of the nightscape will continue.

3.2.1 Lack of visual hierarchy of buildings in urban nightscape – legibility and image of city

Inhabitants and visitors are often much more comfortable in cities during the day than at night. Fortunately, well-designed exterior illumination after dark permits them to find their way around by identifying familiar landmarks and makes it possible for them to recognize the scale and dimension of the space they are navigating. It also supports the clear recognition of other people around them. As the technology for Media Architecture is widely available and so much more affordable than 10 years ago, there is a a risk that every new development will have more than one media façade to attract potential customers. After dark, when there is visual clutter and no hierarchy of buildings in the urban nightscape, many of these clues vanish and recognition can become reduced, leaving people feeling confused and lost.

Appropriate illumination of vertical planes on building façades is especially important for pedestrians, as they occupy a large percentage of their field of vision and, at the same time, allow recognition of a space[26]. Therefore, the nocturnal appearance of an area and its character is determined by the buildings located in it.

The main tool for creating visual hierarchy of buildings in the urban nightscape is lighting contrast. It highlights the key areas of presented architectural compositions after dark and is an essential tool for revealing form. Skilful dosage of contrasts allows the relative importance of individual components of the composition to be identified and determines the illusion of their distance from the observer. In exterior illumination this is defined by the intensity of artificial light, creating the impression of bright and dark surfaces. It is the surface brightness of a building as compared with unlit or at lower brightness areas at night which is a fundamental problem in nighttime perception. Too much light applied on buildings at night can significantly obstruct visual perception as well. Lower light levels are more likely to show the architecture, provided that the appropriate brightness ratio is established. While the first lighting designers used contrast in an intuitive way, studies today identify possible obtainable results quite precisely. The following Table 1 indicates the values of Luminance Contrast Ratio, which defines brightness of the object to the brightness of the background in such a way as to achieve a specific visual effect. In order to make an object stand out from its background, the brightness must be a minimum of two times greater, because the human eye is constructed in such a way that it is not able to notice difference if the brightness is less than twice as great.

Table 1. The Effect of Luminance Contast Ratio by Chartered Institution of Building Services Engineers (CIBSE) [27]

1:1	Not Noticeable
1:3	Just Noticeable
1:5	Low Drama
1:10	High Drama

3.2.2 Lack of integration with architecture (empty buildings)

Despite growing awareness of exterior illumination, there are still many random solutions in which the project of architecture and design of illumination are not consistent and pleasant. Therefore, these guidelines should be built into architecture where possible at the early stage of design, preferably at the conceptual phase. They shouldn't be viewed simply as engineering additions that can come later when they are often subject to compromise or are of inappropriate aesthetic design. Every building should be looked at and analysed initially in its own right and then in its context. Establishing a suitable relationship between a building and its illumination, between its nighttime and daytime appearance, is an

exciting challenge which should be thought through in detail.

Night time illumination of a building should give clear understanding of its function to help in visual legibility after darkness falls. Unfortunately, increasingly this is not the case. In certain urban environments such as Time Square in New York City or Piccadilly Circus in London, naming only few such examples, the property owners no longer rent their assets as offices or apartments, as the revenues generated by renting the frontages are far greater and easier to obtain than having tenants. Also, the overall brightness and light trespass does not allow residents to sleep. In such case architecture is losing its primary function – to be a shelter. Buildings are empty 24/7, hidden behind "luminous curtains". Such a façade is deprived of character and the function it initially had. Moreover, the overall brightness also leaves very little space for any other illumination of the architecture on the site. This approach creates chaos and lack of visual order.

3.3 Impact on natural environment

3.3.1 Light pollution

Light pollution is unnecessary, misdirected or obtrusive artificial light - a side effect of industrial civilization. It is present especially in large urban areas; it is most severe in highly industrialized, densely populated areas of North America, Europe, and EastAsia[28]. Pollution of this type makes it difficult to observe the astronomical sky, and has a negative impact on flora and fauna which have adapted naturally to life during the night; it can also have adverse effects on human health. The resulting phenomenon is mainly due to the operation of inefficient street lighting, advertising, illuminated sporting venues and other architectural objects, including Media Architecture and event lighting.

