**Lighterials in architectural design**

An investigation of designers’ perceptions of light-emitting materials as architectural forms and an empirical study of how these could influence architectural design.

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A thesis submitted to the Bartlett Faculty of the Built Environment, University College London (UCL)
In candidacy for the Degree of Doctorate of Philosophy, Department of Architecture

London, March 2013
I, Vasiliki Papakammenou confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.
Abstract

This research offers a new approach to architectural design by suggesting that artificial light could be included in the architect’s conceptual toolbox. An exploration of the lighting techniques currently used in interior design shows a direct connection between artificial light and architectural design. This is followed by an investigation of innovative lighting applications that are based on new materials. These materials either emit light themselves or can be connected to light in different ways to radiate light. For this thesis the word *lighterials* has been coined to distinguish them from opaque, non-light-related materials. After *lighterials* have been accepted as an architectural group of forms, the architectural space is analysed in terms of its most important elements with reference to artificial lighting and interior architecture. Within this scope a new element, poetics, is introduced, bringing the two design fields even closer together.

The question is asked: How can *lighterials* influence architectural design, including the poetics of a space? The question is tackled by three different studies, a pilot study, a case study and interviews, which employed architecture students, lighting design students and professional architects respectively. The first study provides information about future trends around *lighterials* and the second about how lighting designers could use *lighterials*. In the third and main study, using the methodologies of think-aloud protocol, structured interviews and questionnaires, the architects indicate through their use of *lighterials* in design how *lighterials* could influence architectural space and its poetics.

From analysis of these studies it is apparent that these new lighting applications have the potential to completely change or to enhance an architect’s design. Further, the incorporation of *lighterials* in design can dramatically change the user’s experience of a space. In its examination of new characteristics of light as architectural form this research offers a unique contribution to the field.
Acknowledgements

I would like to thank UCL and especially the Bartlett School of Graduate Studies for the opportunity they gave me to research a subject for which I have a great passion. I would like to express my gratitude to my supervisor, Dr Kevin Mansfield, for the guidance and support in all stages of this work, and also my second supervisor, Peter Raynham, for being there for me when I needed his opinion.

A number of colleagues helped me to conduct these studies. I am obliged to Professor C. Fournier, Dr P. Charalabidou and M. Tite for allowing me to observe the units they taught at the Bartlett School of Architecture in 2009-2010 (for the pilot study). I would also like to thank Dr Kevin Mansfield for giving me the opportunity to incorporate my research activity in the major design module taught at the MSc Light and Lighting degree at the Bartlett Graduate School in 2010 (for the case study). I am extremely grateful to all the people who generously gave me their time and shared their views with me, especially the participants of the interviews, for their help and their enthusiasm for being involved in my study. I would like to thank my colleagues Dr. A. Skarlatou and Dr. N. Davoudian for sharing their views with me in critical stages of this work and A. Songcharoen helping me find appropriate interviewees for the study. I also want to express my appreciation to Derek Porter, the director of the MFA Lighting Design Programs at Parsons the New School for Design, New York, for allowing me to follow classes relevant to my research activity during my study leave, helping me to extend my horizons and gather valuable data for this research study.

I would like to thank my family, especially my mother for her constant support and for subsidising this degree. Without her help none of this would have been possible, but mostly I am grateful to her for passing on to me her great passion for knowledge and professional progress. I would also like to thank my beloved brother Panayioti and his family and my sister Renika. Their enormous love and sensitive support has given me the strength to never give up in my personal endeavours of fulfilling my dreams. I consider myself very lucky to have them in my life. Finally, I thank my husband Panayioti Papazoglou not only for his great help, encouragement and loyal companionship throughout all the years of this study, but also for his intellectual input, and for providing me with laughs and optimism when I needed them the most.
Dedicated to my parents Voula and Pavlo
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Part I
Chapter 1

Introduction
1.1 Rationale

It is generally accepted that lighting is one of the major factors to be incorporated in all architectural work. Architects have developed a keen interest in the field of artificial lighting design, both from a practical point of view and through the lens of academic knowledge. Over the past few years an increasing number of specialised courses have emerged on the subject. The field has also attracted a large number of researchers and scholars investigating not only the concept of artificial lighting in interior architecture but also the technical aspects of light. This research study aims to contribute to the fields of interior architecture and lighting design.

The author of this research is an architect interested in how architectural design is influenced by new materials. This involves the design of architectural forms and their influence on the perception of a space. She is also a lighting designer and, in this capacity, she believes that lighting plays a key role in architecture because it affects the materials’ appearance, making light and forms inseparable partners. Architecture cannot exist without lighting.

However, in practical terms architecture and artificial lighting are two different areas that coexist and supplement one another. Often architects and lighting designers do not work in parallel. In most cases, the lighting design is incorporated in the final stages of a project and makes a moderate impact on the composition. Lighting designers are specialists in understanding the ways light can be manipulated in order to affect space and materials accordingly. Their technical expertise in lighting enables them to deliver what is needed to complete the design idea, even if they participate in the design only at a later stage of the process.

Recent advances in lighting technology prompted the author to look into the possibility of using light as part of materials that emit light. In considering such materials and the different forms they could take, it becomes apparent that light becomes an inextricable element of the form and an interdependent factor of its design. If light is considered as part of the form that an architect is invited to compose, lighting becomes a fundamental part of the design. Such a scenario would mean that architects and lighting designers would need to work together at all stages of the design process.

An investigation of cutting-edge technologies in lighting revealed that a large number of these technologies are widely used. These products have various applications in interior
architecture and share an immediate connection with light. For the purpose of this study the author uses the term ‘lighterials’ to represent the materials that emit light and their applications to distinguish them from opaque, non-light-emitting materials. Lighterials either emit light or connect to artificial light in various ways. Light-transmitting concrete, for instance, is a new material that transmits light (Litracon 2001). Designing shapes using such materials would require designing both the space where these materials are used and the artificial lighting at the same time, and architects would have to integrate artificial lighting design at an early stage of the architectural design process. Another example is electroluminescent light technology, which produces a material that emits light and is already used by architects as one of the most innovative lighting systems. Electroluminescent products have been used so far mostly as tools to highlight the most important architectural elements of a design as well as to applications that there is lack of space (see, e.g. E-Lite Technologies n.d.). A further example is organic light-emitting diodes (OLEDs), which can create a totally new direction in lighting design, by making it possible to design large areas using luminous forms.

Consideration of these applications in interior architecture draws attention to the significance of the lighting designer’s expertise and how such knowledge can enhance the architect’s design. In the collaboration between architect and lighting designer, the architect must adhere to construction regulations, while designing a space that is both functional and aesthetically pleasing. Similarly, the lighting designer is also expected to deliver lighting that is functional, stimulating the user’s feelings according to the function of the space, and that also creates visual impressions. Both architects and lighting designers aim to develop a setting that creates interesting experiences for the users. Many theoreticians use the word ‘poetics’ to describe this objective.

While conducting previous research into cross-cultural differences in the perception of poetics in architecture, the author considered the significance of poetics in lighting design (Papakammenou 2008, p. 89). Poetics is a term used successfully in architecture, but it can also be applied in lighting design. Most people understand the term poetics as it is used in architecture and its connection to natural and artificial lighting. The same research showed that interior spaces were the areas in which most poetic experiences take place. This evidence encouraged the author to conduct further research on poetics and its connection to artificial lighting, focusing on interior spaces.

This study will look into new lighting applications and their impact on architectural design, not only in their implementation in the design at different stages of the design process, but
also their effect on the design result itself. It will consider the various elements that the design result consists of, including the poetics of the space. The availability of these new materials that emit light challenges architects to design luminous forms. Contrary to the traditional architectural design process, where light supplemented the project towards the end of the composition, light now plays a significant role in the process. By incorporating light at an early stage of the architectural design process, light becomes pivotal in shaping the form of the space. This research also negotiates the connection between the architectural idea and the experience and its achievement through the use of light. Using new lighting applications as a reference, it analyses the use of light in architectural composition with a view to gaining a deeper understanding of the conceptual connection between light and materials, forms and human perception. Artificial light is considered an inextricable element of space. It gives special qualities and meaning to space, plasticity to the shapes and visual impressions, all wrapped up in the word poetics.

Poetics is of particular interest in that aspect because of the flourish of the application of lighterials in many different types of interior spaces, especially lobbies. There are many examples where the application of the lighterials shows no connection to the overall space acting merely as repeatable elements copied between similar types of spaces (see Figure 1.1). In such examples, the lighterials bring excessive lighting levels to the space, creating discomfort and supplanting the architectural objectives. On the other hand, there are other cases where their use is accompanied by an architectural intention of better communicating the experience of the space to the users. In such examples, the lighting scheme ties in with the overall design of the space, enhancing the lighting and therefore the functional qualities and atmosphere of the space (see Figure 1.2).
This research study explores luminous materials and links their application with a deeper architectural purpose. It aims to link the architectural idea and the potential experience of the user. Within this scope, this study addresses how these light-emitting materials can relate to the poetics of the space and, if used in later stages, how they can influence the architectural result. The author is also interested in establishing what architects and lighting designers think of lighterials: first, as a special category of materials; and, second, through their use in architectural design. In addition, the author intends to explore the views of architects and lighting designers on the potential uses of lighterials.

1.2 Inspirations

This research looks at how new lighting applications influence architectural design. In discussing architectural design one can consider both the design process and the result. According to Hillier (2007, p. 33), ‘Architecture is at once product and process, at once attribute of things and attribute of activity, so that we actually see, or think we see, both when we see and name architecture.’ Hillier states also that it is the architect’s intention along with the purpose of the building or space that drives the architectural activity and creates the thing, the product (ibid. p. 13). Within the context of this research, a systematic review of the process that architects go through when using these lighting applications accompanied by a particular intention is key when reviewing an architectural proposal. It is equally important to realise how intentions manifest themselves in the product.

Further, following on from Hillier’s view (quoted above), looking at the attributes of things, and of the actions that architects take when they design, would help to understand a design concept. Therefore, it is vital to look into the design process and the product and especially the elements that the space under review is composed of with reference to the intention that brings everything together. This study is based on readings and analysis of such attributes or elements of the space that architects use in their drawings that act as reference points to describe their design intentions. But lighting is the focal point of this research and these attributes and elements are examined with regards to light. The author approaches these elements by applying the new lighting forms to a previously designed space, where the intention of the architect is already known. The aim is to see how the new lighting applications could influence the intentions of the architect as well as the elements of the space.
Introduction

The architect takes many factors into account in order to formulate the space. One of the most prominent factors is the function of the space. Function gives space its main character and influences the way people observe it and interact with it. The intention of an architectural design is linked immediately to the function, by giving emphasis to particular experiences and feelings that the architect wants to create in the user. There are many ways in which a space can be used: for work or leisure, entertainment or worship, healing or learning. Space can have different meanings; according to the American Society of Designers (2009) it can signify ‘power, authority, security, wisdom, achievement, playfulness or serenity’. These words describe poetics. To better understand what poetics is, this study looks at interior design; viewing it as an environment not only where people seek visual and ambient enhancement, but also where deeper emotions, reactions, feelings and impressions are raised.

Poetics links to the design of interior spaces and is linked immediately to their function. The architect uses the function as a foundation, moulding the forms of the space to fit the needs of the occupants to function well, designing all the elements of the space. Based on the function the architect makes a habitable space. The way in which forms are connected to each other and to the overall interior environment depends on the architect’s decisions, made with the aim of creating an interesting aesthetically environment. The space can be functional only with the application of light. Furthermore, the appearances of the forms depend on the materials and the way they are lit. As Le Corbusier (1923) has stated, ‘architecture is the masterly correct and magnificent play of masses brought together in light’.

Artificial light is powerful. It can give space different qualities and motion (see Figures 1.3 – 1.5). It can show shapes clearly, nullify them or make them disappear. Further, it can bring some objects into Sharper focus than others in the interior space. People generally understand the importance of artificial light in interior design, but the attributes of artificial light mentioned so far are just a small fraction of the qualities of light. Recent advances in lighting technology have made it possible for new qualities of light to emerge. For example, the scaling down of light sources and the enhancement of lighting techniques has led to a more coherent integration of light into the design of the interior space. The author believes that the latest technical developments in lighting provide the basis for a study of their impact on architectural design. This research raises many questions and queries about the future of lighting and interior design.
Initially, it is important to investigate how artificial light engages with the interior architecture from a practical point of view. When architects deal with artificial light, they have to deal with the technical specifications of the lamps and the lighting equipment. Over time, the development of existing lighting technology and the advent of new technologies have led to changes in the technical specifications of the luminaires. This has influenced architects to develop different techniques using new technologies that would serve these intentions better. Before this analysis continues it is necessary to review how lighting applications have evolved in the past and to investigate current and future progression in lighting.

### 1.2.1 Lighting design review

Over the past decades, advances in artificial lighting design have led to greater cooperation between architects and lighting designers, resulting in a creative combination of art and technology of light in interior architecture. Light is used as both a functional and an aesthetic element in interiors. The architect’s main concern with regards to lighting is the harmonious integration of artificial light in the architecture of the space, aiming at the maximum satisfaction of the user.

At first, architects used artificial light only as an object, a luminaire, emitting light into the architectural space. Candles were replaced by torches and then by oil and gas lamps. The
widespread use of electricity enabled architects to incorporate lamps in their designs. Lamps evolved dramatically through modern technology. Nowadays, there is huge variety in the light effects lamps can create and their dimensions, giving a different result accordingly to the concept of the space. For example, some lamps are linear. ‘Linear sources can be used to give direction, emphasize the edges of the planes, or outline an area. A parallel series of linear sources can form a plane of illumination that is effective for the general, diffused illumination area’ (Ching and Binggeli 2005, p. 250). Some have a cyclical shape, or a U-shape. A few lamp types are very small and can fit everywhere, for example, LED lamps, while others are large and attract attention in the space, for example, linear fluorescent lamps.

Architects choose luminaires according to how these balance aesthetically with the architectural elements as well as the functional requirements. The selection of the luminaire’s form is based on the design of the space and the occupant’s taste. It is also based on the lighting effect that the luminaire creates in the space, since different luminaire shapes provide different types of illumination. Depending on the luminaire’s form, there are fittings that provide direct or indirect light to the space or both. There are also various options regarding the way luminaires are positioned in the space: they can be pendants, wall sconces, floor fittings or table lamps. Further, architects choose luminaires according to the atmosphere they want to create in the space. For example, there are often cases where architects used ‘large decorative fixtures whose main objectives have been to decorate the interior and help fill visually the large voids created by lofty architectural concepts’ (Goldbart 1977, p. 406) (see Figures 1.6, 1.7).
An important milestone in the lighting design of interior space was the development of spotlights. The spotlights are used frequently to provide focused lighting, drawing attention to the most important parts of the design of the space. They can be recessed, semi-recessed, surface mounted or even track-mounted. Often lighting designers use a combination of different luminaires, depending on the lighting result they want to create. For instance, a room can be lit by fittings that are placed in different locations and provide different levels of illumination for a more comfortable environment. This can also be achieved by using different lamp types or a different intensity of light. A level of lighting that allows the users to use a space comfortably is an important aspect that lighting designers take into consideration when they decide which lighting scheme to use. Lighting design today aims to ensure a satisfactory level of light in the space, but also to reinforce the concept of the interior design.

A key development in the field of lighting design was the use of recessed lights into the ceiling, in the wall or even in the furniture. Using recessed lights, lighting designers developed the concealed lighting technique. This was a breakthrough in lighting design, as this technique makes the lighting result visible, but not the lighting source. With the use of concealed lighting, architects aim to integrate lighting into the design idea (Figures 1.8, 1.9).
The need to make the light source as discreet as possible, incorporating the light in a design structure, led to the creation of lamps that are smaller and last longer, giving the flexibility to lighting designers to create unique lighting results. Examples of these sources are LEDs and fibre optics. These lamps are incorporated within the architectural details, according to the lighting effect the lighting designers want to give. For example, Ching and Binggeli (2005, p. 256) explain that ‘Cove, valance, and cornice lighting are all methods for illuminating a space indirectly from within an architectural detail or a manufactured fixture. They give a soft, indirect glow to the area they illuminate and are often used to highlight ceiling details or wall textures.’

There are many ways to use these lamps as part of the architectural details, by integrating the lamps into the structure of the space. The choice on how to formulate the above varies according to the lighting result desired and the architecture of the space itself. Douglas James of Mindseye has created a list of possible architectural techniques that are often used by architects. He refers to this list as 'The ten rules of lighting', juxtaposing the lighting technique and the corresponding lighting result. James’s rules are outlined in a series of

Figure 1.10 shows a detailed presentation of these techniques, including the architectural drawings and images that according to James demonstrate the relevant applications in real life examples. Each technique mentioned is described based on James’s classifications.

Figure 1.10: The ten rules of lighting by Douglas James. The schematics taken from James’s research show the images and the architectural drawings of the techniques.
Source: http://www.lighting.co.uk/know-how/techniques-1-spots-in-slots/8602226.article
Starting with the spot slot (1) technique; this refers to integrated and directional light. It combines linear axis lighting with the application of focal light where needed (Jennings-Parry 2009). The floor edge slot (2) detail is a milestone in lighting design, because it introduces light into the space that derives from the level of the floor. James explains that the ‘floor edge slots delineate the perimeters of a walkway or a space, and can form part of a “way-finding” strategy’ (Simmonds 2010a).

The raft slot (3) detail is important because it adds rhythm or pattern to a monotonous ceiling area. This technique is generally used to ‘define the space, either bringing the ceiling plane down, or using shape to define a particular zone in a space’ (Simmonds 2010b). The raft slot technique refers mostly to ambient light. In a similar way, the skirting floor wash (4) technique is often used to outline the space area and to lead users towards a specific path.

The overlap (5) detail technique is used in architectural applications where different planes overlay, by the application of linear lighting within the gap between them. Lighting designers tend to use the overlap method to design a number of different layers on the ceiling or on the wall, aiming to attract attention. According to James, this technique is used to ‘create a rhythm’ or ‘to suggest grandeur’ or to achieve ‘visual interest’. (Simmonds 2010c). The linear slot (6) technique is used widely for direct lighting. Architects prefer this method to reinforce the circulation of the space, while the appearance of the slot itself creates an interesting architectural detail (Simmonds 2010d).

The backlit panel (7) is used by lighting designers to create a homogeneous lighting effect. This is achieved by the use of plastic or glass material, which is placed close to the lamp itself, to diffuse light. This method is interesting because it can be used both with daylight and artificial light. James explains that ‘it’s this mix of high functionality with sleek aesthetic design that gives the technique its unique staying power in the world of architectural lighting’ (Vanderkar 2010a). Often the backlit area acts as a light source for the overall space.

Another option that lighting designers often select is the wall graze (8) technique, which is used to spread light across a particular area. With this technique, lighting designers use either light concealed within the detail, which creates a deliberate scallop effect, or linear light to create an even illumination on the wall. This lighting application is used to avoid ceiling-mounted luminaires and James says ‘it’s amazing how much you can illuminate
space using light reflected off walls’ (Vanderkar 2010b). He also points out that this method brings out the texture of the wall’s surface.

The skylight (9) technique is used by lighting designers to imitate the lighting effect of daylight. According to James, ‘whereas other techniques are about integrating lighting or controlling the visual landscape, this one really gives you a chance to influence the mood of a space’ (Vanderkar 2010c). This type of architectural detail allows lighting designers to create uniformity in the lighting levels of the space. This means that it can be used to create a central lighting feature in the space. This technique also enables light to be controlled easily, since the entire lamp sources are located in a specific area of the space. Lighting designers can therefore adjust either the colour of the light or the light’s colour temperature.

Finally, according to James, a technique that stands out is the Turrell (10), named after artist James Turrell’s pioneering techniques, which can be used to define space and turn the attention of the design idea to ‘light, space and the human perception’ (Vanderkar 2010d). James believes that this technique is of particular interest, adding that ‘if there was a popularity contest among lighting designers, they’d probably pick one of the other techniques, but if it were a beauty contest, this would be the winner’ (ibid.). In the Turrell technique light is used in a way that provokes human perception and, despite its simplistic, almost minimalist look, it has a great impact on observers. In addition, a special characteristic of this lighting technique is that the structural detail is reduced and that it is difficult for the observer to understand the technicalities of the application. Vanderkar explains that this method as ‘piercing a hole in the roof of a building with the sky behind acting as the light source’ (ibid.) or turning a wall into a light source, while behind lies an artificial light source.

Turrell uses this technique to create luminous planes that look as if they tie naturally with the environment, without revealing any information about either the route of the light source or its connection to the equipment (Figures 1.11, 1.12). Further, this luminous feature is constructed in such a way that the structural details are not visible, making it seem as if it is a continuation of the architecture of the space itself. The Turrell detail sets the stage for a new way of importing light into the architectural space. This technique does not focus solely on the lighting design or on the architecture. It is successful because it serves both architecture and lighting design equally with reference to the experience and the perception of the space. As James explains, ‘In an architectural context, this technique is useful predominantly to make people stop and take note. It’s also a useful source of light,
but if someone’s really in touch with their surroundings, they will pause and wonder what’s happening. It forms a dialogue between the architecture and the viewer’ (Vanderkar 2010d). This technique describes how the poetics of the space link to the lighting intention and the architectural idea.

The Turrell technique differs from the other lighting techniques in that the conceptual idea of the design aims to engage the user with the architecture of the space. The technique is an advance on the others, because light is at the centre of the designer’s intention to create particular experiences. The Turrell technique could result in conceptual designs that would be difficult to emulate in spaces with different characteristics (see Figure 1.13).
Introduction

The Turrell technique is an advanced technique whose concept can be used as a background to develop further the ideas involved. Similar effects can be created using other techniques and materials that can project the overall concept of the design into the space. The appearance of the Turrell technique looks like a homogenous thin layer of light on the ceiling or on the wall of a space, which leads to other ideas about possible applications of light. For instance, lighting designers could use different types of materials to diffuse light, either translucent or transparent materials or materials with porosity, by using either the backlit technique or the Turrell. Another example is to consider using light to define the parameter of a specific plane. This broadens the approach of lighting applications, considering light as a form, either voluminous or planar. Architects who think of light in this way could compose light as a unified parameter to the architectural design, and this is what this research tries to explore. The following projects provide examples of this thinking, where architects approach lighting this way.

1.2.2 Exemplar projects

In the following projects light is used as a form, a plane or volume into the space. The case studies are analysed on the basis of the architect’s intention with the aim of demonstrating the strong link between architectural design and lighting. In all the examples the role of light is pivotal to the architectural concept. Other key variables examined are the lighting techniques and the materials used. The projects presented here are the Morimoto restaurant, the Inamo restaurant and the Dal Bat fashion store. The author’s visits to the two restaurants resulted in an analysis of the lighting techniques used and the effect on the experience of the spaces.

The first example is the Morimoto bar and restaurant in New York, which is designed by the architect Tadao Ando. In the view of the author, Morimoto is a good example of how lighting can reinforce the poetics of the space and also of how light can be used as an object in the space. The design of the space is split between two different levels: the ground level and the lower level. The lower level also includes a bar. With regards to the poetics of the space, archiDE weblog says, ‘Ando achieves a Zen-like serenity throughout the space by using glass privacy walls between tables, rice paper walls, and an organic ceiling that resembles the raked sand of Eastern rock gardens’ (archiDE 2009).

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1 The author visited Inamo restaurant in London on 26 April 2009 at 19.30 and Morimoto restaurant in New York on 17 November 2010 at 20.00.
In the design of Morimoto, Ando’s intention is to use light not as an effect but as part of the design of the space. Most of the techniques used share the same philosophy: to integrate lighting in the design by the use of concealed architectural details that would not make the lamps and control gear open to direct view. For example, the glass walls in the basement are lit using the floor edge technique (Figure 1.14). Lighting also aims to highlight the architectural idea and the materials in general. Ando uses a resin bar filled with floated leaves and lit with linear LEDs. Further, he uses fabric that looks soft but in reality is a very hard material. Lighting helps create the feeling of softness of the materials as well as enhancing the minimalist look of the design. The overlapping technique is used in particular parts of the ceiling and different types of coves can be found in the dining area as well as in subspaces such as the toilets.

A very special element of Ando’s design is the ‘bottle wall’ that dominates the core area of the space and connects the ground floor to the basement. It acts as a central lighting object (Figure 1.15). It is composed of 17,400 half-litre plastic bottles. Most of the plastic bottles contain one LED lamp, which has either a cold white light or a warm white light. The difference in the colour temperature aims to alter the scale of the wall. Some bottles are not lit at all. This combination of colour temperature variation and occasional absence of lighting follows the architect’s intention to create a sparkling effect and to add warmth to the atmosphere of the space. This application of light creates a shimmering luminous wall within the space that gives intentional privacy to specific areas, but also reinforces the poetics of the overall space.

Another interesting example is Inamo restaurant in London. The design concept of this restaurant is based on a grid of active surfaces that are focused on the dining tables. The
whole concept gives an emphasis on the dining experience. More specifically, each table in
the restaurant is connected to an interactive surface system (Figure 1.16). The diners use
this system to view the menu. People can see pictures of the dishes in images screened in
front of them, a full description of the ingredients and the price of each course. The same
system applies to the drinks. Diners can use this system to place their orders and request
the bill. Apart from ordering, clients can use the system to play interactive games, find out
information on things to do in the surrounding area or even call a taxi.

The most striking feature is the ability to change the appearance of the table based on
some predefined designs (Figure 1.17). This interactive table creates an environment full of
fun and pleasure. The change of the appearance of the tables with the use of light
influences the mood of the diners and the atmosphere of the overall space. Light is
approached as a plane that is imported into the environment and constantly changes.
However, the general setting and design of the restaurant is quite simple and functional.

Inamo is designed by the interior design company Blacksheep. The architects were behind
the creation of the interactive system design and the graphics that are projected on the
tables through the projectors. In consideration of the Asian-based food, the architects
decided to import images and patterns derived from Asian culture. One of the most
challenging tasks in designing the lighting was to strike the right balance in the level of light,
given that the restaurant operates both during the day and at night. In order to achieve
that balance, the designers introduced a system to control the amount of daylight coming
in. The architects created specific layers on the windowpanes in order to achieve a
particular level of light in the interior space. This was followed by a level of light applied on
the tables by the projectors that would not be tiring for the diners. Further, the lighting
designers had to achieve specific contrast levels in the space to avoid discomfort. The architect’s objective was not to give a strong technological character to the restaurant, but a genuine restaurant quality that would be accompanied by the use of the interactive boards.

Tim Mutton, the Director of Blacksheep, explained that they ‘created a concept based around the keywords: warmth, vibrancy, charm and theatre’. And he continues: ‘It was important to balance out the restaurant’s technological aspects by creating a sensuous, social space with a strong personality’ (Dezeen 2008). The Project Designer, Benjamin Webb, described the challenge of creating a project so closely connected to technology and the design of an environment where the graphics of the space and the interior elements would be strongly related. He also clarified that their intention was to create an interesting ambience that would be tuned with the interactive technology. And ‘above all, we had to ensure that the vivid projections were met by the interior elements of the scheme, creating an equally strong and unified impression.’ (ibid.).

The final example shows how light can be used as a volume in a space. A good example of incorporating lighting in the structure and the materials in order to reinforce the poetics of the space is the Dal Bat fashion store in Granada, designed by the architect Antonio Jimerez Torrecillas. The space ‘features a series of transparent walls that form a second skin’ (Torrecillas 2008, p. 146). These walls are lit both from above and from below in order to make this skin more visible (Figure 1.18). This application of light also makes the texture of the material more obvious. The walls are made by various types of glasses made by a local glazier. The architect’s aim was to bring forward the verticality that those elements create within the space. He used light as a basic tool to achieve this.

These luminous volumes create interesting paths in the space that influence the experience of the user. More specifically, the space is designed in such a way that the glass walls define the limits of a path that directs visitors to see the exhibition of the products on sale (Figure 1.19). Light is used as the directional power and combined with the material itself creates unique emotions in the users. ‘The translucent glass lets light glow through and allows the observer to read the materials behind it, thus giving visual form and presence to the history of the space – dramatizing it, in effect (Domotex n.d.).’ The architect’s aim was to design materials as if they were made from ice, which engenders that particular feeling in visitors.
The projects above are just some examples that show contemporary architects’ interest in using light integrated within the design concept. Some of these lighting applications are custom-made by the architects who designed the space, such as the bottle wall in Morimoto restaurant. Others take materials that are widely used, such as the interactive surfaces, to accomplish their goals. In both examples, light is introduced into the space with the intention of integrating it into the form.

1.2.3 Future development

The examples in the previous section show different ways of approaching architectural design and the lighting design of the space. These examples highlight the various forms light can take in architecture as an object, as a plane, or as a luminous volume. Cutting-edge lighting technology showcases a diverse universe of light-emitting materials that allow architects to compose the volume of the material itself and light at the same time. In addition, there are materials that connect to light through various means, as the Dal Bat store project depicts. This can lead architects to create an environment that combines artificial light and solid volumes and planes, taking into consideration the dual criterion of architecture and lighting.

This development of lighting in interior spaces corresponds to the evolution of façade lighting design. At first, lighting designers applied artificial lighting to the surfaces of the façades. Then, smaller sizes of fittings led to the creation of architectural details that would
make the application more discreet and the light source less visible. In contemporary architecture, most buildings are made of glass. This has led lighting designers to light the façade of the glass buildings from the interior space. One could say that the glass building itself acts as a lamp or as a luminous volume within the city context.

Similarly, in interior architecture lighting designers first placed lamps strategically in the space to achieve a specific lighting concept. The lamps became smaller and were incorporated into architectural details, making the application as discreet as possible. The future of interior lighting uses new technologies and new materials that are luminous or incorporate light in their substance in a variety of techniques, such as the backlit panel and the Turrell technique described above. Using such materials to construct volumes and planes within the space would mean that these become the illuminants of the interior space. Thinking of materials in this way creates a need to categorise them into those that emit light and those that do not.

There are new materials that could make architects and lighting designers distinguish materials in the way described above and use them accordingly. Such a difference in the materials’ appearance would reflect on the architectural synthesis of the space. Considering the lighting and the architectural design of the space in this way means that architects would need to aim for aesthetic pleasure and poetics on one hand and functionality and ergonomics of the space on the other.

With regards to poetics, the design of a space would combine architectural elements made by materials with light and materials without light. The structural composition and the appearance of the space would express the intention of the architect. Thinking of design and light in this way would lead architects to create luminous volumes that would be ‘characterised by a play through which they create, in language, structural equivalences between expression and content’ (Ambasz 1974, p. 65). In addition, the architect’s aim would be to create a space where luminous and non-luminous volumes meet and create an environment that influences the experience of the user (Figures 1.20, 1.21).
This research study investigates how interior architecture can bond with lighting design through various ways, techniques and materials, including artificial light. These applications introduce luminous materials and forms into the conceptual toolbox of the architect. The architect Louis Kahn expressed his view of light being used as a material explaining that: ‘light...contains the potential for becoming material, but it is unruly and untamed because it is without conscious purpose’ (cited in Tyng 2000, p. 132). In agreement with Kahn, this study approaches light as having potential material qualities and thus being perceivable as an architectural form. Further, the projection of poetics as an important part of the architectural and lighting design would give the light/material the ‘conscious purpose’ that Kahn hints at. When lighting is designed to follow or add to the architectural idea it has a conscious purpose adding to the experience of the space.

This study aims to explore light as material. Nowadays there are a number of materials that emit light themselves or that can be connected to light in different ways and radiate light. To distinguish them from solid, non-light-related materials, these materials will be called lighterials.
After accepting lighterials as a potential group of architectural forms, the study focuses on how they influence the intention of the architect and the architectural design idea. This involves analysis of the architectural space, looking at the most important space elements with reference to artificial lighting, including the poetics as a vital element that describes the intention of the architect and its impact on the users of the space. The connection between interior architecture, artificial lighting design and poetics is described with examples.

Next, the research question is established: How can lighterials influence architectural design? In order to find the answer to this question three different studies were conducted. The first was a pilot study and the participants were architecture students. It gives information on the potential use of lighterials in architectural concepts. The second study was a case study and the participants were lighting designers but had previous architectural studies. This study provides information about how lighting designers could use lighterials to design the space from the beginning of the architectural synthesis process and how that can influence the process itself. The third study focuses on interviews with architects in practice. The analysis of data collected from this study indicates how lighterials could influence architectural space and its poetics when they are incorporated at the end of the conceptual phase.

This study approaches the research question on a step-by-step basis. Chapter 2 presents a group of materials that relate to light, referred to as lighterials. Lighterials are defined and each lighterial is described separately, including information about their special characteristics, latest developments, supply chains and limitations. The analysis is completed by comparing and contrasting the lighterials in order to determine any similarities and differences. Next, the lighterials are discussed as architectural forms, with special consideration given to their differences and similarities.

The beginning of Chapter 3 analyses architectural design according to its attributes or elements that have reference to light. Each element is explored through examples. These elements include materials, colours, penetration, level change and circulation. A combination of these elements expresses the poetics that are investigated later in the chapter. The concept of poetics, and the way it links to architecture and to lighting design, is analysed, and the term poetics is explained thoroughly with the use of various examples. The relationship between poetics, space and function is then established. Finally, the properties of light in various interior spaces are presented in order to determine the connection between poetics, light and space.
Chapter 4 examines how *lighterials* are applied in interior spaces and their impact on architectural design according to when they are introduced in the design: from the beginning of the design process or after the completion of the concept. Chapter 4 establishes what this research aims to answer.

The next three chapters, 5, 6 and 7, focus on the pilot study, the case study and the interviews that were conducted during this research. Each chapter begins with the methodological approach used. In all the experiments, qualitative methods were used to collect and analyse the data. In more detail, Chapter 5 presents the pilot study and the case study. The pilot study gives an insight into young architects’ interest in *lighterials* and similar materials and how these link to the poetics of a space. The pilot study feeds into the case study. The case study provides information about lighting designers’ experience in working with the *lighterials*. The aim is to understand how architects construct their space using *lighterials* from the beginning of the architectural process and the possible impact of *lighterials* on the process. The participants also share their opinions about potential future uses for *lighterials* in interior design. Additional studies expand further on the characteristics of *lighterials*, providing information about their use, their graphic presentation and, especially, how lighting designers feel about working with them. Finally, the term poetics is discussed with the lighting designers, with the view to understanding how the advent of *lighterials* influenced the design decisions and the design process.

Chapter 6 presents and analyses the methods that were used for the interviews. The methods are explained in detail, based on their use in other research studies and the theory that proves their validity. The design of the experiment is discussed, presenting the different experimental stages that are connected to the different methodologies that have been explained. Some general information about the experiment follows, such as the participant’s profile, the selection of place for the experiment, the experiment’s timeline and the differences between the interviews and the case study. The coding and analysis of the data are then explained in detail followed by discussion of the validation and organisation of the findings, as well as the logistics around the analysis of the *lighterials*.

Chapter 7 introduces the interviews. A detailed analysis of the results includes information on the use of *lighterials*. Questions posed include: Which *lighterials* were used more frequently? Whereabouts in the space were *lighterials* incorporated? How did the use of the *lighterials* relate to the poetics and the function of the space? Again the key question is how *lighterials* might affect architectural composition, with a focus on the result. Each participant was asked to design a given space, which was analysed into the elements
explained in Chapter 3. The results were compared to find how the elements of the space, including the poetics, can be influenced.

Chapter 8 discusses the outcome of the three studies and the aspirations and limitations of this research study. It also identifies inconsistencies of this study. Following the results of the interviews, and the new roles that light can have, light is approached as a form. Finally, the last part of this chapter discusses the potential future of architectural and lighting design if light is considered as a form.

1.4 Significance of the study

This topic is intriguing for several reasons. First, it explores for the first time the cognitive construct of artificial light in the field of architecture, as an inextricable factor of architectural design. This is an original contribution to lighting design. It looks at light as a material in combination with new technologies and applications creating new forms that could be used by architects.

More particularly, the aim of this study is to discover whether such materials can influence architectural design and, if so, how. This would lead to understanding more about how luminous forms could be used in the future and in which phase of the architectural process they should be incorporated. In examples of where lighterials influence the elements of the space, the findings of this research will show which elements can be influenced the most and how.

This research also reveals the new roles that artificial light is going to play in the future. This includes approaching light as an element that is designed to create a story in the space. Thinking of artificial light this way will help lighting designers design lighting schemes that can engage people with the design intention of the space. The study will provide an insight into the experiences of specialists who use lighterials to treat the poetics of the space. Moreover, this analysis will show the significance of artificial light and the great impact it has on the architectural design, especially as an architectural form. Thinking of artificial light in this way should mean that it could be taught as part of architectural design modules. As part of the educational system it could help to improve future visual spaces and conceptual mechanisms. This thesis can be used as a basis for further research in order to find new educational methods that would help both students of architecture and experienced architects to use artificial light in architectural composition.
The results of this research are expected to contribute first to the architectural design field since it will try to show the strong connection between architectural intention and the use of light-emitting forms. In addition, the outcome of this study will form a basis for architects to enrich their architectural statements by making proper use of artificial light, especially when lighterials are used, and therefore progress in communicating and enriching the space’s qualities through the use of such materials.

Chapter 1 presented the theoretical background of this research study and the inspirational path that led the author to research into this topic. It introduced the basic terms used in the following chapters, such as poetics and the lighterials. Further, it reviewed the evolution of lighting design and connected it to the techniques currently used in architecture with a view to understand how luminous forms became central to this study. This was explained through the use of relevant literature and examples, ending with the significance of this thesis in the future. The next chapter focuses on the presentation of the lighterials, which are used as a reference to describe luminous forms. The author categorises these materials according to their special characteristics and based on the way they are applied in architecture.
Chapter 2

*Lighterials: Light as Material*

This chapter presents some of the latest technologies in materials that either emit light or can be connected to light through the various techniques mentioned in Chapter 1. For the purpose of this analysis, these materials are called *lighterials*. *Lighterials* differ from opaque materials that do not allow light to pass through them and, unlike other materials, *lighterials* can radiate light from their surface.
2.1 Categorisation of lighterials

The term lighterials was introduced in this study to identify the types of materials whose properties relate to light. More specifically, lighterials are materials that either emit artificial light due to their technological characteristics or, if connected to artificial light, appear to radiate light out from their surface. The term lighterials is used consistently throughout this thesis as a shorthand term to express light-emitting materials or luminous materials or such lighting applications that involve materials that appear illuminated.

The distinction made between opaque materials and lighterials aims to help architects and lighting designers to categorise the materials in relation to artificial light. The lighterials that are presented below are those that were available to the trade at the time that this study was conducted. However, the term lighterials is a general term that can include any other types of material that might be manufactured in the future that will share similar characteristics to those mentioned above. Therefore, the simple word lighterial does not restrict people to think only of the particular materials referred to in this study but can include any material that emits light or is luminous, whether it exists in the natural world or is custom-made by the architect, like the wall constructed of plastic bottles in Morimoto restaurant described in Chapter 1.

This research study uses the word lighterial as a simplified term to describe the luminous materials. The fact that this research thesis uses particular materials can direct readers to think of lighterials as the products mentioned below. This is not the intention of this research. Instead, these products are used as a reference to describe luminous forms and provide tools that the participants of the experiments could use in order to test the research questions.

The lighterials are differentiated according to the criteria above into two categories (see Figure 2.1):

- The first category includes lighterials that emit light: electroluminescent products, organic light-emitting diodes (OLEDs), light-emitting substances and Planilum®.

- In the second category belong the lighterials that can connect to a light source in order to diffuse light through their structure and appear as luminous. These are active and interactive surfaces, Barrisol®, polyethylene volumes, glass panels, light-transmitting solids (light-transmitting concrete®, Riverstone bricks®) and Scintilla Lumina®.
The following analysis of *lighterials* includes general information about each of them, the latest trends and product developments, and the limitations in their use.

**Figure 2.1: Lighterials categorised as those that emit artificial light and those that become luminous if connected to artificial light**

### 2.1.1 Lighterials that emit light

These materials integrate a technology that allows them to radiate light or they emit light when they absorb sunlight or artificial light. Individual types of the materials will be looked at in turn.

**Electroluminescent**

Electroluminescence (EL) panels are *‘paper thin laminated panels that illuminate as an electrical current is passed through the panel. This Electroluminescence is created when phosphor crystals with coloured overlays are sandwiched between conductors, and as an electrical current is applied, the phosphor crystals rapidly charge and emit light which illuminates the printed overlay’* (EL International 2008). The visual result is a product of the relationship established between the electrons and a piece of a material (Figures 2.2 and 2.3). The material is either powder or thin film with holes on its surfaces.
Electroluminescent technology was first used for instrument panel backlighting and was used in Chrysler vehicles from 1960 to 1967. In the following years, EL technology was used successfully in a range of commercial applications, as well as for medical and vehicle applications and displays by major companies, such as Sharp Corporation and Planar Systems.

Electroluminescent technology has developed in recent years. Thin films are used to produce displays that have full colour applications and a longer life expectancy. Meanwhile, the application of voltage to electroluminescent products has also evolved. Previously, the voltages were applied at the edge of the display. Now the circuits are organised in a way that allows the voltage application to be placed in a location separate from the application, resulting in an enhanced resolution of the displays.

Electroluminescent products can be produced in a variety of forms such as tapes, panels and wires. All these are provided for lengths that exceed 90 metres, with the width varying from 6.35mm up to 165.1mm.

Using electroluminescent products for illumination purposes benefits from the uniformity of the light’s appearance on the surface of the material. Another technical advantage of modern electroluminescent products is that they can be dimmed, which has led to widespread use in interior applications. The dimming option makes them less expensive and energy-efficient (Earlmann 2008).

One of the main advantages of electroluminescent technology is that it needs only one connection to apply light continuously to a very long piece of material. This makes it easier to use in interior design, since it does not require extra space to store the accessories and the controlling equipment. Another advantage is that electroluminescent products are very easy to install and to maintain. They do not generate much heat, a feature that makes them touchable. In addition, because they are very thin, bendable and flexible, these products can take different shapes and be installed easily. Finally, electroluminescent products can be used in wet applications.
On the other hand, electroluminescent products have some limitations. One major downside is that these products run at high voltage. When used in applications where a battery is needed, a converter must also be in place. The converter is normally situated within the product, but it creates a sound as soon as light is emitted. The noise level coming from the converter restricts the use of the products in residential environments. Another disadvantage is their low life expectancy if required to provide bright lighting. Life expectancy can be increased at the expense of brightness. ‘The brightness of the lamp is directly correlated to the amount of current supplied to illuminate the lamp. The lower the brightness or current, the longer the phosphor lifetime. Adjusting the brightness will alter the lifetime curve’ (Earlsmann 2008).

Currently, lighting designers in Europe mostly use the products of Earlsmann Limited, Light Tape UK Limited or EL International.

**Organic light-emitting diodes (OLEDs)**

Organic light-emitting diodes are ‘light emitting panels made from organic (carbon based) materials that emit light when electricity is applied’ (OLED-info.com n.d.). OLEDs are constructed by placing a thin organic film between two conductors, which emits light when electricity is applied. The visual outcome is the result of the relationship between the positive and the negative part of the material and the energy.
OLEDs are a new technology that is still under development. For their construction a thin film is used, which can be printed and used on various surfaces. That leads to ‘new applications such as roll-up displays and displays embedded in fabrics or clothing’ (ibid.). Further, OLEDs produce a good quality and a variety of colours, with pure white being the most widely used (see Figure 2.4).

Since OLED technology was introduced, it has been mostly used in screen manufacturing. Unlike technologies such as the liquid crystal display (LCD) flat-panel screens, OLEDs do not need light on the back of the screen. This particular attribute has two advantages: the first is the fact that this application needs less energy to run, and the second is that products made from this material are thinner and therefore easier to install.

One of the most recent product innovations is that the OLEDs can be fully dimmable. That attribute combined with the fact that they use a lightweight and thin material for their construction make them easy to use in interior spaces. In addition, the technical aspects of OLEDs enable them to light very large areas.

Figure 2.4: OLED panel
Source: http://www.ledvista.ie/about-leds/led-library/oleds

However, OLEDs have the following disadvantages. The first one is that these products do not have the life expectancy of other technologies. ‘In particular, blue Organic Light Emitting Diodes (OLed) historically have had a lifetime of around 14,000 hours (5 years at 8 hours a day) when used for flat-panel displays’ (OLED-Info.com n.d.). Further, the technical difficulties in manufacturing OLEDs and the need to use expensive raw material make this technology very costly. Finally, organic materials are very sensitive to water. That means that OLEDs are not high IP-rated (level of protection against liquids), which limits their applications.
Some of the companies working in the development of this technology and its application in the lighting design industry at the time of this research were Philips, Osram, Lumiotec, Konica Minolta and GE.

**Light-emitting substances**

Light-emitting substances emit light when they absorb sunlight or artificial light. The material gets into a temporary state of higher energy, in which part of the energy is emitted in the form of visible electromagnetic radiation. Light-emitting substances can also be materials with molecules where the application of heat results in light. These types of materials include fluorescent ink, fluorescent pigments, phosphorescent ink and phosphorescent pigments (Figure 2.5). For example, light-emitting wallpaper is made up of layers of different materials. One of these materials is phosphorous pigments and a ‘transparent ITO conductor layer’ (Jarvis 2008), which is covered with the wallpaper on the top. The layer on the back of the wallpaper consists of a ‘silver-based solution that conducts electricity’ (ibid.).

In architecture there is a particular interest in organic pigments and UV-luminous inorganic pigments that can be applied directly on any material’s surface or inserted into paints. So far the application of the light-emitting substances has been restricted to art installations and temporary design solutions. An international supply chain of these products, such as phosphorus pigments, is Shannon Luminous Materials Inc.

*Figure 2.5: Light-emitting phosphorescent material*
Source: http://www.metropolismag.com/story/20070418/performance-enhancers
Planilum®

Manufacturers refer to Planilum as ‘light emitting glass’ (Ecofriend.com 2008) that will replace luminaires in a space.

Planilum is part of a series of microplasma lighting technologies based on the use of a mercury-free gas mixture (Lighting.com 2012). The products which are constructed using this technology are ‘ultra-slim, flat and bright’ (ibid.) and they are used to create luminous surfaces that will emit uniform light. Planilum is just 20 mm thick and is constructed from four layers of glass containing an ionised gas and serigraphed phosphors. It emits a uniform and homogenous white light across its entire surface when it connects to electricity (Figures 2.6, 2.7). The material gets no hotter than the temperature of the human body so people can touch it safely. Further, Planilum has a long life of 500,000 hours of use (or 20 years of usage) and it is 90% recyclable.

The company that designs and distributes Planilum is Saazs and Saint-Gobain Innovations.

2.1.2 Lighterials that connect to a light source

The materials that belong to this category connect to a light source and appear as a luminous material. The light source can be concealed within an architectural detail, using different techniques such as the backlit panel, wall graze, skylight or Turrell described in Chapter 1. As explained earlier, the light is diffused through the material itself, making its surface appear luminous.
Active and interactive surfaces

Active and interactive surfaces function with the use of video projectors. The active surfaces use screens or projections that show particular images or videos. Interactive surfaces use a video system that projects images on a surface and can track any movement on the surface itself (Figure 2.8). This interactive system includes the use of ‘an interactive foil kit that is applied on to the substrate. Combined with a camera and infrared light source, the users’ presence, touch or gestures are detected’ (Eyeclick 2007). The interactive surfaces can be applied on to any type of surface. For example, they can be installed on a bar counter. If people touch the bar counter they can interact with each other, using the light as a vehicle. Further, people can interact with the images projected on the surface by touching them. Often, architects use software programs such as PO-Motion software package (http://www.po-motion.com/) to design images that enhance the design concept.

Architects have predominantly used active and interactive surfaces on bars and restaurant tables, but more recently they have also begun to use them on floors and display boards (Figure 2.9). Active and interactive surfaces offer high-resolution images that can produce high-quality visual results. Another benefit of these systems is that they can be controlled remotely.

Active and interactive surfaces applications have some potential disadvantages in lighting design. The shadows produced by people moving in front of the projectors or due to the technical characteristics of the application is an issue that designers should keep in mind. In addition, the adjustment of the level of light within the space is another important design consideration: when the lighting levels of the surrounding environment are high, the users cannot easily see the system and therefore they cannot use it. Finally, another crucial aspect to be considered in the installation of active and interactive surfaces is that the technical details of their application have to be designed very carefully to avoid glare problems and bad reflections that could be created in the space.

There are many companies that specialise in the production of active surfaces, such as Wrap3 who design digital spaces and objects. At the time when this research was written, in Europe there were two companies that provide and install the interactive surface systems: Mindstorm interactive surface solutions and Eyeclick.
Barrisol®

Barrisol is a material constructed from a polymer. It is a ‘non-flammable sheet in PVC which is tightened under the effect of heat on the periphery of the walls thanks to a specific track system’ (Barrisol n.d.). Due to its stretching properties, it can take any shape the architect wishes, in any colour (Figures 2.10 – 2.12). Further, Barrisol is a material praised for its longevity as it shows little wear and tear even after years of use, and it requires little or no maintenance. Other advantages include good sound and heat insulation properties. Finally, another important aspect of Barrisol is that it is fully recyclable. The only disadvantage of this product is that specialised technicians are required to install it and make any changes to the installation.

Barrisol is best known for its use in ceiling applications. One of the latest developments is that it can be constructed in tiles in various dimensions, creating interesting layouts on the ceiling. Lately this technique has been successfully used on walls in different shapes.

Another cutting-edge development is 3D-form Barrisol, which can be used to create different three-dimensional forms such as ‘rings, waves, cones, paved, cubic, pyramids, vaults, full-clothes hangers, warheads, corbellings, semicircular arches, ogives, tri and five-sided, etc’ (ibid.). To further enhance its appearance, graphics can be applied to the material itself. This can be done either by using special Barrisol painting products or by printing. One of the latest advancements for Barrisol products is that lighting can be integrated within the structure and as a result volumes constructed by this material can be luminous. Barrisol lighting is mostly used to diffuse light. The designer can decide if the
lighting result can be soft or strong according to the thickness of the diffuser. The luminaires used for this type of Barrisol are fluorescent tubes, LEDs or fibre optics.

At the time this study was put together the only manufacturer and supplier of this product in Europe was the company Downer International.

**Polyethylene volumes**

A growing trend in urban and interior architecture is to use furniture that incorporates light in its structure. Polyethylene volumes with integrated lighting are one of the applications that enable furniture to become luminous. Polyethylene volumes are made out of plastic, which is considered a flexible and robust material offering the possibility to create different geometric shapes. Polyethylene can be sculpted into any shape through the use of rotational moulding technology (Figure 2.13). In addition, this type of plastic can be produced in any colour. The majority of these applications integrate LED lamps that can also change colour.
Polyethylene volumes can be used to design furniture or even wall coverings. Molo\textsuperscript{®} design uses the polyethylene technique and is fully recyclable (Figure 2.13). ‘The *softwall + softblock* modular system, as it is called, come in both kraft paper and a 100\% recyclable polyethylene, in tall walls or narrower strips, with the option of an integrated Light Emitting Diodes (Led) lighting system to turn the walls into sources of diffused light’ (Lepley 2009).

The flexible structure of the softwall facilitates the design of furniture of different shapes and sizes such as circular sofas. Users of Molo technology become designers of the space, as they can ‘literally shape space or form in an infinite number of ways. With softwalls\textsuperscript{®} people can play with volume and light within a very conventional room and create incredibly sensual and intimate spaces.’ (ibid. p. 53) (See Figure 2.14.)
In addition to polyethylene furniture, a variety of plastic-based objects and materials are available on the market that share similar characteristics and are often used to filter light. These types of products are the Bencore® or the 3Form® products, which are composite panels made of resins (Figures 2.15, 2.16). These products offer a variety of solutions, colours and textures, as well as appearance and they can filter light in different ways.

Glass

Glass is used widely in contemporary interior design, especially to construct walls used to create a translucent boundary between spaces. Glass can be transparent, coloured, laminated or even textured, opaque or patterned. It can also be designed as a profiled glass system. Further, there is mirrored glass, which is mostly used to make spaces appear
bigger. These types of glass are produced in different sizes, widths, lengths, thicknesses, colours and textures. Glass is often constructed in specific forms and sizes, which limits its use to certain applications. Glass is based on silica and on various other ingredients that affect the quality of the final glass product.

The glass illuminated system\(^\circ\) is a new form of glass. Its construction is based on a combination of electroluminescent lamps and glass. ‘*Electroluminescent lamps are enclosed within some or all of the channels to create a glowing backdrop. The light source provides secondary illumination, requires no maintenance and has a long lifespan, dimming gradually over time*’ (Wilhide 2009, p. 130). In addition, the glass illuminated system can be constructed using LEDs. This system can have different colours, texture or ‘*installation formats and light effects*’ (Lumaglass n.d.). The illuminating systems can be made in curves or any other shape. In addition, this type of glass can have thermal and sound insulation if needed.

A limitation of the illuminated glass system is that if electroluminescent lamp technology is used, the lifetime of the luminous part of the structure is short. It is also difficult to maintain and replace. Finally, at the time this research was conducted the illuminated glass system could be no more than ‘*6 meter’s length of uninterrupted glass and light*’ (ibid).

The illuminated glass system lit by electroluminescent technology is manufactured by Lumaglass (Figures 2.17, 2.18) and the illuminated glass system lit by LED is developed by Powerglass.
Light-transmitting solids

Light-transmitting concrete is a material constructed by concrete and optical fibres. The optical fibres are small and they blend into the concrete itself creating a homogenous new material. It is produced in the form of panels or blocks (Figure 2.19). This material differs from concrete both in structure and appearance. Light-transmitting concrete is a UV-resistant material due to the high quality of the fibres used. Other properties are thermal resistance and high mechanical resilience. As with many of the technologies presented above, this material is recyclable allowing for sustainable use. Finally, light-transmitting concrete can be used in place of bricking solutions as a design element.

The width of the material varies depending on the applications and it is normally between 25mm and 500mm. Panels of different thicknesses come in different dimensions: standard blocks of 40mm thickness are 1,200mm x 600mm and 60mm thick panels are 3600mm x 1200mm. The sizes of the blocks can be produced in other dimensions as well, depending on the application. On average, 4% of the materials used are optical fibres (Litracon n.d.). The fibres provide a consistent light output for up to 20m. The fibres are positioned next to each other into the material. That means that ‘the light-information on the brighter side of such a wall appears unchanged on the darker side. The most interesting form of this
phenomenon is probably the sharp display of shadows on the opposing side of the wall. Moreover, the colour of the light also remains the same’ (ibid.) (Figure 2.20).

The use of this technology enables designers to construct patterns on the material itself (Figure 2.21). The architect can choose how the fibres are incorporated into the material. ‘This is extremely important as the pattern of the light can change. It can be a regular matrix-like or even as organic woodcut-like’ (ibid.). This application was initially used for exterior installations or façade design and filtered daylight through glass fibres. Recently, light-transmitting concrete applications involve interior spaces where optical fibres filter artificial light. Expanding on its use in interior spaces, companies have developed luminaires for decorative purposes. Light-transmitting concrete blocks can also be curved. This technology can be water resistant and can therefore be used in wet areas.

One of the latest developments of light-transmitting solids is Riverstone bricks, which can be assembled together in a number of shapes including various curves and angles. Riverstone bricks are semi-transparent, which means that the designer can turn them into luminous bricks by placing fittings, such as LEDs, inside the bricks. The limitations of light-transmitting concrete and Riverstone bricks are that they are constructed only in particular sizes and that the cost of using this technology is currently high.

Companies that supply light-transmitting concrete at the moment are Litracon, which is based in Hungary, and Lucem, which is based in Germany. The company that supplies Riverstone bricks is Effepimarmi in Italy.

Figures 2.19 – 2.21: Light-transmitting concrete
(left) Block of light-transmitting concrete, designed by Litracon
Source: http://papercities.net/?p=38
(right) Light and shadows create a dynamic appearance of the material
(bottom) Variety of colours and fibre patterns of light-transmitting concrete blocks
**Scintilla Lumina**

Scintilla Lumina® is a light-emitting translucent polymer panel, into which a light source can be integrated. The latest development of the product is the similar Sensitile terrazzo®, which is a revolutionary material that diffuses a single point of light into thousands, producing a luminous panel (Figure 2.22).

Sensitile uses the same principles as fibre optic technology. It connects to a light source that ‘extends light from a single source to hundreds of reflected points along the surface of a material. Constructed of acrylic light pipes’ (Transmaterial 2009). These light pipes reflect light, which at the time of writing can run continuously for 2.4 metres. The shape of this material can be custom made, with the option to integrate graphics if needed. Terrazzo is a durable material. Scintilla Lumina creates an interesting play between shadow and light, especially when light is applied in the surrounding space. Scintilla Lumina uses LED source in order to introduce light and it can have different colours of light.

![Figure 2.22: Scintilla Lumina tile by Sensitile](http://www.materiaapplicata.it/sensitile/)

Scintilla Lumina comes in two thickness, ½ in (1.3 cm) and 1 in (2.54 cm) and various sizes with a clear or matte surface finish. The 2.54 cm Scintilla Lumina tiles are stronger and therefore can be used in large installations. The sizes of the Scintilla Lumina tiles vary according to the installation. However, there are a few standard sizes according to these thicknesses.

One of the limitations in using Scintilla Lumina is that, being made of acrylic material, its surface can be easily scratched. To reduce the sensitivity of the product, specialists advise using the matte version for heavy-traffic areas and applications. Another limitation is that,
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as the material is connected to LED sources without the application of additional energy, the light fades with time.

The American company Sensitile supplies the Scintilla Lumina.

2.2 The application of lighterials

In order to better understand the applications of these lighterials, we examine them individually and study their use in interior architecture.

Electroluminescent products have many advantages that make them appropriate for use in interior spaces. They have very small dimensions, are flexible and produced in a variety of shapes. They can also be mounted onto all kinds of surfaces and materials. This unique combination is particularly useful when the interior needs space. They are also cost-effective and energy-efficient and easy to install.

The electroluminescent products can be cut in any shape with a laser machine, making them easier to use, and can be used to form lines, planes and surfaces with light. The lines are created using electroluminescent wire, the planes are designed with electroluminescent panels and any type of form can be dressed with the electroluminescent tape (Figure 2.23). Electroluminescent technology can also be used to guide people within the space, by indicating the path.

However, a major disadvantage is that electroluminescent tape can produce noise and hence cannot be used in domestic environments or display environments such as museums. (The tape will vibrate if it is not secured and produce a slight hum.) Low life expectancy is another drawback of this technology for its use in interiors. Architects usually provide a long-term architectural solution when designing a space. Having to regularly change electroluminescent products may cause practical problems.
OLEDs are very thin, making them easy to use in various applications (Figure 2.24). OLEDs give the architect the opportunity to use light in innovative ways and shapes. They can be used in residences, bars, restaurants, museums and retail units. However, they cannot be used in areas where water can easily come in contact with or seep into the material, such as kitchens and bathrooms, due to their sensitivity to water. OLEDs are used to form interior spaces that may appear plain during the day, but at night appear as illuminated volumes. Moreover, because of their thin appearance they can be used on various spaces, including ceilings, work surfaces, furniture, tables and blinds. In the case of windows, when the daylight is gone, OLEDs can still illuminate the space.

Light-emitting substances are being used for signage display or in the theatre. Lately, architects are using them to create particular graphics and as decorative elements, which become luminous after their exposure to light, either natural or artificial (Figures 2.25, 2.26). Light-emitting substances can be applied on other material, which makes them easy to use in many installations. So far they have been mostly employed in interior spaces, such
as domestic environments, museums, retail units, bars and restaurant, but they are also being used in exterior projects.

Scintilla Lumina is a relatively new material and its use is still uncommon. It can be used as room dividers, lighting, signage, wall coverings and in furniture (Figures 2.27, 2.28). Due to the fact that it incorporates light pipes within its body, Scintilla Lumina can pick up the colours of the surrounding environment, as well as the lights, creating interesting visual results between the material and the shadows.
The developers of Planilum, on the other hand, have designed various objects, mostly decorative, based on Planilum technology. They have successfully created luminaires for the ceiling, pendants, wall sconces and floor lamps, furniture and as well as space dividers (Figures 2.29, 2.30). The major advantage of this technology is its slimness and the fact that it is no warmer than human body temperature.

Active and interactive surfaces can be applied on any surface, regardless of the shape (Figures 2.31, 2.32). Applications of these systems are mostly seen in interior spaces such as retail units, museums, bars and restaurants. The active and interactive surfaces are largely used as a vehicle for communication between people. For instance, in a museum they could provide important information about the items on display. An interesting characteristic of active and interactive surfaces is their ability to act as focal points. They attract attention and therefore can become one of the most important elements of the space, influencing the circulation.
Barrisol is widely used as part of contemporary design in exhibition spaces, museums, restaurants, bars and retail units. The malleability of the material coupled with the ability to use different textures and colours lends itself to frequent use by architects. Barrisol can also be used to filter light, which offers a variety of creative solutions (Figures 2.33 – 2.36).

Figures 2.31 & 2.32: Interactive surfaces used for bar counter applications
(Left) A system called I-Bar used on the bar counter
Source: http://www.vrtiger.com/bussiness/bussiness_11.html
(Right) Integrated video projectors can project any content on the milky bar surface. The intelligent tracking system of I-Bar detects all objects touching the surface

Figures 2.33-2.36: Barrisol applications
(Left) Interior spaces designed using the Barrisol light model designed by Barrisol
(Right) Barrisol lighting walls. The light can be adjusted for a very bright and clear lighting, or a calm and relaxing atmosphere
Polyethylene volumes have so far been used in interior and urban architecture to construct furniture, most commonly in the shape of seats, tables and lamps (Figure 2.37). The integrated light in polyethylene furniture can create a very interesting ambience and space. Incorporating LED in the construction offers the designer the additional element of colour to experiment with. The long life expectancy of LEDs makes this a practical solution as well. In a similar way, composite plastic can be used to design furniture (Figure 2.38).

Glass illuminating surfaces are very interesting products to be used in interiors such as bars and restaurants (Figure 2.39). In combination with LEDs, they can create different lighting effects including a multiple colour background. Depending on the design concept and the time of the day, people can adjust the lighting effects to suit their needs. In restaurants, bars, museums and retail units, these systems can give the possibility of integrating communication systems with architectural design. This can be in the form of logos, graphics and information displays. Glass illuminating systems can be dimmable, giving architects the chance to create different atmospheres and moods in the space (Figure 2.40).
The light-transmitting concrete can be used across all interior spaces, including residences, bars, restaurants, museums and retail units (Figure 2.41). Light-transmitting concrete® has already been used to construct luminaires. One of the most interesting things about light-transmitting solids is that they can give a degree of transparency to the space. The radical difference between the solids that have been used historically and light-transmitting concrete is that the latter transforms space from private to public, heavily influencing the way people interact within the space (Figure 2.42).

The characteristics of light-transmitting concrete cause a constant visual game between light and shadow, which the architect composes to achieve the perfect balance. This innovative character of concrete and bricks opens up new possibilities in interior design. Light-transmitting concrete and Riverstone bricks have been mostly used for wall applications and space dividers. Again, these materials can be produced in different textures, colours and patterns (Figure 2.43).

Figures 2.41 – 2.43: These images demonstrate designs made of light-transmitting concrete
(top left) Wall made by light-transmitting concrete, showing the relation between the shadow and the light
Source: http://www.tumblr.com/tagged/translucent-concrete
(top right) Light-transmitting concrete used on the Iberville Parish Veterans Memorial in Louisiana, designed by Litracon
Source: http://up-ship.com/blog/?p=3801
(bottom) Light-transmitting concrete block stone, designed by Litracon
Finally, contemporary architects and designers seem to be very interested in lighterials, since new materials with similar characteristics are becoming available in the market.\(^2\)

### 2.3 A comparison of lighterials

The two categories of lighterials described above – lighterials that emit light and those that can connect to light – can play an important part in the final visual outcome and the way people perceive interiors. An analysis of the similarities and differences between these technologies will help determine the way they can be applied in architecture in the future (Figure 2.44).

The most important similarity between light-emitting lighterials and lighterials that can be connected to light is that both types can be composed as three-dimensional volumes within a space. The first category can dress any form and turn it into a luminous one, and the second can create different types of luminous forms. Some lighterials, such as electroluminescent products, light-emitting substances, Planilum, polyethylene products, Barrisol, OLEDs and active and interactive surfaces, create luminous surfaces emitting a continuous uniform light. The rest of the lighterials create patterned surfaces with the texture distributing the light. On the other hand, the active and the interactive surfaces can be used to create either uniform surfaces or patterned luminous surfaces. The two different types and applications of lighterials create very different visual results: a homogenous light appearance versus light filtered through pattern.

The electroluminescent products and the interactive surfaces, because of their functional and technical characteristics, can be used mainly in bars, restaurants or retail units. Electroluminescent products cannot be used everywhere largely owing to the noise that they create. On the other hand, active and interactive surfaces are different from the rest of the lighterials, because they are the only lighterials that can create common public behaviour within an interior space. Therefore active and interactive surfaces are mostly used in public spaces.

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\(^2\) Inflatable volumes can be considered as lighterials. Their appearance is based on the use of a translucent material that is filled with translucent bubbles full of air and lit internally. An example is the Via Lattea® manufactured by Maritalia (Yau 2009). There are also various companies that construct walls or building inflatable forms (FStructures.com 2006)
All the *lighterials*, apart from the OLEDs, are IP rated. They are therefore water resistant, which makes them usable in humid and wet areas, such as kitchens, bars, bathrooms or spas. OLEDs, however, are sensitive to water and their use is restricted to dry spaces.

Some *lighterials* can create interesting visual results on their surface with the use of light or shadow, which makes their use interesting during the day as well. Since light can pass through the material or is filtered through the material, these *lighterials* have a sense of transparency. This enhances the play between light and shadow in the space. *Lighterials* such as light-transmitting solids, glass *lighterials* and Scintilla Lumina have this characteristic. The harmony of the chosen pattern and the controlled amount of light applied on the material give the desired visual outcome. The architect composes the material itself in relation to its function and aesthetics and the way shadows interfere in the space, creating a pattern.

While many *lighterials* are flexible materials, some are more rigid. Malleability defines the way they are used and the types of applications and the forms they can take. The electroluminescent, OLEDs, light-emitting substances, polyethylene products and Barrisol® products are quite flexible and can be used to produce any shape, in any dimension. The active and interactive surfaces can also be easily applied on every surface, regardless of the shape. On the other hand, light-transmitting solids, Planilum, Scintilla Lumina and glass panels come in specific shapes and sizes, so the designer has to follow a specific grid and layout in order to use them in the space. Finally, many *lighterials*, with the exception of electroluminescent products and light-emitting substances, are very highly valued today. OLEDs are not used in architecture yet, despite their potential, because they are not cost-effective despite the life expectancy of the materials.
After examining all the products it is important to link their use to the intention of this study, which approaches light as part of material. An architect is able to design a form that is constructed of a material that emits artificial light or connects to an artificial light source. In this case, the architect should design not only the shape of the form but also the lighting at the same time. Thinking about design development like this implies that the lighterials could influence the architect’s design concept and the design of the forms. In considering the common forms that an architect uses to design a space, it is necessary to establish the similarities and the differences between the forms and the lighterials. What follows is an introduction to the architectural forms that architects commonly use in the architectural synthesis. It is followed by a discussion on which of the lighterials have the potential to be used in a similar way to forms in architectural composition.

Architects use lines, planes and volumes in order to design a space. They also deal with parameters relative to these forms that define them properly: texture and pattern, contrast...
and scale. Further, architects decide on the materiality and the lighting application that complete the architectural idea.

More specifically, when the architect wants to design, for example, a linear form, the only lighterials that could be used for this action are electroluminescent products in the form of wire or tape and light-emitting substances. In addition, Glass illuminating systems are another type of lighterial that could be used to design linear forms depending on the way it is used and the scale of the form itself.

Planar forms can be created by the use of any lighterial except for polyethylene volumes. Walls, ceilings or floors can be constructed this way. These elements are traditionally considered to be solid, opaque boundaries. Lighterials create the possibility to alter this idea, giving another perspective to the appearance of these architectural elements and their composition. For example, when light-transmitting concrete is used, the wall is identified by its porosity. ‘Rather than being preoccupied by solid, independent, object like forms, porosity addresses the experimental phenomena of spatial sequences that trigger emotions and joy in architecture’ (Sokol 2008, p. 171). When artificial light is used with light-transmitting concrete, ‘it can be even used as a curtain’ (Arman 2004, p. 49), rather than just a solid boundary.

Further, when it comes to planar forms, each of the lighterials can give another architectural result to the space, depending on the way it is used. Each has unique characteristics and possible choices of colour, texture or pattern for the architect. There are also some lighterials that provide the flexibility to be used in new ways. For example, for light-transmitting concrete, ‘the amount of light passing through the panels is determined by the different percentage ratios between the components or by the variation of one of the elements in the production processes’ (Arman 2004, p. 50). That means that the architect can control the amount of light that passes through the pores of the material and determine its brightness. Further, in the case of light-transmitting concrete, as mentioned earlier, architects can design their own pattern. Therefore the architect has to design the wall’s appearance in detail in order to be able to accomplish specific visual results.

The same applies to volumes. All lighterials can be used to construct three-dimensional luminous volumes in interior architecture. Volumes, like planes, are characterised by their texture and pattern, contrast or scale. When it comes to the choices of texture of the form, different materials offer different smoothness or roughness on their surfaces. Lighterials can also be characterised by texture, from those that have a smooth even luminous
surface, such as OLEDs and glass, to those that have a harsh surface, such as light-transmitting concrete and polyethylene volumes. Further, lighterials can be characterised by either a tactile texture, such as light-transmitting concrete and Riverstone bricks, or a visual texture, such as Barrisol. In addition, lighterials can also be constructed in matte or glossy applications. For example, Barrisol comes in a glossy texture whereas Scintilla Lumina can be produced in either a matte or a glossy finish.

Regarding pattern, lighterials offer a variety of choices, from the simple to the very complicated, depending on the architectural idea. The pattern might derive from the structural characteristics of the material and the way it is either assembled or fabricated, as happens in the case of the Lumaglass® application, or it could be applied to the material itself, for example, in the case of light-transmitting concrete. In particular, lighterials such as glass, light-transmitting concrete, Riverstone bricks, Scintilla Lumina and active and interactive surfaces have the potential to be designed in many different patterns or already have a characteristic pattern on their surface. For instance, glass can be found in many different patterns. It can be either decorative glass, with patterns drawn on its surfaces, or any colour of laminated safety glass assembled in a specific way in the space. And it can be textured glass or mirrored blocks.

In addition, the contrast between the forms plays a key role for the development of the design. The relationship between non-luminous and luminous forms can be as important for the appearance of the space as the relationship between solids and voids. Ching and Binggeli explain this symbiotic relation between solids and voids by saying: ‘visible forms give space dimension, scale, color, and texture while space reveals the forms. This symbiotic relationship between form and space can be seen at several scales in interior design (2005, p. 104). In a similar way, luminous forms reveal the opaque ones and the opposite.

Further, the contrast between the luminous and the opaque forms influences the architectural idea. There are lighterials that are considered brighter than others, such as the polyethylene volumes or the Lumaglass application. However, most lighterials offer a dimming controlled system option. The architect could use this to coordinate the hierarchy of the volumes in the space in terms of contrast or change it according to the time of the day and the event that is taking place in the specific space. The contrast between the lighterials and the opaque volumes can be either strong or subtle especially with regards to texture. Ching and Binggeli explain that ‘a texture seen against a uniformly smooth background will appear more obvious than when placed in juxtaposition with a similar texture. When seen against a coarser background, the texture will appear to be finer and
reduced in scale (ibid. p.100). The intensity of the light used in *lighterials* determines the visual result of the texture of the plane or the volume.

Further, concerning the **shapes** of the planes and the volumes, different *lighterials* can have different shapes or just specific shapes. Only a few *lighterials* have the potential to be designed in any shape the architect wishes: sphere, cylinder, cove, pyramid, cube, triangle, square or any other organic form. These, for example, are active and interactive surfaces, light-emitting substances and Barrisol. But even these *lighterials* have a different level of flexibility in terms of shapes. For instance Barrisol can be more flexible than more rigid *lighterials* such as light-transmitting concrete and Riverstone bricks.

In addition, the contrast between the volumes is highly dependent on their **colour**. The colour can alter the way these materials appear in the space. *Lighterials* can be constructed in different colours, except for Planilum, which can be produced only in white. Most *lighterials* also incorporate technologies such as LEDs, which can be colour-changing.

Furthermore, the **scale** of the forms in relation to each other and to the overall space is pivotal to the development of the design. All technologies have the potential to be used in different scales, apart from electroluminescents, light-transmitting concrete, Riverstone bricks and Scintilla Lumina, which are restricted to specific sizes and lengths. Figure 2.45 presents a summary of the above.

<table>
<thead>
<tr>
<th>Lighterials that emit light</th>
<th>Lighterials that connect to light</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forms</strong></td>
<td><strong>Electro luminescent</strong></td>
</tr>
<tr>
<td>Lines</td>
<td>X</td>
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<tr>
<td>Planes</td>
<td>X</td>
</tr>
<tr>
<td>Volumes</td>
<td>X</td>
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<tr>
<td>Pre-fabricated Pattern</td>
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<tr>
<td>Custom Made Pattern</td>
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</tbody>
</table>

**Table 2.2:** The most important differences and similarities between the *lighterials* that this study focuses on, when approaching them as architectural forms
These applications are used as a reference to luminous forms which make up a promising group of new architectural forms that an architect can use. They can be used on any surface: on the ceiling and the floor, as walls, and even in the construction of stairs, ramps and furniture. If architectural forms were considered to include a specific group of forms that radiate light, the architect could define different forms in the space as luminous or opaque while designing; for example, a drawn line would be automatically suggested as luminous or opaque; and the same would apply to planes and volumes.

Chapter 2 aimed to explain the term lighterials and the reasons that led to the introduction of this term. The lighterials were categorized and explained in detail, in order to make the reader familiar with materials that relate to artificial light. Further, an analysis of the similarities and the differences between the lighterials themselves, led to a deeper understanding of their applications in architecture, building on their use as architectural forms, which is the major focus of this study. The lighterials are used as a reference to describe luminous forms. Since, the intention of this study is to see how lighterials influence architectural design, it is important to examine the elements that an architectural space consists of. The following chapter focuses on that subject, taking into consideration both architectural and lighting design in the analysis of the space.
In order to understand how lighterials influence architectural design, it is first essential to look at the elements that architectural design consists of to be able to discover how these elements were individually influenced by the lighterials. Poetics is one of the elements that characterise space. In this chapter, poetics is analysed as a term and with regards to its use in architecture. The poetics of the space and its connection to light is explored with the help of examples, aiming to unfold the relation of poetics to the lighting of the space.
3.1 The elements of space

The elements that a space consists of can be approached in different ways, according to the purpose of the study. For example, Chen (1997, p. 262) in his research ‘Form language and style description’ based his study on the following elements: form elements, joining relationships, detail treatments, materials, colour treatments and textures. Chen used these elements to describe different styles of space. Van der Voordt, Vrielink and van Wegen (1997) used an alternative set of elements to analyse and evaluate the goals and the values that rest in the spatial relationships of the plan of a particular space: site, building, rooms, functionality, efficiency, aesthetics, privacy and social contact, identity, accessibility, safety and adaptability.

In a similar way, it is important for this study to set the parameters that describe architectural design and the spaces under examination. This research focuses on architectural design and lighting design as two interconnected fields. In the view of the author, the most appropriate way to approach the elements of the space is with reference to both architectural and lighting design. Approaching design elements in this way provides a relevant background to understand them from both perspectives.

Starting with the elements that describe architectural space with reference to lighting, this study follows the approach used by Michel in his investigations of light as an important element that shapes a space. In his book Light the shape of space, Michel (1996) distinguishes some particular elements as important when he analyses the space with reference to light (Figure 3.1 shows these elements interconnecting). According to Michel, these elements are grouped in the following categories: the spatial envelope, articulation of the space, the role of the structural system and movement through the space (see Figure 3.2).
• The spatial envelope

The boundaries of the space define the spatial envelope. The visual perception of the envelope includes important positions and points where one can see the distortion, clarity and proportion of the architectural space. The appearance of the space is linked to its character and it affects how the space is used. The colour of the architectural space completes the architectural idea and influences how someone perceives the spatial envelope.

• Articulation of space

The articulation of the space is determined by the patterning that is used as part of the design in the space and its connection to the dominant boundaries, as well as by the penetration of the spatial envelope. The relation between the subspaces and how these link together with the overall space influence the articulation of the space. Finally the spatial banding, the different levels of the space, the curvature and the way the transition from one level to another is achieved are vital.

• Role of the structural system

The building’s form and the structural elements such as the columns and the beams provide the basis on which the architect models and patterns the forms of the spatial envelope. Another key element of the structural synthesis is light, natural or artificial and the aim to architectural beauty.

• Movement through space

Circulation in the space and the elements that stimulate movement are important parameters of the movement within the space. People tend to move towards the light, which influences circulation. Two elements that affect movement within the space are the zones of transition and the levels of brightness.
The author also investigated how other studies approach the elements of architectural design. Suwa and Tversky’s study ‘What architects and students see in architectural design sketches: A protocol analysis’ (1997) shows a list of elements used to understand what practising architects and architecture students can see in their drawings. Suwa and Tversky call these elements ‘information categories’ and they used them to help decode architects’ sketches in order to understand the architects’ design aim. Suwa and Tversky grouped the elements in the following categories: spatial relations, functional relations, background knowledge and emergent properties (Figure 3.3).

- **Spatial relations**
  
  This category includes both local and global relations. These provide an insight into how architects sense relations between forms and objects. These relations are categorised as adjacent, far, connected, lined up, symmetrical, configuration and axis.

- **Functional relations**
  
  This category focuses on the form and the functions and it chiefly describes how space is used and interacts with people. The practical roles of spaces or things and the abstract features and reactions are two important elements of this category. Functional relations also include the views, the lights and the circulation of the space.
- **Background knowledge**
  
  This category includes knowledge of the domain of architectural design from various angles: first, knowledge of the structure of the space and the materials used to create specific arrangements and functions; second, standards that evaluate aesthetically the architectural design; and third, knowledge of how the architectural design influences the social context in which the space is built and how the social context influences the design.

- **Emerging properties**
  
  This category refers to the spaces and the objects of the space under review referred to as things, which are designed to serve particular intentions. This category also takes into account the shapes and the angles of the spaces and the objects, as well as their sizes.

![Suwa and Tversky’s Element Categorisation](image)

**Figure 3.3:** Suwa and Tversky’s division of elements into four major categories: spatial relations, functional relations, background knowledge and emergent properties

At this point it is necessary to analyse in greater detail the elements that characterise space. The following sub-sections juxtapose Michel’s approach to space with reference to lighting with Suwa and Tversky’s approach to space with reference to architectural design. The images are included in this chapter to support the literature.
3.1.1 Spatial definition

According to Michel, the parameters that influence perception of the spatial envelope are the boundaries, the visual perception, the positioning in the space, the clarity, the proportioning and the distortion, the character of space and the colours.

The boundaries of the space include many features, such as the walls, the floor, the ceiling and often the furniture. The architect sets the limitations of the space based on functional requirements and the client’s requests. These restrictions influence the way the architect shapes and arranges the boundaries of the space. ‘The boundaries are the limits of the envelope for visual perception no matter how close or how far away they are, as long as they are visible’ (Michel 1996, p. 107).

Depending on the function of the space, boundaries can have different sizes. Function is the factor that defines the actions that take place in the space and as a result sets some standards. In designing a space an architect takes into consideration the minimum requirements of free space necessary for the users to perform specific actions (Figures 3.4, 3.5). The configuration of the space and the combination of different spaces develop an idea of sequence in the user. This sequence creates the necessary background for people to perform specific actions based on the functionality of the space.

Figure 3.4 & 3.5: A hotel where the rooms have particular sizes and configuration according to their function following the architectural idea. Capsule Hotel, Kyoto, Japan. Designed by Fumie Shibata of Design Studio S
(above) View of rooms from the corridor Source: http://www.oneinchpunch.net/2009/11/luxury‐capsule‐hotel/
(right) View of the entrance into the main space of the room Source: http://notventures.notcot.org/post/564/?action=register
Morris in his thesis on 'The architecture of boundary' writes about the importance of the boundaries of a space in the design process. The researcher identifies 'the three primary roles of the boundary, first locating it within the framework of the private-public continuum, then identifying its importance to the institution of private property, and finally outlining the advantages of a selectively permeable boundary' (Morris 2009). Boundaries define the physical limits between private and public space (Figures 3.6, 3.7). This influences people’s behaviour and the way they use space. The design of the boundaries controls the connection between the private and the public space. For example, boundaries could be made of a transparent material allowing visual contact or there could be translucent or even non-transparent material deterring contact.

In parallel, Suwa and Tversky’s study discusses the local and global relations between the different areas of the space, as well as the size and configuration of spaces or things within the whole space or a specific area. Within the territory of the configuration, architects design the boundaries to frame the overall space and then they design particular areas within the space itself. The size of these spaces connects to their function and the dimensions needed to function within them.

Michel discusses the visual perception of the space. People often turn their attention to the floor: ‘awareness of this natural process places emphasis on the floor, either out-of-doors or inside, as a primal component of the spatial envelope’ (Michel 1996, p. 104). The floor, together with the ceiling, creates a feeling of continuity in the space (Figure 3.5). The
walls connect the floor to the ceiling and the edges created enhance the perspective and the depth of the space. Colours, materials and textures determine the perception of the boundaries. Their combination develops a specific language that reinforces the idea of the sequence to the user (Figures 3.8 – 3.10). This enables the visitor to use the space more easily. ‘All the spatial boundaries are characterized by the same texture and color, giving harmony to the whole sequence’ (ibid.).

Suwa and Tversky also refer to the spatial relations and particularly the practical roles that things or spaces have (e.g. a ticket office should be close to the entrance). Architects combine adjacent areas or objects to create spatial arrangements. This arrangement indicates how people use space or the things inside the space. Suwa and Tversky explain specific arrangements within the space, such as adjacency, alignment or remoteness. The
Analysis of Space

distances between the objects and the spaces, how they are aligned to each other, whether there is symmetry in their location and so on, establish their spatial relations.

Another important element that Michel distinguishes is the **positioning** in the space. The positioning follows the **spatial configuration**. In every space some viewing points allow users a better understanding of the architectural idea. These positions often have a visual connection to important focal objects that aim to attract attention. The architect organises the space to achieve specific visual results, such as **clarity**, **proportioning** or **distortion**. For example, if the space were designed to have clarity, the overall concept of the space would be characterised by simplicity of forms and ease in perceiving the space. Another space might be characterised by proportion. *The proportions of architectural space are volumetric, not two dimensional. As planes, the boundaries themselves are normally shaped as squares, rectangles, or other curved or planar geometric shapes, but their proportional configuration as a group sets up a controlled volume, which determines spatial perception*’ (Michel 1996, p. 116). This proportional configuration can be seen either in the overall perception of the space, or in the plan or in particular parts of the design. On the other hand, when the design idea aims to distort forms, the morphology of the forms becomes more complicated and unclear.

In parallel to Michel’s idea of positioning, Suwa and Tversky discuss **symmetry** and **views**. Proportion relates to symmetry because the principles of symmetry cannot be considered without using proportion in architectural design.\(^3\) The views are connected to the functional relations of spaces and objects. Suwa and Tversky discuss views with reference to things one sees or to particular visual points in the space. (Figures 3.11, 3.12). They say that views *‘include the actual appearance of spaces or things ... and the visibility of space to and from another space within the site’* (Suwa and Tversky 1997, p. 390). By deciding on the visibility levels between objects and spaces, architects decide the views and their impact on the users of the space. These views help architects better communicate their architectural design and the appearance of the space (Figures 3.13, 3.14).

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\(^3\) Vitruvius described proportion as *‘a correspondence among the measures of the members of an entire work, and of the whole to a certain part selected as standard. From this result the principles of symmetry’* (cited in Padovan 1999).
Another element that describes the spatial envelope, according to Michel, is the character of the space. He writes that: ‘We talk about spaces as having mood. That is the essence of architecture in its capacity to work on our feelings’ (Michel 1996, p. 110). Michel compares space to a person’s character. He also describes the moods of spaces as ranging from ‘from the satisfying and peaceful to the stressful and depressing. They include the appealing and the exciting, the distasteful and the deplorable. The spatial envelope is a principal conveyor of the character of a space’ (ibid.). The appearance of the space influences the way people perceive its character. The way the surfaces of a space are treated, the colours, the materials and the forms, all together give a particular impression to visitors. For instance, Michel says surfaces such as walls ‘can be harsh or soft, tattered or trim, upright or leaning, monotone or colorful, bright or shadowed’ (ibid.). (see Figures 3.15 – 3.18).
Michel includes two additional factors that influence the character of the space. These are the age of the space combined with people’s associations with specific styles. Every architectural style has particular attributes. Some of the best-known styles have a distinct character. For example, gothic architecture is characterised by pointed arches, flying buttresses and ribbed vaults. On the other hand, rococo style is expressed with excessive decorative elements and pale colours. In a more contemporary setting, a futuristic style normally has the characteristics of curvilinear forms and whitish hue. People’s association with the character of the space creates different feelings.