The luminance of Media Architecture is relatively insignificant during the daytime, especially when it is sunny. In order to be visible, its output must be very high. Unfortunately, very often its luminance is not reduced or switched off at night. To avoid the negative effects of light pollution and light trespass, CIE/ ILP defined the base for a well-designed external illumination (Tab. 2). These relate to such issues as acceptable levels of sky glow, light trespass into the windows of the façade and permissible average and maximum luminance of the façade. These should be also taken into consideration while designing Media Architecture. According to the guidelines, there are five environmental zones:

Zone E0 - protected – UNESCO Starlight Reserves, IDA Dark Sky Parks

Zone E1 - naturally dark landscapes - National Parks, Areas of Outstanding Beauty

Zone E2 - low brightness zone - small villages or relatively dark urban areas

Zone E3 - average brightness zone - small urban centers and urban areas;

Zone E4 - high brightness zone - town and city centers with high levels of activity at night.

Environ-mental Zone	Sky Glow ULR [Max %]	Light Intrusion (into Windows) Ev [lux]		Building Luminance Pre-curfew
		Pre-curfew	Post-curfew	Average, L [cd/m^2]
Zone E0	0	0	0	0
Zone E1	0	2	0	0
Zone E2	2.5	5	1	5
Zone E3	5	10	2	10
Zone E4	15	25	5	25

Table 2. Obtrusive Light Limitations for Exterior Lighting Installations by CIE/ ILP[29]

ULR = Upward Light Ratio of the Installation is the maximum permitted percentage of luminaire flux that goes directly into the sky.

Ev = Vertical Illuminance in Lux - measured flat on the glazing at the centre of the window.

L = Luminance in Candelas per Square Metre (cd/m^2)

Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by the local planning authority. If not otherwise stated - 23.00hrs is suggested.

3.3.2 Flora and fauna

Studies conducted so far show that lighting installations (including Media Architecture) impact negatively on flora and fauna which have adapted naturally to life during the night[30]. Artificial lighting primarily interferes with the functioning of living organisms such as birds, fish, insects or bats. Excess artificial light, particularly visible light of different wavelengths can have a huge impact on the lives of nocturnal species upsetting their circadian rhythm. The preference of animals and insects for nocturnal activity may result from factors such as avoidance of predators, heat aversion, safer feeding or reproduction. Consequently, the color and changes in the intensity level of ambient light at night can lead to problems with reproduction, avoidance of suitable habitats and changes in seasonal migration routes, and even to a reduction in numbers and extinction of certain species[31]. As for flora, night lighting can have an effect on the shape of their leaves, their pigment, bud dormancy, the time when a tree drops its leaves in autumn or root system growth [32].

3.3.3 Global warming

Global warming is a currently observed phenomenon of climate change. It is caused by power plants which, as waste, produce large amounts of carbon dioxide and other by-products[33]. While many greenhouse gases occur naturally, human activity, including exterior illumination over the past 50 years, has repeatedly increased their level[34]. Global warming causes the climate to change and describes the increase in the earth's average temperature due to the build-up of greenhouse gases in the

atmosphere from human activities. Warmer global temperatures in the atmosphere and oceans are affecting rainfall patterns, storms and droughts, growing seasons, humidity and sea level. Climate change impacts more than just a change in the weather; it results in seasonal changes over a long period of time. It can affect many related aspects of where and how people, plants and animals live, such as food production, availability and use of water and health risks. Fearing visible and future climate change, governments around the world are looking for ways to reduce greenhouse gas emissions and the consumption of fossil fuels (coal, oil and natural gas) for electricity generation.

3.3.4 Energy consumption

In the context of exterior illumination, application of effective, efficient lighting is one of the first steps towards reducing energy consumption and the production of greenhouse gases. It turns out that about 30% of all U.S. outdoor lighting is directed at the sky, leading to a $ 2.2 billion loss[35]. This wasted light is wasted energy. As regards Media Architecture, some systems need a large amount of electricity to run, especially if they are used around the clock. Therefore, usage hours should be reconsidered and adjusted according to the time of day, season or special events.