Where Michel discusses the character of the space, Suwa and Tversky (1997, p. 390) explore people’s reactions and interactions ‘which people may have from experiencing spaces or things’, as important parameters of architectural design. Suwa and Tversky explain that feelings are part of the functional relationship between people and space. The way people experience space has an impact on the way they feel and this is an important element to consider as part of the design. To explain the impact that the design can have on how a visitor experiences the space, Suwa and Tversky use words and phrases such as ‘forces’ or ‘shows’ the visitor or makes the visitor feel ‘something’s going to happen’.
The final element that Michel explores as part of the spatial envelope is **colour**. Once the architect has chosen the materials, the colouring of the space is very important for its final appearance. This element determines the perception of the boundaries and greatly influences the spatial envelope. Colour defines the character of the space, and also influences the way the users feel. (Figures 3.19, 3.20) There is a strong connection between colour and shapes and emotions, but also between colour and light. With regards to colour and shapes, the choice of colour influences the visual perception of the dimensions of the space. A space painted in dark colours looks smaller than if it was painted in white. In addition, colour affects emotions. In his PhD research, Kadar identified the emotions of

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**Figures 3.15 – 3.18:** Examples of how different spaces can create different feelings in users and may therefore be described as having different character

(top left) The character of the space is calming. Six Senses Spa, Paris, France, designed by Pierre Davi  

(top right) The design of the space provides an atmospheric environment. Luxury Boutique Store, Ho Chi Minh City, Vietnam, designed by CLS Architects  

(bottom left) Beijing Noodle No 9, Las Vegas, USA, designed by Design Spirit. The overall design of the space is based on an Arabic pattern coloured white, creating a minimalist interior that appears to overpowering  

(bottom right) The design of the space is inspired by toy building blocks. The character is playful and interactive. Headquarters of Disney Store, San Francisco, USA, designed by Clive Wilkinson  
‘happiness, sadness, anger, fear, disgust, surprise and neutral’ (Kadar 2007, p. 2). He found that colours such as red, blue and orange represent people’s strong emotions, whereas grey and white describe neutral emotions (ibid., p. 80). The same study shows that negative emotions connect to darker colours and positive emotions to brighter. However, Kadar could not establish a connection between specific emotions and specific colours (ibid., p. 142).

Colours and light are also interdependent elements that determine the character as well as the perception of the space. The reflectiveness and the absorbency of the materials influence the way light renders colours. Light makes a colour brighter or darker.

Unlike Michel, Suwa and Tversky (1997) ignore colours and concentrate on materials. They categorise ‘material’ as an element that is connected both to structural factors and to the background knowledge of the architect which includes the architect’s aesthetic consideration.

3.1.2 Articulation of space

Michel distinguishes and analyses the following elements as important for the articulation of the space: patterning, penetration, subspaces and spatial banding. He also adds curvature and level change.

Pattern is an element that enhances the interior design. As Michel (1996) explains, ‘combining an interesting composition for the spatial envelope with pattern detailing of its boundaries is an excellent way of animating space for human appeal’ (p. 123). One important reason why architects use pattern is because ‘these uses of patternation operate
within a refined and controlled order, supporting a larger architectural intent’ (Taylor 2009). Architects use pattern to signify their intentions or to ensure that the space will be functional. They also use it to highlight the significance of different elements and therefore establish a visual hierarchy. Architects often use patterns within their design in order to make visitors understand space easily, especially when they are applied to the boundaries of the space. Patterns attract attention and people often follow them to navigate through spaces. They also act as focal points. When people locate a pattern, they tend to scan the space to find other relevant patterns.

Rodemann wrote that: ‘Pattern perception is often regarded as highly subjective, dependent on individual taste and preference. Neurologically, however, it has been proven that distinct areas of the brain are stimulated differently by different pattern design and colour combinations’ (Rodemann 2009, p. 101). People’s mood can be affected by the use of patterns in the space. For example, striped gratings on patterns create migraines (ibid). A study on dot pattern evaluation showed that ‘most perceived the dot pattern as “distracting”, “busy”, “vibrating”, “overbearing”, “wearying” and “disruptive” using a semantic differential versus “soothing”, “calming”, “stationary”, “graphic”, “simple”, “refreshing” and/or “comfortable”’ (ibid., p. 103).

Architects can create patterns using shapes. Again, these shapes can be identical and repeatable in a specific sequence. Pattern can vary with the use of shapes that follow the same architectural ‘language’ but they differ in scale, colour and material. All elements of the space such as the walls, the floor, the ceiling and the objects can be used to create patterns, either as part of their detail or through their layout. As part of the detail, the surface of the form can host a pattern through the use of wallpaper or a particular image replicated across the form. As part of a layout, a pattern can be identified in the way shapes are set in the space (Figures 3.21, 3.22)
Light also creates patterns. Architects use light effects and light sources in a repeatable manner to generate sequence and unity of spaces. With regard to light effects, architects often use light, or a combination of light and shade, to create patterns in the space. And with regard to light sources, architects organise them in a specific way, aiming for a particular set-up that ‘orchestrates lighting compositions in a planned sequence’ (Lyons and Bedoc 1994, p.16) (Figures 3.23, 3.24).

Figures 3.23 & 3.24: The use of patterns in the space to define the architectural idea
(left) The pattern is used on the walls unifying the space. Wunderman Offices, Athens, Greece, designed by KLAB Architecture
Source: http://archplanner.com/wunderman-project-office-design-by-klab-architecture-greece
(right) The bookcase follows a pattern that characterises the space. Vagabond Travel Workshop, designed by Job Koelequin

Figures 3.21 & 3.22: The use of patterns in the space to define the architectural idea
(left) The pattern is used on the walls unifying the space. Wunderman Offices, Athens, Greece, designed by KLAB Architecture
Source: http://archplanner.com/wunderman-project-office-design-by-klab-architecture-greece
(right) The bookcase follows a pattern that characterises the space. Vagabond Travel Workshop, designed by Job Koelequin
Suwa and Tversky, on the other hand, do not refer to patterns particularly, but they discuss **shapes and angles** within the space’s design. This category includes shapes of things or the angle of these shapes and their relationship to the rest of the space. Pattern could be seen to lie within this territory, since it depends on particular forms that are repeatable elements in the space.

According to Michel, the articulation of the space also depends on the **penetration** of the spatial envelope. How people perceive and use an enclosed space differs greatly from how they perceive and use a space that has openings. The location of the opening as well as its size influence light and the visual result. The proportion of the openings compared to the total building mass affects the articulation of the space. Further, the frame of the opening highlights its presence and, depending on the colour and the material, it could be emphasised or even go unnoticed.

Michel also gives paramount importance to the brightness ratio developed between spaces: the different levels of brightness. The brightness ratio is ‘established by the luminance on the envelope and the average luminance of whatever is seen through the openings’ (Michel 1996, p. 129). The brighter area attracts vision and encourages movement. The shadows that accompany light play a key role, highlighting the brighter areas of the space. In addition, the contrast between two neighbouring spaces influences the way people perceive the dimensions of the space.

Suwa and Tversky (1997) do not discuss openings but the visual **axis**. Axis brings ‘a sense of direction which spaces or things inherently possess’. The axis is categorised as part of the spatial relations between shapes and things within the design.

Michel considers the **subspaces** as an important parameter of the articulation of the space. Architects determine in their design the relationship between the openings and the opaque parts of the space (Figure 3.25). This relationship is important because it establishes which elements or forms will be visible in the subspaces. The subspaces can be designed either as protruding forms from the boundaries of the space or strategically embodied subspaces into the design directing people’s vision towards other areas away from the main space (Figure 3.26). Architects compose subspaces recognising the importance of their scale and their appearance in the perception and exploration of the space. The spatial envelope plays a significant role within this scope, because it provides the framework of continuity and articulation of the space. According to Michel, ‘no matter how a space is articulated – by pattern, penetration or protruding elements – the primary spatial envelope must remain
intact, and maintain its own identity and clarity’ (Michel 1996, p. 132). The spatial envelope acts as an orientation element and its design adds clarity to the use of the space.

Suwa and Tversky include spaces in their list of elements when examining the relationship between shapes and sizes. They classify the spaces and their characteristics, such as shape and size, as elements under the category of emergent properties, referring to spaces as areas or places designed in a certain way in order to serve a particular function. They refer to words such as museum space or around this zone to distinguish particular spaces of the overall design area.

Michel also acknowledges the importance of spatial banding in the articulation of the space. According to Michel, space is creating zones either on the horizontal or the vertical axes. Horizontal banding of the space refers to subspaces and corridors that provide an indication of where people will move. The horizontal banding can be reinforced with the use of elements such as pattern and light that help people navigate the space. These parameters emphasise the direction and therefore the perspective of the space (Figures 3.27, 3.28).

**Figure 3.25 & 3.26:** The use of protruding elements that act as focal objects to make people move in the subspaces
(left) The design of the façade looks like windows to subspaces
Source: http://www.ehomemecor.net/the-master-bedroom-designs-for-married-couples/
(right) The objects are suspended from the ceiling. The visitors have to stand below the holes to view the objects closely. Solo exhibition at Belinische Galerie, Germany, designed by Magma Architecture
Vertical banding refers to the vertical structural elements of the space, such as columns and staircases. Columns imply continuity to the other floors. Similarly, staircases connect all the floors together through a vertical core. Further, the fact that they connect two or more spatial envelopes together makes their design even more important (Figure 3.29). Spaces between floors can have different functions, design and appearance. Staircases create a middle zone where people adjust to the new design idea (Figure 3.30). Level changes within the same floor also influence the articulation. Within the same scope Michel discusses the **level change**, focusing on the elements used to connect the different areas together. Such elements can be ramps, elevators or stairs, which are used as in-between elements connecting spatial envelopes with similar or different characteristics.

Suwa and Tversky (1997) describe similar elements under the name **physical connectedness**, linking them to the local spatial relations. They refer to this category as ‘physical connectedness by mediation of other things’ (p. 389).
Finally, Michel includes **curvature** as a parameter that influences the articulation. Curved forms often enhance the feeling of continuity in the space. When walking along a curved wall views change continuously. That creates anticipation in visitors and becomes part of the overall experience (Figures 3.31, 3.32). Architects use curvilinear forms especially in contemporary interior design. Curvilinear forms create positive emotions for the body, the mind and the spirit (Madani Nejad 2007, p. iii).

In contrast, Suwa and Tversky discuss the elements **shapes** and **angles** as part of the emergent properties categorisation. They use words such as *round* or *wavy line* to refer to the shape of such objects and forms of the space. Curvature could lie within the same context as shapes and angles since it refers to the curved shape of particular elements of the space that depends on the ratio of the angle of an arc and its length (SolitaryRoad.com n.d.). On the other hand, curvature could be included within the physical connectedness elements, since, as Michel describes, it shows continuity.

**Figures 3.29 & 3.30:** The images show elements of the space that connect it to subspaces vertically (left) The design of the glazed walls shows a continuity of the design extending to the upper floor. Private Residence in Singapore, designed by Ong & Ong
Source: http://bigexcellenthouse.com/modern-minimalist-house-by-ong-ong/
(right) The staircase as an element used to unify the different floors. Designed by Edilco
Source: http://www.design42day.com/2009/10/staircases-by-edilco/
3.1.3 Role of the structural system

According to Michel (1996), the role of the structural system is pivotal to the way architects design. The elements that Michel distinguishes are building form, light and structural synthesis for architectural beauty.

The position of the columns and the beams, in addition to any other permanent structural element such as staircases, plays a key role in the architect’s concept development. Architects have a choice whether to make the prominence of the building form visible or not. By choosing to hide it, they create a new design of the interior space, concealing the structural elements in the new design (Figure 3.33). By choosing to make the structural elements visible, the structure itself often adds pattern and rhythm to the space (Figure 3.34). In contemporary architecture the shape of the building is often unified with the interior design. That influences the layout of the space and the overall shape, making the interior forms appear more dynamic. The design elements become part of the structure and act as part of the overall spatial envelope.

Many interior spaces follow the structure of the building by incorporating the structural grid in their design. The grid influences the composition of how different elements of the space, such as the floor, the ceiling, the furniture, the circulation routes, the tiles and the
pattern, come together. The dimensions of the grid also reflect the dimensions of the overall space. Architects choose to shape the space according to the grid, but sometimes alter the grid by introducing shapes that change the interior space.

Suwa and Tversky (1997) discuss the importance of the structural elements from the point of knowledge that architects must have in the domain of the structures. In that context, the two researchers use the term **background knowledge** to explain three different parameters. The first parameter is the domain knowledge of materials and structures. The second parameter includes the standards that architects have with regards to their own preferences and aesthetic criteria. The third parameter involves the social parameter that architects take into consideration, which impacts on the design.

![Figures 3.33 & 3.34: Use of the structural system as part of the overall design](http://www.furniturefashion.com/2009/01/10/wallpaper_home_furnishings_and_interior_design_award_winners.html)

(Left) The design is based on the creation of an organic form derived from a Banyan tree used as the columns of the spaces. Apartment in Madrid, Spain, designed by Office dA

Source: [http://www.furniturefashion.com/2009/01/10/wallpaper_home_furnishings_and_interior_design_award_winners.html](http://www.furniturefashion.com/2009/01/10/wallpaper_home_furnishings_and_interior_design_award_winners.html)

(Right) The architects created a tree-like design that evolved around the column system of the space. Rotterdam art and culture building, Rotterdam, Netherlands, designed by OD-V


Based on Michel’s analysis, the structural system is strongly connected to sources of **light**. An important part of the overall structure is the openings that permit natural light into the space (Figure 3.35). The amount of natural light that penetrates into the space and the quality of light depends on the orientation of the opening and its scale. Natural light affects the design of the spaces close to the openings, as light can create glare issues and discomfort. In this case, controlling the natural light plays a significant role in the development of the interior design. Moreover, the views of the exterior environment from
the openings influence the architect’s decisions, because an attractive or interesting view can turn people’s vision towards the opening (Figure 3.36).

Figures 3.35 & 3.36: Use of natural light to enhance the design idea
(top) The design is based on the use of openings that allow the natural light to enter the space, elevating the design idea. Cell Brick House, Bunkyo-ku, Japan, designed by Atelier/ Yasuhiro Yamashita
Source: http://buildingskins.wordpress.com/
(bottom) The use of natural light to heighten emotion. Designed by Tadao Ando
Source: http://thearchitectstake.com/interviews/zackdevito-architecture-designers-master-builders-part-2/

Michel (1996) explains that artificial light is also part of the structural system (Figures 3.37, 3.38). There are various factors that influence the architect’s composition. Examples of these factors are the dimensions of the light source, the intensity and colour temperature of the light, the glare or the reflection and refraction of light. Further, the amount of light needed links to the functionality of the space. The levels of light vary according to the actions that take place within the space and the lighting requirements needed to perform
specific tasks. And the location of the electric cables and provisions also affect the lighting decisions. Ideally, the architect aims to synchronise all these factors with the synthesis of the building and structural form itself. In this case, the architect directs the light and achieves balance between lighting design and architecture. Similarly, Suwa and Tversky (1997) enlist lights as important elements in the design. They include lights in the functional category, discussing how lights influence particular elements and the overall space.

Finally, Michel highlights the structural synthesis for architectural beauty. Architects face many restrictions as they develop the form, such as the functionality of the space and have to deal with the static requirements for the construction of the building form, the lights and the comfort levels. However, architecture aims to create forms that not only serve their purpose but also have beauty and inspire people who use the space. As Michel (1996) says, ‘structure contributes to beauty when it synthesizes form and space in an artistic coherency for quality human living’ (p. 152). The architecture of the space is successful when it is done with respect to the structure and in harmony with the overall building form. Suwa and Tverksy refer to the aesthetic standards that architects use to evaluate their own design decisions, as part of the background knowledge category.
3.1.4 Movement through space

Michel includes circulation, stimulating elements, transition zones and brightness changes as part of the movement in the space category. Directing people’s movement in the space is part of the design process and is pivotal to the architectural composition.

Michel believes that circulation in the space is critical and depends on different elements. One of the most important factors involves the elements that act as stimulants for movement. Light is another important factor as people turn their attention and therefore their movement towards the light (Figure 3.39). Moreover, people’s movement follows transition zones that direct circulation towards a particular path. Michel (1996) explains circulation as an overall experience: ‘true, people move as governed by their motivation at the time, but they also move according to how they see, hear, and experience their total environment … Spatial organization and the lighting of certain features of the built environment prompt people’s movement patterns, and those features can be manipulated to make architectural design more comprehensible and meaningful’ (p. 158). Suwa and Tversky (1997) also enlist circulation as a major component of architectural design.

Circulation is influenced from factors that make people move towards a specific direction. These stimulating elements could be objects that act as focal points (Figure 3.40). Architects use these focal objects to organise the circulation in the space. In a similar manner to the way in which people are attracted to these objects, people follow particular routes based on the design of the space. In spaces where more than one focal object exists, the human eye scans the most striking one, with the most dominant character, and people move towards it automatically. In comparison with the stimulating elements used by Michel, Suwa and Tversky discuss things that are used as part of the emergent properties category. Such elements indicated in their study are sculptures or trees or water.
Another technique that architects use in order to direct movement is to create paths that lead to incomplete visual scenes. People become curious to see the end of the scene. This feeling of curiosity makes them move according to specific paths. A similar reaction is achieved when architects use semitransparent materials to construct walls that separate one area from another. People often go around the visual impediment to discover what lies behind it.

Architects also use patterns to direct movement. There are many examples where architects use patterns to direct people’s vision and therefore their movement to a specific direction. Michel uses the example of an atrium. Visiting an atrium within a large space, people understand the sequence of spaces and floors. Patterns can be created in various ways; for example, pattern based on colours, on artificial or natural lighting, or on texture.

As mentioned earlier, another important element with regards to movement in space is the movement towards light (Figure 3.41). Michel explains this behaviour, which all plants and animals have, as phototropism: the movement towards light. Humans react to light in the same manner. Michel (1996) explains further: ‘research has now supported this fundamental behavioral trait found in people. The entry of light into the retina causes extreme physiological change as it stimulates the photoreceptor cells, and any bright surface or light source in the visual world attracts the focus selector’ (p. 163). Architects use light to highlight particular areas in order to attract people’s movement. People tend to select the brightest area or path. This corresponds with a study by Taylor and Socov (1974), according to which people tend to choose the path that is brighter. Architects design and light spaces according to the above research and empirical evidence. Often they create a
hierarchy of different forms with different brightness levels. Materials also influence this decision, as depending on the material, light could be reflected or absorbed. Architects establish the **brightness levels** of the space according to function and aesthetics (Figure 3.42).

![Figures 3.41 & 3.42: Use of artificial light as an element to direct movement towards a specific area or point](http://www.designshoot.com/installation-interior-design-by-by-francois-schneider-and-pier-wunschel.html/)

(left) The linear artificial light is located on the ceiling, guiding people around the space. Social Club, Paris, France, designed by Francois Schneider and Pier Wunschel

Source: [http://www.flickr.com/photos/62631437@N00/471216351/](http://www.flickr.com/photos/62631437@N00/471216351/)

(right) The artificial lighting highlights the subspaces

Michel (1996) highlights the significance of **transition spaces** to movement in the space. Transition zones are created between bright and dark areas (Figure 3.43). Changes in the levels of light affect people’s movement; especially when the contrast is high. Architects create a transition space to mitigate the impact of the change in the light levels. A similar situation occurs when people move from an exterior space on a sunny day into a dark interior or the opposite.

Transition zones are created between spaces with different materials, styles, colours, lighting or characters. For example, a transition space could be formed between two subspaces, where one is made out of wood and is circular and the other one is made from concrete and is linear. The area that links these subspaces is a transition zone where people adjust to the new concept and character of the space (Figure 3.44).
The analysis above gives an insight into each element and how it contributes to the design of a space. All these parameters are interconnected and influence one another in the architectural design process and result. The approaches of Michel (1996) and Suwa and Tversky (1997) add information on these elements and broaden the readers’ view of the architectural space, taking into consideration both the architectural and the lighting perspective.

The author aims to draw parallels between the elements that Michel uses and those used by Suwa and Tversky. This study brings together these two researches in order to complete the approach of space with reference to both lighting and architectural design. The outcome of bridging these researches is a list of elements that describe the design of a space where lighting and design are interconnected. Because they enlist elements under different types of categories, Figure 3.45 shows elements that are common to both studies.
Looking in more detail at the spatial envelope category, Michel discusses **boundaries, visual perception, positioning, clarity, proportion and distortion, the character of the space** and **colour**. The elements of this category draw a comparison with some of the elements that Suwa and Tversky use to describe architectural design. More specifically, instead of **boundaries**, Suwa and Tversky discuss **size** and **configuration** of the space. In the place of the **visual perception** element, they use the local relations category instead to explain the arrangements of the forms in the space such as **far, lined up** or to describe **adjacency, remoteness** and **alignment**. Further, Suwa and Tversky refer to **views**, to explain the **positioning** of important elements, forms and objects in the space. On the other hand
Michel talks about viewing the distortion or clarity or proportion of the space from particular positions in the space. Moreover, where Michel discusses the character of the space, Suwa and Tversky argue that the abstract features and people’s reactions are very important elements. Finally, Michel refers to colours, but Suwa and Tversky mention architects’ knowledge of materials and aesthetic preferences.

Michel enlists patterning, penetration, subspaces, spatial banding, curvature and level change under the category of articulation of the space. When Michel explains patterns and curvature in architectural space, Suwa and Tversky discuss shapes and angles. Moreover, they use the concept of axis instead of penetration that Michel mentions. All three researchers believe that the use of spaces and subspaces influences the articulation of the space. Michel also argues the importance of spatial banding, curvature and level change, when Suwa and Tversky use the idea of physical connectedness to express similar relations.

While Michel includes parameters such as building form, lights and synthesis for architectural beauty, to describe the role of the structural system, Suwa and Tversky discuss the importance of lights in architectural design. They also create the category background knowledge, to express all elements that link to the architect’s knowledge of structures and aesthetic preferences, incorporating social factors within this scope. Finally, Michel is interested in movement in the space, introducing parameters such as circulation, stimulating elements, transition zones and brightness changes. Suwa and Tversky also consider circulation as an important element of design, adding the things that interpolate into space.

Acknowledging that this research focuses on lighting and architectural design, this analysis introduces a new list that takes into consideration both perspectives: Michel’s point of view from the lighting design perspective and Suwa and Tversky’s from the architectural design perspective. The following list is produced from all the elements drawn from the studies explained above, including those that are not common to both. This creates a new and complete list that can be used to analyse the elements of the space based on a lighting and architectural design approach, as seen by the author. Figure 3.46 sums up the list of elements.
All the elements listed in Figure 3.46 determine the appearance and the use of the space. They give unique qualities to the architecture of the space, both individually and also when they are combined. Analysing these parameters in a space under review in this study brings the author closer to understanding the intention of the architect. All the above elements, apart from background knowledge, are used as a basis to explore diverse architectural designs in the later chapters. Background knowledge is not used in this research because it focuses on particular interior spaces with given architectural characteristics and architects’ background knowledge is not a topic under examination.

Michel (1996) writes about the elements of the space, explaining that their combination will create an ‘interchange between the architectural environment and your personal, intuitive response to its mood’ (p. 110), referring to it as the character. He also discusses the synthesis of architectural beauty when architects combine all the elements of the space together. On the other hand, Suwa and Tversky explain that feelings, interactions and reactions between people and space are important to consider when designing, as well as the aesthetic evaluation from the designers side. Both researches conclude that the aim of
architectural design is to affect the users by creating interesting experiences. To express this capacity of architectural design and the architect’s intention of creating spaces that have an impact on their users, another term is introduced in this research: **poetics**. In lighting especially, poetics influence the concept, creating spaces that are not just adequately lit where light serves the function of the space and creates a story within the design.

Light affects the way people function in a space and lighting makes people use space in a particular way. Lighting design refers to the architect’s capability to transform the moment and the space with the use of light. Often lighting designers intend to create an environment that is correctly lit in terms of light levels, rather than an environment of emotional impressions. Most of them use technical means such as computer programs to design the lighting schemes of the spaces. But the use of technology could result in losing the connection with the poetics of architecture.

This study aims to bring together the architectural and the lighting design field. Poetics is a term often used in architecture. Borrowing the term poetics from the architecture field and applying it to lighting design will bring the two fields closer together. The following section focuses on an analysis of the term poetics. The poetics of the space and its connection to light is explored with the use of examples, with the aim of discovering the relation of poetics to the lighting of a space.

### 3.3 Focusing on poetics

Poetics is a term that is used in architecture to cover the idea of all the sensuous elements that come together in order to provoke the emotions, feelings and reactions of observers. This term is introduced in this research to understand the relationship between architecture and artificial lighting design and people. At this point it is valuable to research further into the term poetics and elaborate on it through the use of examples in both architecture and lighting design.

#### 3.3.1 What does ‘poetics’ mean?

Poetics comes from a Greek verb ‘τοιω’ that means ‘I create’ or ‘I make’. The poet is the maker or the creator and the term poetics can be applied to the making of music or art or poetry or architecture. In architecture, the poet can be the architect or the lighting designer.
Poetics has a strong link to architecture. *The word tekton means carpenter or builder in Greek. In 500 B.C. tekton also was used to describe not only physical elements but referred to the act of making called poesis. Eventually, the maker of physical constructs was called an architekton, from which the word “architect” comes* (West 2005, p. 16). Consequently, the word ‘poetics’ can be used in the same way in architecture as well. The architect as ‘poet’ aims to provoke the senses. Poetics in architecture refers to creativity and aesthetics and could be defined, as Zabetas (2007) wrote, as ‘*the construction of the beauty and the beauty of construction*’.

The word poetics is used often in architectural research. Most of the time, it is used to express both the experience within a space, a building or a landscape and the experience that lies behind an architectural idea. Hamilton (2006) uses the word poetics to describe the relationship between the function, the place and the experience in the form, and he explores architecture ‘as both the purpose-driven art of building and the experience-driven art of creating place’ (p. 6). Hamilton talks about experience being a key driver in the development of architecture, but also a pivotal element in the development of the purpose or the intention of the architectural idea.

Zumthor (1999, p. 11) stands out by discussing ‘a poetic quality’ that comes from the ability of the architect to create a ‘meaningful situation for (the materials) ... since materials in themselves are not poetic.’ Fortkamp (2005) examines how architects deal with the experience of architecture and poetics, based on their sayings and writings. She uses the word poetics in a similar way to Zumthor, explaining the way the space communicates with the user and the way the latter perceives the space.

Pallasmaa, in ‘Hapticity and time’ (2000) (cited in Fortkamp 2005) introduces poetics in architecture as a major element that links to experiencing architecture. He discusses how buildings can lose the inviting elements that affect people’s sensory systems. He uses the following attributes to explain the ‘existential and experiential’ premises of architecture: ‘*multi-sensory experience, material poetics, and fragility*’ (Fortkamp 2005, p. 34) to explain further the qualities of architecture that link immediately to human perception.

Another researcher, Erbaugh, explores the interaction of poetics and tectonics, focusing on poetic expressions in contemporary construction (Erbaugh 2006, p. 5). He highlights that the key to a successful result is the integration of poetics into the technical aspect of the design process. He also argues that incorporating poetics within the technical part of the design ‘should not be conceived of as an aesthetic style, but rather as an intelligent process’.

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( ibid. ). Erbaugh proposes that the poetics should be part of the architectural design during the analysis of the project requirements and the technical procedures.

When architects refer to poetics, they consider not only the built place, but also the empty space. This is where people live and act (Figures 3.47, 3.48). It is, therefore, very important to distinguish the meaning of the place and the space, as Hiroshi Nakao suggests. He explains that often architects design only for the place, meaning the part of the design that is made by material forms and follows particular requirements, either social or physical. He then distinguishes space by saying: ‘Space is created for the conscious not for the body ... The human being consists of a soul and a body, and the soul inhabits the space while the body lives in a place’ (Nakao, cited in Yamazaki 1994, p. 88). The place and the space are clearly distinct but at the same time inextricably connected. Architects often neglect to incorporate space as a distinct feature in their designs. But space is fundamental to the way we experience a design. Space is as important as place and architects should put emphasis on this element of the design as well. The above corresponds with Relph’s opinion (1976, p. 14, cited in Seamon and Sowers 2008) about the place and space relationship, that they ‘are the significant centres of our immediate experiences of the world’.

In addition, Soni (2010) writes about memory being an important part of the poetics of the space. More particularly Soni explains that architecture ‘generates memorable experience in certain context through certain characteristics’ (academia.edu, 2010). These special characteristics can create impressions to the people who visit the space, which lies within the natural scope of architectural design as Stenros explains (cited in Vesa 2001). On the other hand, Hopsch (2011) discusses the rhythm that architecture can set in the body, which links with the experience of the space. She implies that the brain remembers and the body remembers, connecting architecture with the user’s motion and memory (ibid.). Often spaces follow a particular design that influences users to move in a specific way. After spending some time in the space, the visitors can use the space automatically.
Zabetas (2007) links poetics to the architectural **language** that architects create, transforming users’ basic daily needs into architectural components. He explains that architects design based on the users’ needs and desires. He refers to the architectural design process as ‘the ability of building components or indoor and outdoor spaces to communicate with the resident/user by addressing the latter by means of an architectural speech that is unuttered but tangible (comprehensible)’. Moreover, Zabetas describes architectural design as a plot that involves various architectural and structural components to create a specific speech. He also refers to space as a three-dimensional text that unfolds and suggests a particular story.

Phillips (1975) discusses the way in which architecture has been approached over the years, pointing out its relation to poetics. He refers to 1830 as a landmark year, when architects detached their approach from the concept of Euclidean geometry and created a new way of thinking about architecture, which employed *more than three dimensions*. According to Phillips, today architecture acts not only on the users’ perception from a visual point of view, but it also involves ‘the scale of feeling’ (p. 1). Philippou has a similar approach: ‘Architecture is usually seen as three dimensional. But there is also, a fourth dimension; the poetical one’ (Philippou 1991, p. 109). For Philippou, poetics brings three-dimensional...
architecture to life. Philips and Philippou both point out the dynamic impact that architecture can have on people’s feelings, referring to this impact as the fourth dimension of the architectural design.

Van Schaik discusses poetics from a conceptual point of view, turning his attention to the side of the architects. More specifically, he is interested in the relationship between the user and the space and the impact it has on the architect’s conceptual process. For example, he suggests that the architect could first explore the way people distinguish an object from the space, ‘in from out, up from down, and so on’ (van Schaik 1997, p. 13), before the architect tries to create a space where the users will experience new situations and feelings that will affect them in the way they will use the space and will impact their emotions.

**Aesthetics** provoke emotions. This is the view of Casakin and Mastandrea, who highlight the importance of emotions in people’s everyday lives and how these influence their experience. They explain that emotions, ‘affect our everyday existence, and our general experience of well-being endowing it with pleasant and unpleasant qualities’ (Casakin and Mastandrea 2009, p. 58). For instance, artefacts or architectural designs or any other type of art can provoke emotions, which they call ‘aesthetic emotions’. Architects take aesthetic emotions into consideration when designing a space, from two different aspects. First, architects aim to make people incline towards particular designs, and second, aesthetic emotions encourage architects themselves to take particular ‘design decisions over others’ (ibid.). So when architects consider poetics of the space, they contemplate aesthetics and more particularly, aesthetic emotions.

Poetics therefore links to the architect’s intention; to stimulate the visitor. The word poetics is more frequently used in relation to poetry or other literature, but a poem and an architectural space follow similar principles, as the architect and the writer share some common characteristics (Philippou 1991, p. 103). A poet aims through the use of appropriate language combined in a specific way to describe an action, an object or a feeling and to provoke the observer’s feelings. Each word is significant and using it in the text in one way gives a different result from using it in another way. The poet’s objective is to attract readers’ attention and awaken their emotions.

‘In writing, sentences which are related form paragraphs, and paragraphs form chapters, ultimately to comprise one complete entity – a book. And so it is in interior design’ (Bell 1987, p. 19). In interior design, instead of words, sentences and paragraphs, the architect
uses walls, furniture, columns and other architectural elements (Figures 3.49, 3.50). The way in which these elements are composed and combined describes the way the space functions. Further, the materials and the colours that dress those architectural elements form the space’s identity. The architect combines the forms with the materials, the colours and the light to create a space that will be not only comprehensible to the users but also inviting and inspiring. The architect transforms the amorphous material construction into a living space, aiming to achieve the occupant’s well-being.

Figures 3.49 & 3.50: Architectural elements communicate to the residents how to use the space
(left) Text on the wall symbolises the use of architectural elements as words
Source: http://3.bp.blogspot.com/_nH5E6mclu3o/SVasmz_3YoI/AAAAAAAACPo/4AhvlEPfgqw/s400/Marina+Camargo+Letters+in+Perspective.jpg
(right) The design of the architectural space itself communicates to the user how to use the space

Approaching architectural design in this way corresponds with another study, which views design process as syntax. Beever (2006) compares language with architectural design, analysing them in components. She refers to the components of the architectural design as design elements, explaining that ‘design elements are ordered by what, in essence, is a three-dimensional syntax; organizing principles (e.g. balance, rhythm, emphasis, etc.)’ (p. 10). Beever believes that architects compose the design elements by following a particular syntax that aims for the creation of an architectural language. The architect uses these elements to suggest and describe the space to the visitor or occuulant through a three-dimensional architectural text. This language is successful when it involves successful aesthetic results (Figures 3.51 – 3.53).
Van Schaik (1977, p. 12) agrees with the correlation between architectural design, poetry and poetics ‘by reference to a common experience of a body of literature.’ Van Schaik uses the term poetics to describe emotions that are evoked when listening to a song, looking at a painting or reading a poem. Poetics can derive from any form of creation that aims for the sensory stimulation of people. Poetics refer to arts generally and architecture, design, music or photography. Poetics activate of the senses of sight, smell, hearing or touch. All arts aim to create a particular experience to people and all have a corresponding reference of time and the space. Van Schaik gives the following definition to poetics: ‘Poetics is the experience of inhabiting, the experience of negotiating a passage through the world in time and space’ (ibid.). So poetics do not exist unless there is a context: a space.

Poetics is a term that has its roots in philosophical browsing and it is used to describe multiple sensorial experiences in a space. In other words it is a term that packages all the senses that are created by exploring a space. It is a nebulous term; it is a word that requires context. One can discuss the poetics of a given space. Further, poetics deals with a

Figures 3.51 – 3.53: The architects designed this residence incorporating a poetic sensibility to the spaces, using local materials, natural light and local Cycladic architectural style. Residence on Santorini, Greece, designed by ISV Architects
(top left) Interior view of the main space
(top right) Exterior view in perspective
(bottom) Plan
Source: http://www.isv.gr/en/?about=5&id=105
language that communicates the aesthetic dimension of the space, as well as the psychological one. That means that in architectural design, there are elements that can provoke people's emotions through visual stimulus. These visual stimulants that set the space's atmosphere are described by the term poetics and depending on the function of the space the poetics differ from one space to another. The literature above is a synthesis of the different qualities that poetics include. Starting with the elements that Michel (1996) and Suwa and Tversky (1997) refer to, poetics describes the mood of the users, the feelings that it creates in them and their reactions and interactions. Following the information above, poetics can be decomposed also into the space’s syntax, aesthetics, language, memory, and experience, and but also, can highlight the distinction between the space and place (Figure 3.54).

So, the word poetics states in this research the emotional/ psychological/ aesthetic relationship created between user and space, which can be decomposed into the qualities mentioned above. The author considered using other words to express this link between users and space. For example, if the word ‘story’ was used instead of the word poetics, it would be insufficient to cover the strong impact the design has on the feelings of the users and therefore to juxtapose the experience of the space from the side of the user, which poetics as a term does more successfully. Further, using ‘character’ instead of poetics would again make readers focus only on the characteristics of the space without challenging them on the reactions of the observers. A word such as ‘atmosphere’ can express the capacity of the space to influence the experience of the user, but it would focus on the sensory qualities and the feelings that the space creates for the users without taking
into consideration the intentions of the design idea. But since this research referred to lighting as an inextricable factor of architecture, a term borrowed from the field of architecture can cover the conceptual and the theoretical qualities implicated in architectural design. Hillier (2007, p. 35), discussing the nature of architectural design, said that it is strongly and immediately associated to theory: ‘architecture is therefore permanently enjoined to theoretical debate. It is in its nature that it should be so’. Therefore since the objective of this research is to bring lighting and architectural design together, the use of such a word would create the theoretical background to explore this connection further.

In the next section, the author examines the relationship between poetics and space. The function of the space appears critical in the development of the poetics, serving different psychological needs.

**3.3.2 Poetics and space**

Poetics play a significant role in interior spaces. Different types of spaces cover different needs and provoke different emotions and aesthetic stimulations. According to the function, space accommodates different actions that link to the immediate experience between user and space: ‘function in architecture must recognize the relativity of experience’ (Lang and Moleski 2010, p. 41). People’s perceptions, needs and emotional stimulations affect the way people function within that space. Therefore the poetics of the space relate to the function.

The use of the space plays a key role in the way it is designed. Suwa and Tversky (1997) refer to function when they analyse the spatial configurations and the practical roles of spaces and things in space. Hamilton (2006) suggests approaching architectural design by allowing experience to be part of the functional concerns (p. 5). Further, he argues that architects can use ‘a design methodology that deals with this expanded concept of function in a rational as well as an irrational or expressive manner’ (p. 5). The architect’s intention in interior design is to organise the forms and space into a coherent whole. With regards to poetic sensibility, that process involves composing design elements, ‘into three dimensional patterns according to functional, aesthetic and behavioural guidelines’ (Ching and Binggeli 2005, p. 37). The functional requirements of the space are crucial for the design outcome and set the parameters for what the occupants need. ‘The conceptual procedure is directed to the preliminary goals of the functional requirements, the image and style, the aesthetic enrichment and the psychological stimulus and meaning’ (ibid.).
Interior spaces vary in terms of the style and function that determine the characteristics of the space. When discussing different types of space, there is a list of different qualities that the design elements can give to space; some examples are: playful, dynamic, diverse, transparent or ‘accessible, aesthetics, cost effective, functional/operational, historic preservation, productive, secure/safe’ (WBDG 2011). Architects decide on the qualities that the space has according to function. Poetics express those qualities that bring the psychological dimension into the design idea. Arnheim believes that the psychological factor and the physical form of the space are correlated. More specifically, he explains that the forms of the space relate to function and this relation is ‘the translation between an object’s functions and the language of perceptual expression’ (Arnheim 1977). In this chapter the author focuses on the function of the space and the impact it has on the mood of the people who are using it.

According to Coles and House (2007), the different types of spaces can be generalised in the following categories: transient spaces, retail spaces, work spaces, living spaces, public spaces and restorative spaces. This section focuses particularly on the general characteristics of examples of these categories, such as exhibition and display, shops and showrooms, restaurants and bars, hotel lobbies, galleries and clinics.

The transient spaces category includes spaces designed for exhibition and display. Such spaces are designed to ‘capture the attention and to display and promote the artefact or information’ (Coles and House 2007, p. 73). However, each of these spaces has to be designed in a new, innovative way with respect to the artefact that is being displayed. Most users visit such spaces only once or a few times. Therefore the design idea of the space, in combination with the topic of the exhibition under review, is vital to bring the visitor back to space for the same or another exhibition. The most important aim of the architect is to engage the visitor in the exhibition in unfamiliar yet inspiring ways.

Media spaces such as radio and TV stations are primarily used to bring information to a broader audience. Media spaces also help define public opinion as well as share knowledge. These spaces also reinforce ‘human activities such as cognition, perception, sensation and action’ (Ellsworth 2005, p. 3). Architects use the objectives of media spaces to create a successful design. For example, they design areas for research and presentations, but they also make use of relevant technologies. Moreover, this ‘space type design must be flexible enough to take into account these types of integrated technologies as well as to properly store, handle, and circulate printed and other media types’ (WBDG 2009b).
When people visit media spaces they are open to knowledge and new things. They are also open to new experiences. It is therefore very important that the space is shaped to promote a forward-looking feeling both to the media employees and to the guests (Figure 3.55). Further, such spaces should promote the idea of ‘experience in the making’ (Ellsworth 2005, p. 4) since media spaces are considered to be dynamic and creative and this is what makes them successful. The design of a media space can be linked to the communication of ideas between the producers and the visitors (Figure 3.56). Lastly, a successful design of a media space makes users adaptable to the environment and prepared to use the multi-media resources provided.

The exhibition area encompasses a wide variety of different types of spaces, such as auditoriums, meeting spaces, small theatres and galleries. Exhibition spaces could be required to host many visitors (Figure 3.57). This is a factor that determines the dimensions of the space that would allow people to move, sit and use the area adequately. When visiting these spaces, the focus is on the exhibits and any information around them (Figure 3.58). The design of the space aims to engage visitors with the topic.

There is a strong relation between the design of the space, the visitor and the exhibits. The intention of the architect is to make the visitor excited, interested and inspired. More specifically, ‘to understand the museum exhibition, therefore, it is necessary to see it not merely as a core function of museums, but as a powerful means of communication with the museum’s public’ (Lord and Lord 2001, p. 15). The design of the gallery or the exhibition space is considered successful if the visitor can understand the meaning of the artefacts and learn new things about them. The use of information tags, audio equipment,
kinaesthetic elements or interactive boards help visitors to understand better what the exhibits are about and hence enhance the overall experience.

The living spaces category includes residential buildings and accommodation spaces. The interior spaces designed for residential purposes share common features that create an environment that better meets the needs of the user. In a synthesis of a residential space, the architect designs a mix of different types of spaces: bedroom, living room, bathroom, office and kitchen. Each of these subspaces expresses an atmosphere that helps people function well and feel good. ‘A bedroom must relax, a study must stimulate, a kitchen must ‘work’ and common spaces must unify. While every space has its own purpose and feel, they also fit together to express a single vision’ (Free Spirit Interiors n.d.).

With regards to residential spaces, people tend to pass on many qualities of their own character into the interior living space (Figures 3.59, 3.60). From a psychological point of view, the most important goal that architects set is making residents feel safe, happy and relaxed in their space. When the architect designs a specific interior space of a residence she/he aims to achieve ‘this perfect balance of room and function: spaces which speak to you in the way that they feel, sound and smell’ (Residence Interior Design n.d.). Gill (2004, p. 6) takes it a step further and writes: ‘a designer can translate the unique values and desires of an individual and household to allow them to have a home in the deeper sense of the word’. However, apart from the residential spaces where the individual can control the appearance and many aspects of the design, there are living spaces such as hotels where the architect can design, with similar objectives.
The retail spaces category includes spaces such as shops, showrooms, banks or leisure spaces such as restaurants and bars. When architects design retail spaces, the aim is to develop an idea that will reinforce the display of the products, as well as the selling. The design of the retail spaces links immediately to branding as well, which plays a significant role in the shops’ promotion. Retail spaces vary from bookstores to clothes stores to hairdressers and so on. Depending on the particular use, each type of retail space requires specific equipment; for example, a dry cleaner uses different machines from a hairdresser. And the quantity of the products on sale and their dimensions play a pivotal role in the design outcome. Further, how people circulate in retail spaces is also important. Key areas of the design process are the entrance and the exit. In these areas, architects often include a preliminary subspace or a shop-window, which is used to show the intentions of the retail shop and some of the highlighted products on sale.

In addition, architects focus on the routes within the space as a very important part of the design composition. These routes are usually organised around the objects on display (Figures 3.61, 3.62). The architect organises space in such a way as to ensure that the user will buy the goods. Moreover, the goal of the architectural idea is to transfer people into a different reality that encourages the buyer to indulge in what is on offer. The architect’s target is to make the space attractive, aiming for: ‘the integration of aesthetics into the entrances, windows, and retail areas within the space’ (WBDG 2009a). A key part of the design is to make the retail store comprehensible and to give it an identity. In addition, the design of the space aims to make the store’s services known to the visitor.

Figures 3.59 & 3.60: The design of the space of this apartment reflects the residents of the space Origami House, Barcelona, Spain, designed by Garcia & Ruiz Architecture
Source: http://interiorrefs.blogspot.co.uk/2009_04_12_archive.html
The design of bars and restaurants describes different functions and needs. These types of spaces combine different types of users: people who work there and those who visit. The space is organised so that the people who work there can do their job well, whether they work in the food or drink preparation areas or in the serving process. On the other hand, people who visit the bar or the restaurant have to use particular zones in the space, separated from the ones that workers use. Following the conceptual idea of the design, each zone could allow a different level of connectivity and interaction between the two groups of users.

The design of a bar or restaurant aims to create different feelings in the workers and the visitors. On the one hand, it should provide a comfortable and organised space for the workers; on the other hand, it should provide an attractive environment for the visitors. People go to a restaurant or bar with the intention to relax and socialise. A bar or restaurant could distinguish itself not only by a high level of services but also by its design. This depends very much on the experience of the visitors and links immediately to the poetics of the space (Figures 3.63 – 3.66).
Another category of space is **work space**. Work spaces include offices, workshops, studios or even factories. The design of such spaces is ‘process-driven: that is they will be organised to suit the sequence, mode of work and philosophy of the operation they house. That does not mean that they have to be clinical, soulless spaces; very often an interior architect is employed to ensure that the quality of the activity and the values of the company are reflected in the appearance of the space’ (Coles and House 2007). Further, because of this process-driven nature of such spaces, the design idea has to add to the intention of the company and add to its value.

In addition, most work spaces combine a variety of other types of spaces too (see Figure 3.67). For example, offices include a wide range of subspaces from work areas and conference rooms, to meeting rooms, cafeterias and relaxation areas. The design of an office space aims to provide functionality and to ease working there. Modern offices are often open and transparent with movable partitions and flexible configurations between
the desks. More specifically, the office space usually houses a number of work stations in open plan spaces or in enclosed rooms attached to each other. How office spaces are divided is very important, not only for the employees using them but also for the storage capacity that is needed, and it will vary according to the business sector. In addition, the design of office space should permit some flexibility in order to accommodate the requirements that different users might have.

An architect’s purpose is to enhance creativity and inspire the users of the offices. Further, the architect’s aim is to create a space that makes people feel comfortable. The poetics of the space is what describes the office as a successful working environment where people enjoy working and have a sense of well-being. The ‘office space type is typically a flexible environment that integrates technology, comfort and safety, and energy efficiency to provide a productive, cost-effective, and aesthetically pleasing working environment’ (WBDG 2009c). Approaching the design of the office in this way encourages the feeling of team work, partnership and the communication of ideas (Figure 3.68).

There are other functions that a space can have in the category of public spaces. These include airports, railway and bus stations, cinemas, theatres, museums, galleries or religious buildings, each serving different functions. All these types of spaces refer to a large number of people, the sizes of these spaces are often large and they often combine many different subspaces, such as shops and restaurants. It ‘can be seen to have parallels with town planning’ (Coles and House 2007) which makes it a special category of building, whose design is based mostly on the scale of the site or the space, or on the client and the

Figures 3.67 & 3.68: Office space designs
(left) Office design idea, designed by syd6
(right) Modern Office Interior Design ideas
demands set by people who specialise in standards and regulations. Within this scope, the architect has to create a space whose overall design will refer to the purpose. Religious spaces, for instance, ‘tend to be majestic in scale and with very strong architectural identity’ (ibid.) and they have to balance this feeling reducing the effect of feeling neither ‘overwhelmed by its context nor disruptive’ (ibid.).

A common type of space that all these different types of space share is the lobby. The lobby is used either as a reception next to the entrance or to connect different spaces. As a reception area, the lobby’s purpose is to welcome and orientate people, as well as to connect the entrances to other spaces (Figures 3.69, 3.70). Also, the reception is used to maintain control of the access and security for the other spaces. In addition, receptions provide information to the visitors. The lobby is a transition space between two different states, between two rooms or between two different functions. It is the space that gives users the opportunity to adjust to the new physical and psychological settings. The lobby is the initial space when entering into a new space. It is the “public face of building interiors” (WBDG 2010), and so it should be presentable. Taking that into consideration, ‘the great challenge for the architect and client is to achieve a space in which the visitor would like to stay’ (Dexigner 2008).

All lobbies relate to a variety of different users, such as visitors, clients or employees. For the people who work in the building, a lobby might be considered to be a space where workers can have a break or unwind and socialise for a while in working hours. In a similar way, people who visit can also socialise there, while broadening their knowledge about the company they are visiting. The design of the lobby gives visitors a hint about how the rest of the spaces are designed. Even when the subspaces have a different design concept from the lobby, the latter is used for ‘balancing aesthetics’ (WBDG 2010). The lobby acts as a ‘taster’ that helps visitors to get psychologically ready to continue their path in the surrounding spaces. Often architects base their design idea on the company’s profile, using particular types of signage, materials or colours as a reference to identify it.
Finally, the last category is **restorative spaces**, which are spaces such as hospitals, clinics, spas and gymnasiums. These types of spaces evolve around health and the feeling of well-being. The architect therefore has to promote through the design idea spaces that act as positive incentives or a combination of tranquil spaces and spaces from which the visitors can draw strength and dynamism.

When designing a clinic, the architect uses a different approach to the spaces mentioned before. A clinic depending on its purpose, size and other characteristics would typically include not only laboratories, treatment areas, consultation areas, recovery areas, waiting areas and surgeries but also offices and storage areas. These subspaces allow a clinic to meet its functional requirements in order for medical staff to perform their duties and for patients and other users to receive the services needed.

Since the purpose of these spaces is connected to a very sensitive issue like health, a clinic should not make users feel depressed or apply any type of emotional pressure. On the contrary, the design of such a space should be welcoming and make people feel comfortable. A clinic should *regulate the positive effect of each design element in the interior of each area* (Talonario 2010). Further, a well-organised and designed clinic creates a feeling of trust and certainty in the services offered (Figures 3.71, 3.72). The overall design of the space should make the visit as stress-free as possible.
The different categories and types of spaces presented above show that architecture deals with a language that communicates the functional dimension of the space, as well as the psychological dimension that relates to the use of the space. This means that in architectural design there are elements that can provoke our emotions and feelings through visual reactions that are immediately connected to the function and therefore to the design of the space. These reactions that set the space’s atmosphere are described by the term poetics and one of the most important architectural elements that influence the poetics of a space is light. In the follow section a discussion takes place in order to understand how poetics, space and light connect.

3.3.3 Poetics, space and light

Generally, light is valuable from a functional point of view and it can be used for three main reasons in interiors (Kelly, 1952). The first is to make the overall space visible for **functional reasons** and to make the objects and the elements of the space distinguishable and usable. This is described as ambient luminescence. A second reason light is used is to **highlight** tasks. This can be described as focal glow. The third way that artificial light can be used within the space is to interact with the users and to create **excitement**. This is called play of brilliants.

Another reason light is used is for safety. Light provides the feeling of **safety** in the space and that combined with the appropriate levels for facial recognition make people feel calm. Light can also **guide** you through space. When someone enters an interior space they tend to turn and move towards the light (Michel, 1996).
Poetics link to lighting, the space and the experience. For example, focal lighting is used to make space more attractive and to highlight architectural details, but also to create atmosphere. There are many light effects that can be achieved, each giving another visual and sensory result to the occupier. ‘If uplighting alone is used, for example, the space may be bland, monotonous and flat. Highlights and shadows created by directional light help the viewer see and sense the volume and shape of the space’ (Shemitz 1968, p. 165). Light attracts attention. Focal lighting is used to highlight a particular object or a form of the space. And architects use light to guide visitors to a space, highlighting the floor or ‘draw them deeper into spaces by lighting vistas beyond’ (ibid.).

Furthermore, the way space is designed and the way light is used within this space tells a story. For instance, Turrell uses light to articulate the planes, edges and volumes of the space or to eliminate them. ‘His work is motivated with altering the perception of a physical space through the articulation of light, and the power it has in modification and ambiguity’ (Lawson 2003, p. 30). In a similar way, architects can use light to emphasise the volumes and the proportions of the space. At the same time, they can use light to correct faulty design issues, by making particular parts more visible or turning them into shadow. Light can also be used to contrast the shapes of the space and to underline the overall architectural result.

It is important to understand the relation between light and materials. Light reinforces the appearance of the materials or can make them appear totally different. It can reveal their texture and colours. Architecture is the combination of materials and light, shaped and combined together. Colour also plays a significant role in the way people perceive space. When light is applied onto a surface, the colour and therefore the material’s appearance changes significantly. The architect has to determine the amount of light, the intensity, as well as the colour temperature of the light in order to achieve the desired results.

Beever (2006) has looked into the connection between light and space from the designer’s point of view. She suggests that architects should decide what the role of light should be in the environment they design. Beever discusses a dual relationship between light and space saying that ‘the relationship between light and interior space is a mutually dependent one’ (ibid.). She explains that lighting is crucial for the appearance of the space. The forms, the colours of the forms and their textures appear different when light is applied. ‘In return, space captures light – receiving it, bending it, hiding it, modelling it’ (ibid.) (Figure 3.73). Considering light in this way means that it is an important design element that determines the outcome of the design composition.
Architecture is all about experiencing a space, as well as lighting. Many researchers have analysed light and the way it helps to create interesting experiences for the occupants of a space. For example, Goldyn (2005 p. ii) challenges the relationship between shadow and light and their ‘everchanging qualities’. He discusses light and its role in creating experiences, treating light and shadow as inextricable elements. He writes: ‘there is no light without shadow, and the interaction of these two unequal brother possess an ability to create, transform, reverse, stretch, distort, signify, dim, focus, diffuse, scatter, and bring into existence elements beyond their immediate presence’ (ibid.). Goldyn describes the power of light and its connection to shadow in the making of the space. In his research, after analysing how artists and architects deal with the elements of light and shadow in their projects, such as Robert Irwin, James Turrell, Tadao Ando, Louis Kahn, Maria Nordman, Bruce Nauman, Hap Tivey, Dan Flavin and Le Corbusier, he comes to the following conclusion: ‘looking at the ways light and shadow materialize, become tangible, and enter into existence, both elements move beyond mere articulation of surface and are given both form and meaning’ (Goldyn 2005, p. 104).
Yan-Yung Ng (1991) studied the coding and modelling of light and its poetic interpretation into architecture. Based on his research, he examines light from different perspectives, analysing the results in a quantitative and qualitative manner. In one chapter, ‘The romance of light’, he discusses the association of architecture and light. He states that: ‘the perception of light has always had three fundamental aspects: cognitive, aesthetic and symbolic. The functional and cognitive aspect of light has always been a major concern of designers. Light illuminates, reveals the world and allows the world to be seen and experienced’ (ibid., p. 84). Additionally, he describes light as an element that has a big influence on the way people perceive a space. He also makes a big distinction between ‘seeing’ and ‘perceiving’, by giving emphasis to the experience of the latter. ‘This brings attention to the need for an aesthetic of light, which involves taking the perceived visual picture and translating it into sensations, feelings and emotions ... Therefore, whilst it is important that the effect of light is seen and felt, it is equally important that the experience of seeing, or perception, is made meaningful; and this is the meaning of light’ (ibid.).

The above statements are confirmed by another researcher, Demers, who addresses issues of image assessment and the design of light in architecture. He approaches light as an architectural form giver by emphasising a number of different qualities that light can have: light as art, light as science, or both. He writes that: ‘light is a form giver in architecture but it is also an architectural form transformed by space. The duality of these functions is perhaps paradoxical, but it defines the intangible nature of light and emphasises its poetic connotation’ (Demers 1997, p. 6). Based on different architects’ views, Demers confirms that architecture and light can create an aesthetically pleasant environment for its users and that light is an essential factor to provoke emotions. ‘In this sense, architects have always perceived the importance of light for its aesthetic quality and the expressive character of interior space’ (ibid.).

Most of the researchers above discuss the dual relationship between architecture and light (Ng 1991; Demers 1997; Beever 2006). Architects can use light to create interesting and functional interior spaces. Bell discusses how the design of the space can be communicated better by the use of light: ‘The way in which the plane surfaces are treated, how they meet and relate to each other affects the appearance of the space and our response. Even when many of the enclosing planes, screens or objects within a space are white, the various forms and relationships can be clarified and made understandable by the flow of light’ (Bell 1987, p. 20). According to Bell, light has many properties that help to define edges, creating contrast between different brightness levels and helping to reveal silhouettes and patterns.
Analysis of Space

(Figure 3.74). These qualities of light help people perceive the space and better understand the design. As Lawson explains in his research in light and human response, ‘the mind subconsciously filters fields of varied lighting intensity to determine points of focus, spatial depth, and ultimately a hierarchy of visual importance’ (Lawson 2003, p. 18).

Another interesting study by Beever (2006) introduces light as a language. More specifically, Beever is also interested in the relationship between light and space and how these two interact. She approaches light not only from a functional point of view, but also as ‘a compositional tool to be explored and manipulated in the design process’. Of particular interest is her view of light as word, which sets the basis to study light as a language in the space, depending on the way light is applied. More specifically, she discusses certain types of lighting applications that make people perceive light either as an object in the space, or as a verb or finally as an adjective. In the first approach when a lighting installation creates a focus, it can be referred to as a noun. If it creates a feeling of movement, then it can be referred to as a verb. If the light is used in such way that a particular form is emphasised, lighting can be considered as an adjective.

The analysis above shows the different roles of light in the architectural design context, linking the architectural intention of the design to poetic qualities (Figure 3.75). To sum up the above writings, light can be used: for functional reasons, to highlight, for excitement, for safety, to guide, to make attractive, to create atmosphere, as a story teller, to emphasize, to correct, to create contrast, to reinforce the appearance, to create, to

Figure 3.74: Artificial light is used to define forms and edges
Hotel Puerto America room, Madrid, Spain. Architectural design by Gluckmann and lighting design by Isometrix Lighting + Design Ltd
transform, to reverse, to stretch, to distort, to signify, to dim, to focus, to diffuse, to scatter, to bring into existence, for cognitive, for aesthetics, for symbolism or as form giver, to define, create movement.

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Figure 3.75: The different roles of artificial light used in interior design solutions

So far, this thesis has explored how light engages with the architecture of the space and the poetics in a conceptual and psychological way. This approach sets the background for the development of lighting and architectural design in the conceptual phase. Figures 3.76 and 3.77 show a case study designed by Gunter M. Adams, called the house of light. The House of light is a series of spatial sequences with differentiated articulation, addressing the emotional aspect of human perception. This space consists of nine rooms. Each room has different poetic qualities. The designer’s aim is to create a space with a specific character that can influence the emotions of the visitors in a particular way. Light has a key role in the experience of each space.
Analysis of Space

CASE STUDY: DESIGNING WITH LIGHT by Gunter M. Adams

1. Room of South
   In this room, the visitor decides where to go. The shape of the space and its dimensions aim to distract the direction of the visitors. This emotion is reinforced by the materials of the space.

2. Room of Yearning
   The design of the room provokes yearning in the visitors and make them feel as if they are dreaming. Its unreal proportions and reflecting walls and details enhance the feeling and the halogen light gives a sense of festival.

3. Room of Supper
   The designer uses natural materials, such as wood, while the floor is covered with leaves. The grid with suspended luminaires on the ceiling creates a play between light, shadow and the sun that sets.

4. Room of Thankfulness
   The designer uses mirrors to create the feeling of infinity. People experience an endless room. The horizontal illumination adds to it and all the elements together place people in a space where they might feel a connection to God.

Figure 3.76: Part 1 from the full study 'House of Light' by Gunter M. Adams (Kress and Adams, 2003), using artificial light in conjunction with architectural design concept, using poetics as a key factor. The analysis shows how poetics, space and light link.
Figure 3.77: Part 2 from the full study ‘House of Light’ by Gunter M. Adams (Kress and Adams, 2003), using artificial light in conjunction with architectural design concept, using poetics as a key factor. The analysis shows how poetics, space and light link.
3.4 Elements summary

The analysis in this chapter highlighted the elements that an architectural space consists of and also the elements that an architect has to consider and compose in order to deliver a design proposal. Again, this study approaches this list of elements from both the architectural design viewpoint and also from the lighting design perspective, drawing in aspects from both areas. Lighting design influences architectural design, drawing in elements to the list such as brightness changes and transition areas. On the other hand, the lighting design also partly borrows from the architectural design side a very special element, poetics, bringing the two fields even closer. The meaning of poetics in architecture was described earlier. The author then tried to bring poetics closer to the lighting design field, explaining the different roles of the artificial light that highlight the poetics of the space and its connection to the experience of the user. A final list developed from the analysis above is shown in the Figure 3.78.

![Final List of Elements](generated by the author)

**Figure 3.78:** The final list of elements that describe the architectural idea and intention

In the following chapter, a discussion takes place on the use of new applications such as the lighterials and their potential impact on the architectural design. The research question of this study is explored in detail and the author describes the path that has been followed to find the answers.
Chapter 4

Research Questions

The previous chapters focused on information about lighterials, categorising them as those that emit light or those that can connect to light in numerous ways in order to become luminous, and on analysing the space as elements that can describe the design intention, considering all aspects of design and also poetics. An attempt was made to specify how lighterials could be used in architectural design by approaching them as architectural forms. Incorporating artificial light in the architectural form itself enables architects to use light to design the forms of the space. This gives architects the opportunity to venture into this area despite it being dominated by lighting designers. Architects could take more responsibility throughout all phases of the design cycle – architecture, interior design and lighting design – thus designing in a more complete way. Despite this usually being the role of the lighting designer, a specialist in light and lighting, this research study shows how the architect can also take on the role of designing with artificial light.
4.1 The impact of lighterials in architectural design

Nowadays, designers tend to use materials in conjunction with light. This takes lighting design in a new direction. In fact, if the applications of lighterials are taken into consideration, architects can design both the material and the artificial light at the same time and in the same way. Since light is such a strong element in the design, it is most likely that these applications will influence the architectural conceptual composition. On the other hand, if an architect designs a space and then decides to apply the lighterials, some important questions arise: Is light needed in specific areas of the space? Should this part of the space be left in darkness? Which forms of the interior space should have greater contrast between light and shadow? Would the use of light highlight the concept of the space? And, ultimately, does bringing lighterials into the space change the design and the concept of the space under review?

Focusing on the likely near future of architecture, architects think that ‘designs will be more closely tied to structural analysis ... producing better performing, higher quality facilities’ (Gonchar 2007). Unlike traditional architectural synthesis, the future directions of architecture point to the use of new materials and lighting applications such as lighterials, direct 3D modelling and architectural composition with a new perception of forms. Today, architectural practices work in a more coherent way: ‘within architecture firms, the new technology is redefining culture, hierarchies, and work flow’ and ‘technologies are being involved much earlier in the work flow’ (ibid.). This means that architects cannot ignore what the future holds for them in terms of new materials and applications. Architecture is led by the development of the technologies and materials. For example, the composite material fibreglass was first used in the 1950s in boatbuilding and has been much developed since then to construct various designs in the architectural space: ‘fluid forms that give a dynamic and dramatic, weaving and tying together of spaces’ (Gagg 2011). In the case of lighterials, when technology links with light, which is such an important tool in architecture, there are promising implications for the development of architecture.

The professional literature shows the different roles that artificial lighting design can have in the development of an architectural concept. If a space is designed to have a particular lighting scheme that supplements a specific architectural intention, then one can hypothesise that if the role of the lighting changes, it will influence the architectural idea too. On the other hand, if architects are designing the space using lighterials, then not only might the architectural result be influenced but also the process of synthesis, since dealing
with light issues and light volumes from the beginning of the process can bring both limitations and changes in the development of the idea.

Approaching architectural design in this way could make a significant impact on the culture of the spaces that architects produce and therefore the lifestyle of people who occupy and use those spaces. For example, lighterials could influence the colours, the materials and the hierarchy between different elements in the space and therefore influence the way the space is used. A plain wall that people would normally not pay any attention to might become a luminous component and consequently the wall and the space around it would be used differently by the user. Such changes could enhance or totally change the poetics of the space.

The development of the poetics will depend on the technique that the architect uses. Hiroshi Nakao says, ‘technique is not technology … Architecture cannot be created by technology, but technology can assist us in finding the technique of creating space in architecture’ (quoted in Yamazahi 1994, p.88). He further explains that ‘recently, the development of electronics and the use of information processes … helped people understand the fact that consciousness is something that flies over physical distance and time, without belonging to the physical world. The more technology has rapidly progressed, the greater the value of information has become’ (ibid.). The different quality that both the material and the lighting applications give to the space influences people’s consciousness. Since the poetics of the space impact on people’s consciousness, architects have to use technologies that enhance the poetic qualities they want to create. Technologies therefore become the tools of the architect and not vice versa. As Loos (quoted in Hartoonian 1986, p. 18) said, ‘Architecture absorbs technical facts and transforms them into architectural figures. The latter can respond to emotions and feelings of a given culture of building if architecture alludes’. In this study, architecture absorbs the idea of using or constructing lighterials and transforms them into architectural forms, aiming for poetic effect.

4.2 Developing the research question

This study focuses on the influence of lighterials in architectural design. Lighterials might affect either the architectural process or the architectural result, or both. In addition, poetics is added as an important part of architectural design. This research, therefore, also aims to reveal how lighterials affect the poetics of the space.
The previous chapters explore analytically the elements that compose the space, combining two different approaches: the one coming from an analysis of the space with reference to lighting and the other supplementing this list of elements with regards to what architects see in their drawings. This enabled the author to create a new list of elements that characterise space that considers both architectural and lighting design as unified fields. After establishing the elements of the space, the important area of poetics was added to the study, bringing the two fields even closer together. The poetic qualities were investigated in detail, as well as their importance in the development of a successful architectural concept. This idea was then reinforced by the use of light and the unique qualities that this adds to the poetics of the space. At that point the relationship between poetics, light and the space was examined in order to explain the significance of this research.

The *lighterials* and the idea of luminous volumes link immediately with the design of the forms and the poetics of the space and offer undoubted interest to be explored further. A first step would be to find out whether students in architecture are interested in these types of materials and how they import such materials into their concepts, taking poetics into consideration.

After that, it is necessary to test the use of *lighterials* in projects both from a lighting design point of view and from the architect’s side. The intention behind this is to understand the difficulties that they might create in the process or the unexpected changes that they might make to the result. With particular respect to the result, the intention of the author is to compare and contrast the elements that compose the space before and after the introduction of the *lighterials*. A difference in the results would show the possible effects of *lighterials* on the design outcome. Following that, it will be worth noting how each of the *lighterials* could have eventually influenced the outcome in terms of the poetics that they have given into the space and how that makes people feel. The effect of *lighterials* on poetics will therefore be discussed.

Some *lighterials* have already been used in various spaces, but the point is to understand more about how they could be imported into the design and what that decision might result in. Knowing more about *lighterials*’ impact on design and the space itself would make architects aware of the different roles that light can have, through the use of luminous forms in their design. In this way they will be able to communicate the poetics of the space in a stronger way. Further, architects will give more consideration to the effects of *lighterials* on the emotions of the people who use the space. That will potentially mean that
architects will be able to control the poetics of the space if they choose to import lighterials into their design solution, since they will know how they can influence their architectural idea.

Until now, artificial light has been incorporated into the design for functional reasons or as a factor to create specific poetics in a space. This study makes architects consider artificial light as an initial element to be used in the design composition, rather than an element that is added later when the architectural design is complete. It is almost as if architects consider the space as being in darkness at the initial steps of the synthesis. Thinking of space in this way would mean that architects would be in place to set the lighting as they move towards the solution.

So the questions that this research asks are: How do these new applications of lighting, such as lighterials, impact on the architect’s concept and the architectural design process when they are used from the beginning of the architectural composition? How do lighterials influence the architectural result if they are added in a later phase into the architectural space? Which elements of the space would be affected most and how? If they are added to the design idea at a later phase, will lighterials influence the poetics of the space and the architect’s intentions?

The aim of this research is to understand more about lighterials and their use in and influence on architectural design, meaning both on the process of architectural design and on the architectural result, considering the elements that compose a space including the poetics of the space. In Part 2, a pilot study is presented in Chapter 5 that shows whether contemporary students of architecture are interested in materials that have similar qualities to lighterials. If so, how do they incorporate them into their design concept and, in that case, do they aim for specific poetic qualities?

The pilot study is followed by a case study that focuses on changing the process of architectural and lighting design, aiming to challenge lighting designers with an architectural background to combine both disciplines in order to get their feedback on whether lighterials have influenced the process. Throughout this challenge the participants have to consider poetics in their design process as an important force that drives their design intentions. The results of this experiment contribute to the third stage of the research, the interviews, which aim to show how professional architects use lighterials and what their opinions are for the potential use of lighterials in future projects and in architectural education. In contrast to the case study, in the interview process the
architects use *lighterials* in the final stage of their design. Following the methodology designed for this experiment, the results and their analysis will show how incorporating *lighterials* into the design ideas have influenced the design intentions of the participants.

As explained above, the three different studies; the pilot study, the case study and the interviews, use participants with different backgrounds. One of the reasons leading to this decision is the fact that these different stages of this research study aim to collect information to build up knowledge, step by step, on the use of *lighterials* and their impact on architectural design concepts, including the poetics. So, in the first study, the author is looking into the pure architectural creativity on poetics and luminous forms, derived from young students in architecture facing no design restrictions. In the second study, lighting design students compose a space taking into consideration poetics and *lighterials*. In this study the students face few design restrictions as they are required to design with specific lighting levels in mind bearing their clients’ needs. In the third study experienced architects provide their insights following a more rigid approach by incorporating restrictions, such as space limitations. The order of these experiments help to tackle the research question in a creative and abstract way (students), but also in a structured and secure way (professional architects).

There are some benefits in conducting studies with professionals. Professional architects can shift from one architectural problem to another in a more productive way than students, since they have a better visual understanding of the ideas they put on paper. More specifically, it has been found that experienced architects can study the relations between different functions and the forms in depth and therefore provide more realistic solutions (Suwa and Tversky 1997). Using experienced architects in the interviews will provide useful information about how *lighterials* can be used to reinforce or even to change the design result, based on sketches and verbal data that will be based on in depth thinking.

The following figure (Figure 4.1) presents the three studies and the research questions they address.
Chapter 4 addressed how *lighterials* could impact the architectural design, with a view to explore how luminous forms will be used in the architectural and lighting design fields going forward. This chapter looked into specialists’ opinions on how architectural design will be approached in the future. The author expanded based on their ideas by incorporating lighting as an important part of the architectural design process at different stages of the conceptual procedure, either at the beginning of the concept design or after the design idea is produced. The research questions of this study were presented in detail, including the ways that these questions would be explored in the following chapters. The three studies (pilot study, case study and the interviews) were described analytically in terms of the participants’ backgrounds and the research question each of the studies aim to attack. In the following chapter the two first studies; the pilot and the case study, are presented.
Part II
Chapter 5

Studies

The aim of this research is to discover information on how *lighterials* could influence architectural design. This is approached initially by exploring whether *lighterials* are used in the conceptual part of architectural design and take poetics into consideration (the *pilot study*). The author’s interest then moves on to finding out if there is any influence on the architectural process when architects design and use artificial light introduced through the material itself. An experiment is conducted to test how architects and lighting designers use *lighterials*, taking poetics into consideration from the beginning of the architectural design process (the *case study*). In both studies the participants were students of architecture. The first group of participants were undergraduate students of architecture and the second group were MSc students specialising in lighting design.
5.1 Inspirations – pilot study

The first question that this research addresses is whether architects nowadays are interested in using materials such as *lighter*ials to express their ideas. If so, how are these connected to the design intention and the poetics of the space? The author attacked these questions through a pilot study that aimed to collect information from students of architecture who dealt with projects that implemented poetics. These projects could provide some evidence of architecture students’ interest in luminous forms and the forms’ connection to the poetics of the architecture of the space.

This study is based on the observation of two projects taught in two different units, units 1 and 18, of the undergraduate architecture degree course at the Bartlett School of Architecture, University College London. These units were chosen because poetics is a key element of the briefs and poetics plays a pivotal role in the development of the design process. Furthermore, these two classes provided a diverse background of participants, including second- and third-year students and Diploma in Architecture students. The students’ ages ranged from 18 to 24 years and they had different cultural backgrounds, such as British, Chinese and Spanish. At this point, it is essential to understand the content of the briefs that inspired students to think of poetics and, potentially, lighting as well.

The brief for Unit 1 (Appendix I) was based on architectural transmutations, alchemy and the ‘forgetting of air’. The brief focused on matter and form, two elements inextricably linked in alchemy. The students were challenged to convert one form into another through transmutation. Further, this brief dealt with the idea of designing not only the form but also the air. That meant that the brief challenged students to design with consideration of the poetics of the space. Designing both the forms and the air of the space meets Hiroshi Nakao’s words, who describes it as designing for space and place relatively, giving emphasis to the way space affects people’s perception as well as their feelings (cited in Yamazaki 1994, p. 89). In that respect, the brief of Unit 1 challenged students to take advantage of air and use it as an element that is measurable and controllable, as if it has ultimately lost its ethereal dimension. The students were therefore asked to design the forms of the space in such a way that the relationship between form and air would create specific feelings in the observers.

The sample that was taken from these observation studies was based only on the design concepts produced by students who used artificial light to create this transaction, linking it
to the alchemist theory that the brief required. The target of this preliminary study was to understand whether *lighterials* could be considered as the ‘radical architectural materials’ that the brief encourages students to find and whether the students use them to express the poetics of the space they design.

The brief for Unit 18 (Appendix II) encouraged students to examine the analogies between the structure of the psyche and the structure of the space. Within this juxtaposition, architecture has the most dominant role due to its power to engage people with the psychological dimension of the space. The focus of this brief is on the intention of the architectural idea to provoke and manipulate the users’ emotions. In this context, students had to design a space that would challenge the reactions of the observers. The students’ design would be a space, an installation or a building that would affect the observer’s emotions in a particular way. Again, this report presents the projects where students used light to approach the goal of the brief.

The students of both units worked on these projects for three months, followed by a final presentation of their ideas. Information was collected from different presentations within this period, but the results that are presented below were taken on the day of the final presentation. The methodology used for this pilot study is based on observation studies. The author observed the students’ presentation, taking notes of what they said and photographs of their presentations. This methodology was chosen so that students would be unaware of the author’s presence and would act spontaneously, without acknowledging the collection of the data. In this way, the author’s interests did not influence the development of the ideas pointing towards the use of light nor the collection of the data.

The students used images, models and drawings in order to communicate their ideas to the listeners. These were captured by the use of a digital camera. This recording took place in one of the classrooms in Wates House building, where the Department of Architecture is housed, on the campus of University College London. The collection of the data took place in December 2009. The students presented their ideas within a time limit of 30 minutes. During the presentation, the students explained individually the concept of their project, how exactly it was connected to the brief and the particular feelings they wanted to create for the occupants of their spaces. The key issue in this pilot study is to understand the main concept of each project and its translation into an architectural form and language. Out of all the architectural solutions, which were 25 in number, this research focused only on solutions where students used artificial light and especially *lighterials*, or similar materials, in their projects. With regards to the lighting technique, the students had to describe how
light would link to the concept, how the luminous forms would be constructed and what poetics that would bring into the space.

What follows is an analysis of eight projects with regards to the concepts that students want to create. The projects are presented in Table 5.1, which gives information about each of the students includes the poetic qualities they aimed for in their projects, the *lighterials* they used, the general lighting design objective of their project, a general description of their concept idea and reference images of their work. The first student aimed to create a secretive atmosphere, the second student storm projections and the third one cloud simulations. The fourth student dealt with the invisibility of the form, whereas the fifth student tried to present an occupied ‘alive’ space. The sixth student was interested in using space to communicate the emotions of the visitors, the seventh wanted to show presence through the design, while the eighth aimed to differentiate public and private spaces.
<table>
<thead>
<tr>
<th>Student</th>
<th>Poetics</th>
<th>Function</th>
<th>Lighting Objective</th>
<th>Lighterals</th>
<th>Description</th>
<th>Reference Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 / Unit 1</td>
<td>Secretive Space</td>
<td>Perfume Laboratory</td>
<td>Self luminous Wall Appearance of a candle</td>
<td>Glass</td>
<td>- Aim to influence sight and smell of the visitors - Boundary between public and private space - Decrease of visibility due to the materiality of the wall and its luminous appearance - Feels that something is hidden behind the wall - Wall seems more volumetric - Transaction space that increases curiosity - Creates a strong emotional impact</td>
<td><img src="image1" alt="Reference Images" /></td>
</tr>
<tr>
<td>2 / Unit 1</td>
<td>Storm Projections</td>
<td>Installation</td>
<td>Filtering light through smoke, spray or liquid</td>
<td>Glass/Active Surfaces/Barrisol</td>
<td>- Creation of weather systems and especially clouds which are generated using light, colour and drops of rain - Observation of clouds imprints on the floor and on the walls - Use of glass structures. Their position in reference to the light and the intensity of light is tested - Record of different phases of weather systems - Use of different type of liquids</td>
<td><img src="image2" alt="Reference Images" /></td>
</tr>
<tr>
<td>3 / Unit 1</td>
<td>Cloud Simulation</td>
<td>Hair Salon</td>
<td>Filtering light through smoke, spray or liquid</td>
<td>Barrisol</td>
<td>- Ceiling structure based on the design of bubbles - The glass bubbles symbolize the bubbles of the shampoos and conditioners used in hair salons - Simulations of bubbles into the interior - Use of smoke or hairspray or gel as a medium - Filtering light through the bubbles - Different experiments using gels with different intensities</td>
<td><img src="image3" alt="Reference Images" /></td>
</tr>
<tr>
<td>4 / Unit 18</td>
<td>Invisible Landscape</td>
<td>Installation</td>
<td>Filtering light through water</td>
<td>Glass/Interactive Surfaces/Oled/Electroluminescent</td>
<td>- Concept of Psychobotany - Relation to space: formless, featureless, depthless, scale-less and mass less - Tiny sensors on leaves makes them musical instruments when reacting to emotional changes in the environment - Energy exchange between plants - Plants interact with people - Plants located in translucent glasses lit internally - Division between plants which are alive and people</td>
<td><img src="image4" alt="Reference Images" /></td>
</tr>
</tbody>
</table>
The first student’s aim was to design a space that would have a secretive atmosphere. The atmosphere would create a distinct division between the public and the private spaces. The
intention of the student was to create a feeling of curiosity in the users, challenging them to investigate the space. This idea links to the function of the space, which is a perfume laboratory. With this intention, the student designed a central object in the space: a luminous wall. More specifically, the student’s objective was to create a wall that would have the appearance of a lighted candle and would add to the space the sense of warmth and the feeling of a secretive atmosphere (Figure 5.1). The lighting was designed to be part of the wall, within the material itself. This made the wall appear to lose its scale and created invisibility on the other side of the wall. The student explained that the aim was to encourage visitors to try to see what exists behind the wall, because its appearance would create a feeling that something was hidden behind it. Further, the idea of the wall being self-luminous is very important since it shows the volumetric nature of the wall itself. The student’s intention was to create a strong visual element that people would notice as soon as they entered the laboratory. The student also decided to leave some parts of the wall perforated so that the wall would look more volumetric (Figures 5.2, 5.3).

**Student 2**

The second student wanted to produce projections of a storm into the interior space. The intention was to incorporate into the space an element of the storm as an exterior...
atmospheric factor that would make the interior space feel like an exterior space and that could alter the mood of the users. In order to achieve this effect the student used artificial light. More specifically he recorded different imprints that light created on the floor of the space, when it was filtered through different mediums, such as water, solids or smoke. The student used a glass structure filled with these mediums to filter light. For example, the student chose to fill the glass structure with water, because water is constantly moving and never stays still (Figures 5.4 – 5.6). The movement of the water combined with the random images of shadow and light are the elements that made the space appear to be affected by a storm.

**Student 3**

The third student designed a cloud simulation in the space. The intention was to construct an environment that would never be static but would constantly change as the sky does. The student designed a space that functioned as a hair salon, whose forms would add to the creativity of the hair stylists. In more detail, the objective of the student was designing a space that would give the impression of a ‘smaller sky’ within the space, which would influence the users as the weather changed and time passed. The ceiling was the key element of that idea. Made of glass, it would bring the simulation of the clouds from the exterior into the interior space. The architecture of the ceiling would follow a structural
synthesis of glass semi-transparent bubbles that would just hang from the ceiling, while appearing static (Figure 5.7). The bubbles would be filled with either spray smoke or gel (Figures 5.8, 5.9). The student used artificial light in such a way that it would be filtered through these mediums and would create in the space the feeling of a clouded ceiling that would no longer be static. According to the concept of the design, the medium used within the bubble would either be the same for all bubbles or it would differ from bubble to bubble to create different effects. The student experimented with the use of spray, smoke and gel, each bringing different results into the space.

Figures 5.7 - 5.9: Models that describe and test the interior sky-ceiling that Student 3 wants to create in the space
(left) Model showing the ceiling of the space. Its design is based on the use of bubbles, filled with spray, smoke or gel, which would filter light in the interior space
(centre) Model testing the structure of a bubble on a different scale, filled with smoke
(right) Image taken from a model where the student tested how gel filters artificial light

Student 4

The fourth student intended to create a ‘transparent’ environment. More specifically, the student’s aim was to produce a space that would be filled with plants (Figure 5.10). Having the plants as key elements of the space, the student wanted to introduce their presence and energy into the space without using solid forms and objects. The student therefore placed the plants within a glass structure, which was totally transparent, filled with water in order to keep the plants alive (Figures 5.11, 5.12). The student’s intention was to create the feeling in the visitors that even though there was nothing else in the room apart from plants, it would be filled with a lot of energy, communication and presence. This idea was reinforced by the use of the artificial light. The lighting was applied to the bottom of this glass volume. The student used water within the glass to filter the light. This technique created the effect that the light on the bottom of the glass structure was reflecting on the surface level of the water as well. The final lighting appearance of the glass structure was of two different levels of light: one on the bottom and another where the surface of the water was ending (Figure 5.13). The student explained that the intention was to create a space
where visitors would notice only horizontal layers of light, which would turn on and off or could be dimmed, representing a form of communication.

![Figures 5.10-5.13: Drawing and photos demonstrate Student 4’s idea of using transparent structures made of glass where plants live to show how they can communicate with humans through light](image)

(top left) Drawing showing the location of the plants in the glass structures  
(top right, bottom left and right) Images showing the landscape from different perspectives.  
The close views show the level of light on the water’s surface

**Student 5**

The fifth student aimed to create a room inside a room. This second room would appear to be occupied, but it would not be as functional as the rest of the space. As an object, this subspace would be considered as a focal object, visually important and interesting to look at and part of the room’s scenery. To achieve this synthesis, the student decided to construct a luminous object (Figure 5.14). The scale of this subspace in reference to the rest of the space, its shape, the materials from which it would be made and the special lighting would create the desired atmosphere. The aim was to make this volume distinguishable, obvious and important but at the same time discreet. This subspace would be made of a type of stretched opaque white material and the whole structure would be characterised by its lightness. With regards to the lighting, the student designed a luminous object lit by a warm-colour light that would appear dimmed in relation to the rest of the space.
The sixth student approached space as a living organism that has feelings as people have. Thinking of a space as a living organism, the student decided that it should be able to be constructed and deconstructed, dressed and undressed, full and then empty. To this end, the student designed two different spaces, which would share the same characteristics of shape, dimensions and materials. Each space would be enough to accommodate one person. The two spaces would be interconnected and interactive. The student’s intention was to make these two spaces communicate when people were using them. In more detail, this space was designed so that each time a person entered the space, the space would show its presence and feelings through the use of artificial light. The light would be bright when the space was ‘born’ and then it would dim slowly. When there was no light, the space would have no mass; it would become almost invisible or it could be said that the space ‘fell asleep’ (Figure 5.15). Further, the idea would evolve as soon as visitors realised that there were two identical spaces and not just one. The fact that these two spaces interact with each other would make people interact more with the space itself. When a person used one of these spaces, people who used or watched the other would know because of the light and the changes in the form. These two forms were designed as luminous forms connected to each other. The student aimed to unify light and form and make one space become gradually less material while light faded away. When that happened the other space would become a whole luminous volume, opening up slowly until it became a full structure with strong lighting.
The seventh student totally ignored the form of the space and decided to make visitors interact with each other. The student focused on the way people move, use or interact in
an empty space and how these movements could potentially create a map that would change according to people’s decisions. This idea was based on the design of a piece of cloth made of luminous material. People who visited the space would wear the cloth and based on the way they moved in the space they would create a map of lights (Figure 5.16). This map would change dramatically if the number of visitors increased.

Student 8

The eighth student focused on the materiality of the façade of a building and the distinction between the private and the public spaces. The student’s design was a building whose façade would communicate to the visitors how the interior spaces are used. The shape of the building was designated by a specific material that would have different thicknesses in different parts of the façade. The thickness of the material and its different levels of transparency would relate to the use of the interior spaces as public or private. The distinction of the spaces would be made stronger with the use of artificial light. The thickness of the materials permitted a specific amount of light to appear on the façade of the building. If a part of the façade were brighter, it would mean that the interior space
related to this particular part of the façade would be a public space. A less bright part of the façade would give the impression of a mysterious environment referring to a more private space (Figure 5.17). The lighting result would depend on the combination of light and the thickness of the material, which would permit a specific amount of light to pass through. The thicker the material, the more the space would appear enclosed and private. The different thicknesses of the material combined with the lighting technique were distributed according to the various areas of the façade of the building.

![Figure 5.17: Student 8’s idea of artificial light filtered through different thicknesses of translucent material communicating different levels of privacy](image)

The evidence above is a sample of different ideas that architecture students can produce that consider light linked with poetics. These examples show the importance of the space’s function for the development of poetics, as explained in Part I. The students used luminous forms not only to communicate the concept of the space to visitors but also to influence their emotions. For example, a ceiling made of glass transparent bubbles filled with different mediums such as liquid and smoke and filtering light (Student 2) would mean that the projections of the shadow and light into the space would react according to people’s movement or would change the atmosphere from static to active. In another example, Student 6 used luminous volumes to show that a space was occupied and to block the entrance into that space, classifying it as private. Luminous forms can also be used to show the circulation of the space, as shown in the project with the luminous cloth (Student 7). People move into the space directed by the light, which in this case would indicate where
people could move or stop. Further, the project based on communication between plants (Student 4) shows that light can be used to direct people’s visual interest into a different level than the obvious one.