3.4 Impact on human health

3.4.1 Increase in traffic accidents due to location of media architecture

Because the technologies used by Media Architecture are relatively recent, and for the reason that they have developed rapidly in key performance characteristics such as brightness, resolution, motion, colour, etc. and have become much more affordable in recent years, their impact hasn't been thoroughly studied. However, research conducted in the last 10 years which links the presence of electronic signage and advertisements with an increase in traffic accidents and lower road safety should be looked into[36]. As the latest LED technology enables the displaying of full-motion, real-time videos and graphics as well as sound, they are increasingly capable of "interacting" with approaching drivers, cyclists and pedestrians. "A distracted or inattentive driver is likely to have delayed recognition or no recognition of information necessary for safe driving"[37]. Too much visual clutter at or near intersections can lead to traffic accidents.

Therefore, safety information should have the highest priority. Moreover, it's commonly known that bright lights and visual change, especially at night, can draw the eye to an object that is brighter than other objects in its surrounding field of view (Phototaxis)[38]. Extreme brightness can not only cause disturbance but also compromise dark adaptation in elderly people, something which is important for viewing from long distances.

3.4.2 Artificial light at night (ALAN) and light trespass

Artificial light at night (ALAN) is a rapidly increasing phenomenon and it is acknowledged to have worldwide consequences[39]. Light at night has been associated with health problems in humans as a consequence of altered natural day and night biological rhythms. Light trespass is a common occurrence in the city at night time; it involves the "leak" of artificial light beyond the property or area that is illuminated, when spill light from a streetlight, illumination of architecture or advertisement enters a window and illuminates an indoor area.

Latest scientific medical research reveals that human health and wellbeing are profoundly affected by the intensity and different colour spectrum of natural light. In the morning there is a high intensity of blue (400-500nm), while in the late afternoon and early evening there is red and orange (600-700nm). In the late evening and at night humans need complete darkness or red wavelength light. Particular wavelengths of natural light during the day and night activate different sets of hormones and determine biological and biochemical activity of the human body and regulate natural circadian rhythm. So far, little is known by the general public about the non-visual effects of light. In 2001, a group of scientists at Thomas Jefferson University, the Department of Neurology, USA[40], identified a new photoreceptor type in the eye (ipRGC - intrinsic photosensitive retinal ganglion cells) which is different from rods and cones. This group of newly discovered cells is responsible for regulating the internal circadian clock in humans. These cells are sensitive in the blue light region of the spectrum [460-500nm]. When humans are exposed to white or blue light at night (the light produced by current LEDs and Compact Fluorescent Lamps [CFL]), the ipRGC sends information to the brain to stop the production of melatonin. This in turn adversely affects the immune system and triggers numerous biochemical processes. Melatonin production also significantly affects the regulation of anti-cancer (NK) and anti-germ (B) cells[41]. Humans require a properly functioning circadian rhythm and appropriate melatonin levels in order to repair and rejuvenate body tissues at night. Therein lies the problem; humans spend considerable amounts of time under artificial light sources, including outdoor spaces that cannot mimic the spectral content and levels of illumination of natural light.

3.5 Impact on the concept of national and regional identity, tradition and history of a place

More than half of the world's population at present lives in towns and cities and this figure is set to increase to 75 percent by the year 2050. This means they should still be designed for people[42].

Even though media architecture expands public space and generates new backdrops for existence in the metropolis, it's difficult to forget that human beings evolved in certain specific locations and have their own identity, tradition and history. What makes certain urban cities special and differentiates, for example, London from Paris, Berlin, Stockholm or Tokyo is their individual character, use of local building materials, architectural styles, how the city is used etc. These were designed and evolved locally.

Nowadays when renowned architects put forward their architectural or urban proposals, they look at the context of a place in the daytime. Why should this be different with Media Architecture at night-time? Globalization is affecting different parts of our lives, but will humans ever be ready for a global design solution for cities? Perhaps Media Architecture should relate more to its environment and not act as a showcase to another world, detached from place and time. Therefore in sensitive areas like historical centres such interventions should not be allowed as permanent installations.