This pilot study was conducted in order to discover whether architecture students consider materials such as lighterials when they design a specific environment and whether they link them directly to the poetics of the space. Based on the results presented above, it would seem that there are cases where students can use materials such as lighterials to create poetics in the space. The projects show that these students are interested in the way that light can connect with the forms and the architecture of the space, mostly in terms of luminous forms. This pilot study does not show the percentage of people interested in lighterials, so it cannot predict whether there is a trend in using lighterials. The important outcome that arises is that architecture students are interested in luminous forms and can design using light. This indicates that a further investigation in lighterials would be valuable. In addition, these students were very interested in the development of the poetics, relating their concepts to innovative ideas and materials.

These findings feed into the following case study, where lighterials are investigated further with regards to their properties and their use in the development of the poetics in architectural design, and also their meaning and applications in real life projects.

5.2 The case study

The second important question that this chapter explores is whether architects can use lighterials as part of the architectural design process with the intention to create specific poetics in the space. This question is addressed by challenging architects and designers to design a specific space using any of the lighterials, aiming for the development of the poetics. What follows is a description of the idea of this case study and the process that was followed.

5.2.1 Selection of case study

This case study was inspired by the work of Konyk Architecture Practice, which designed the project called A/N ON_AIR. The ON_Air project was designed for a temporary event in a space located in one of the top floors of a skyscraper in New York. The ON_Air project was an inspiration for this study because the architects that designed it used artificial light, specifically luminous forms, to design the space and to create specific poetics in the space.
Studies

(Figures 5.18 – 5.20). An email interview with the senior architect of the project, Craig Konyk, gave further information about the principles around the concept of that project (Konyk 2011).

According to Professor Konyk, in the design process of this space he considered ‘the material and the light effects in conjunction with the entire design. It is all considered at the
moment of its inception’. Asked about his decision to use luminous forms, he replied that: ‘I have for many years been fascinated with translucent materials and also the idea that one is never quite aware of where the light in a space is coming from, I mean the source of that light. A glowing surface is just about the most mysterious way for light to be introduced into a space’. Another question focused on his experience of working with artificial light from an early stage of the development of the architectural idea. According to Professor Konyk ‘an architect always must have a conceptual basis for working with artificial (as well as natural) light’. He clarified that ‘in the ON_AIR installation, I wanted to have a material that would actually feel like it was not a material. And the choice of a material that would glow and allow you to see shadows through it was the conceptual basis for the design’. When he was questioned about the poetics of the space and whether he believed that it was influenced by the lighting scheme, he agreed strongly, explaining that ‘the spatial experience of the interior was dramatically influenced by the materials used and the lighting effects achieved by its use’.

The interview with Professor Konyk and the information collected about the concept of the ON_Air project influenced this study on two levels. First, this information enhanced the knowledge of working with artificial light and luminous forms from the beginning of the design concept. The ON_Air project is an excellent example of how architects can use lighterials to create poetics in the space in a real life setting. Second, the information obtained from the ON_Air project influenced the author’s decision in choosing the type of space that would be used as a background for the students to design with the lighterials.

The main idea for this particular case study was in choosing a space that would provide inspiration for the participants and would lead them to the creation of poetics.

One of the key questions that the author asked Professor Konyk was with regards to the special characteristics of the space for the ON_Air project that led him to using lit volumes. He explained that the pivotal characteristic of that space was the ‘immateriality’ of the space itself. Further, he clarified the significance of ‘the sense of extension of its boundaries through the invisibility of the glass boundary of the interior glass surface. The panoramic view out to the city on all sides of the space. The idea of placing the glow benches back from the edge eight feet to achieve a virtual ‘porch’ on the 53rd floor of the tower’. Therefore, the characteristics of the space that relate to immateriality are immediately linked to the glass façade, which does not create a solid boundary, as well as to the fact that the forms of the space (e.g. benches) would act as luminaires rather than solid forms/furniture.
As a result of this information, the author decided to use a case study that would share common characteristics with the ON_Air project for the experiment. Such a space would be located in a glass skyscraper that would have beautiful views but would also be located in an interesting site. With the help of Dr Kevin Mansfield, (course director of the MSc in Light and Lighting at UCL) the author found a space, in the One Canada Square building in Canary Wharf, in London (Figure 5.21). This space shared similar characteristics with the ON_Air project, including the surrounding glass façade, placed on the 50th floor of the skyscraper, located near the river with stunning views (Figure 5.22).
Dr Mansfield kindly agreed to use this case study as an additional requirement for the major design project that the students had to undertake as part of their training programme. The author worked closely with Dr Mansfield in order to incorporate the case study successfully into the brief of the module, balancing the demands of the module itself with the elements of poetics and lighterials. According to the brief, part of the students' objectives for this module was designing a specific space placed within a larger area located on the floor of the skyscraper, taking into consideration the poetics and the lighterials from the beginning of the project. (Appendix III)
As discussed in Part I, and confirmed later by the pilot study described above, the function of the space and the poetics are strongly connected. The function of the space for the case study was a transition space. The author decided on this function, first, because a transition space in itself implies to visitors mystery and uncertainty of what follows, including a feeling of anticipation. Further, the architecture of the space was suitable for a transition space because the chosen space connects the lift lobby (the first reference point for the viewer) with the ‘unknown’ path that passes through the lobby leading next to office spaces A and B. In addition, the location of this space was appropriate for a transition space, because its location in a contemporary building with a glass façade, situated close to the river Thames in Canary Wharf, provided an inspiring case for an architect to work on. A space within a skyscraper would provide inspiration for architects not only because of the *immateriality* concept explained above but also because of the interesting relationship that such a space has between the interior and the exterior space. Further, because the design of all floors in this particular skyscraper is repetitive and identical, the students would be challenged to consider a design idea that would differentiate this transition space from the other transition spaces within the same building. This would stimulate architects to focus on the poetics as an important part of the architectural design, and it would also encourage them to use *lighterials* to create a unique experience for visitors to this particular floor.

According to the brief’s requirements, the students had to design the entrance to the floor (after the lifts) that would lead visitors to another space where the lobby would be located. In more detail, the students had to design the corridor outside the lift and the lobby that led to the offices, taking into consideration reception space and seating area. In addition, the design of the lobby area had to meet the criteria set by the client, since this was a real life project. The minimum requirements from the developer’s side included specification for the flooring, the ceilings, the lighting, the wall finishes, and the sprinkler/fire protection, the mechanical and electrical data of the space, and statutory signs/tenant signs and window covering.

5.2.2 Profiles of participants

The students of the MSc Light and Lighting course were graduates in architecture, interior design, engineering and related fields. All the designers were between 20 and 35 years old, coming from different cultural backgrounds, including British, Greek, Indian, Bulgarian and Chinese. All participants had moderate professional experience in the field of architecture
and lighting. The participants of this study were required to have background knowledge of lighting design in order to be able to use lighterials within their architectural design.

With regards to the setting of the experiment, there were eight design teams each consisting of two or three members and identified as groups 1–8. They had a timeline of five weeks to complete the whole project.

### 5.2.3 Preparatory seminars

Since the key elements of the brief were the poetics and the lighterials, the author presented two seminars to the students. The first seminar concerned poetics and how the idea of poetics links with architecture and lighting design. This seminar included information on poetics and lighterials with reference to the projects that were collected in the pilot study (data from the architecture students). The students were introduced to these projects and a discussion took place explaining how the poetics and the luminous forms connected. The second seminar was focused on lighterials and information about their technical characteristics, the limitations in their applications to interior spaces and the latest developments in them. This was followed by examples of real life projects where architects had designed their own luminous forms, such as the Morimoto restaurant described in Chapter 1, and examples where architects used already existing lighterials as in the case of Inamo restaurant and the use of interactive surfaces (Chapter 1).

These seminars gave the students some hints and background knowledge on both the poetics and the lighterials, emphasising the importance of creating a visual ‘narrative’ within the space that would engage visitors, using lighterials. Each seminar lasted for a couple of hours and they took place at the Bartlett Graduate School, located at 1-19 Torrington Place, London. Both seminars were run by the author and they were obligatory for the students of the particular module.

### 5.2.4 The questionnaire

After submitting their projects, the participants had to complete a questionnaire that was used to collect opinions on the overall procedure and more particularly on the way that lighterials influenced the process and their use in the development of the poetics (Appendix IV). A questionnaire was used for this study, because it provided ‘a relatively simple and straightforward approach to the study of attitudes, values, beliefs and motives’ (Robson 2002, p. 233).
The questions were constructed in detail, grouped to give as much information for the study as possible. For the construction of the experiment, a combination of different types of questions was used. Some were multiple-choice questions, others were based on a yes/no answer, and some questions were structured so that the participants had to explain their thoughts in detail. An advantage of the whole procedure was that the respondents replied to the questionnaires as soon as they finished the design process. They therefore had the chance to explain the advantages and the disadvantages of the process while it was fresh in their minds.

In more detail, the first part of the questionnaire aimed to collect personal information from the participants, such as their name, their professional field, their gender and age and their nationality. This was followed by two groups of questions. The first group focused on poetics. The designers had to explain the character of the space they were attempting and they then had to answer Yes or No regarding the successful incorporation of poetics into their design. They were also asked if they found the process challenging, obstructing, interesting, difficult or confusing and if they believed that *lighterials* enhanced the poetics of the space.

The second group of questions focused on the *lighterials* and the way they were used. In particular, the designers were asked if they had enjoyed working with the *lighterials* and whether it had been the first time they had used them in design. Again, they had to say whether they found *lighterials* important, useful, interesting, difficult or irrelevant and explain their answer. Moreover, they were questioned on whether *lighterials* hindered or enhanced the process or did not affect it much, explaining their answer in more detail. Another question covered the use of the *lighterials* in their future career and the reasons for doing so. Moreover, they were asked if they would include materials such as *lighterials* in the architect’s palette of forms permanently and if they believed that they should be incorporated into architectural education. In both answers the participants had to provide reasons. At the end of the questionnaire the participants had the chance to write comments about this study.

The next section focuses on the presentation of the projects taken from these groups combined with an analysis of the information derived both from the data itself and also from the completion of the questionnaire.
5.3 Case study results

5.3.1 Analysis of the projects

The projects received from the participants show that most of them managed to incorporate lighterials in their design solution and use them to reinforce the poetics of the space. The way in which each group used lighterials and linked them to the poetics of the space is analysed in this section. One objective was to find the similarities and the differences between the groups in the use of the lighterials and what they wanted to achieve by using them. Figures 23 – 26 show where the lighterials were applied in the space under review. Table 5.2 presents the main ideas behind the project of each group, accompanied by a description of the poetics of the space, the lighterials they used, their targets and a full description of the architectural concept with some few reference images.

Figures 5.23 – 5.26: Areas within the space that the lighterials were applied to: walls, floor, ceiling and desk. The colours indicate which group (here called ‘team’) used lighterials in these areas.
<table>
<thead>
<tr>
<th>Group</th>
<th>Poetics</th>
<th>Lighterials</th>
<th>Application</th>
<th>Design Objective</th>
<th>Description</th>
<th>Reference Images</th>
</tr>
</thead>
</table>
| A     | -       | OLED/electroluminescent/Barrisol | Wall | Separate space between reception & offices | - Wall broken in geometrical parts and lines framing those parts would be luminous  
- Designers wanted to create a ‘light’ structure between the spaces, not a solid wall | ![Image](image1.png) |
| B     | Effect of movement of the water | Electroluminescent/Acrylic Sheets-LED | Curved ceiling structures in sequence | Directed people from one space to another, ending to the glass facade where people can view the river | - The acrylic sheets were mounted on the ceiling using a metal construction  
- LED placed within the structure, all dimmed in a specific way to create the water effect  
- Electroluminescent tape located in parallel to the structure liquids | ![Image](image2.png) |
| C     | Fluidity into the space and directionality | Barrisol | Wall and the ceiling | Create a luminous passage and the shape of the river using colour changing lighting scheme | - The shape of the river indicate people where to go  
- Colour changing lighting scheme: turning to light blue in the morning, then changing to green in the middle of the day and turning to red in late afternoon  
- The ceiling, which is shaped as a river, ends at a wall just behind the reception desk | ![Image](image3.png) |
| D     | Dynamic directionality | Scintilla Lumina | Floor and Reception desk | Organise circulation | - Designers want to turn the people’s attention to the floor and direct their way to areas with the same type of tiling  
- Luminous floor lead people to the glowing reception  
- Reception made from Scintilla Lumina to glow and therefore becomes a focal point  
- The Lighterial is applied where movement is directed, People who move to the areas which have a different light have a more spontaneous movement | ![Image](image4.png) |
The first question that this case study aims to explore is the lighting designers’ purpose in using *lighterials* in the space. The data collected from Group G has been excluded, because they did not use *lighterials*. The results show that four out of the seven groups managed to incorporate poetics into their design ideas and six out of the seven groups used *lighterials* to achieve it. After the analysis of the results, the author distinguished five main reasons for which the designers used *lighterials*: for **directionality**, for **movement**, for **space division**, for **visual effects** and for **connectivity**.

To begin with **directionality**, four of the seven groups used *lighterials* to direct the users of the space towards the reception. The design of the path towards the reception connects to the use of a specific *lighterial*. Groups A, B, C and D used *lighterials* for directionality. More specifically, Group A used *lighterials* as a language, inviting people to move from the entrance of the space to the reception area. The use of the same language was followed in

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**Table 5.2**: Analysis of the projects of each of the groups participating in the case study
all corridors by making the circulation path distinguishable. A similar concept was created by Group B, using a ‘wavy’ form on the ceiling to direct people to the reception area and the offices. Again, this group used the same shape on the ceiling in all circulation areas. The designers highlighted this decision by placing another lighterial across the ceiling area, in parallel with the wavy shape. Group C also designed the shape of a river on the ceiling in order to give a sense of fluidity, which people could follow to orientate themselves in the space. The shape of the river on the ceiling would act as a reference element, guiding visitors to the end of the transition space. Again, this design idea was emphasised by a colour-changing lighting design, indicating where visitors should move. Finally, Group D placed the lighterial on the floor in specific areas, which led directly to the reception area and specifically to the desk that was made of the same lighterial. This application also created a very clear path that visitors would follow as soon as they entered into the space.

Groups B, C and D used lighterials to enhance movement within the space. Group B used a lighterial on the ceiling, which featured the use of LED lighting. The LED lights were dimmed in different zones across the space, which created a water effect. The visual effect was indicated by the lighting movement on the ceiling, guiding people to move towards the interconnected spaces, which were designed to end at specific points. A similar solution was given by Group C, which used coloured light on the ceiling to influence the movement of the visitors, creating a path that ended just before the reception desk, making people focus on it. Group D, however, used a different strategy. They placed the lighterials on the ceiling to turn the visitor’s attention to the ceiling, aiming to enhance the circulation.

Four out of the seven groups used lighterials to divide the space in different ways. For example, one group used lighterials to divide spaces with different light levels. Another group used lighterials to divide spaces that have different functions. Lighterials were also used to divide the public and the private spaces. In more detail, Group A used luminous forms to distinguish spaces with different functions. This group used lighterials on the walls that surrounded the offices and the reception area to indicate a change of function. To reinforce this idea, they placed the lighterials strategically only on the one side of the wall facing towards the reception area and the offices, and not on the other side of the wall facing the corridors and backspaces. The same strategy was used by Group B, who created an effect of moving water and ripples using lighterials on the ceiling; the effect was designed just for the circulation areas such as the corridors and the reception area, strongly differentiating these from the office spaces. In this example, the office area was treated as a private space and had a different design on the ceiling, quieter than the one described.
before. Group C used *lighterials* to keep visitors in specific areas, clearly indicating the territory between the public and the private spaces. Lastly, Group C used *lighterials* only on the side of the wall that faced the corridors and the reception area, aiming for higher levels of light than in the offices and a similar language in terms of both architectural and lighting design.

Some groups used *lighterials* to create specific effects. For example, Group B used dimmable blue LEDs on the ceiling to create the effect of moving water. Their aim was to add the idea of the water that surrounded the site into the interior space itself, copying the shape of the river. A similar solution was provided by Group C, who also used *lighterials* to create the shape of the river on the ceiling, backlit using colour-changing lamps. The colours they used were red, green and blue, according to the time of the day: blue for morning, green for noon and red for night, creating different atmospheres at different times. Lastly, Group E used mirrors to reflect images of people and the light, giving a feeling of infinity. These visual effects aimed to make people think of corridors as floating bridges that would bring into the space the illusion that people were standing on a very high floor. This idea connects to the fact that the space is located on the upper floor of a skyscraper.

Finally, the designers used *lighterials* to connect spaces. More specifically, Group C used *lighterials* to connect two spaces that were not linked visually. They used the *lighterial* to construct the walls and the ceiling of the reception, as well as the long corridor, creating a similar language between the public areas and achieving similar light levels. In addition, groups D and E created circulation paths that were linked together using *lighterials* either placed on the floor (D) or on both the floor and the ceiling (E). Group D connected all the public areas together, the reception and the corridors, through a path made by a *lighterial*. This *lighterial* was used on the floor, in this way organising the circulation areas. Finally, Group E used mirrors to multiply levels and images into the space, connecting them visually.
5.3.2 The questionnaire answers

Figure 5.27 shows a summary of the responses that each group of participants gave to the questionnaire.

<table>
<thead>
<tr>
<th>Questionnaire Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group A</strong></td>
</tr>
<tr>
<td>The participants of Team A did not complete the questionnaire.</td>
</tr>
<tr>
<td><strong>Group B</strong></td>
</tr>
<tr>
<td>• Used light for directionality</td>
</tr>
<tr>
<td>• Incorporated poetics</td>
</tr>
<tr>
<td>• Found poetics and lighterals interesting</td>
</tr>
<tr>
<td>• The process made them understand better the relationship between space and material</td>
</tr>
<tr>
<td>• Enjoyed working with lighterals</td>
</tr>
<tr>
<td>• Had used lighterals before</td>
</tr>
<tr>
<td>• Lighterals enhanced the process</td>
</tr>
<tr>
<td>• Lighterals enhanced the poetics</td>
</tr>
<tr>
<td>• Would use lighterals again</td>
</tr>
<tr>
<td>• Would include lighterals in the architect’s palette of forms permanently</td>
</tr>
<tr>
<td>• Lighterals should be taught in architectural education</td>
</tr>
<tr>
<td>• Faced difficulty separating lighterals from materials</td>
</tr>
<tr>
<td><strong>Group C</strong></td>
</tr>
<tr>
<td>The participants of Team C did not complete the questionnaire.</td>
</tr>
<tr>
<td><strong>Group D</strong></td>
</tr>
<tr>
<td>• Designed a refined, subtle and business like character of space</td>
</tr>
<tr>
<td>• Incorporated poetics</td>
</tr>
<tr>
<td>• Found poetics and lighterals interesting</td>
</tr>
<tr>
<td>• Enjoyed working with lighterals</td>
</tr>
<tr>
<td>• First time they used lighterals</td>
</tr>
<tr>
<td>• Found lighterals interesting and useful</td>
</tr>
<tr>
<td>• Lighterals enhanced the process</td>
</tr>
<tr>
<td>• Using lighterals added interest and creativity</td>
</tr>
<tr>
<td>• Used light for directionality and for focus</td>
</tr>
<tr>
<td>• Lighterals enhanced the poetics</td>
</tr>
<tr>
<td>• Positive incorporating lighterals in architectural education</td>
</tr>
<tr>
<td>• A lighteral’s manual would be very helpful.</td>
</tr>
<tr>
<td><strong>Group E</strong></td>
</tr>
<tr>
<td>• Designed an infinite floating space, dynamic and interactive space</td>
</tr>
<tr>
<td>• Incorporated poetics</td>
</tr>
<tr>
<td>• Found poetics and lighterals interesting</td>
</tr>
<tr>
<td>• Some members of the team had used lighterals before</td>
</tr>
<tr>
<td>• Found lighterals interesting and important</td>
</tr>
<tr>
<td>• Lighterals did not affect the process</td>
</tr>
<tr>
<td>• Lighterals enhanced the poetics and brought balance between emotion and function</td>
</tr>
<tr>
<td>• Positive using lighterals again</td>
</tr>
<tr>
<td>• Include lighterals in the architect’s palette of forms</td>
</tr>
<tr>
<td>• Should not be part of the architectural education</td>
</tr>
<tr>
<td>• Lighterals are connected to product design more</td>
</tr>
<tr>
<td><strong>Group F</strong></td>
</tr>
<tr>
<td>• Used light to separate public and private spaces</td>
</tr>
<tr>
<td>• Did not incorporate poetics into the design</td>
</tr>
<tr>
<td>• Enjoyed working with the lighterals</td>
</tr>
<tr>
<td>• Working with lighterals was difficult</td>
</tr>
<tr>
<td>• Had used the lighterals before</td>
</tr>
<tr>
<td>• Would use lighterals again in the future</td>
</tr>
<tr>
<td>• Lighterals should be incorporated in the architectural education and the architect’s palette of forms</td>
</tr>
<tr>
<td>• Lighterals should match with the application</td>
</tr>
<tr>
<td><strong>Group G</strong></td>
</tr>
<tr>
<td>• Did not use lighterals and poetics in the process</td>
</tr>
<tr>
<td>• Found lighterals interesting</td>
</tr>
<tr>
<td>• Would use them in the future</td>
</tr>
<tr>
<td>• They did not use lighterals in this project because they did not match with what they wanted to do</td>
</tr>
<tr>
<td>• Some members of the team thought that lighterals should be incorporated into architectural education</td>
</tr>
</tbody>
</table>

Figure 5.27: Summary of information about each group and their answers to the questionnaire given after they had completed the design idea.

In more detail, six of the seven groups managed to use *lighterals* from an early stage of the architectural design. All the participants reported that they enjoyed working with the
**lighterials** as part of the architectural design procedure. Two out of the six groups used Barrisol®, one group used Scintilla Lumina® tiles, another one electroluminescent tape and two other groups used glass. Further, the evidence shows that most of the lighterials were applied to the ceiling and the walls, whereas only one group used the lighterials on the floor. In particular, three out of the seven groups used lighterials on the walls and the ceilings: one group used glass mirrors and the other two used Barrisol. Another group used Scintilla Lumina tiles on the floor, while the last group used electroluminescent tape on the ceiling. The author believes that the choice of the lighterials had to do with the properties of the materials as well as with the concept idea. For example, Barrisol could not be applied on the floor since it does not offer the strength and durability that a hard material would offer. Its use was therefore limited to surfaces such as walls and ceilings.

According to the information they provided, members of five different groups have used lighterials in the past, and only a couple of them thought that it was a difficult procedure. Lighterials were found by most of the designers to be interesting and important for the design process. Just one group thought that the lighterials were difficult to use, while another believed that they were quite useful and helped them to establish a nice architectural result. It is important to mention that the participants who used lighterials from the beginning of the process found that lighterials enhanced the design process. Those who did not agree with that explained that they tried to develop the design concept first, without taking lighterials into consideration and then incorporated the lighterials afterwards. Others believed that if lighterials were taken into consideration from the beginning of the procedure, it would be a struggle to establish a concept that would lead to a successful architectural result. But even though these participants felt that lighterials made the process difficult, they all also agreed that lighterials enhanced the process if used from the beginning as soon as they had a main objective about the poetics of the space and that it added a creative impact to their design concept.

With regards to the participants’ intentions, a couple of groups explained that they aimed to design a space that would function well and be as comfortable as possible. Another two groups discussed the poetics of the space, clarifying that they designed a space that would give a floating feeling to the users. Another group designed a space so that people would feel they were in a refined and subtle environment. And yet another group felt that they designed a space that would interact with the visitor from the minute they walked in, through their movement through the space until they reached their office destination.
Three groups taking part in the study believed that they incorporated poetics into the space and they used it as a main goal in their architectural concept. Further, three of the seven groups found it interesting designing for the development of poetics, while one group found it challenging. Following that, some designers explained that using new concepts such as poetics and *lighterials* made them understand more about the space and its materiality, concluding that both elements were worth considering while designing. Comparing the answers from the participants of each group, it was found that all but one believed that *lighterials* enhanced the poetics of the space. The participant who was negative explained that it would be preferable to create lighting effects in the space regardless of the forms they have designed. The participants who were positive agreed that *lighterials* act as stimulating elements in the space, creating a feeling of creativity and emotionality. In addition, some of them felt that *lighterials* are luxurious materials to use while others believed that they add directionality.

Moreover, all designers were willing to use *lighterials* in their future projects. Four of the seven groups believed that *lighterials* offer variety and versatility. And most of them were impressed by the number of different applications that *lighterials* could have in order to create different effects and different atmospheres. One of the groups agreed that the *lighterials* were special and therefore they could be used to make their design unique.

Finally, one group believed that *lighterials* could be used in minimalist applications and forms and would therefore have frequent application in contemporary architecture.

Most groups would like to include *lighterials* permanently in the architect’s palette of forms. Only two of the seven groups believed that they should not be included. However, when they were asked if *lighterials* as luminous forms should be incorporated into architectural education most of the groups replied negatively. The participants had different reasons for that. For example, some of them believed that because these materials are product-oriented it was difficult to consider them as part of architectural design education. Another group was of the opinion that students of architecture should find out about these *lighterials* from their individual research and not from a university module. And a couple of other groups judged that further studies were necessary to understand more about the properties and applications of *lighterials* in order to know under what conditions they should be included in an architect’s education. At the same time, two groups believed that lighting was a part of the design that should be planned by the architect as part of the overall design of the space. *Lighterials* could therefore play a pivotal role, creating architectural environments that would include the architectural
lighting design process as well and not just the lighting effect. Further, the participants explained that if luminous forms were used in an appropriate way, designers would be able to explain their concept better.

5.4 Additional studies

The results taken from the architecture and lighting design students gave information on the connections between the lighterials, the poetics of the space and lighterials’ use in the development of poetics. In parallel to the case study project, an additional exercise took place in order to collect information on the participants’ opinions on lighterials. More specifically, the lighting design students in the case study had to complete a form that contained images of the lighterials and specific questions about them, such as questions on their appearance, their potential use and their graphic representation in architectural drawings (Appendix V).

The aim of this form was to obtain some basic information about how people perceive lighterials, both as materials and as lighting applications, and how designers would describe them. This information is valuable, because it will show some common characteristics between the lighterials. Further, the objective of this additional study was to see whether the designers would be able to represent lighterials graphically and communicate them in architectural drawings. If that were possible, it would mean that the lighterials could be thought of as architectural forms in terms of graphics, as discussed in Part I. The most important part of this would be to see if the sketches indicated that lighterials share a common architectural graphic language. Finally, this study aimed to add more lighterials to the existing list and to understand better how designers feel about using them in their projects.

The form comprised five parts. The first part enabled students to write their opinion on each of the lighterials separately concerning their appearance and properties as materials. In this part of the form were displayed a list of all the lighterials and images of the products themselves and their applications. In the second part, the participants were asked to add to the list any other lighterials not already included. In the third part, the participants had to reproduce the lighterials graphically, showing a possible way of representing them on

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4 The form’s appearance and structure was inspired by a form created for the annual Open House London event in 2009. The form was called ‘Be architective’ and it was funded by the London String of Pearls and supported by the Arts Council, England. The author collected this form during her visit to City Hall, London, at that time.
architectural drawings. Finally, in the fourth and the fifth parts of the forms, the students could write their opinion on what makes lighterials special as products, and any other comments that they would like to express with regards to lighterials.

In the following paragraphs the results obtained from the completion of the forms are analysed, from part one to part five in sequence: the lighterials’ description from the participants; the new lighterials added to the list; their graphic representation; and, finally, the participants’ reasons for believing that lighterials are special products and their comments.

Looking first at the participants’ descriptions of each lighterial separately, nine out of the 14 participants in the case study who completed the form, wrote a description of the lighterials. It is important to mention that the designers had never seen the lighterials in reality apart from the OLEDs and glass. Their evaluation was based on images of the lighterials themselves and their applications. Table 5.3 shows in brief the descriptions that the participants added to the form, for each of the lighterials separately.
<table>
<thead>
<tr>
<th>Material</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electroluminescent</td>
<td>new, soft, smooth, cold, plain, colourful, flexible, warm, safe, creates clear boundaries, decorative, use in advertising, posters, middle ground material</td>
</tr>
<tr>
<td>Organic Light Emitting Diodes</td>
<td>new, smooth, flexible, advanced, progressive, fascinating, lightweight, delicate, portable, dull, plain, hard, plastic, harmonious surfaces, high luminance, gradient intensity, colourful, interactive</td>
</tr>
<tr>
<td>Active &amp; Interactive Surfaces</td>
<td>new, playful, colourful, happy, alive, reactive, interactive, vivid, cold, high visual interest, difficult, create illusion, dynamism, gives content, for activities, energetic, versatile, many possibilities</td>
</tr>
<tr>
<td>Barrisol</td>
<td>colourful, smooth, flexible, quality material, cover large areas, smooth or hard, blends with space, old, opaque, curvy applications, well-balanced, powerful, multi-purpose, impact or subtle, soft, comfortable, calming, relaxing, dramatic, theatrical applications, inspiring</td>
</tr>
<tr>
<td>Polyethylene Volumes</td>
<td>soft, smooth, curved, tactile, atmospheric, dimmable, gradient appearance, hard, cold, plain, durable, 3D forms for extensions, luminous curves</td>
</tr>
<tr>
<td>Glass</td>
<td>old, hard, straight, flat, flexible in colours, texture, formats, effects, expensive, brittle, soft effect, natural materials, cold, plain, intricate, intriguing, simple, effortless, high brilliance, reflective, transparent, constructive</td>
</tr>
<tr>
<td>Light Transmitting Concrete</td>
<td>rough, patterned, hard, old, straight applications, texture, blur lighting, shadows creation, texture, flexible, nice soft lighting, rough, warm, earthy, old yet modern, constructive than decorative, colourful, interactive, hard</td>
</tr>
<tr>
<td>Glowing Substance</td>
<td>plastic, blur, low quality material &amp; lighting, cold, unnatural, for funky effects, modern, emanating warmth, seamless, pervasive, create anticipation, represent energy, decorative, impressive, hard, tough, colourful, smooth, straight application than curvy</td>
</tr>
<tr>
<td>Scintilla Lumina</td>
<td>plastic feeling, low quality material &amp; lighting effect, new, colourful, firm, straight applications than curvy, patterned, cool material due to texture, well diffusion of light, interesting, hides lamp source, sparkling, warm, rough, straight, hard, decorative, vibrant, playful, living material, unobstructive, plain</td>
</tr>
</tbody>
</table>

**Table 5.3:** The descriptions that the participants of the case study gave to each of the lighterials under review
Most of the designers used similar ways to describe *lighterials*. The electroluminescent products, the organic light-emitting diodes, the active and interactive surfaces and the Scintilla Lumina were perceived as new materials, whereas Barrisol, glass, light-transmitting concrete and Riverstone bricks* were perceived as old. The designers thought that light-transmitting concrete, Riverstone bricks and Scintilla Lumina were warm materials. On the other hand, they believed that the organic light-emitting diodes and the active and interactive surfaces are cold materials. They also thought that the electroluminescent products, glass and light-emitting substances could be considered both warm and cold, according to the application.

The designers distinguish *lighterials* thought of as being smooth, such as the electroluminescent products, OLEDs, Barrisol and polyethylene furniture. Also they found that some of them were hard, such as glass, light-transmitting concrete, light-emitting substances and Scintilla Lumina. Many *lighterials* were considered to be flexible, such as electroluminescent products, OLEDs and Barrisol, or colourful, such as the electroluminescent materials and the active and interactive surfaces, Barrisol and Scintilla Lumina. In addition, some of the participants believed that a few of the *lighterials* look plain, such as glass, the OLEDs, polyethylene furniture and the light-emitting substances, while participants distinguished those *lighterials* which have a pattern, such as light-transmitting concrete, Riverstone bricks and Scintilla Lumina. Many of them were interested in the quality of these materials: they considered Barrisol to be a high-quality material, whereas the electroluminescent products and the Scintilla Lumina were considered to be low-quality materials.

The participants used many other adjectives to describe *lighterials* and their properties. For example, OLEDs were described as progressive and advanced, as well as lightweight, delicate and portable, although some designers thought of them as being dull. *Lighterials* such as the active and interactive surfaces were described as happy and playful, full of vivid colours that bring high visual interest into the space. Barrisol was perceived as relaxing, whereas polyethylene furniture could be used to create an atmosphere in the space. Glass was perceived to have different applications and properties and therefore different visual results. And Scintilla Lumina tiles were thought to have an intense and at times sparkling appearance.

Some designers commented on the applications of the *lighterials* shown in the images on the form. A few believed that some *lighterials*, such as the electroluminescent products, could be used only for decorative purposes, whereas others have a structural character,
such as light-transmitting concrete and the Riverstone bricks. Similarly, a few participants said that lighterials such as OLEDs could be used to design uniformly lit surfaces that could diffuse light evenly across the space. They also said that lighterials could have a gradational lighting appearance or be opaque. Lighterials such as the active and the interactive surfaces are believed to create illusions in the space and also to make space appear more energetic.

A few lighterials were distinguished for their curved applications, such as the polyethylene furniture and Barrisol, whereas others appeared to have more linear applications, such as the light-transmitting concrete, the Riverstone bricks and the Scintilla Lumina tiles. In particular, Barrisol was believed to make the light and the material blend with the space. The designers also distinguished the use of light-transmitting concrete and the use of Riverstone bricks as able to create a ‘blurry’ lighting scheme. A few of the designers mentioned that some lighterials were difficult to use, as they required a lot of research and detailing in order to give the appropriate architectural result, such as the use of the active and the interactive surfaces. But also many lighterials were considered to be expensive and therefore hard to use, such as glass.

The participants, after describing each of the lighterials separately, had the chance to add new materials to the existing lighterials list (Figure 5.28). These new materials included Planilum® as a light-emitting material that shares similar characteristics with the first category of the lighterials that emit light. In the category of glass lighterials were included liquid crystal glass (LCG), suspended particle device (SPD) glass, mirrors and electrochromic glass, as new versions of glass types. Water was also included in the list, because it is an extra substance that can be incorporated into the materials explained above, in order to make them appear different.

![Figure 5.28: The list of lighterials used for the case study appears in grey; the lighterials that the participants added appear in magenta](image)
The students were also asked to sketch on the form how they would indicate graphically the lighterials, in plan, section and elevation. Eight of the 14 participants submitted their ideas. What follows is an analysis of the sketches, with the intention of finding common patterns or ideas across the different sketches. Because the number of participants involved in this study is small, the analysis shows only some evidence of how the lighterials could potentially be represented graphically (Figure 5.29 - 5.31).
Most of the participants used a yellow colour to draw the lighterials while some used a gradational yellow colour to indicate that they are connected to or emit light. Most created different types of frames that were either two-dimensional or three-dimensional and included a symbol or an indication within the frame or outside it. In many of the sketches, and particularly in the ones using frames, the lighterials were shown graphically as if they radiated – designed with a number of lines surrounding the frame itself. These lines were shown either straight or curved, in different sizes and parts of the sketch. Many designers drew a pattern, which was composed either of horizontal/vertical lines, circles or dots, or of rectangular shapes in various scales. What is also interesting is that some participants showed a different sketch for the plan, the section and the elevation whereas some others drew only one sketch for all these views. Many participants used symbols to indicate lighterials, such as arrows and letters often with the initials of each of the lighterials; for instance EL for electroluminescent.

Of particular interest is that different participants used similar ways to represent specific lighterials. For example, most participants showed the electroluminescent on the drawing as a frame, which either looked as if it radiated or with a specific pattern, using in both
cases straight lines. For the OLEDs, again most of the designers indicated them as frames that acted as borders of an area indicated with a pattern or in other cases a frame that seemed to radiate. And most of the designers used symbols such as lamps, small circles, arrows and letters with the initial letters ‘OLED’.

In addition, the active and the interactive surfaces were signified by a pattern followed by a grid or else multiple rectangular shapes, placed one on top of another. The active and interactive surfaces were pointed out as frames, which in some cases included something within. Barrisol was designed as simple frames, or frames with patterns made by grids and lines, or symbols such as lamps, big circles and the initials BR. In a similar way, the polyethylene volumes were drawn as frames with patterns made by dotted lines or frames that radiate. The glass *lighterials* were mostly designed as frames that included a symbol such as a lamp and the initials GS or as patterns made by random lines or again as radiating frames. The light-transmitting concrete was designed as a frame, with a perforated pattern using symbols such as arrows, lamps and the initials TC, or radiating frames. Furthermore, the light-emitting substances were designed as frames, patterns or symbols such as small circles within the frame shown as they radiate or arrows or the initials GLS. Finally, the Scintilla Lumina was designed as a frame that radiates light or a pattern such as dots and circles.

The conclusion of this analysis is that the participants used lines, volumes and planes, and patterns in different scales or contrasts to indicate the *lighterials* graphically. This evidence shows *lighterials* to be communicated as architectural forms represented by lines, planes and volumes in drawings. The data shows that the electroluminescent products were indicated mostly as lines especially curved lines. In a similar way, designers represented the OLEDs in a linear way, by the use of lines, mostly horizontal and/or combined with other smaller lines, vertically or at an angle. Lines were also used to indicate active and interactive elements, Barrisol, glass, light-emitting substances and polyethylene volumes *lighterials*. Further, most participants indicated *lighterials* as frames: as planar elements or as three-dimensional frames/volumes. The light-transmitting concrete and the light-emitting substances in particular tended to be drawn as volumes by most of the designers, followed by glass, Barrisol, polyethylene volumes and Scintilla Lumina. Just one participant used a volume shape to indicate OLEDs.

Many *lighterials* were specified in the drawings as patterns added to the sketch of a plane or a volume or independently. The participants used just patterns for specific *lighterials* such as glass, light-transmitting concrete and the active and interactive surfaces. For the
glass *lighterials*, the pattern that was used was either a grid or made of symbols such as lamps or made by a composition of lines and dots or just lines. For the light-transmitting concrete, the pattern used was either dots, grids or a combination of dots and symbols such as arrows. The active and interactive surfaces were drawn either as a synthesis of boxes or as different types of line patterns. Less frequently, there were examples of Scintilla Lumina, Barrisol and the polyethylene products drawn as patterns, where the participants used dots, boxes, grids, symbols and lines.

Another element that was noticed in the sketches of the participants was the difference in the scale between the shapes of some *lighterials*. For example, the scale of a particular pattern changes from one sketch to the other when referring to Barrisol. In a similar way, there was a difference in the scale between the sketches for the light-transmitting concrete, where dots were used in different sizes and in a different amount. The participants designed sketches that had a difference in opacity. For instance, the light-transmitting concrete was drawn as a frame with a thick black perimeter, while the same participant drew glass as a frame with a grey thinner parameter. The same phenomenon is seen in the use of the patterns. Some sketches show very dense patterns drawn with the use of a strong black pen, for example, to indicate the polyethylene volumes, whereas the same participant designed Barrisol using a black pen where the colour was not as strong and the pattern less dense. That shows a difference in contrast between the sketches.

Finally, the participants wrote a few sentences about the special elements that the *lighterials* share (Figure 5.32). *Lighterials* were seen as new, fun and flexible materials, which can act as navigators in the space and have light integrated into the structure. Participants referred to them as light-emitting materials, or as volumes or surfaces of light, drawing attention to their dominant characteristics, which can alter the main purpose of the space. They pointed out that shadow is a special element that accompanies *lighterials* and should be taken into consideration in the applications.
5.5 Emerging outcome of the studies

The studies described above were undertaken to understand whether students in architecture and lighting design could use lighterials to design a space and to create poetics in the space. The architecture students gave some examples of how lighterials can be used to bring poetic qualities into the space. The students’ projects were used as reference to the lighting design students to understand what poetics mean. With regards to the poetics of the space being designed using lighterials, the lighting design students explained their intentions of creating a specific atmosphere and how their design would affect people who would visit or work in the space. Most of them felt that incorporating the poetics into their design was definitely an interesting procedure and one that makes designers think deeply about what they do and how it impacts on the users of the space. One of the groups also believed that poetics was a difficult element to deal with, but they found it challenging to think about architectural design in this way. The majority of the participants thought that lighterials enhanced the poetics of the space they had designed.

Of the seven groups of lighting designers, six managed to design the space using lighterials as a principal element from the beginning of the process. Only one group found this procedure hard to follow and wanted to use artificial light for effects after the completion of the design process. The other groups thought that the process was interesting and enjoyed approaching architectural design this way. Most of them found lighterials interesting or important. There were only two groups that considered the use of lighterials
as difficult or useful. Based on the final results, the participants’ opinions on working with *lighterials* from an early stage of the design procedure is a way to enhance the process of finding a successful architectural solution for the space.

Most of the participants had used some *lighterials* before in other projects and were positive about using them again in the future. The majority of them believed that *lighterials* should be included in the architect’s palette of forms but they also responded negatively or were unsure whether *lighterials* should be incorporated into architectural education permanently. The analysis of the results also gave information about how the designers used *lighterials* and how they linked them to the poetics of the space. Subsequently, five categories of design trends evolved when the participants designed taking into consideration poetics and *lighterials*. The first one is directionality, the second is movement, the third is division of the space, the fourth is the creation of effects and the last is the connectivity of the spaces.

The research data shows *lighterials* have been used to direct people to specific target elements (such as a reception desk), drawing them further into the space or to provide direction to other spaces. Apart from direction, *lighterials* enhanced the movement into the space, since people tend to move towards the light as soon as they enter a space. The *lighterials* guided people to move towards specific areas or to stop. In most examples, the designers used the *lighterials* to create paths that would be recognisable and memorable for visitors.

The second use of *lighterials* is dividing the space. *Lighterials are* used to distinguish the functional qualities of the space and to direct people to specific areas. In the case study, most designers used *lighterials* to separate the reception area from the office areas or the corridors. The use of the *lighterials* helped to differentiate spaces and to distinguish the qualities of each space (corresponding to Shemitz’s 1968 theories discussed in Chapter 3).

Participants also used *lighterials* to create visual effects in the space, such as the effect of flowing water or the use of mirrors. This action enhanced the aesthetics of the space and stimulated the visitors’ sensations and emotions. This fundamentally alters the effect of the design, influencing people to experience it visually and emotionally (as discussed in Chapter 3 in relation to Ng 1991). In particular projects, *lighterials* could influence the overall meaning and the detailing of the surfaces and how they related to each other. This in turn influenced people’s responses and thereby linked them to the poetics of the space (see Bell 1987 as discussed in Chapter 3).
Last but not least is the use of lighterials to connect elements or subspaces. Using lighterials in this way affects how people use specific objects and spaces. For example, one of the groups used lighterials to connect the different spaces together, using the form of the ‘river’ on the ceiling that runs throughout specific spaces, connecting them. Visitors would follow the flow of the river. As people generally tend to respond to a specific stimulus, the use of the lighterials created a language expressed by both the form that would make people understand its intention and the light that would make people focus.

The results showed lighterials’ role in directing, moving and dividing space or in creating visual effects or connecting spaces. Following Michel’s (1996) and Suwa and Tversky’s (1997) analyses of the space (as discussed in Chapter 3), the lighterials’ use could influence the architectural outcome. The analysis above showed that lighterials could be used to direct people or to make them move, which could determine the circulation of the space. It can therefore be seen that lighterials could influence circulation. On the other hand, since the lighterials can be used to divide the space, they could impact on the boundaries or the spatial configuration setting. In addition, if lighterials are used to create visual effects, they can act as focal elements or as stimulating elements in the space and attract attention.

Finally, lighterials can be used to connect spaces, which means that they could be used as connecting elements, creating spatial connections.

Generally, lighterials were used in the case study to reinforce the poetics of the space and make the design intention more obvious. Lighterials as applications gave designers the choice of designing a space using artificial light as a primary tool. The participants of this study were able to link the technical lighterials to the conceptual poetics in order to create a space that would be functional and also create specific feelings in the people experiencing it. Although the sample analysed so far is not enough to generalise the findings, it gives a general idea about how some designers thought of lighterials and their properties. Further research could open up new perspectives about the use of lighterials in architecture.

The results taken from the graphic presentation of the lighterials shows that the designers could see lighterials as architectural forms and therefore were able to incorporate them into their architectural drawings. These findings open up the way for further research on how the lighterials could be approached as forms: lines, planes and volumes. And the fact that the participants used pattern, scale and contrast to distinguish them in their sketches, makes this approach even stronger. Evidence showed that a few of the lighterials were perceived as linear elements, such as the electroluminescent products and the light-emitting substances, while most of the designers used planes or frames to represent them.
Most of the lighterials were presented as frames, either three-dimensional or two-dimensional, which included patterns of either horizontal or vertical lines or symbols such as a lamp and arrows or dots and circles or yellow colours to distinguish them. Also many designers used grids in different scales to indicate them. While most of the lighterials were designed in plan, there were a few participants who designed a different shape for the plan, the section and the elevation. Finally, a very distinctive way of representing the lighterials graphically was the use of lines around a frame, which gave it the appearance of radiating.

In conclusion, this study shows that lighterials can influence architectural design, enhancing the process, when used from the beginning of the conceptual procedure. However, using lighterials in the case study in this way could give information only about whether they influenced the process of the architectural design and not how they influenced the architectural result. In order to be able to determine this, it would be necessary to compare and contrast the architectural design both before and after the use of lighterials. That could be done by investigating how each of the elements that describe architectural space could be affected by the lighterials. These studies also shed light on how designers can use lighterials with the intention of creating poetics in the space. Focusing on the poetics before and after the application of the lighterials would provide more precise information about how the poetics can be influenced. Finally, using professional experienced architects rather than students in architecture, would give a deeper insight in understanding how architects would feel using luminous forms in the design.

Chapter 5 presented the pilot and the case studies. The pilot study gave information about how architecture students use luminous forms in their design concept, linking it to the poetics. These samples were presented to the participants of the case study, with a view to become a source of inspiration. The lighting designers were encouraged to design based on poetics, using the lighterials from the beginning of the conceptual phase. The results showed that lighterials enhanced the process and the poetics of the space. Also the analysis revealed new roles of light through the use of luminous forms. Finally, the case study revealed how luminous forms can be communicated graphically on drawings. The next chapter presents the interviews, examining how lighterials can influence the architectural design result.
This chapter presents the interviews. This experiment is an attempt to answer the research question about *lighterials* and their influence on architectural outcome and the poetics of the space, with the use of multiple methods. The experiment is based on a design task that was given to professional architects. The author used the experience gained from the case study described in Chapter 5 to structure the experiment. What follows is a presentation of all methods used in the experiment, its stages, and the coding process that was followed, as well as how the results were analysed.
6.1 The methods

This section presents the methodology that was chosen for this experiment, focusing on three different methods: the think-aloud protocol analysis, the structured interview method and the questionnaire. The use of the sketches is also examined as a method for understanding the architects’ intentions and for communicating the design ideas. All the methods used in the experiment are qualitative research methods.

According to Tesch, qualitative data has four characteristics: ‘the characteristics of the language, the discovery of regularities, the comprehension of the meaning of text or action and reflection’ (cited in Robson 2002, p. 457). Qualitative methods have some strengths, including the fact that they are based on real life situations. They can be quite flexible in accommodating new data, even though when the experiment has already started. Further, according to Groat and Wang (2002, p. 199) they are ‘especially appropriate for understanding the meanings and processes of people’s activities and artefacts’. In the architectural design field especially, using such methods can be valuable in retrieving data on the intentions of the architects and the meaning of their actions with regards to the design of a space.

Conversely, qualitative methods also have some negative points. In most cases, when using qualitative methods the researcher can end up collecting a vast amount of data, which can make the analysis of the results difficult. In addition, there are no rules and specific procedures established that can be followed by the researcher in order to analyse the results. Finally, the qualitative data has weaknesses in terms of validity and generalising the data. The latter weakness was faced in this research study. The analysis of the results could not be generalised because of the small sample that was used (24 interviews). Also, in the qualitative analysis procedure it is hard to exclude the influence of the researcher on the results. This does not mean that the results are not valid, but it is difficult to crystallise the final outcome. This is why the analysis of the interviews answered the question of how the lighterials might influence each element of the space rather than how the lighterials actually do influence each of them.

6.1.1 Think-aloud protocol method

The analysis of think-aloud protocols ‘is a rigorous methodology for eliciting verbal reports of thought sequences as a valid source of data on thinking’ (Anon. 2002). In other words, this method is based on the collection of verbal data that demonstrates a specific way of
thinking. This methodology was used in this research because the aim of the experiment is to find information about what the architect thinks when designing a space. In particular, protocol analysis combined with sketching could retrieve information about what ‘architects think of and read off from their own freehand sketches’ (Suwa and Tversky 1997).

The think-aloud protocol procedure can provide information to the researcher about the design and concept development process that would not be possible to understand in detail just by analysing the architectural result. This methodology ‘gives information about the architect’s reasoning’ (van Someren, Barnard and Sandberg 1994). More specifically, with regards to the research question, it is necessary to use a method that would provide information about the design of the space under review and the different elements of which it is composed. Using the think-aloud protocol procedure, it would be possible to understand how lighterials are applied and how architects react to the luminous forms. This information would also provide the background to study further how these applications link to the poetics of the space. The way architects use the forms and the reasoning they provide can be used to analyse their design intentions and to understand how their intentions are impacted when the lighterials are introduced into their design idea at the end of the design process. Further, as explained in Part I, in order to describe the poetics of the space, it is necessary to have context. The words that an architect uses to describe this context are valuable for establishing the character of the space and the feelings that the architect wants to create in the users. The aim is to understand if the architect’s intentions have changed after the application of the lighterials.

The think-aloud protocol method is based on a description of a process. In this experiment the aim was to obtain descriptions of the intentions of the architects. Using this method provided reasonable details about the analysis of the space into elements. Dorst and Dijkhuis (1995), in their research on the comparison between paradigms for design activity description, concluded that: ‘describing design as a process of reflection-in-action works particularly well in the conceptual stage of the design process, where the designer has no standard strategies to follow and is proposing and trying out problem/solution structures’.

According to this method, verbal data is used to retrieve and analyse the information. This has been seen in Ericsson and Simon’s (1980) research in psychology, where the researchers were interested in finding evidence for the cognitive process in order to generate ‘stimulus-response relations’ (p. 215). They identified that what makes this method special is that verbal protocols can provide detailed information. Further, with
regards to the data, the important part of this method is that it can give the researcher enough information not only to know the participant’s answer to the questions addressed but also to describe how exactly the participant was driven to that answer.

Further, Tversky and Lee (1988) argued that space is schematised by language and that ‘language provides a systematic framework to describe space, by selecting certain aspects of a referent scene while neglecting the others’. Architects use words and phrases as well as drawings to describe things and to communicate their idea better. They use particular words to give emphasis to specific things and that is often reinforced by their facial or other gestures. According to Eastman (1969, p. 670), when a particular task is given to designers, it is important to keep a record of their ‘expressive behavior while solving the problem’. Even understanding the expressions on the face of the participant is a protocol. Protocol analysis has been used in the field of architecture before. Eastman dealt with problem-solving through a protocol method, dividing the problems into well-defined or ill-defined according to the amount of information that was received by the participants when explaining aloud how they solved the design problem. All the data, descriptions, words and details of the designers’ behaviour and expressions can be analysed better according to the ‘orthographic projection’, the drawing (ibid.).

In design studies, drawing is a fundamental tool, especially in the think-aloud procedure. Akin and Lin (1995) made a study of drawings and explained why they were critical for this method. They wanted to understand more about the visual data, its importance in design and how it connects to the verbal data. To do so, they created two different models: the dual model and the activity-based model. They approached drawing as a ‘primary activity of the designer’ (ibid., p. 213). Further they believed that ‘any verbal information generated is usually its reflection, almost like an echo’ (ibid., p. 213). According to the dual model, neither the verbal nor the visual data could explain the process in detail. Their second model, the activity-based one, was based on six main tasks: drawing, talking, writing, thinking, examining and listening. This breakdown makes the data more comprehensible and it explains the design process better. Akin and Lin explained that in both models the drawings were the key element and they provided the ‘road map to the various aspects of a design or design problem’ (ibid., p. 235).

The importance of drawings in information-processing tasks is described in more detail by Schon and Wiggins (1992), who tested both the design procedure and the outcome. They found that the design process is directly connected with making and seeing, doing and discovering. Further, they concluded that the structure of the designer’s thinking follows a
seeing–moving–seeing pattern. More specifically, the researchers explained that in studying drawings one can see all the steps; the designer’s idea and how it evolved ‘emphasizing, for example, the implementation of ideas, the interplay of variables, the management of constraints, or the alternation between proposals and evaluations’ (Schon and Wiggins 1992, p. 154). Recording this process gives valuable information about the way the participants think, and this is a vehicle to recognise and understand more about the moves they make during the design process. Moreover, Schon and Wiggins believe that the visual data is a very strong tool that can be used in research studies, since this type of data can be analysed in various ways: to find new ideas and ‘to see things in new ways’ (p. 155).

Following this evidence, the think-aloud method is ‘regarded as the most likely method (perhaps the only method) to bring out into the open the somewhat mysterious cognitive abilities of designers’ (Jiang and Yen 2009, p. 154). Jiang and Yen researched a variety of papers, journals and PhD studies trying to understand which method was used the most in design research studies. They concluded that the think-aloud method was most used, especially in architectural design studies. Further, they explained that the data obtained using such a method can be analysed into different design tasks, including the design process, redesign, design episodes, design discussion, the usage of product and other less significant tasks, emphasising that this method is mostly used in order to research further into the design process.

To conclude, the think-aloud protocol method has many advantages, such as providing information about the architect’s reasoning (van Someren, Barnard and Sandberg 1994), giving an idea about how an architect proposes and tries out problem solutions (Dorst and Dijkhuis 1995), giving detailed information about a series of stages (Ericsson and Simon, 1980) and showing the architect’s cognitive ability (Jiang and Yen 2009). However, this method also has some disadvantages. A negative point is that while participants report what they do, they tend to slow down the way they think in order to ‘synchronize it with verbalization’ (van Someren, Barnard and Sandberg 1994). Such researches show that the emotional parameters as well as the motivation of the participants influence their sayings. Erickson and Simon (1980) reported that such a method used for the collection of the verbal data is unsatisfactory and such ‘reports is mainly to generate hypotheses and ideas’ (p. 216). In addition, this method is weak in capturing information that cannot be expressed by the use of the words and taking that into consideration would mean that the research data would never be complete; nevertheless it can give detailed information on the task under examination (Dorst 1995, p. 141). Reaching a similar conclusion, Schooler and
The Interviews

Engster-Schooler (1990) discussed how verbal data can overshadow visual memories and that there are some visual details that cannot be expressed easily by the use of words. Further, Lloyd, Lawson and Scott (1995) add the factor of time to their criticism of protocol analysis: the methodology sets a timeline on the architect that he is not used to function within. Too much time can block designers’ thoughts since they can revisit the problem again and again without coming up with a solution. On the other hand, architects are not used to designing a task within such a time constraint and the results can therefore be blurred (Lloyd, Lawson and Scott 1995, p. 258).

For the current experiment, although the duration of the experiment was restricted to 50 minutes, the architects were informed about the task at least eight hours in advance. Giving the design task brief to the designers prior to the meeting gave them some time to think about what they would do. This decision was based on the findings of Lloyd, Lawson and Scott (1995) on the drawbacks to the think-aloud protocol. According to them, the method, and therefore the experiment, is more accurate if the researcher ‘would not attempt to give the designer a new task “cold” but allowed a period of time for the designer to digest the task, though not to focus on it’ (p. 258). Taking that into consideration, the brief was sent by email to the participants at the beginning of the day, and most of the interviews took place in the afternoon.

Finally, although the think-aloud protocol method has been used before in architectural research (Goldschmidt 1991; Suwa and Tversky 1997), but there is less evidence of its use in lighting design research. Skarlatou (2010) was the first researcher to use the think-aloud protocol in lighting design research. She used it to obtain information about light effects and the criteria that underlie them. Using the protocol analysis method for the current study is probably unique, since it focuses on both the architectural and the lighting design process and result.

6.1.2 Structured interviews

Another qualitative method used is interviewing. Standardised, open-ended interviews are used to obtain information for specific matters. This method involves writing the questions in advance, before the interview takes place. The interviewer asks all participants the same set of questions. The questions are asked in the same way and in the same order and all participants have a specific timeframe in which to complete the interview.

The interview is an interesting method to use in research studies that aim to collect views from participants in their own words. It is a flexible method for data collection 'enabling
multi-sensory channels to be used: verbal, non-verbal, spoken and heard’ (Patton 2002, p. 349). This flexibility enables interviewing to be used in architectural design studies, where architects can explain particular parts of their design after being asked a particular question, either by the use of sketches or by verbal response or both. The purpose of the interview in that context is to gather data about ‘what a person knows, what a person likes or dislikes or what a person thinks’, as Tuckman describes (cited in Patton 2002, p. 351).

In addition, the interview can be used as ‘an explanatory device to help identify variables and relationships’ (Patton 2002). This means that if a participant designs a space, the interviewer can ask particular questions to understand the design intentions better or to ensure the outcome of the research. In this case the interviewer focuses on ‘content specified by research objectives of systematic description, prediction, or explanation’ (Cannell and Kahn cited in Patton 2002, p. 351). This is also supported by Lincoln and Guba who explain that the use of structured interviews is appropriate ‘when researchers are aware of what they do not know and therefore are in a position to frame questions that will supply the knowledge required’ (cited in Patton 2002, p. 354). Therefore, in research studies where the research objectives are known, they can be turned into questions directed to particular answers.

Following the research objectives, the use of structured interviews can ensure that the interviewer will collect the necessary data. The exact wording of the questions in combination with the sequence in which they are asked are key characteristics of this method for ensuring important feedback. Where there is more than one participant, it is important that the participants all answer the same questions, formed in the same way and in the same order. This increases the ‘comparability of responses; data are complete for each person on the topics addressed in the interview’ (Patton 2002, p. 353). Interviews also enable organisation of the data and ease in their evaluation and analysis.

On the other hand, the interview method also has some weaknesses. When using standardised open-ended interviews it is difficult to relate each interview to particular participants and cases. And this type of interviewing does not permit a natural flow to the interview and the collection of the data but rather a stricter and guided approach to which the interviewee has to adjust.

6.1.3 The questionnaire

The questionnaire is a very different methodology from the think-aloud protocol and the interviews. Those methods were used in this experiment to collect views, problems and
knowledge from the architects while they were designing. The questionnaire can be designed to collect and focus on particular types of answers and use a variety of formats in order to collect relevant answers from the participants. The questionnaire used in this experiment was the same as that used in the case study. The reasons for choosing this method were explained in Chapter 5. In both studies, the questionnaire aimed to find answers regarding the poetics, the use of the *lighterials* and their potential use in the future in architectural practice and in architectural education.

### 6.1.4 The sketches

As explained earlier, the drawings were used as key elements for this research study, combined with the think-aloud protocol and the interview methods. The participants, while designing the particular task, had to solve problems that evolved while generating the design ideas. In the experiment, this process took into consideration how appealing an environment can be for the users. During this time, architects produced different design solutions and they evaluated them during the process. The vehicle used to examine all the different design possibilities and evaluate them accordingly was the sketches. Using freehand sketches, architects can create many different architectural solutions in a very short period of time, without using rulers or computer software. Suwa and Tversky (1997) have examined the reasons that make freehand sketches a good option to be used to crystallise architectural ideas. While discussing various forms of drawings such as freehand sketching, they explain that these ‘*not only serve for memory aids, but also facilitate and constrain inference, problem solving and understanding*’ (Suwa and Tversky 1997). Further, they came to the conclusion that architects are stimulated by the sketches to even more analytical thinking and ideas, from a perceptual point of view as well as a functional one. Sketches help designers to create more ideas visually and to understand more about a particular idea.

The idea of architects using sketches to evaluate their design ideas is reinforced by Liu, Liu and Chuang (2009) in their study of the relationship between the design concept and the sketches of architectural design novices. They reported that the sketches played a key role in the progress of ideas, approaching them as a valuable tool to present the architectural idea. They also produced information about how designers use sketches to provoke new ideas and to actually explore them visually. Following their research, they came to four important conclusions: (1) designers use sketches to create a dialogue and keep track of their ideas; (2) sketches help architects see parts of the idea as well as the overall idea; (3)
for the architects it is very important to represent the ideas they have in their mind in order to solve the design problems; and (4) ‘sketching captures the moment and stores it’ (Li, Liu and Chuang 2009).

Another important factor that sketching contributes to the design process is the discussion. Obrenovic suggests that the sketches have the form of ‘work in progress’ documents; people, users and colleagues therefore feel free to make comments on them and ‘can criticize them or suggest changes’ (Obrenovic 2009). Obrenovic also implies that sketching is much more than ideas on paper; designers can use sketches to ‘deal with attributes of the overall user experience, such as time, phrasing and feel’ (ibid.). This links to the intention of this particular research, where architects are required to address the poetics of the space and communicate their ideas with sketches. Using sketches to obtain information about the poetics of the space is an idea suggested by Bilda, Gero and Purcell (2006). They say that sketches can address three different actions: the ‘perceptual action, which refers to interpretation of visual information; functional actions, which refer to attaching meanings to things and conceptual actions, which refer to the planning of the actions and initiating actions for design decisions’. According to Bilda, Gero and Purcell (2006), sketches can be used to code specific elements and actions; thus one can see the link between different ideas, as well as compare the different ideas between them and draw conclusions.

Commenting on their findings, the researchers considered each line of a sketch to contain a message that communicates something to the designer and to the people who evaluate the sketch. ‘Sketching is like a language’ (Bilda, Gero and Purcell 2006). This means that it is important for architects to use sketching to describe what they have in mind. This is one of the reasons that make sketching an important element of an architect’s education.

Goldschmidt (1991) used the think-aloud protocol method to extract verbal information while sketching and study the sketches. By analysing the data she distinguished ‘design moves’ and ‘design arguments’: design moves were the sketches the designers draw and design arguments were what they reported while sketching. By analysing the comments they made while sketching Goldschmidt also reported that designers perceive what they are doing in the sketches as ‘seeing as’ and ‘seeing that’ (Goldschmidt 1991, p. 131). She referred to the process of sketching as cyclical which gives a new appearance to the sketch and the design result. Goldschmidt’s example shows that using both protocol analysis and

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5 ‘Seeing as’ means that the designer while sketching a shape has a ‘figure’ in mind as a reference. ‘Seeing that’ refers to the exact shape that the designer has sketched without referring to a figure or something else that he or she has in their mind.
design sketches at the same time and recording this data is a useful method to obtain results for researches in architecture or design-oriented studies.

As a final point on sketches and their use in design studies, a very important aspect of sketching is that architects use them to examine new ideas and evaluate them. As Tversky et al. (2003) have stated: ‘Design entails both generating ideas and adapting those ideas to intended uses’. This also corresponds with Goldschmidt’s statements that people try to create new combinations of forms when sketching. Sketching may therefore be considered as an appropriate tool to find new ideas in architecture, and to test new applications and new materials, such as lighterials. In her review of Bill Buxton’s book on helping companies understand the role of design in their organisation, Sketching User Experiences: Getting the Design Right and the Right Design, Aubrey (2007) agrees that ‘sketches help to develop and evaluate early-stage ideas and not the actual product’. Similarly, this research study aimed for the evaluation of some ideas about the use of materials that share similar characteristics with the lighterials in architectural design, but it did not focus on how the actual products were used. Following this approach, this experiment used sketching to see how architects create poetics in the space by using the lighterials.

6.2 General overview

Before explaining how the methods above were used in the experiment, an overview of the setting of the experiment is important. This section presents general information about the participants’ profiles, the selection of the place, how the information derived from the case study was used as a basis for the main experiment, and details of the experiment’s timeline.

6.2.1 Profiles of the participants

Twenty-four architects took part in this experiment: 11 men and 13 women. All participants were in the age group 25–35 years. The target group of this study were architects who were based in the United Kingdom. These architects had various cultural backgrounds including British, American, Spanish, Portuguese, Dutch, Greek, Italian, Belgian, Serbian, Austrian, German, Colombian, Chinese, Vietnamese, Japanese, Thai and Bahraini. All the participants were professional architects and interior designers, with more than four years’ experience in real life projects. In contrast to the case study, the main study involved only
experienced architects, because professional designers are able to think in more detail and more realistically when designing a concept idea.

6.2.2. Selection of place for the experiment

The author visited the architects in their offices and carried out the experiment there. This meant that the architects felt comfortable working in their own environment, but also that they could concentrate on the task since the experiment took place in a quiet room. The equipment used for this study was a Flip Video Ultra High Definition Camcorder with a built-in microphone to record the sayings of the participants and capture their moves while designing. The participants were seated by the desk, with the camera set 30 cm away from the design area and placed 50 cm above it. The participants were given sketch paper and tracing paper, as well as a pencil and coloured pens.

The participants of the experiment were not made aware that the experiment related to lighting design nor of the different stages that would follow. They were invited to participate in an experiment done for a postgraduate PhD degree that would focus on architectural design. The brief of the main design task was sent to the participants before the meeting, in order to give them enough time to reflect on it (Appendix VI).

6.2.3 Case study vs the interviews

The experience gained from the case study described in Chapter 5 was used to structure the interviews, especially with regards to the choice of the site under review (the transition space located at the Canada Water skyscraper in Canary Wharf) and the compilation of the questionnaire. The same site was used in this experiment because both it and the case study aimed to achieve similar objectives: to collect information about lighterials and how they affect the architectural result and the poetics of the space. As explained in the previous chapter, this particular space was chosen for specific reasons that would help architects engage with the poetics of the space and the lighterials.

However, the brief used for this experiment was structured differently from the one used for the case study in several ways. Even though the reasons for using the same space remained the same, this experiment did not include the regulations and restrictions that the client had imposed on the project for the MSc students. Moreover, the students had the chance to attend lectures on poetics and its relationship to the architecture of the space and on the use of lighterials, as well as to see the examples produced by the architecture students. The participants of the interviews did not have this opportunity. The reason for that was the time limitation, which was restricted to less than an hour, due to
the participants’ busy schedule. Instead, since poetics played a pivotal role in the brief, the participants were informed about it through the use of inspirational images and explanatory words included in the brief.

Another difference between the two studies is that the students were able to visit the site and the particular space whereas the architects who participated in the interviews could only see images included in the brief. The brief was structured so that the architects would understand the meaning of poetics, as well as the appearance and the dimensions of the space. The brief also included information about the space itself and the requirements of the design task, and information on the restrictions and the timeline, as well as on the drawings they had to deliver.

Further, the brief differed from the one given to the participants of the case study in the way that the transition space led to offices: spaces A and B (Figures 6.1, 6.2). For this experiment, it was decided not to use just offices as a function for spaces where the transition space would lead but to use a variety of spaces that would relate to poetics, as explained in Part I. In Chapter 3, the author discussed different types of function of space and how these are related to poetics. More specifically, that chapter focused on six different types of spaces: transient, retail, work, living, public and restorative. The author decided to exclude living spaces due to their immediate connection to the clients as a personal space with particular characteristics that derive from the occupants’ taste and needs as individuals.
The function of the transition space was a lobby. Spaces A and B were allocated different functions for different participants. The choice of the function derived from the author’s research on different activities accommodated by skyscrapers in that area. The results of recording the skyscrapers’ functions were compared to the categories of functions explained in Chapter 3. On this basis the author selected exhibition and media spaces from
the transient spaces category, shops and leisure spaces from the retail category, offices (banking) from the work spaces category, and the clinic from the restorative category. The function of each space was mentioned at the beginning of the brief. The six functions of exhibition, media, retail, leisure, office and clinic were allocated across the 24 participants.

6.2.4 Timeline of the experiment
The architects had 50 minutes to complete the overall experiment, with a timeline of 10–20 minutes to create the concept idea and communicate it through sketches, plan and perspective (Appendix VII). Ireland (2003) recommends that one-to-one interviews ‘range from 20 minutes to 1 or more hours’ (p. 25). Researches have shown that a study focused on the use of the protocol analysis method in design studies would need from 20 minutes to a few hours (Jiang and Yen, 2009). There have been many experiments in architecture where the design tasks were developed within a timeframe of 20 minutes (Bilda, Gero and Purcell 2006; Do and Gross 1997; Goldschmidt 1991; Suwa and Tversky 1997). However, this amount of time referred to a design task where the architects had to design an overall space such as a museum or a house and not just an interior space like the transition space that this experiment deals with. Before the setting of the main experiment, four pilot studies took place in order to understand how much time an architect would need to create an initial architectural idea for such a space. The result indicated that most architects were able to design an initial concept and communicate it through the plans, sections and perspectives sketches within 10 to 20 minutes.

6.3 Interview stages
The interviews were conducted one to one. One-to-one interviews are ‘ideal for learning exactly how each person feels and thinks about a topic or design, without concern for the influence of others’ (Ireland 2003, p. 25). The experiment consisted of five stages conducted in the following sequence: the design concept stage, the design analysis stage, the new request stage combined with the lighterials presentation to the participants, the re-visiting of the design concept stage and finally the questionnaire stage. This section describes the design of the experiment and the methods implemented at each of the stages.

6.3.1 Design concept stage
At the design concept stage, the participants were given five minutes to understand the brief and ask any questions about it. For the following 10–15 minutes, the architects had to
work on the design concept of the space and to create freehand sketches. They were given
a plan scaled to 1/100 and a 3D perspective of the space (Appendix VIII). They were
expected to submit at the end of this stage their design idea in plan, section and
perspective sketches. They had to focus on the entrance to the floor, the corridors leading
to the main transition space and the transition space itself situated between spaces A and
B. The architects did not have to design spaces A and B unless they needed to show how
they linked to the overall idea. Within the timeline of 10–15 minutes, the participants had
to explain what they were doing out loud, including analysing their design actions and
providing reasoning. The method used for this stage was the think-aloud protocol method.
In more detail, the participants described aloud, step by step, the actions they were taking.
Following the brief, the participants had to create a story in the space. Their utterances
were used as a base to understand this story. After the application of the lighterials the
architects had to explain what changed in the character of the space and the particular
feelings they wanted to create in the visitors. The aim of the author was to compare and
contrast the participants’ sayings to understand how the lighterials affected the poetics of
the space.

6.3.2 Design analysis stage

After the completion of the concept development the architect had to go through an
interview at the design analysis stage. During this stage, participants were asked to
indicate specific elements on the drawings using coloured pencils for about 5–10 minutes
while explaining further (Appendix IX). The elements that the architects had to indicate
were based on the list of elements referred to in Chapter 3, Figure 3.78, which derived from
Michel’s and Suwa and Tverksy’s approaches to architectural space analysis.

As explained in Chapter 3, these elements characterise and analyse the space with regards
to both the lighting and the architectural design. Gathering such data would provide the
background to understand better the ideas involved and analyse space and its particular
characteristics.

These elements were used as the key words of the questions. The questions were formed
in two different ways: questions to force action and guide the architect to use the pencil
and indicate something on the drawing (e.g. Can you indicate the boundaries of the
transition space?); or questions that asked precisely about particular things (e.g. Can you
explain the poetics of the space?). Further, the order of the questions used created a
sequence of actions and responses from the designer on the drawing itself, building up
information on the concept. With regards to the sequence of elements that was used in the questions, the initial questions were orientated towards more general elements of the design – boundaries, articulation, transition – before moving on to the elements that would characterise space in more detail, such as the colour, the material and the lighting distribution.

The elements of the list were used as a basis to form the questions. Some of them were combined in one question (as happens with the important positions/points, the visual perception and the axes) and other were slightly reworded to simplify the questions (instead of transition the question asked about transition zones). However, because the names of the elements could be misunderstood unless one has read the literature, they were described further to the participants, to ensure that they understood their meaning and what each element might involve. For example, one of the elements was the important positions/points of the space, which as a heading does not describe all the sub-elements that it includes. Therefore, the question for this element was converted to: Can you indicate important positions/points (views, clarity/ proportion/ distortion) for interesting visual effects? What is the visual perception (practical roles, far/lined up/symmetrical/adjacent) of these effects? Architectural design is about combining different elements together and using just one word to describe a setting is difficult.

6.3.3 New request stage

Dealing with new requests from clients is a procedure that happens very often in architectural practice. Up to this stage, the participants did not have any idea about the experiment’s connection to lighting design. A hint was given to them in the design analysis stage, where one of the elements that they had to indicate on their drawings was the light. This new request turned the architects’ attention towards lighting and was done in order to see how architects would response to the new lighting applications and how they would incorporate them into their design.

After the completion of the design analysis stage, the new client’s request was introduced into the experiment. According to this, the client wanted to include lighterials in the transition space in order to promote it (Appendix X). During this stage the lighterials and their applications were introduced to the participants through a PowerPoint presentation (Appendix XI). In parallel to the PowerPoint presentation, the author explained to the participants each of the lighterials in detail, focusing mostly on their definition and their categorisation into the two basic divisions. This list of lighterials included those suggested
6.3.4 Re-visiting the design concept stage

The participants then had to re-visit the design concept stage by applying lighterials to the design solution, spending another ten minutes to do that. The participants had to explain their reasons for picking the particular lighterial and the poetics they were aiming for. At this point, the participants were encouraged to express any difficulties or any negative comments in using lighterials. The architects used tracing paper placed on the top of their plan and sketched on it the applications of the lighterials.

6.3.5 Questionnaire stage

Finally, for the last ten minutes of the experiment, the architects had to complete a questionnaire. The questionnaire was the same as that used for the case study (Appendix IV). As in the case study, the questionnaire focused on questions leading to two outcomes. The first aim was to show whether the architects found lighterials helpful and whether they enjoyed working with lighterials. The second aim was to determine if the luminous forms could be used as part of the architect’s palette and if they believed that this design approach should be taught in architectural education.

Figure 6.3 shows the timeline of the experiment, following the different stages of the experiment. In addition, it shows the different methods used in the experiment which were used in the different stages of the experiment; the protocol method in the design concept stage. The structured interview method was used in design analysis stage, new request stage and revisiting of the design concept stage. Finally the questionnaire was used in the questionnaire stage.
The Interviews

Figure 6.3: The five stages of the experiment and the method used in each stage

6.4 The coding process

The verbal data collected from the interviews and the video recordings were transcribed. This information is presented in Appendix XII and follows the sequence of the experiment’s different stages; it first includes the dialogues from the Design Concept Stage, then the ones collected from the Design Analysis Stage and last the data taken in the Re-visiting of the Design Concept Stage as indicated in Figure 6.4. On the top right corner of the diagram is indicated the function of the space, which is different for each participant. This data is also accompanied by the participants’ supporting sketches (Figure 6.5). The sketches show the main design idea in plan on the left and all the elements indicated in different colours on the right. Below these sketches are positioned the section and/or a 3D sketch.
The design of the record sheets based on the protocols collected from the participants in the main experiment.

Figure 6.4: The design of the record sheets based on the protocols collected from the participants in the main experiment.
The data collected from the experiment (the drawings, video recordings and answers to the questionnaire) was used for the coding and the analysis stage. All the information about lighterals focusing on how they could influence the architectural result was coded and examined in detail. For this analysis the author used the data collected from the Design Analysis Stage explained above, where the participants had to indicate particular elements on their drawings and explain their intentions further. The definitions of the elements that
The Interviews

were given in Chapter 3 combined with the participants’ reasoning were used for the analysis. In addition, the participants’ sketches were used to show how the elements under review could be influenced by the application of the lighterials. The data collected from all studies so far (pilot study, case study and interviews) on the use of each of the lighterials was used to triangulate the results. How exactly the data was coded and the process of validating the findings is explained below with the use of examples taken from the data itself. Finally, the data obtained from the questionnaire was used for further analysis.

Beginning with the architectural design, where the interest is focused on how lighterials could make an influence, it is essential to revisit separately all the elements that characterise the space under review and explore how each of them could be influenced after the lighterial was applied. In order to achieve this, the sketches of the architects were used where they had clearly indicated each element separately before the application of the lighterials. The sketches were examined, in detail, for each element separately. Taking into consideration Stacey, Eckert and McFadzean’s (1999) comment that ‘viewers understand sketches by perceiving both the symbolic categories and the shapes of design elements’, the aim of this coding process was to observe the shapes of the design elements before and after the application of the lighterials, for each of the design elements separately (boundaries, connecting elements, poetics, materials, colours, patterns etc.).

Dorst and Dijkhuis (1995, p. 263) explain that such categorisation in the design analysis is as a reflection-in-action process where the person is ‘constructing his/her reality’. This means that the results obtained from the participants’ descriptions with regards to different design elements were enlisted as ‘informal analysis’: results that were based on the architects’ ‘own actions that are reflective responsive and opportunistic to the design situation’ (Suwa and Tversky 1997). This is the reason why this research focuses on the designers’ actions and justification. As Goldschmidt (1991, p. 125) argues, ‘to discover patterns of reasoning, if they exist, we must isolate and analyze the smallest units of design reasoning. This we do through parsing protocols into design moves, and at an even finer grain, into design arguments’. In this report, verbal data, words, phrases and sentences are used as arguments and the sketches may be considered as moves.

6.4.1 Analysis of the elements

The participants’ verbal protocols and their sketches from the design analysis stage were used for the analysis of the elements. The definitions of the elements given in Chapter 3 based on both the lighting and architectural design approach were used as a basis to
understand in what context the element could be influenced. Each design idea has its own characteristics and conceptual background, so each of them was examined separately.

The first element analysed here is the transition zone. Following the definition of the transition zones, a change in the transition zones of the space can occur when there is a shift between bright and dark areas due to variations in the level of light or the use of different materials. An example of the change in the transition zones is the use of lighterials to create brighter paths with the use of OLED. Other examples include the use of light transmitting concrete to make a distinction on the threshold between subspaces and the application of interactive surfaces on seating areas.

The following element looked into is the boundaries of the space. The author investigates the design ideas for changes in the physical limits between private and public space or in the configuration. There are examples where architects used lighterials to extend boundaries visually such as the use of light transmitting concrete aiming to make the shadow projection behind the wall a feature of the space. Further, architects aim to separate areas with the use of electroluminescent tape or to enclose a particular area using Barrisol.

The circulation of the space can change if the elements that act as stimulants for movement change or if light is used to turn people’s attention and therefore their movement towards it. The influence on circulation can be seen in examples where architects use interactive surfaces to create a more spontaneous movement or in design ideas where architects used particular lighterials such as electroluminescent tape to organize circulation paths. In addition, the circulation of the space can be influenced when architects make one path brighter than another, enhancing the movement towards particular areas of the space.

The change in the level of brightness is the next element under review. In some interviews the participants had indicated initially particular areas of space as darker and others as brighter, which changed after the application of the lighterials. This corresponds to the tendency that people have in selecting the brighter path or area. In most cases this change can happen when architects use lighterials such as OLEDs which have a high light output and emit uniform light in areas where before were indicated as the darker. There were also cases where the brightness change was accompanied by the use of mirrors, reflecting light in non-lit areas or by the use of interactive surfaces where the level of brightness can alter according to the number of people who use space.
Also, the colour of the space can be influenced in cases where architects use *lighterials* which emit light different to the colour of the form before the application. Also, the material can change when architects replace forms of the space with *lighterials* that are made of another type of material.

With regards to the connecting element, the use of particular *lighterials* can influence the spatial banding and the physical connectedness of the space. There are examples where architects use *lighterials* to link, bound, unify or even enclose an area. Moreover, *lighterials* are used to create the same language between areas connecting them visually. There are also design ideas where *lighterials* help differentiate the connecting elements within the space with the aim to make the sub-spaces independent.

The following element is the pattern of the space. Changes in shapes which are identical and repeatable as part of a particular detail or as part of the layout of the space can impact the pattern. The pattern can be influenced when architects incorporate patterned *lighterials* on a form that did not have a pattern before or the opposite when *lighterials* with homogenous light are used on forms that have a pattern. Also, a change in the pattern can be seen in cases where architects use *lighterials* to create a repetitive layout in the space for example the use of OLEDs on multiple columns or the addition of interactive and active surfaces, displaying repetitive images.

Important points and positions in a space is the next element analyzed. This element can be influenced when new distinctive forms are added in the space or when the existing features in the space change in scale and appearance, acting as protruding objects that capture people’s vision. Especially in the case when a form which was previously opaque becomes luminous, it suddenly attracts attention and influences the important points of the space. A similar effect occurs when interactive and active surfaces which display images are incorporated into the space. Finally, the use of *lighterials* that are semitransparent result in the projection of the shadows of the adjacent forms, making them act as important features.

The stimulating elements of the space can be influenced when the focal objects of the space change, shifting the attention to the most striking. The *lighterials* can be considered stimulating elements when used as furniture, for example the polyethylene furniture or when *lighterials* with high visual features such as active and interactive surfaces are placed in the space. In the majority of the cases, the most highlighted elements of the space act as stimulating and focal points.
Adding *lighterials* into the space can also have an impact on the concept of the lighting scheme. *Lighterials* can impact particular characteristics of the lighting, such as the colour temperature or the intensity. In most cases, when *lighterials* replace existing luminaires, the lighting scheme of the space changes affecting the architectural character of the space and the light levels. In many examples architects use *lighterials* to replace opaque walls and furniture turning them to luminous. Also, the lighting scheme can be influenced when interactive surfaces are used, transforming the lighting of the space according to the number of people who use it.

The final element in review is the poetics of the space. The use of *lighterials* can affect this element by changing the architects’ initial objectives. This influence can be seen in examples where a change in the mood occurs from static to playful and from relaxing to active. Similarly, *lighterials* can have an impact on the feelings, for instance with materials that add warmth and others that give a cold impression. Other examples include luminous volumes which could affect feelings such as claustrophobia or being trapped. Also the *lighterials* can cause different reactions and interactions to the users mainly when interactive surfaces are used adding to their experience. Further, the poetics of the space can be influenced in design ideas where the syntax of the space changes, for example by adding rhythm in space by using repetitive luminous forms like OLED on columns. Finally, the use of *lighterials* can alter the language of the space with the use of light as a message transporter to users.

To understand the analysis of the drawings, participant MRE is used as an example. MRE based her idea on designing two corners within the transition space, made by stairs, which would refer to a landscape and would be used for seating. The participant used reflective materials on the landscape to create the visual effect of ‘bouncing the image up’. According to this idea, the use of reflective materials on the stairs and the ceiling above would be used to alter the appearance of the space when the space is mirrored on the material. Further, MRE’s aim was to clearly distinguish the static seating area from the area related to the movement of the visitors. Between the two landscapes she wanted to create an enclosure that would impact instantly on the visitors’ feelings and decisions.

After the design analysis and the client’s new request stages, MRE decided to import two *lighterials* into the space by putting interactive surfaces on the steps and by replacing the reception desk with polyethylene furniture. Following the analysis of all the elements of the space before and after the use of *lighterials* in MRE’s case study, six out of the eleven elements under examination may have been influenced. These elements were: the
circulation, the stimulating elements, the materials, the poetics, the pattern and the lighting. What follows is an explanation of the way in which those six elements were affected after the application of the lighterials. In the following figures the application of the lighterials are indicated by the use of the magenta colour (Figure 6.6). The rest of the elements under examination are indicated with the relevant colour as previously shown in Figure 6.5.

More specifically, the author undertook the following steps for the coding of the data. For each of the elements under review, the literature was used as a base to describe each element separately. The importance of this section was to approach each element from not only an architectural but also a lighting point of view. Therefore the definition of the elements helped to understand how it might have affected the space under review.

For example, as discussed in Chapter 3, the boundaries of the space include many features, such as the walls, the floor, the ceiling and often the furniture. Boundaries define the physical limits between private and public space. Within the territory of the configuration, architects design the boundaries to frame the overall space and then they design particular areas within the space itself. The size of these spaces connects to their function and the dimensions needed to function within them, ‘finally outlining the advantages of a selectively permeable boundary’ (Morris 2009).

Taking MRE’s design as an example, the analysis does not show any changes in the configuration of the space or the size of the rooms or changes in the boundaries between public and private space. This means that the application of the lighterials that MRE chose –
the interactive surfaces for the stairs (the landscape she designed) and the polyethylene furniture for the reception desk – could not have influenced the boundaries of the space. On the other hand, it has been shown in Chapter 3 that the circulation is an element that can be influenced when elements that act as stimulants for movement are brought into the space. In MRE’s example, introducing interactive surfaces into the space may act as a stimulus for movement since people may want to experience it. This means that the interactive surfaces could impact the circulation of the space.

On the other hand, the same element, circulation, was also checked from another perspective; each of the lighterals was described as being used for specific reasons, collecting information from all the participants so far, including the MSc participants of the case study and those from the interviews (the architects). For the interactive surfaces, the data collected shows that they can create a spontaneous path and can bring high visual interest into the area to which they are applied, adding visual stimulation. Further, the interactive surfaces can create movement towards the direction of their application within the space, or they can create traces of movement and interaction between space and people and between people themselves. The participants also explained that interactive surfaces can attract attention and change the lighting of the space, depending on the number of people who are using the space at that particular moment. Taking this into consideration supports the hypothesis, based on the literature, that interactive surfaces could influence the circulation of the space because they would attract people to move towards the area of the application. In MRE’s design idea that could mean that people would create their own paths while moving from one stair to another.

MRE’s sketches show that the circulation of the space was divided into two areas: the enclosure area between the two landscapes as a moving area and the landscape’s platforms as a stationery seating area. Following the analysis above, the application of the interactive surfaces on the platforms meant that the platform would no longer be used as just a static element, but people would move around those steps to interact with the surfaces and with each other. Therefore, such an application could change the circulation of the space, especially making the movement on the platform stairs more random and disordered (Figure 6.7).
The rest of the elements were analysed in a similar way. Regarding the stimulating elements of the space, MRE explained that she found the enclosure between the two platforms she designed as the most stimulating element of the space, in addition to the upper parts of the platforms where people could observe the overall transition space. By applying the interactive surfaces to the steps, MRE could turn the platforms themselves into stimulating elements as well, since they add movement and joy into the space and therefore make people interact more (Figure 6.8).
Further, concerning the materials of the space, MRE decided to use polyethylene volumes to design the reception desk, which was initially made of a high-reflective material. This decision made the reception desk distinguishable and separated it visually from the rest of the space, acting as a very important visual element.