3.6 General recommendations for improvement in the field of Media Architecture.

• Improvement of existing and creation of new standards and regulations with regard to Media Architecture.

• Media Architecture should never be considered as a stand-alone element of the urban environment but as an important part of a larger urban context. Therefore, its location should be integrated into a lighting masterplan.

• Yearly operational licences to evaluate Media Architecture, including its locations, content and performance characteristics could be introduced. This would permit the municipal authorities or any other decisive body to oversee its operations. Owners could be granted a license to operate a sign for a year and would have to renew the license if they wanted to alter the approved content or any of the performance characteristics.

• Avoidance of placing elements of Media Architecture such as media façades near intersections or other "busy traffic spots" to reduce distraction and promote better detection of traffic signs and other objects relevant to the driver's task. These elements are usually located on building elevations, at ground level closer to the approaching driver and placed at angles (especially on the corners of curved buildings) that may involve unnecessary head movement and eyesight effort.

• To minimize the negative effect on the environment, flora, fauna and human beings, it is necessary to control the overall level of illumination. A flexible lighting control system with a built-in astronomical time clock facility which can guarantee the right illumination at the right place at the right time should be employed. This uses location data such as latitude and longitude and also has a mechanism for the upgrade of the date and time of the year. Based on this information, it enables and disables the external lighting. After midnight (or some other specified time) the level of light intensity should be reduced or turned to "0" so that the potential negative impact on the urban environment can be greatly alleviated.

• No urban building or structure should have Media Architecture applied without reference to and thorough analysis of the context of a particular place.

• The content of media façades should be designed with the tradition and history of the place in mind.

4. CONCLUSION

As Media Architecture is expected to become an "increasingly important digital layer in cities all over the world"[43] in the near future and new technologies such as LEDs become more and more available due to their lower cost, left unrestrained it might create visual chaos in our urban environments.

If property owners are allowed to install this new medium without any constraint as lettable wall surfaces for advertisements with any possible content, a nighttime landscape of the city which resembles a combination of the cult films Blade Runner[44] and Metropolis[45] might be created. Such examples are already visible in Times Square of New York City or London's Piccadilly Circus where buildings are losing their previous function of being a shelter and becoming instead an empty shell created with a façade of "digital bricks"[46]. It must still be possible to design cities, allowing for diversity, but also at the same time creating balance and visual hierarchy.

Despite growing awareness of the external use of this new phenomenon, there are still many solutions that are completely random, in which the project of building architecture and design of Media Architecture do not form a cohesive, harmonious whole. Historical background and context of a place should be considered. Projects designed for Asia might not fit particularly well in historic parts of Italian cities etc. Also, in order that unique projects of Media Architecture can be admired in the same way as the first illuminated signs in Times Square, they need darkness in the immediate surroundings to be able to stand out. This darkness is also an important aspect as far as our nighttime skies, nocturnally active flora and fauna as well as our own well-being and safety are concerned.

One of the ways to minimise such negative issues might be for cities to implement lighting masterplans developed by professional independent lighting designers and commissioned by city representatives. After a thorough study of the city by day and night, they would set a number of important principles to be followed. Documents in the form of a set of guidelines would be helpful to lighting designers, engineers, architects (including media architects) and other members of the design teams responsible for the external illumination of cities and would give guidance on how to deal with problematic issues. These documents would also support planning authorities when new applications for Media Architecture are submitted.

In spite the fact that digital media are an exciting, new visual tool, a broader normative debate about what good practices in media architecture should consist of, with regards to the environment it operates in, should be considered.
As majority of people don't want to live in digital cities all the time, the words of visionary Andy Warhol might be very suitable today in the context of Media Architecture:

"The best, most temporal way of making a building that I ever heard of is by making it with light. […] If you build buildings with light outside, you can make them indefinite, and then when you're through with using them you shut the lights off and they disappear"[47].

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