The changes caused by the application of the lighterials described above influenced the poetics of the space, since the application of the lighterials made the space more active, introducing an interactive mood to the visitors. Therefore, the lighterials influenced the poetics of the space by adding to the experience of moving and greatly increasing the visitors’ potential enjoyment of the transition from one area to another.

Moreover, MRE explained that she did not use any patterns in the space. However, after the application of the interactive surfaces, people would activate the platforms by touching them and these would emit light. While moving from one point to another, people would add a pattern of light on the seating area that would change according to their actions (Figure 6.9).
Finally, the lighting scheme of the space can also be influenced by the *lighterials*. Before the application of the interactive surfaces, the steps were highlighted by integrated linear lighting on the edge between the steps, to make it appear as though the steps were floating in space, separated one from another. By adding the light emitted from the interactive surfaces to that lighting scheme, the light levels of the space would change according to the number of people who would use the seating area.

The procedure followed in the analysis of MRE’s design was carried out for all of the participants’ designs. In each case, the design elements were compared before and after the *lighterials* application. After the completion of this process, all the findings from all the participants were compared in order to understand which elements were mostly influenced by the application of the *lighterials*. This further analysis was conducted on the basis of the explanations of the elements presented in Chapter 3 and also the findings about each of the *lighterials* collected from the case study. For instance, analysis of MRE’s design showed that the circulation between the stairs she designed was directed along two specific routes: towards space A, and towards space B and the entrance, indicating it on the drawing in yellow. After placing interactive surfaces on the platforms, it was suggested that the circulation of the space would significantly change. As the case study showed, *lighterials* influence the directionality and the circulation of the space.
With regards to the poetics of the space and how that factor was influenced by the lighterials’ application, the data received from both the think-aloud protocol procedure and the questionnaires was used. Following the think-aloud method, the language used by the participants to explain the poetics of the space they had designed and the feelings that they were aiming to bring to the visitors was used in order to get as close as possible to the architect’s intention. The verbal protocol provided information about the concept of their designs, and the completion of the questionnaire provided written data on the intentions and the description of the poetics of the space they had designed, after the application of the lighterials. The results were supported by both sources of data combined together.

More specifically, in MRE’s example, the aim of the design she produced was as she explained ‘trying to allow for two types of inhabitation: a static and a movement, the materials allow for tactile connection with the space or by touch, the colours relate to natural colours that react on the feelings of the people, relaxed, relates to natural organic shapes, can enjoy this moment of transition, materials used to link’. The particular words that MRE used to describe the space – tactile connection with the space, two types of inhabitation: a static and a movement, moment of transition, relaxed – provide evidence for understanding the poetics of the space. Her design aimed to achieve a space that was separated into two opposite modes, static and movement. Such a space would make people feel relaxed through the design of the landscape, following organic forms and natural colours.

After the application of the lighterials, a similar analysis was made, adding the interactivity factor. The result at this stage showed a design idea different from the one described before as relaxed and natural. The information obtained from the questionnaire was added to this conclusion, since people had to reply to the following questions: What type of character would you say that the transition space you have designed is? Do you believe that the use of the lighterials enhanced the poetics of the space? In these questions MRE explained that she designed a ‘space of both movement and static state which interacts with the visitor through visual connection and interactive touch surfaces’. This statement confirms the additional characteristic that was given to the space, obtained from the interaction introduced by the interactive surfaces. In addition, MRE responded positively to the idea that the lighterials enhanced the poetics of the space.

In this experiment, the data taken from the drawings was analysed by comparing it with the subjects’ statements. Based on this information, the process of the analysis aims to understand the possible differences before and after the application. Initially, this
The Interviews

The experiment was planned to have an additional stage after the application of the lighterials. The idea was to ask the participants to re-visit their design idea after the application of the lighterials and explain again the elements of the space, using the think-aloud process. The data that would be collected from this additional stage would help distinguish whether the elements were influenced or not. However, four pilot studies demonstrated that the data obtained from that additional stage was invalid for two main reasons: first, the length of the experiment and the repetition of the same design process made the participants tired and incapable of really estimating and understanding the difference in their design ideas between the two stages; second, most architects believed that the design elements were not influenced by the lighterials, which after discussion with them was showed to be an invalid outcome. This exercise showed that, even though the architects involved were aware of how light could affect the design idea, they could not instantly understand this change and how it could affect their design unless they discussed it in detail.

6.4.2 Validation of the findings

The data collected was based on qualitative methods as mentioned above. The analysis of the qualitative data required its validation from different sources; the participants’ in-depth interviews and the case study designed for the MSc students. This ‘specifies that it is crucial for validity – and, consequently, for reliability – to try to picture the empirical social world as it actually exists to those under investigation, rather than as the researcher imagines it to be’ (Schleiermacher, cited in Patton 2002, p. 53). Even though the qualitative analysis of data may include some ‘subjectivity and judgment’ (ibid.), it is important to remember that because ‘qualitative data is unique, the analytical approach used will be unique. Because qualitative inquiries depend, at every stage, on the skills, training, insights, and capabilities of the inquirer, qualitative analysis ultimately depends on the analytical intellect and style of the analyst. The human factor is the great strength and the fundamental weakness of qualitative inquiry and analysis’ (Patton 2002, p. 433).

However, the author aimed to triangulate the data from the different sources explained above by using the participants’ statements and drawings, the questionnaires and their views as recorded, reinforced by a valid literature based on various researchers and the views of different people. As Patton (2002, p. 93) suggests, the authors of qualitative analysis should ‘include triangulation of data sources and analytical perspectives to increase the accuracy and credibility of findings’. The research studies that use more than one method have fewer weaknesses in the results, because different methods help to find data
that ‘provide cross-data validity checks’ (ibid. p. 248). In this way, the author minimised the biased results and maximised the accuracy of the results. The method of coding was consistent through all the analysis of the interviews.

Based on Schleiermacher’s hermeneutic philosophy, the interpretation of the data should be based on a ‘framework for interpretive understanding, or meaning, with special attention to context and original purpose’ (Patton 2002, p. 114). In this instance it is essential to check with other coders the interpretation of the data in order to avoid biased results. Therefore, using other interpreters for the same data in the same context would help determine the validity of data, following Tikunoff’s theory on interactive research (cited in Patton, 2002, p. 400), according to which interpreters and specifically teachers could help in confirming the results. ‘Getting feedback from informants’ is a method to verify your findings as Miles and Huberman suggest (cited in Robson 2002, p. 485). For this reason, the author enlisted the help of external informants to check the validity of the coding analysis. The two encoders are architects, specialising and researching in lighting design.

The validation of the coding results took place in two ways. The first approach was based on the use of the coding system devised by the author, which was then explained to her supervisor, asking him to confirm the findings. In more detail, the author used the drawings and statements of one participant, MRE, showing the before and after version of each element, indicating the change or otherwise to the supervisor. The changes were supported by the data explained above. The supervisor had to confirm whether that was a valid approach or not.

The second means of validation was by using another informant. This particular encoder took part in the experiment previously as an interviewee (CRL); therefore she knew the process, the context and the aims of the particular study. The author explained MRE’s drawings, design intention and statements to CRL. The author then explained to CRL how MRE approached each of the elements separately, drawing attention to her statements. After that, the author explained to CRL which lighterials were imported into MRE’s design, explaining the particular characteristics of these particular lighterials and the way they could be used in the space, based on the collection of the data described above. At this point CRL had to examine each of the elements under consideration and to see how the application of the lighterial could have influenced that particular element. CRL was given a description of each element based on the literature of Chapter 3. Finally, CRL analysed the
elements herself, explaining how she believed the elements of the particular space could have been influenced.

Following CRL’s analysis of the elements in MRE’s drawings, CRL had to do the same for her own drawings. She was shown the choices she had made when she took part in the experiment as well as the statements she made on the elements. She was also reminded which *lighterials* she had used in her design idea. CRL then had to read the definition of each of the elements (according to Chapter 3) and to explain whether the elements under review could have been influenced by the *lighterials* or not (Appendix XIII).

This process showed that CRL’s analysis and coding coincided in almost all 12 elements with the author’s analysis. The only element that was found to be differently interpreted by CRL was the transition zones. According to CRL, the transition space was reinforced by the change in the lighting hierarchy. In MRE’s design, CRL suggested that the use of the interactive surfaces would reinforce the transition zones. In her own design idea, CRL commented that the use of light-transmitting concrete would add another transition zone between the areas where the *lighterials* has been applied. The author took into consideration CRL’s comments in the way she interpreted the data.

### 6.4.3 Organisation of the findings

All the results obtained from all the participants were processed and analysed in the same way and they are presented in the following section. The analysis gives information not only about the *lighterials*’ influence on the elements and the poetics of the space, but also about the possible relation between *lighterials* and their exact application. Further, the analysis indicates if any of the *lighterials* are used to create specific poetics or if poetics link eventually to the function of the space. Finally, the information provided below explains whether participants would use such lighting applications in the future in their designs and whether they would include lighting applications in architectural education.

All the data and the results obtained from both the think-aloud protocol and the questionnaires were organised in a number of spreadsheets. Microsoft Office Excel 2007 computer program, operated in Windows Vista was used for this analysis. Each Excel sheet included information about each designer (personal information, such as name, age, occupation and cultural background) and their answers. More specifically, three different Excel sheets were assembled. The first included information about the elements collected from the design analysis phase (think-aloud protocols). The second included information about poetics with reference to the function of the space and the *lighterials* and the third
sheet was structured following the final questionnaire’s layout, demonstrating the responses of all the participants to each of the questions.

In more detail, the first Excel sheet was arranged within one column and one row; in the column were included all the names of the participants, which are fictional to protect their personal data, and the row listed the design elements under consideration (the elements according to Michel 1996 and Suwa and Tversky 1997). The elements were coded as abbreviations (BOU for boundaries, IMP for the important element/points, CON for the connecting elements and so on). A second column was created for each of the elements, aiming to categorise them into elements that have been influenced by the application of the lighterials, indicated by the word ‘yes’ and the elements that were not influenced, indicated by the word ‘no’. Next to the column of each of the design elements was another column, where the author imported the reasons that influenced the design element. The data collected from the video recordings were transcribed and imported into the Excel sheet, which was analysed as explained above. The Excel sheet was filtered in order to understand which elements were mostly influenced by the application of the lighterials, indicated by ‘yes’. This Excel sheet is shown in Appendix XIV.

The second Excel sheet included information on the poetics and the function of the space. A column was used to indicate the names of the participants and in the rows was included information about the function of the space, the description of the poetics from the protocols, the lighterials that had been used and the specific place where they were applied. Another row contained answers about the poetics characterisation after the application. Further, in a separate column was indicated if the poetics were influenced, by the application of the lighterials (‘yes’) or not influenced (‘no’). In general, this Excel sheet was used in order to understand if the poetics had changed, if the function of the spaces that the transition space led to was relevant to this change, which lighterials were mostly used and the reason they were applied in the space. This Excel sheet is shown in Appendix XV.

Following a similar structure, the third Excel file was used to accommodate all the results obtained from the questionnaire. Again all the participants names were listed in a column and then a row consisted of different questions was used to organise the results based on the answers of the participants. This Excel sheet is shown in Appendix XVI. The results were filtered in relation to the possible answers to understand what most of the participants had replied.
6.4.4 Analysis of the lighterials

With regards to the lighterials’ use in the design ideas, the author distinguished major categories and subcategories. Initially the lighterials were categorised according to what most architects wanted to achieve when using them. Using the protocols – the words they used to explain their intentions – the author extruded some categories that evolved from the statements of the participants.

For example, KCH, MRC, MRE and STO explained that they added particular lighterials (polyethylene volumes for KCH, MRC and MRE and active surfaces for STO and STP) to attract attention. So the attention category was created. Different categories were created from the different reasons explained by the architects showing the use of lighterials for guidance, for blockage, for definition or for decoration. Subcategories were created within some major categories. For example, the decoration category includes the use of the lighterials for decorative purposes, as when STO placed light-emitting substances onto artificial plants, but also for aesthetic reasons, as when MCI placed the elegant OLEDs in the task lamp as decorative elements. This means that the subcategory aesthetic is included in the decoration major category.

The use of the lighterials to create atmosphere also includes cases that use dim or those that used them to make the elements look more volumetric. Examples are: LF, who discussed ‘dimming the volume’ and polyethylene furniture that ‘would show – not to disturb’; and TTS who used the Barrisol® to ‘create little domes, make the area feel more enclosure and more volumetric’. Similarly ANP used the softwall polyethylene volumes on the walls which ‘have a pattern and parts of it could be luminous so they would become more volumetric’. A further subcategorisation is given under highlight, which includes lighterials used to emphasise or to make significant and so on.

After the categorisation, the author recorded the number of participants who used the lighterials in the way that the major categories indicated. Table 6.1 shows the major categories, which were developed after the coding process, and a scale to show which categories were used the most (from I to indicate those used the most to V to indicate those used the least).
The author counted the number of participants who used particular lighterials and the number of participants who used them on the floor, on the ceiling or the walls or the furniture, as luminaires or for decoration. The author related the use of specific lighterials to the function of the space to look for patterns between different design ideas and the choice of lighterials. For example, retail was the only function that exploited active surfaces and Planilum®, and leisure exploited Barrisol® and Scintilla Lumina® (Table 6.2).

Table 6.1: The results after the analysis of the data collected by the protocol method on the uses of the lighterials. The Scale of Use column indicates how much each category was used (where I is most used and V is least used).

Table 6.2: The results after the analysis of the data collected by the protocol method on the relation between individual lighterials and the location they were applied to. The function of the space is also indicated.
Finally, from the participants’ sketches the author distinguished patterns in common to different design ideas in their graphic representation of the lighterials. Lighterials represented by lines, planes or volumes were identified and categorised separately.

Chapter 6 presented the third study: the interviews. That included the methods used, the participants’ profiles and the selection of place for the experiment. The different stages of the interviews were also described in detail, as well as the coding of the data, the validation and the organisation of the findings and the analysis of the data. The question that this study addresses in whether lighterials influence architectural design result. The answer is demonstrated by how each of the elements of the space is affected by the lighterials. The next chapter presents how each element can be influenced by the applications of the lighterials analytically, following the coding system explained above. The elements are presented in the order of how much they were influenced, starting from the element influenced the least (transition zone) leading to those influenced the most (lighting scheme and poetics). The design ideas where this influence was perceived are described in detail and evidence of the influence is supported by illustrations that show how each element was before the application of the lighterials and how it might have been afterwards. The next chapter begins with the presentation of the results for the lighterials’ use which are approached from different perspectives:

- What were the architects aiming for when they used the lighterials?
- Which lighterials were used the most?
- Whereabouts in the space did they use lighterials?
- Which lighterials most influenced the elements of the space and which elements?
- How did lighterials relate to the space functions that the transition space leads to?
- Were the lighterials used as architectural forms?
- Which of the lighterials were used as lines, which as planes and which as volumes?
- How were most of the lighterials represented graphically?
Chapter 7

Analysis of the Interviews

This chapter focuses on the analysis of the results obtained from the protocol analysis, the structured interviews and the questionnaires on the application of the lighterials and any information obtained about them. Further, it analyses how each of the elements of a space could be influenced by the application of lighterials, starting with the elements influenced the least. The analysis also focuses on the poetics of the space for each design study and how that was enhanced or changed after the application of the lighterials. Finally, the answers collected from the questionnaires are presented.
7.1 The lighterials

The data collected from the experiments gives general information about the lighterials. This information provides a good background for understanding better what the participating architects aimed to do when they used the lighterials. The analysis of the results shows which lighterials were used the most and whether particular lighterials were used in a specific way and as particular elements of the space. The analysis investigates whether there is a link between the lighterials and poetics and whether the choice of lighterials relates to the function of the spaces that the transition space leads to. A summary is given of the elements described earlier and how these were influenced by the lighterials. All this information about the lighterials would help to determine whether they could potentially be considered to be architectural forms. Finally, an overview of all the architects’ drawings shows how they presented the lighterials graphically.

Looking first at what the architects wanted to achieve when they used the lighterials, the evidence reveals that they mostly used lighterials to attract attention and to distinguish public areas from private ones. They also used them to provide guidance, to create specific effects and for interaction. Lighterials were also used to provide uniformity in the illumination of the space or to define shapes. They were also used to connect spaces, for decorative purposes or even to blur the view towards specific areas. Finally, less frequently architects used lighterials for surveillance on the people who explore the space, as well as to give volume, to show presence, to create blockage, distortion, division or action or to frame.

Taking into consideration the application of each of the lighterials and the intention of the architects, the evidence shows that particular lighterials were used to serve specific intentions. Table 7.1 summarises which of the lighterials were most used for particular purposes.
The results show that the lighterials that were used the most were the following (ranked in order of use):

1. Polyethylene furniture, interactive surfaces, OLEDs.
2. Light-emitting substances, light-transmitting concrete, Barrisol®, Scintilla Lumina®, electroluminescent products.
3. Glass, Riverstone bricks®, active surfaces, Planilum®.

The evidence shows that the most popular lighterials incorporated in their design by the architects were the polyethylene volumes. Table 7.2 indicates the number of architects that used each of the lighterials and where the lighterials were placed in the space. The table also shows how many applications of each lighterial were placed on walls, floors, ceiling, furniture, luminaire, decorative elements or elsewhere.
The data also shows that there were cases where the poetics of the space were either enhanced or changed when particular lighterials were used. However, where polyethylene volumes were used the poetics did not change, unless the architects used polyethylene volumes in combination with interactive surfaces or with light-transmitting concrete. The interactive surfaces, on the other hand, influenced the poetics of the space in all the design cases. Most of the time, the poetics were influenced when OLEDs or light-emitting substances were used.

Regarding the lighterials and the different functions of the space, the evidence shows that only the polyethylene furniture and the interactive surfaces were used for all types of spaces, regardless of whether the transition space led to offices, the clinic, or leisure, media, retail or exhibition spaces. The use of the other lighterials did not appear to link with the function of the spaces that followed and their use varied. It is worth mentioning that Scintilla Lumina was used only where the transition space led to leisure spaces, the Riverstone bricks only where it led to media spaces, and the active surfaces and the...
Planilum only where it led to retail spaces. Furthermore, it is interesting that only in the case of the transition space leading to banking, media or retail spaces were the poetic qualities influenced.

One aim of this study was to see if the architects used *lighterials* as architectural forms. Based on the drawings and the use of the *lighterials*, the evidence is that they used the electroluminescent products, OLEDs and light-emitting substances to create linear forms. They also used interactive surfaces, OLEDs, Barrisol, electroluminescent products, glass and active surfaces as planes. The evidence also shows that the architects created luminous volumes using the following *lighterials*: polyethylene furniture, light-transmitting concrete, Barrisol, Scintilla Luminia, glass, Riverstone bricks and Planilum. There were just a few cases where they used light-emitting substances and electroluminescent products to create patterns and for contrast. Finally, the architects designed luminous forms in different scales, from furniture volumes to walls (Table 7.3).

![Image](image_url)

**Table 7.3:** The *lighterials* used as architectural forms: lines, planes and volumes

The results also show that the architects presented the *lighterials* graphically, mostly using frames that appeared to radiate, patterns or a range of symbols such as letters, arrows and dots to symbolise *lighterials* in their drawings, either in plan or in elevation and sometimes in sections. Many architects also wrote the name of the *lighterial* next to the shape to point out their choice (Table 7.4).
Analysis of the Interviews

Observing the different elements of the space analysed before and after their connection to the *lighterials*, the data shows that of all the design ideas, the lighting schemes in the space and the poetics can be influenced the most. In the cases where this change can occur, the architects used mostly either polyethylene volumes, influencing the lighting schemes, or interactive surfaces, influencing both the lighting scheme and the poetics. Further, the frequent use of polyethylene furniture, OLEDs, Scintilla Lumina and light-transmitting solids indicate a change in the materials of the space. The use of polyethylene furniture, interactive surfaces and light-transmitting concrete influences the stimulating elements of the space, while the interactive surfaces and the light-transmitting concrete also influence the important positions and points of the space.

* Table 7.4: Graphic presentation of each of the *lighterials* on the architects’ drawings
Pattern as an element was mostly influenced when the light-transmitting concrete and the light-emitting substances were used. Interactive surfaces can also affect pattern, but it depends on the number of people who use the space at any particular moment. In addition, the light-transmitting concrete and the interactive surfaces played a pivotal role in altering the connecting elements of the space. The interactive surfaces and the OLEDs significantly affected the colour of the space. The use of active and interactive surfaces and OLEDs can also affect the brightness of the space and the interactive surfaces can strongly impact on the circulation of the space. Finally, the use of light-transmitting concrete relates to how the boundaries are viewed, whereas the transition zones within the overall space can be affected by a variety of lighterials but mostly by the light-transmitting solids.

The following section presents the elements of the space and how each can be influenced by the lighterials. For each element, a short description is given, following the scheme of Chapter 3. Table 7.5 summarises the relationship between the lighterials and their influence on the elements of the space.

<table>
<thead>
<tr>
<th>Lighterials</th>
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<th>Oled</th>
<th>Light Emitting Substances</th>
<th>Planium</th>
<th>Scintilla Lumina</th>
<th>Active &amp; Interactive surfaces</th>
<th>Barmisol</th>
<th>Polyethylene Volumes</th>
<th>Glass Panels</th>
<th>Light Transmitting Solids</th>
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Table 7.5: The elements of the space influenced when the lighterials were introduced (indicating how many design ideas incorporated each type of lighterial and which element it could influence)
7.2 The elements

The evidence reveals that in all the design cases at least one of the elements under review could be influenced by the *lighterials*’ application. This section presents all the elements in the order of the level of the *lighterials*’ influence beginning with the element least influenced by the *lighterials*. Figure 7.1 shows the scale of the influence measured by the number of the participants/projects, out of the total of 24.

![Figure 7.1: The scale of influence by the lighterials on different elements of the space](image)

The following subsections describe how *lighterials* could have influenced the elements of the space, illustrated by examples of different participants’ designs. As in previous chapters these figures are divided into ‘before’ and ‘after’ sketches with each element represented by a particular colour and the application of *lighterials* in the right-hand ‘after’ sketch indicated in magenta. In the beginning of each section, a brief description is given of the element under review, following the analysis of Chapter 3.

7.2.1 Transition zones

*Transition zones are created between bright and dark areas due to changes in the levels of light. Changes in the levels of light affect people’s movement, especially when the contrast is high. Transition zones are created between spaces with different materials, styles, colours or characters.*

Five out of the 24 design ideas showed that the transition spaces can be influenced by the application of *lighterials*. The *lighterials* used in these examples were OLEDs, light-emitting substances, polyethylene furniture, interactive surfaces and light-transmitting concrete.
Participant MCI indicated on her sketches that the transition space she had designed was a particular space between the seating area and the buffer zone designed in parallel to the windows for an exhibition space. Her idea was based on the creation of a path that visitors could use if they did not want to remain in the seating area. She explained that this path would act ‘as a buffer zone between the shell and the inner space’. She introduced OLEDs into the space, applying them on one side of the partitions that separated the reception area and the buffer zone (Figure 7.2).

![Figure 7.2: MCI’s design idea indicating the change in the transition zones](image)

The placement of the OLEDs aimed to make this transition from one type of space to the other more obvious, making the path brighter. In addition, she used ‘a gradation of the colour of the carpet in the middle’ using light-emitting pigments that could be ‘graphically put on the floor and the ceiling’. This action highlighted where people should exit from the space A, creating a transition from space A to space B or from the entrance to the inner space.

Another participant, MRC, used the interactive surfaces to enhance the transitional experience. More specifically, MRC explained that the transition from one area of the space to the other played a significant role in the development of his idea. He considered as transition areas the ‘zone you enter into the offices and the entrances you get in’, emphasising as part of the transitional experience ‘the interaction between the shapes and the functions and the colours of the islands’ (the term he used to refer to the large round elements used as seating areas). The interactive surfaces were applied ‘on the fabric for seating to give a glow around it’. It was also applied ‘on the floor, seat and back’ so that the visitor would experience ‘a ball of light’ when sitting. Approaching the seating areas in this
way and his use of the interactive surfaces added another important transition area in the space experienced when people enter the islands: when they sit or when they touch the walls (Figure 7.3).

![Figure 7.3: MRC's design idea indicating the change in the transition zones](image)

Another example showing lighterials’ impact on the transition areas of the space is EMR’s design, which used light-transmitting concrete to make a ‘real transition from the reception to the seating area’ (Figure 7.4). Before that, his idea was based on the creation of a ‘threshold, distinction between the reception space and the waiting area’. Using the light-transmitting concrete on the walls around the reception area can make the transition space more obvious since the overall reception space acted as a transition space.

![Figure 7.4: EMR’s design idea indicating the change in the transition zones](image)
Similarly, ALS (Figure 7.5) and CRL (Figure 7.6) replaced some of the walls that surrounded the transition space with light-transmitting concrete, creating a transition between the two spaces.
7.2.2 Boundaries

The boundaries of the space include many features, such as the walls, the floor, the ceiling and often the furniture. Boundaries define the physical limits between private and public space. Within the territory of the space configuration, the architects design the boundaries to frame the overall space and then they design particular areas within the space itself. The size of these spaces connects to the function of the space and the dimensions needed to function within it.

The data shows that for 5 of the 24 design ideas the boundaries of the space can be changed when lighterials such as light-transmitting concrete, electroluminescent products, OLEDs, light-emitting substances and polyethylene furniture are incorporated in the design concept.

We start by looking at two design ideas where the designers CRL and ALS used light-transmitting concrete.

CRL claimed during the design analysis stage that the wall around the reception formed a strict boundary of the space she designed. Then, in the re-design stage, she placed light-transmitting concrete on the curved walls around the reception space to create an illusion of the existence of an occupied space behind these walls acting as an extension to the overall transition space. Further, she argued that her intention was to make the space appear more natural by breaking the initial strict physical boundary. Meanwhile, her aim was to prevent people from looking in the waiting area and to make them focus on the wall itself (Figure 7.7).

![Figure 7.7: CRL’s design idea indicating the change in the boundaries](image-url)
In a similar way, ALS decided to replace the form of the wall that separated space B from the corridor alongside with light-transmitting concrete. Before that, the boundaries of her space were defined around the reception space. However, after the application of the light-transmitting concrete, the boundaries of the space were expanded to the entrance where the elevators were situated. The intention was to create a visual connection between space A and the reception area and the corridors, which did not exist before. The boundary that the designer had initially indicated did not change dramatically, but it became more translucent, altering the strict feeling of the surrounding boundaries (Figure 7.8).

Participant STO used electroluminescent tape to define the boundary between the walking and seating areas. He wanted to ‘use the electroluminescent tape to define the edge of the seating area probably on the floor’. This action marked the limits of the reception area more strictly than before since the electroluminescent tape on the floor indicated the beginning and the end of the lobby area, as well as the beginning of the circulation path between the entrance and spaces A and B. This adds another boundary that separates the transition space into subspaces: the seating and reception area and the rest of the space (Figure 7.9).
Participant JL explained at the beginning of the experiment that the boundaries of the space were defined by small trees placed strategically. Her idea was to use the trees to hide the windows and define the boundaries around the seating area and towards the entrance. Then she added OLEDs to the surface of the windows that surrounded the transition space. This action extended the boundaries of the space to the window level, since she created a luminous boundary behind the trees (Figure 7.10).

HDR decided to place polyethylene material on the curved ‘skin’ she designed, claiming that this action would make the boundary of the transition space more obvious, especially when natural light came into the space through the windows. Further, she wanted to reinforce
the appearance of this skin in the space by creating strong shadows. Before that she had explained that the transition space was designed to have two boundaries: one physical – the curved skin designating where people could move; and a second one – the opaque glazing on the windows, which would act as a visual boundary.

Comparing the idea of the appearance of the skin before and after the application of the polyethylene furniture, the evidence shows that the architect believed beforehand that there was ‘not one clear boundary’ but two, whereas after the application of the *lighterial* the second skin became luminous, hiding the second boundary at window level (Figure 7.11).

![Figure 7.11: HDR’s design idea indicating the change in the boundaries](image)

### 7.2.3 Circulation

*One of the most important factors of circulation involves the elements that act as stimulants for movement. Light is another important factor as people turn their attention and therefore their movement towards the light. The circulation concerns people’s movement followed by transition zones that direct circulation towards a particular path.*

When it comes to the circulation of the space the evidence shows that in most projects the circulation can be mostly influenced when architects incorporate interactive surfaces in the space, especially when applied on the floor (participants MRC, MRE, IS and ANP). Before this application, they were asked to indicate the circulation of the space, showing a well-organised circulation around specific circulation paths. For instance, MRC separated the users into those who worked there and those who were visiting. He indicated specific
circulation paths following the movements between the entrances to the spaces and the offices and the enclosed seating areas he had designed (Figure 7.12).

![Figure 7.12: MRC’s design idea indicating the change in the circulation](image)

The same happens in the case of MRE (Figure 7.13).

![Figure 7.13: MRE’s design idea indicating the change in the circulation](image)

On the other hand, IS explained that ‘circulation has to do with the speed of walking’, showing on her sketch how that connected to the circulation of the people who would work there and those who would visit (Figure 7.14).
ANP added that circulation is a ‘very important part of the concept’ and she reinforced her idea by placing electroluminescent tape on the ceiling in the shape of dots to organise it around specific moves (Figure 7.15).

However, for all these participants the circulation plans could have changed when interactive surfaces were incorporated in the space. The reason is that even though visitors would not immediately understand how interactive surfaces work, as soon as they found out that the floor surfaces reacted to their movement by projecting light, it would affect their movement. The application of interactive surfaces attracts attention and often people are interested in interacting with the space itself and with each other. Applying the interactive surfaces to the floor would prompt people to change their direction or their
speed or even make them want to repeat the same path in order to interact with light. The use of interactive surfaces would therefore impact on the circulation of the space, making it more random. ANP explained that the electroluminescent dots on the ceiling ‘show where the path should be and people on the floor create their own’.

Another example that demonstrates how lighterials impacted the circulation of the space, is found in MCI’s design, where she used OLEDs to cover the exhibition panels separating the reception and the seating area, creating a third area that acted as a buffer zone (Figure 7.16). MCI designed these panels to be used as exhibition stands or to provide information about the company’s profile. Initially MCI showed on the drawing that the circulation path used by the people who worked there was different from the circulation path used by the visitors. The visitors would follow specific paths from the main entrance of the transition space to the offices’ entrances or towards the seating area. In addition they could use the path beside the panels. But then MCI decided to add the OLEDs behind these panels creating a path that was strongly lit, adding another dynamic path into the circulation area.

Figure 7.16: MCI’s design idea indicating the change in the circulation

7.2.4 Changes in brightness

Changes in brightness are vital for the movement of people within a space. Architects use light to highlight particular areas in order to stimulate people’s movement. People tend to select the brightest area or path. Architects establish the brightness levels of the space according to function and aesthetics. Often they create a hierarchy of different forms with different brightness levels.
Another element under investigation is the relationship between bright and dark areas of the space. For seven out of the 24 design ideas, the brightest points of the design in relation to the darkest ones can be changed as soon as the *lighterials* were incorporated. Three of the participants used OLEDs on the walls, floor or ceiling while two of them used polyethylene furniture, changing dramatically the contrast of the lighting appearance of the space.

LF used OLEDs on the moving panels but he also incorporated polyethylene furniture in the seating area of the space. He explained that he would prefer to have the surfaces of the panels as the brightest surfaces of the space, reinforcing this idea by the application of the OLEDs. But he further explained that his aim was to make the centre of the space the darkest area, which was later altered as soon as he placed the polyethylene furniture there (Figure 7.17).

![Figure 7.17: LF’s design idea indicating the change in the brightness](image)

LH, on the other hand, placed OLEDs on the columns on the perimeter of the space, again changing the lighting contrast in the space, by considering as the brightest area the area located next to the perimeter of the space and not the seating area as he had initially suggested (Figure 7.18).
There were also many other participants who changed the contrast between the brightest and the darkest elements of the space, when they imported the interactive surfaces in their design. KCH (Figure 7.19) and NTL (Figure 7.20) placed interactive surfaces on the seating area. It is likely that the brightest point of the space would still remain the same as both the participants initially explained. However, if many people were to use the seats, the amount of light emitted would be greater than usual. This means that, in both examples, the seating areas would no longer be the darkest points, at least for some of the time.
The interactive surfaces that were applied in DN’s corridors completely changed them from the darkest to the brightest parts of the space, again according to the number of people using the space (Figure 7.21).

Alternatively, TS explained that in his design the two volumes in the centre were the brightest elements of the space. Then he replaced the material from one of the volumes with Riverstone bricks. This would make the appearance of the volumes differ from each other (Figure 7.22).
Finally, ADM based his idea on the design of ‘cocoons’, which would be playing a critical role in the space as they would be used as sitting areas or rooms. He clarified while designing the space that the exterior of the cocoons would be the brightest elements in his space. However, he later decided to use glass mirrors that would occasionally turn the shell of the cocoons to luminous volumes or turn them into total darkness, influencing the contrast between the brightest or the darkest elements of the space (Figure 7.23).
7.2.5 Colour

Colour determines the perception of the boundaries and influences greatly the spatial envelope. The choice of colour influences the visual perception of the dimensions of the space. Colour affects emotions. There is a strong connection between colour and shapes and emotions, but also between colour and light. Colours and light are interdependent elements that determine the character as well as the perception of the space. The reflectiveness and the absorbency of the materials influence the way light renders colours. Light makes a colour brighter or darker.

Another element that can be affected by the application of the lighterials is the colour of the space. Eleven of the 24 participants used lighterials that particularly influenced the colour of the space. LF, for example, used graphics on the panels that later were replaced by white light OLEDs. The white colour would have become even stronger in the space when he added polyethylene furniture into the seating area. Another participant, MCI, added on the ceiling and on the floor light-emitting pigments that made the ceiling appear whiter and the floor from dark to dark combined with white light details. MRC initially selected purple colour for the Velcro walls, replacing it later with a polyethylene softwall and changing the wall’s colour to white. Further, he added interactive surfaces to the seats of the islands he designed, which were initially designed to be made of dark leather. He also applied interactive surfaces on the wall and the floor where originally was going to have red, yellow and blue. This application added light to the seating areas, the wall and the floor.

KCH had initially picked dark brown carpet for the play area’s floor, where eventually he applied interactive surfaces. He also designed furniture made of brown foam, where later he applied the interactive surfaces. In both cases the lighterials must have added colour through the use of light in the space.

Another distinct example of how lighterials influence the colour of the space is seen in the designs of EMR, who swapped the dark wooden-walled box located at the entrance of the transition space with light-transmitting concrete. That meant that the colour of the box changed from a dark matt colour to a grey colour with yellowish light patterns. A different example is NY’s design, which added light-emitting substances on the pattern of the wooden wall designed behind the reception desk, changing it from totally black to black and white. Further, she switched to white polyethylene sofas in the entrance from a dark textile sofa she had initially picked. Again, in the beginning ANS selected aubergine corian for the table tops of the restaurant area, which eventually were covered with multi-
coloured projections due to the application of active and interactive surfaces. The same participant also used Scintilla Lumina to construct the walls surrounding the transition space, which at first were designed to be made of white finish plasterboard.

Another participant, IS, placed on the black linoleum floor interactive surfaces that made the space appear more colourful. Further, she replaced the black compact pieces she had chosen for furniture with light-transmitting concrete, changing the colour from black to grey with a white lighting pattern. JL added white colour into her space since she decided to cover the columns on the perimeter of the transition space with OLEDs. She also used a number of white Planilum luminaires. In a similar way LH changed the grey walls he had first chosen with white OLEDs. Finally, NL initially designed the transition space’s walls to be white gradating to black. These colours were replaced with white polyethylene walls that again followed the concept of the gradating colour in the intensity of the light. The walls of the space eventually had a gradating of white light and the whiteness of the space was reinforced by the use of white electroluminescent tape on the wall around the window.

7.2.6 Connecting elements

*Spatial banding is important for the articulation of the space. Spatial banding creates zones either on the horizontal or the vertical axes. Horizontal banding of the space refers to subspaces and corridors that provide an indication of where people should move. The horizontal banding can be reinforced with the use of elements such as pattern and light, which help people navigate the space. These parameters emphasise direction and therefore the perspective of the space. Connecting elements imply continuity. This category includes similar elements that aim to physical connectedness.*

Another element that changed due to the application of the *lighterials* was the connecting element. The data demonstrates that most architects placed *lighterials* on the walls to link two spaces. Some other examples showed *lighterials* placed on the ceiling and on the floor and just one participant used them as furniture to unify spaces A and B. In particular, for 12 out of the 24 design ideas, the connecting elements were changed after the application of the *lighterials*.

Participant CRL used light-transmitting concrete on the curved walls, distinguishing them as elements that link the two spaces, visually and physically. Before that, CRL explained that ‘*the borders of the space and their form*’ were the elements that connect these spaces
Analysis of the Interviews

together, enhancing this idea in some of the border-walls by the application of the light-transmitting concrete (Figure 7.24).

![Figure 7.24: CRL’s design idea indicating the change in the connecting elements](image-url)

In a similar way, EMR replaced the walls around the reception area with light-transmitting concrete, making the wall itself the key element that connects the two spaces together. The fact that visitors could see the shadows of the people moving behind the wall as silhouettes made the connecting idea even stronger. Before that, the architect explained that he considered the windows as the connecting elements between the two spaces, since the windows push people ‘along the path...when someone walks within the space all the circulation follows the exterior’ (Figure 7.25).

![Figure 7.25: EMR’s design idea indicating the change in the connecting elements](image-url)
Again, ALS used light-transmitting concrete to link space B to the entrance and to the corridor next to it. When she was asked about the connecting elements in her design, she responded that ‘the panel or the way it sits next to the window’ is one of the connecting elements. She also explained that ‘the materiality links’ spaces together, especially spaces with different functions. And she said that ‘the logo is the same and the colours’ making them important elements that connect the spaces together (Figure 7.26).

![Figure 7.26: ALS’s design idea indicating the change in the connecting elements](image)

In another example, ANS explained that in her design the tables act as connecting elements, ‘as the element that intrudes into the space the most and it is repeated and these are the common elements between the two transition spaces that lead to spaces A and B relatively’. This idea changed later when she added interactive surfaces to the tables, making the following distinction: ‘two different transition spaces with two different projections that identify one space from another’. She also replaced the white plasterboard partitions with Scintilla Lumina in order to make the shadows of the people moving behind a major visual element of the space and therefore link the spaces together (Figure 7.27).
Another participant, LH, explained that the ramp was the key element of his design idea and it was the one that bound the two spaces together. However, later he added OLEDs on each of the columns of the space, making the luminous columns important connecting elements of the space as repetitive elements that run from one side to another (Figure 7.28).

DN used lighterials to enhance the idea of ‘the two volumes, the same language they have’, which were designed to ‘work together according to the theme of the gallery’ and therefore connect the spaces together. She then decided to place the interactive surfaces on the
walls of the corridors as well as on the seating areas of these volumes and on the top of the reception, making this connecting relationship more obvious (Figure 7.29).

In contrast to the above participants, a few others applied *lighterials* on the ceiling to connect spaces together. An example is MCI, who placed light-emitting substances on the ceiling and the floor, creating a central feature in between the two different reception spaces she had designed. Before doing that she had explained that there were no connecting elements in her design and that she perceived the whole transition space as *‘an independent space, like a third space’* (Figure 7.30).
Participant TS approached the seating area as a ‘social centre, where people can meet and chat and relax’, stating that this was the key element in the transition space that connects the spaces together. This idea was reinforced with the use of Barrisol on the seating area’s ceiling, where the design of ‘little domes, make the area feel more enclosed and more volumetric’ (Figure 7.31).

Figure 7.31: TS’s design idea indicating the change in the connecting elements

ANP explained that the connecting elements of the space she designed were ‘the walls and the screens’; this idea could be then altered when the electroluminescent tape was introduced into the space, following her design to ‘create dots on the ceiling which follow the lines on the floor’. ‘The dots on the ceiling show where the path should be’, she explained – a path that connected the two spaces together. She meanwhile decided to change the material of the walls from glass reinforced concrete to polyethylene softwall, using the same language on the walls around the space (Figure 7.32).
In contrast, KCH initially had the idea of designing a transition space using the same material on the floor all over the space, as ‘one language with the rest’ of the transition area. Then he decided to add interactive surfaces to particular subspaces such as the play and seating areas (Figure 7.33), distinguishing them from the rest of the space.

STO reinforced the connecting elements of the space, the seating benches, by the use of electroluminescent tape ‘to define the edge of the seating area probably on the floor’, unifying the reception and the seating area (Figure 7.34).
Finally, KN described the connecting element in his design idea as the particular point where the colours of the different coloured partition walls and the desk met. That point was located vertically separating the ceiling, the desk, the wall and the floor. However, KN then replaced the half-black, half-white desk with polyethylene furniture, turning the desk into one homogenous feature placed in the centre of this contradictory space. He also added light-emitting substances such as light-emitting paint on the wall to create a stronger visual connection between the two different coloured sides (Figure 7.35).
7.2.7 Patterning

Architects can create patterns using shapes. These shapes can be identical and repeatable in a specific sequence. Pattern can vary with the use of shapes that follow the same architectural ‘language’ but they differ in scale, colour and material. All elements of the space such as the walls, the floor, the ceiling and the objects can be used to create patterns, either as part of their detail or through their layout. Architects use lights’ effects and light sources in a repeatable manner to generate sequence and unity of spaces. Pattern brings controlled order in the space. Patterns attract attention and people often follow them to navigate through spaces. Architects often use light to create patterns in the space or a combination of light and shade.

When it comes to the patterning of the space, half of the examples showed that the pattern can be changed when lighterials are imported into the design. Many participants used lighterials that have a pattern in their appearance. In more detail, CRL, EMR, ALS and IS used light-transmitting concrete, TS used the Riverstone bricks, ANS and ALS used the Scintilla Lumina and DN used glass with pattern. There were two cases where the participants (CRL and EMR) at first explained that they didn’t use any patterns in the space, changing that by incorporating these materials into the space (Figures 7.36, 7.37). In general, the analysis of 13 out of 24 design concepts showed that the pattern can be changed.

![Figure 7.36: EMR's design idea indicating the change in the pattern](image-url)
Analysis of the Interviews

Half of the participants who took part in this study changed the pattern of their space as soon as they applied the *lighterials*. More specifically, participants MCI and CRL used light-emitting substances on the ceiling adding a luminous pattern (Figures 7.38, 7.39).

Figure 7.37: ALS’s design idea indicating the change in the pattern

Figure 7.38: MCI’s design idea indicating the change in the pattern
NY, on the other hand, used light-emitting substances to enhance the already existing pattern on the wall next to the entrance (Figure 7.40). MRE, IS and DN used interactive surfaces on the floor or on the walls, adding light occasionally according to the usage of the particular surfaces (Figures 7.41, 7.42, 7.43).

Figure 7.39: CRL’s design idea indicating the change in the pattern

Figure 7.40: NY’s design idea indicating the change in the pattern
Analysis of the Interviews

**Figure 7.41:** MRE’s design idea indicating the change in the pattern

**Figure 7.42:** IS’s design idea indicating the change in the pattern

**Figure 7.43:** DN’s design idea indicating the change in the pattern
In addition, LF, ANS, TS, ANP and LH used luminous surfaces such as OLEDs and electroluminescent products to create a particular pattern in the space. More specifically, LF explained that his intention was to keep ‘the same pattern of the panels, repeating the same dimensions on the panels’. However, following the application of the lighterials he decided that only a few panels would be lit and the rest would not include light. This could add another pattern into the space: a pattern that would be created by the rhythm between the lit and non-lit panels (Figure 7.44).

In a similar way, ANS said that the blinds she used in the space were not plain, but had a pattern, explaining that ‘every side has one continuous image which can be seen when the blinds are all down. A very abstract pattern not very defined image’. Then she placed interactive surfaces on the tables, which involved a different pattern for each side of the space. This pattern would be repeatable throughout the tables located on the same side (Figure 7.45).
TS used a pattern within the fabric of the furniture, explaining that ‘also the arrangement of the objects on the floor creates different patterns’. Following that, TS added another pattern, which followed the shapes of the domes on the ceiling made by Barrisol (Figure 7.46).

ANP added one more pattern on the ceiling in the shape of dots, which was created by the use of the electroluminescent tape (Figure 7.47).
LH explained that the geometry of the space itself, the windows and the columns added a distinctive pattern in his space, enhancing this idea by the use of OLEDs on the columns around the space (Figure 7.48).

7.2.8 Important positions/points

For every space some points allow users to understand the architectural idea better. These positions often have a visual connection to important focal objects that aim to attract attention. The architect organises the space in order to achieve specific visual results, such as clarity, proportioning or distortion. Various protruding objects and forms attract attention and are strategically embodied into the design, directing people’s vision towards them. Architects compose these elements recognising the
importance of their scale and their appearance in the perception and exploration of the space. By deciding on the visibility levels between objects and spaces, architects impact the views of the space.

Another element that has been investigated in this study is important positions or points in the space. The analysis of the results proved that when interactive surfaces are applied in a specific area, the area can become an important position/point that attracts attention. The interactive surfaces bring into the space a strong visual effect and make people interact with the surfaces. There are many examples in this research where participants added interactive surfaces in their space, (participants KCH, NTL, IS, ANP, DN, MRE, ANS).

For example, KCH explained that when people entered the space, they would look ‘at the overall area … see the area sloping down or another going up, see the playground and the café’ because they would be located on a higher level and they would be able to look down. ‘Everything is seamless – might not notice the difference in the level but it might be the colour that changes the different islands and distinguishes different areas.’ This idea changed when the interactive surfaces were applied to the play and seating areas. The reason was that when the visitors entered the space, they would look at the overall area, but the major features that would capture their vision would be the lit ones, including the interactive surfaces. The light would appear and disappear randomly according to the way the visitors use it, attracting even more attention (Figure 7.49).

![Figure 7.49: KCH's design idea indicating the change in the important points/positions](image)

In a similar way NTL explained that in her design idea the important points were the entrance and the exit, before she applied the interactive surfaces (Figure 7.50). Applying
the interactive surfaces on particular parts of the continuous ‘ribbon’ she designed, on the counter and the seating area, she made them stand out compared to the rest.

Figure 7.50: NTL’s design idea indicating the change in the important points/positions

IS imported the interactive surfaces into the space to make people focus on the floor as soon as they enter. Before that, IS’s intention was to make visitors focus on the claustrophobic feeling that the design of the space would create in them while walking from the entrance into the main space (Figure 7.51).

Figure 7.51: IS’s design idea indicating the change in the important points/positions

The same happened in ANP’s design idea – adding the floor to her list of important points/positions such as the partition wall she designed (Figure 7.52).
DN discussed the furniture and how important these points were in her design, but also she distinguished the ‘play between tightening and opening up of the spaces’. After the application of the interactive surfaces, the corridors could be included in the important points of the space as well the seating elements and the reception counter, sharing the same language (Figure 7.53).

MRE clarified that the important points for her were ‘the reception desk, the panels behind the landscape, the enclosure point in-between and the upper seating level’. However, the stairs/landscape would attract attention if the interactive surfaces were applied (Figure 7.54).
ANS put forward the idea of the partitions being important parts that block the interior views and further shifted the interest from the partitions to the tables, where she intended displaying two different types of graphics for each side of the space (Figure 7.55).

Apart from the interactive surfaces, the participants also used other lighterials that can enhance or totally change the important points/positions of the space. For instance, in many of the examples, the furniture, made either of polyethylene or Scintilla Lumina, played an important part in the overall design idea. KN described that in his design the important point was when people would stand ‘in the middle’ of the space feeling that they ‘are in a cage and the only option they have] is either going to A or B’. This idea was
reinforced by replacing the reception desk with a polyethylene volume, turning it into an important point (Figure 7.56).

![Figure 7.56: KN’s design idea indicating the change in the important points/positions](image)

In similar fashion, MRC replaced the reception desk with Scintilla Lumina in order to make it sparkle and prompt people to move towards it. MRC enhanced the interior of his islands, using interactive surfaces (Figure 7.57).

![Figure 7.57: MRC’s design idea indicating the change in the important points/positions](image)

NY explained that there were three important points in her design: ‘first you see the totality, and then you look at the wall, sign and the reception and then forget about it’. However, she then replaced the sofa that connected the transition space to the bar with
polyethylene *lighterial*, making it an important focal object not just at the entrance to the transition space but also within the overall space (Figure 7.58).

![Figure 7.58: NY’s design idea indicating the change in the important points/ positions](image)

There are a few examples of architects using light-transmitting concrete and Riverstone bricks to turn the visitor’s attention to the walls. CRL first considered the important points to be the seating areas and the entrance. Later, she decided to make the walls that surrounded the reception area a prominent feature with the use of light-transmitting concrete (Figure 7.59).

![Figure 7.59: CRL’s design idea indicating the change in the important points/ positions](image)

Similarly, EMR first explained that in his design the most important point of interest was ‘the moment that you step up from inside – the way that dark and light contrasts, open up
to the bright and open space’. Later, he used ‘light-transmitting concrete so that when someone comes in and look through they can see silhouettes and light come through from the perimeter and in the evening the whole box would glow, the shelves’ (Figure 7.60).

The same technique was used by ALS, who believed that first it was important to 'see the logo – the people who dine – the maitre – the waiting area, second the seating area and third as you approach the maitre and you see a little bit of the bar area’. Then, to the list of important elements she added the wall made of light-transmitting concrete, separating the long corridor adjacent to the entrance. In this way she created a ‘theatrical projection of people’ that move behind it making the view towards it an important feature (Figure 7.61).
TS said that the most important element in his design was ‘the penetration. Whatever it is it will be low level. You don’t want to block the visual connection, something semitransparent, everything is glass. You don’t know where to go, everything is transparent’. However, he then changed the material of one of the two big volumes of the space from glass to Riverstone bricks, making it more distinguishable (Figure 7.62).

NT argued that ‘the central feature: overcast sky’ was one of the most important elements as well as the doors, since ‘people always look at the door as they come in’, explaining that ‘also you need to have an interesting exit in order to finish it off’. Yet she turned the whole space into a glass box through the use of textured glass with integrated lighting on the furniture as well as on the reception desk. She also added concealed lighting to the glass partitions in order to make them major features of the space as well (Figure 7.63).
In a final example, MCI turned the visitor’s attention to the middle of the space where she designed, on the ceiling and on the floor, a pattern made by light-emitting substances. This feature would act as a focal point, grabbing people’s attention as soon as they walked into the space, and later they would discover the path, the buffer zone, which was initially designed to be the most important element of the space (Figure 7.64).

7.2.9 Stimulating elements

The stimulating elements could be objects that act as focal points. Architects use these focal objects to organise circulation in the space. Because people are attracted to these objects, they follow particular routes based on the design of the space.
spaces with more than one focal object, the eye scans the most striking one, with the most dominant character, and people move towards it automatically.

With regards to the stimulating elements, the evidence shows that for 17 of the 24 design concepts the stimulating elements could be increased after the application of the lighterials. The lighterials made particular elements of the space stand out, such as furniture, or parts of the ceiling, the floor or the walls.

The lighterials used for the furniture can be seen in the design ideas of the participants LF, KN, MRE, ANS, NY, and NTL. LF considered as stimulating elements the ‘moving panels’ he designed (Figure 7.65). Then he used polyethylene furniture in the seating area for mood making.

![Figure 7.65: LF’s design idea indicating the change in the stimulating elements](image)

KN added another stimulating element in his design idea, the reception desk, which was made of polyethylene furniture. Before that decision, he explained that the only stimulating element in his design idea was the ‘inner door when entering into the trap’ (Figure 7.66).
MRE explained that the ‘enclosure – stimulated to act (move) and upper parts of the seating area ... could allow for more interaction with everything’, making these two positions the most stimulating positions of the space. Later, she added the reception desk made of polyethylene furniture, a luminous volume acting as a magnet to attract people. Similarly, she used interactive surfaces on the stairs, provoking people to act spontaneously and to use the steps, turning the seating area from static to active (Figure 7.67).

ANS explained that her intention was to make the ‘windows ... act as stimulating elements’, aiming at the fact ‘that they are there and you can’t look outside’. Then she placed the interactive surfaces on the tables and the reception desk, creating, as she explained, ‘visual stimulation, visual interest, either discreet or complicated’ (Figure 7.68).
NY considered the most stimulating element in the space to be *the wall behind the reception, because it will have the texture*, enhancing it by the use of light-emitting substances. Then she replaced the sofa with polyethylene furniture, which was strategically positioned to link the transition space with space A making it visible from both sides (Figure 7.69).

NTL’s choice was the design of a ‘ribbon’ that would be constructed as a continuous object around the space. According to her concept, *changes from the horizontal straight part to the curvy vertical one and [changes] from the horizontal part to a seat*. Particular parts of
the horizontal ‘ribbon’ would be used as seating areas or as a desk, which would attract more attention when the interactive surfaces were applied (Figure 7.70).

Figure 7.70: NTL’s design idea indicating the change in the stimulating elements

In some of the other design ideas, the walls were considered to be stimulating elements after the application of the *lighterials*. Evidence of this can be seen in the design ideas of the participants MRC, DN, EMR, ALS, CRL and NL. For example, MRC explained that the ‘islands’ he designed were acting as stimulating elements. According to his concept, ‘*they are the feature elements which define the space, they eternalise moving around them and they attract attention because they are colourful*’. However, after the client’s request phase, he placed on the surrounding walls polyethylene volumes and added integrated ‘*LED light across the wall*’, which ‘*attracts movement*’, explaining that ‘*it will be dark and when I move the whole surface it becomes active by using a monitor or something*’. Further, MRC placed interactive surfaces inside the seating area of the islands, adding another element to the list of stimulating elements that would motivate people to do particular things. He explained that the ‘*place will be in the dark if there is no interactivity in there and nobody is in*’. He also explained his intentions of using a Scintilla Lumina volume as a reception desk because this material makes the reception appear sparkling and shouting ‘*for attention – the spaces change from light full to dark and light full again as if it goes to sleep and wakes up*’. The visual result would depend on the number of people who would use the space. The use of light would challenge people to either move along the walls towards specific directions or use the seating areas within the ‘islands’ experiencing ‘*a ball of light*’ in the specific position (Figure 7.71).
DN did something analogous, stimulating people into action while using the corridors, the table in the seating area and the reception counter where the interactive surfaces were applied (Figure 7.72).

EMR explained that the perimeter walls of the reception area were the most stimulating elements. Using light-transmitting concrete, he allowed projections of people moving behind these walls to be seen from the reception as shadows. His idea of having these walls as stimulating elements was enhanced by the use of the light-transmitting concrete, making the reception appear as a ‘piece of furniture’ with an extra characteristic: the silhouette
effect created between the light and the shadow due to light-transmitting concrete’s properties (Figure 7.73).

Similarly, participants ALS (Figure 7.74) and CRL (Figure 7.75) added another stimulating feature into the space using light-transmitting concrete on an existing wall.
NL replaced the material of the walls enclosing the transition space with polyethylene furniture, with the aim of using a ‘gradient of light with more light towards the reception as a point that would give the impression of what is happening in spaces A and B’. He also reinforced the idea of having the view through a specific window as the most stimulating element of the space by framing it using electroluminescent tape. That would encourage people to go there and look through it, as he explained (Figure 7.76).

Participants MCI, KCH, TS, IS and ANP used lighterials on the floor and on the ceiling. MCI considered the stimulating elements to be the panels that created a border between a specific path that she called ‘the buffer zone’ and the seating area. MCI placed OLEDs on
the panels to highlight them, but she also added a ceiling-to-floor element in the centre of the space, between the two seating areas, made of light-emitting substances for mood making (Figure 7.77).

![Figure 7.77: MCI's design idea indicating the change in the stimulating elements](image)

KCH again emphasised the idea of having the ‘islands’ he designed as the most stimulating elements of his space, by adding interactive surfaces to the seating areas. He used the same language in the playground by placing the same *lighterial* on the floor (Figure 7.78).

![Figure 7.78: KCH’s design idea indicating the change in the stimulating elements](image)

TS discussed the furniture as major features of his design idea. However, he distinguished one of the two main volumes, the bars he designed in the space, by replacing it with Riverstone bricks, while everything else around was designed to be made of glass giving a
translucent character to the space. He also strengthened the concept of the seating area, by adding ceiling coves made of Barrisol with integrated lighting (Figure 7.79).

IS explained that in her design idea the ceiling in the entrance to the space would be the most stimulating element, but at the same time she incorporated interactive surfaces on the floor, making the floor a major element, provoking people to concentrate on it (Figure 7.80).

Finally, ANP argued that in her design the screens and the seating areas were the stimulating elements. She said that ‘the screens attract attention by hiding something. It’s even more when it gets narrower. It makes people feel they want to get in there and the
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seating area with the carpet attracts attention’. Then she added interactive surfaces on the floor in another part of the space making it a stimulating element as well (Figure 7.81).

7.2.10 Materials

The reflectiveness and absorbency of the materials influence the way light renders colours.

The analysis of the results showed that the materials of the space were changed in 20 out of the 24 architectural ideas under review. In most cases, after importing the lighterials, this resulted in a change in one or two of the materials of the space. LF and MCI added OLEDs to the plasterboard initially used. NTL used OLEDs on a metal surface and JL and LH covered the surrounding walls with OLEDs. There were also cases where the architects initially used wood that was then replaced by another material. For example, KN and KCH replaced the wooden reception desk with polyethylene furniture; LF changed the wooden chairs to polyethylene furniture; and NY turned the wooden sofa located in the reception area into a polyethylene volume. MRC, ALS and ANS altered their wooden furniture, reception desk, and partitions and walls, respectively, to Scintilla Lumina. And there were two examples where the architects changed the materials of particular elements to light-transmitting concrete. This happened in CRL’s design, which had initially used wood, and in EMR’s case, which used plasterboard. And NL replaced plasterboard walls with polyethylene volumes.

Further, there is evidence that some materials were replaced with Barrisol. More specifically, TS changed the wooden ceiling he had initially designed to Barrisol ceiling
coves, as well as the glass bar to Riverstone bricks. STO changed the wooden element placed on the ceiling above the reception desk to Barrisol materials and HDR used polyethylene volumes. Moreover, MRC used polyethylene volumes instead of Velcro walls and ANP transformed the glass reinforced concrete walls into polyethylene soft wall. Finally, ADM modified the material of the cocoons he designed from laminated Mylar into glass mirrors and MRE changed the reception desk made from aluminium to a polyethylene volume.

### 7.2.11 Lighting scheme

*The lighting is also part of the structural system. There are various factors that influence the architect’s composition. Examples of these factors are the light source’s dimensions, the intensity and the colour temperature of the light, the glare or the reflection and refraction of light. Further, the amount of light needed links to the functionality of the space. The levels of light vary according to the actions that take place within the space and the lighting requirements to perform specific tasks. The architect directs the light and achieves balance between lighting design and architecture.*

Regarding the lighting of the space, the data showed that in most cases the lighting scheme of the space is influenced when the *lighterials* are introduced. The most distinct examples were those where OLEDs were used, especially when they were applied on the walls, as shown in the design proposals of MCI, JL and LH. More specifically, MCI decided to apply OLEDs on the partitions, whereas before she had decided to use downlights along the ‘buffer zone’ next to the panels (Figure 7.82).

*Figure 7.82: MCI’s design idea indicating the change in the lighting scheme*
JL explained that the only source of light in her space were some floor lamps that would have the appearance of street lighting luminaires, placed in a particular rhythm. Then she added to the lighting concept the application of the OLEDs to the windows, applied ‘floor to ceiling so that the trees would seem backlit’. She also decided to replace the street-style lamps with Planilum (Figure 7.83).

Similarly, LH applied OLEDs to the columns on the perimeter of the space, in addition to the lighting scheme he had initially designed where the lighting of the space followed a geometrical pattern (Figure 7.84).
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Then, there were other design ideas where the architects used polyethylene volumes, either on the walls or on the furniture, changing the concept of the initial lighting scheme. Evidence of this was found in the work of NL, STP, LF, KN, MRE, NY, ANP and HDR. NL and STP used polyethylene soft wall on the partition walls to separate the two spaces. Previously, NL had placed a few downlights in the centre of the space (Figure 7.85) and STP used coloured lighting on the reception surface (Figure 7.86).

![Figure 7.85: NL’s design idea indicating the change in the lighting scheme](image1)

![Figure 7.86: STP’s design idea indicating the change in the lighting scheme](image2)

In a similar way, LF, KN, MRE, NY, HDR and ANP used polyethylene volumes as furniture. More specifically, LF replaced the downlighting in the seating area with luminous furniture made of polyethylene, explaining that the lighting scheme would depend on the status of
privacy in the space, which would be different for different times; ‘dimmed volume would show: not disturb’ (Figure 7.87).

![Figure 7.87: LF’s design idea indicating the change in the lighting scheme](image)

KN’s lighting scheme was based on the idea of the reception desk being ‘the only item to be lit’ in the space. Initially he placed a downlight above the reception desk. This idea was later changed, by replacing the reception desk with the polyethylene furniture (Figure 7.88).

![Figure 7.88: KN’s design idea indicating the change in the lighting scheme](image)

MRE initially designed a concealed lighting detail below the reception desk, aiming to wash the floor with light; this was later altered to lighting the whole reception desk volume by replacing it with polyethylene (Figure 7.89). (MRE’s design is returned to later in the discussion of the effect of interactive surfaces on lighting schemes.)
NY enhanced her lighting scheme, which was based on the use of a ‘spot light above reception’ and ‘light around the wall ... framing the wall of the reception’, by adding a luminous volume in the reception space, replacing the textile sofa she had initially designed with a polyethylene volume. She also incorporated light-emitting substances within the pattern behind the reception desk, to replicate the daylighting quality and appearance ‘in a delicate way within the material’ (Figure 7.90).

HDR initially designed a lighting scheme that was based on the use of light sources placed on the ceiling in a way that would make the lighting appear ‘entirely independent that goes beyond the boundary of the wall following its own rhythm’. HDR replaced the ‘innerskin’ she
designed with a polyethylene volume, aiming to make light ‘more even and continuous’ (Figure 7.91). The same technique was used at the reception desk, which was changed to a polyethylene volume.

ANP also replaced all the partitions of the walls, which were not initially lit, with polyethylene soft wall, ‘which could have a pattern and parts of it could be luminous so they would become more volumetric’ (Figure 7.92).

Less influential was the application of the Barrisol and the way it affected the lighting schemes of the spaces. Examples can be found in the work of TS and STO. TS decided to use Barrisol instead of ‘lamps around the seating area’. He designed ‘little domes’ on the ceiling made of Barrisol with the intention to ‘make the area feel more enclosed and more
volumetric’ (Figure 7.93). On the other hand, STO reinforced the idea of using downlights to light the counter by importing Barrisol ‘integrated with the screens and Barrisol again above the receptionist’ (Figure 7.94).

![Figure 7.93: TS’s design idea indicating the change in the lighting scheme](image)

![Figure 7.94: STO’s design idea indicating the change in the lighting scheme.](image)

In addition, there are two examples where the architects used glass with integrated lighting in areas that previously had been designed not to have lighting. NT changed the lighting scheme of the space and instead of having light on ‘the blind and on the floor’, she decided to import glass with integrated light into the partitions around the transition space. Further, she applied the same idea of using the luminous glass on the reception volume where ‘instead of normal reception it can become a little glowing box ... The glass with integrated
light, very soft light with texture, a very interesting pattern, like a volume of light and that can be replicable to the seating areas tables’. These modifications completely changed the initial lighting scheme to ‘low level light that gives ambient light ... all quite dimmed’ (Figure 7.95).

Figure 7.95: NT’s design idea indicating the change in the lighting scheme

ADM’s lighting scheme initially aimed to highlight the cocoons, which were the most important elements of his space, by adding light ‘where these volumes touch the floor’. Later, when he found out about the lighterials, he decided to replace this lighting scheme and the material of some cocoons by making some of them of glass mirrors in order to ‘become invisible when you open the light to still have this continuous space of mirrors not to break up the concept and start dividing the surfaces with light solid surfaces’. As soon as the cocoons were lit each of them would appear as ‘one single volume of light and then they would continue reflecting on the other surfaces even more enhancing this effect’ (Figure 7.96).
Finally, many of the architects used interactive surfaces in their space, adding to the initial lighting scheme of the space. Examples of this can be found in the design ideas of the participants MRC, KCH, MRE, ANS, IS, ANP, NTL and DN. MRC, KCH, IS and ANP used interactive surfaces on the floor. MRC used interactive surfaces to enhance the lighting of the space inside the ‘islands’ by adding them ‘on the floor seat and back’ to create ‘a ball of light when you sit’. MRC based the lighting scheme of the space on the idea of people interacting with each other and the space. This idea was reinforced by the use of LED lighting and Scintilla Lumina on the partitions of the wall, so that the visitors would ‘look in silhouette and in traces of movement like a light path which fades and close’ (Figure 7.97).
KCH connected the lighting scheme to the number of people that would potentially use the areas where the interactive surfaces would be applied, altering the lighting scheme in this way (Figure 7.98).

![Figure 7.98: KCH'S design idea indicating the change in the lighting scheme](image)

IS initially explained that the lighting of the space would be introduced by the use of some light sources, ‘faking natural light during the night’. Then she added interactive surfaces to the floor, referring to the number of people that would use each subspace to determine the lighting scheme at any given moment, explaining that, for example, it would be ‘just a few lights on the entrance tunnel because it would be a few people, more into the waiting area and reception’ (Figure 7.99).

![Figure 7.99: IS's design idea indicating the change in the lighting scheme](image)
ANP discussed a lighting scheme that would involve luminous ‘lines on the ceiling’ and pendant lamps above the seating area with the appearance of ‘bubbles hanging’, which would be ‘more intimate’ when these pendants were placed lower and closer to the tables, and the placement of some ‘spots on the reception’. Later, ANP replaced the luminous lines on the ceiling with electroluminescent tape in the shape of dots, and she also added interactive surfaces on the floor with the intention of highlighting people’s movement when they were walking through (Figure 7.100).

![Figure 7.100: ANP’s design idea indicating the change in the lighting scheme](image)

There were some participants who used interactive surfaces on the seats: for example, NTL, who originally decided to create a lighting scheme that would focus on the circulation, explained that she used ‘interactive surfaces on the seats so that when someone sits, it would emit light’ and she also applied them ‘on the reception desk, so that the surface would light when they [paid]’ (Figure 7.101).
In addition to her use of polyethylene discussed above, MRE also used interactive surfaces (see her design in Figure 7.89). She first argued that her aim was to use linear light below ‘each of the steps’ so that they would seem ‘to be elevated or floated one from the other’ but also ‘on the bottom of the reception’. Then she decided to also use interactive surfaces on all the steps so that she would add some interactivity between the users and the environment (see Figure 7.89).

ANS designed a lighting scheme in which she would place ‘linear light on the corridor to direct movement and connect spaces’, as well as ‘spot lights on the tables’. Later ANS decided to add Scintilla Lumina on the partitions of the space to block the visual aspect and to add interactive surfaces on the tables to create visual interest (Figure 7.102).
DN’s intention was to create brightly lit walls while the rest of the space would be in darkness. She then decided to enhance this idea by adding interactive surfaces to the walls, but also adding them to the table in the seating area and to the reception counter (Figure 7.103).

![Figure 7.103: DN's design idea indicating the change in the lighting scheme](image)

Finally, EMR’s and ALS’s lighting schemes can be influenced by adding the light transmitting concrete in their design idea. EMR initially did not apply any lighting on the ‘box’ he designed and later he explained that by using the light transmitting concrete he would make the ‘whole box glow’. In a similar way ALS explained that she would increase the lighting levels on the corridor behind the light transmitting wall so that the ‘theatrical projections of people’ would be seen.
Poetics describe multiple sensorial experiences in a space. Poetics deals with a language that communicates the aesthetic dimension of the space, as well as the psychological one. This means that in architectural design, there are elements that can provoke people’s emotions through visual stimulus. Depending on the function of the space, poetics differ from one space to another. Poetics can be decomposed into the space’s syntax, aesthetics, poetry, experience, language and memory but poetics can also highlight the distinction between the space and the place.
Concerning the poetics of the space, one of the aims of this study was to understand the architects’ intention and the particular feelings they wanted to evoke in the visitors. What follows is a description of the architects’ initial intentions and how these were changed after the application of the lighterials.

The evidence shows that almost in all cases the poetics of the space were either enhanced by the application of the lighterials or totally changed. There was only an example showing that the poetics did not change. We look first at the examples of where the poetics were enhanced in the design ideas of participants IS, ANP, KN, MRC, JL, STP, ADM, NL, KCH, NY, STO and ANS.

IS explained initially that her concept was based on the idea of a space that ‘gives you the feeling that you have to start walking faster because you feel trapped. If the space widens you start walking slower, if it becomes narrow you are walking faster. So people almost run from the lift and then start slowing down and then [go] faster towards the light. The space is more compressed and there is the tunnel which acts as a filter area.’ She described this effect as ascetic and minimal and the design of a space as ‘more about how you feel rather than indicating to you somehow what to feel. It is an abstract space with simple lines. They lead your behaviour without knowing why’. By adding the interactive surfaces on the floor she managed to accent the ‘trapped’ effect, since people would feel ‘trapped’ in the light and would need some time to adjust. This application would also make people walk faster or slower according to the interactive surfaces and their reaction to the particular effect. Further, the fact that the interactive surfaces were applied on all the floor areas of the whole transition space increased the feeling of curiosity, which again the designer wanted to add to the users’ experience.

ANP designed a space that would be ‘playful, curious, a positive space’, incorporating elements within the space such as screens, colourful carpets, furniture with a distinctive pattern and graphic lines on the floor. This playful and curious atmosphere was later reinforced by the application of the interactive surfaces, making the circulation more fun and positive.

KN explained his intention to create a tunnel or a corridor into the space, where the visitors would feel trapped and would potentially have only two options to exit. He also discussed how a space with a characteristic pattern that would make the effect stronger. This idea was later reinforced by the application of the light-emitting substances, which were added
within the pattern of the wall in the form of paint. KN aimed to make the pattern of the wall more uniform in spite of its complex composition of squares and dots.

MRC described big, round elements in the space that he called ‘islands’, which would be used as a seating area and would make people interact with each other and with the space itself. He explained that his objective involved the creation of a ‘cosy, multipurpose, inviting, playful, colourful space’. By adding the interactive surfaces to the seating in these elements he created the inviting and playful atmosphere he wanted inside the islands. As soon as people sat, they would experience ‘a ball of light’ surrounding them. This experience would also make the seating area cosier. Moreover, MRC added polyethylene walls around the reception area aiming to capture the attraction of the people and to enhance the interactive atmosphere. To do this, he ‘attracted the movement’ of the users by placing LED coloured light within the polyethylene partitions, which would follow their movement and then turn off as soon as they leave the area. These made the overall experience of the space and its appearance look even more colourful and inviting, imparting a playful and interactive mood to the visitors.

The idea of JL’s design was based on the creation of a ‘delusion’ for the visitors, which as she explained it ‘should be cool, feel like cool-cold weather’. For this purpose, she added trees as a major element into the space, bringing an exterior feeling in the interior space. That idea was later reinforced by placing OLEDs on the columns of the space, and also by replacing the existing luminaires with Planilum. Both lighterials, OLEDs and Planilum, have a white cool light appearance adding to the feeling of a cool environment. Yet, both elements enhanced her aim of making the space ‘elegant without being intimidating’.

STP used the expressions ‘maturity’ and ‘elegance in the materials’ to describe the major characteristics of his design. This idea was later strengthened with the application of the polyethylene soft wall, which brought the feeling of a more private space, an ‘enclosure ... that wouldn’t look like an archive’. In addition, following his wish to make ‘an informational space’ using ‘the architecture of the space as a message’, he incorporated the active surfaces above the reception of the pavilion.

ADM had the idea to create a transition space where the visitor would be able to ‘stay in place, travelling without moving’. He wanted the visitors to experience this transitional feeling by seeing themselves ‘in multiple places at the same time’. He portrayed this space as ‘an adventurous space’ where everything would have to do with exploration, which wouldn’t necessarily be ‘a pleasant thing’. He aimed to evoke emotions that might be
either pleasant or unpleasant but would definitely add ‘a disturbing feeling’. By applying
glass mirror in a couple of the voluptuous cocoons he designed as rooms or seating areas,
he aimed to enhance ‘the effect of the distortion’. When the two cocoons became
luminous, light would be reflected on the surface of the other cocoons.

NL proposed a design that would be ‘slightly contributive’ (i.e. discreet) into the space and
‘just simple, not too many crazy forms’. However NL’s design aimed to give people the
feeling of an ‘essential arrival’, like ‘a punctuation mark’. NL explained that in his design the
key element was the view from the window. He therefore decided to enhance the feeling
of ‘the punctuation mark’, by adding electroluminescent tape as a frame around the
window. This luminous frame would be an element that people would notice as soon as
they arrived in the space, making them move towards the end of the room where the
window is.

KCH planned a ‘welcoming’ space, setting the play area as a very important space that
would make the whole area feel ‘soft, cosier’. His intention was to design a space that
would be both very relaxed and playful. By changing the reception desk to a polyethylene
luminous volume, he turned people’s attention towards it, enhancing the welcoming
feeling. The addition of interactive surfaces in specific areas added to the playful
atmosphere, especially in the seating and the play areas, where people could become more
interactive.

NY did not want to design a space that would make the users ‘feel enclosed’ but wanted
them to ‘feel the totality of the space’. The general characteristics of the space were formal:
‘proper, elegant or sober’, with delicate characteristics. To enhance this atmosphere, she
decided to put light-emitting substances within the pattern of a wooden patterned wall
designed as a key feature behind the reception desk, adding to this delicate feeling.
Further, she replaced the sofa that was located in a strategic point in the centre of the
space with a luminous polyethylene volume, to invite users to ‘feel the totality’ while sitting
there.

STO in his analysis of his design gave emphasis to the poetics of the transition space as
being a ‘well-defined boundary between the waiting area and spaces A and B’. This
intention was enhanced when he added electroluminescent tape on the floor, which
surrounded the seating area, with an intention to ‘define the edge of the specific area’ and
to distinguish in this way the different uses of the space.
Finally, ANS’s aim was to design a space that would be ‘light and playful’. For this reason she replaced the plasterboard partitions with Scintilla Lumina, in order to provoke ‘visual stimulation, visual interest, either discreet or complicated’. In addition, she insisted that the space’s character was playful, importing multicoloured tables and chairs into the space, as well as logos and graphics. However, she later decided to enhance this quality by adding interactive surfaces on the bar surface as well as on the tables. In this way she intensified her initial decision of creating ‘an adult’s kinder ground [playground]’.

In contrast to the previous examples of where the application of lighterials enhanced the poetics, there is also evidence that for many participants the poetics of the space changed after the application of the lighterials. Such evidence was found in the dialogues of LF, MCI, MRE, ALS, LH, DN, TS, NTL, HDR and EMR. LF initially designed a ‘light, lively’ and ‘attractive’ space, which involved design elements that brought into the space ‘a transparency, an open feeling to the exterior’. Afterwards, LF decided to cover the panels that acted as key elements in his design separating the private space from the public with OLEDs, placed on only one side of the panels and explaining that ‘the other one should be solid’. The reason he did this was to increase privacy towards the corner of the space and to create a ‘focus’. This action altered LF’s initial intentions of having transparency in the space and having an open public space.

MCI initially discussed her design intention as the creation of a space that would have a residential quality combined with the elegant style of a gallery. Further, she insisted in having two different spaces; two seating areas and two reception desks in order to distinguish space A from space B. However, when she decided to import graphics made of light-emitting substances into the ceiling and on the carpet, she created a central feature in the entrance of the space, altering the residential quality she had referred to earlier to a more corporate atmosphere. In addition, the particular point where the feature was positioned within the space would act as a connecting element instead of separating the two different areas.

MRE designed a space that had two different characters: ‘one static and the other movement’. She explained that her intention was to design a space where people would have a choice between relaxing, choosing the seating area designed with ‘natural organic shapes’ and ‘natural colours’, or moving, enjoying ‘the moment of transition’. Nevertheless, by importing the interactive surfaces on the steps, she altered this distinction between the seating and the moving areas, making the space more interactive, allowing people to act more spontaneously and to become ‘more active’.
Another example comes from the design concept of ALS, where she discussed an ‘atmospheric space’ that would ‘give mystery’ to the visitors. She emphasised that her objective was not to ‘overload’ people ‘with information’ and that she wanted to create a feeling of ‘anticipation’. However, this space was eventually changed to a ‘joy‐fun‐social‐convivial’ space after the application of the lighterals. More specifically, by adding Scintilla Lumina tiles to the partitions, ALS really enhanced the feeling of anticipation within the transition space and made the elements more attractive. The application of light‐transmitting concrete on one side of the space changed the poetics of the space by adding to it ‘theatrical projections’ of the people walking by appearing as silhouettes, making the atmosphere more sociable and fun.

Another participant, LH, explained that the space he designed was ‘calm and settled’ and ‘gentle’. After explaining that the ramp was the key element of his design, he clarified that the design of the space would ‘not have a strong effect’ on the users and that someone should ‘spend time and be sensitive to feel the space’. He chose all the materials to be a neutral concrete grey so that people would pay attention only to the ramp itself and perhaps also to the ceiling, which would be the only element apart from the ramp, which would have a ‘geometrical pattern’ and would potentially have a geometrical relationship with the ramp itself. But by introducing into the space the OLEDs placed on the perimeter columns, he changed the lighting effect, adding a rhythm around the space that would potentially have a geometrical relationship with the ramp too, grabbing visitors’ attention while guiding them around the space. After all these changes, the architect explained that the space he designed was a ‘subtle’ space that provokes particular feelings in the people who use it.

DN, on the other hand, explained that the space she designed was ‘formally interesting’ with a very well-organised circulation. By adding interactive surfaces to the corridor walls of the exhibition space, the table of the seating area and the reception counter, she turned the space into a playful and interactive environment. After the completion of the experiment DN discussed a design idea that implemented ‘variety in closed and open subspaces’, creating a variety of different moments within the space.

TS explained that his aim was to design a space that would be almost like ‘an airport lounge, cosy’ and that would provide a lot of information. He discussed the key idea of the design as being that ‘the plan is open to see through the other side’ and he decided that all the furniture should be made of glass because he did not want to ‘block the visual connection’. This idea was altered when one of the two main volumes was changed from a
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glass structure to one of Riverstone bricks. This change differentiated the two volumes, making the one made of Riverstone bricks stand out more and altering the way people see the overall space. Further, he enhanced the feeling of enclosure in the waiting area by creating three-dimensional Barrisol domes on the ceiling above. The shapes of these domes, their position and the fact that they were luminous, would act as an inviting element, challenging people to walk towards them.

NTL proposed a ‘dynamic, positive’ design that would create a playful atmosphere for the visitors, but ‘at the same time’ it would be a space that would be ‘pure, not so impressive’. This idea, however, did not apply to the seating and the reception area once the interactive surfaces were introduced. The application of this lighterials made the character of the space more playful. In contrast to her earlier thoughts, the interactive surfaces would attract attention, adding to the playful atmosphere of the space in a less discreet way than initially claimed by the architect.

Finally, EMR designed a box within the space, enclosing in it the entrance and the reception desk. This solid box made of wood was later was replaced with light-transmitting concrete. Initially, EMR explained that this box would be of wood, because this material combined with the design itself would make the overall space ‘quiet and very sophisticated’. The architect explained that wood as a material would add ‘a sense of warmth and seriousness’ into the space. This whole feeling changed when light-transmitting concrete replaced the wooden box. The light-transmitting concrete would not create the same feeling as wood, but as an application combined with the properties of the material, it would make a ‘real transition’, as the designer said. He described the overall experience of the space as ‘when someone comes in and looks through they can see silhouettes and light coming through from the perimeter and in the evening the whole box would glow’. This description does not refer to ‘a quiet and very sophisticated’ space.

7.3 The questionnaire

As explained previously, at the end of the experiment each of the architects had to complete a questionnaire. (Appendix XV) The following results show how participants responded about the poetics, the lighterials and the process of the experiment as well as to the lighterials’ future. All but two of the 24 participants explained that they used the poetics in their concept design (Figure 7.106). All except one participant enjoyed designing taking lighterials into consideration (Figure 7.107). The participants were equally divided
into those who found the process interesting and those who found it challenging. Only two participants thought the process was difficult (Figure 7.108), referring particularly to the limited time they had in the interviews to use lighterials. Just over half of the participants thought that lighterials were useful and seven found them interesting but only four characterised them as important (Figure 7.109). Half of the participants explained that they had used lighterials before in real life projects (Figure 7.110). Most participants said that lighterials enhanced the design process, while only four thought they did not affect it and only one participant thought they hindered it (Figure 7.111).

Figure 7.106: The number of participants that incorporated poetics into their design proposal

Figure 7.107: Participants views on whether or not they enjoyed the architectural design procedure with the lighterials

Figure 7.108: Participants’ views on the process of using the lighterials
There were 19 participants who thought that the lighterials enhanced the concept, giving some comments to explain their opinion further. One of the participants believed that working with the lighterials was another form of perception and changed the notion of the space actively and passively, whereas another one explained that this experiment made him approach light as a material equally as useful as an active material. Others stated that this process allowed them to look further in the design, and their use brought new ideas into their concept, enhancing it in the process. Further, they added that lighterials made them think of the space in different terms. Another participant explained that the use of light gave hierarchy in space and that it visually allowed people to understand movement,
important functions of the space and the elements of the design. And another said that this process helped him materialise the concept and his intentions perfectly, emphasising the unique benefits of using materials that included light as a property. A few other participants believed that using lighterials strengthened the concept and allowed architects to significantly alter the quality of the space. For others, the lighterials engaged with the visual sense more and the use of lighterials provided small detailed design ideas that made the overall design more specific. Lastly, there were two architects who commented that the lighterials should be incorporated into the design process from the beginning as part of the concept rather than as an additional element imported at the end of the process, making it something more than just a fashionable finish.

However, architects also mentioned the difficulties they faced while working with the lighterials. The most common difficulty was that they lacked the technical knowledge of how exactly they could apply lighterials in the space. This also related to their lack of knowledge of the quantity of light that these materials would eventually bring into the space and how strong the light effect would be. Other participants were confused as to which lighterial was the best to apply to the specific design idea. Someone else mentioned that he found it hard to balance the space already designed with the new ideas that lighterials brought into the concept. Another participant explained that it would be better if he could see the materials in reality and therefore understand their properties better. And another suggested that if there were lighterials typologies it would help architects to choose the appropriate lighterial that serves their idea better. One participant considered lighterials as a complementary element in their design that could be added near the end of the process, while another participant thought the opposite. Finally, one of the participants expressed a concern that lighterials could become overwhelming if used too much and questioned whether their use should be limited to particular functions of the space such as entertainment spaces.

Another question to which architects responded was whether they believed that lighterials enhanced the poetics of the space. All but one of the participants responded positively to this question (the exception didn’t know) (Figure 7.112). Many of the participants argued that lighting and poetics were connected, and one of them said that their connection was very interesting: approaching light as a material to transform the mood and the identity of the people using the space. Another person explained that light was a natural source for sensorial experiences and if used in the correct way lighterials could be very poetic. One of the participants focused on the lighterials’ quality of changing the atmosphere of the space.
and dramatically enhancing its poetics. Another clarified that using lighterials could help architects create more interesting moments that would be different from the standard design, while enhancing the story of the space and highlighting areas and particular effects. Some other opinions were that lighterials enhanced the dynamic feeling, increased the interactive use of the space and allowed for greater creativity and a greater degree of expression. And one person presented light as the most important aspect of a space. Designing with integrating light within the structure made participants think of light as part of the language of the space. One participant projected lighterials as tools to be used in order to replicate/translate the daytime experience to the night time and another commented on using lighterials to underline certain aspects of architecture. Another participant concentrated on the relationship between the lighterials and the space and how light influences the views of the space.

![Figure 7.112: Participants' opinions on whether lighterials enhanced the poetics of space](image)

Participants also saw lighterials as forms that an architect could use to make new effects, and another explained that these materials made things more visible. Finally, lighterials were believed to add another layer or level of interest in the space provided the result was not overwhelming or too busy and cluttered architecturally; to prevent this it was suggested architects should use just one lighterial in the space.

The participants were also asked whether they would use lighterials again in the future; the answers were all positive (Figure 7.113). All participants argued that such materials had the potential to enhance the aesthetics and the character of the space, as well as the creativity of the architect. Further, some of them expressed the view that lighterials were innovative, fun and interactive, while others believe that they could change the atmosphere of the space.
Most of the participants agreed that they would import the lighterials into the architect’s palette of forms permanently (with only four disagreeing and two undecided) (Figure 7.114), while a similar number of participants believed that as using these types of material in architecture is becoming common the application of lighterials and information about them and lighting design should be incorporated into architectural education (Figure 7.115). One of the participants pointed out that architectural education should link to the latest products and technology developments. Another suggested that deciding to incorporate lighting and lighterials in architectural education would mean that it would broaden the possibility of integrating new materials in architecture, and another believed that they could build complexity into spatial design and add to experience. A similar idea from another participant was that any element that helped to enhance the architectural design should be part of the education of the architect. There were also participants who, although they disagreed about the necessity of including lighterials in architectural education, did agree that lighting was becoming increasingly important and taking a pivotal role in architecture.

The participants agreed that it was always exciting to work with lights; however, their opinion was that while all architects should be aware of the potential and the existence of
Analysis of the Interviews

these materials there incorporation should be in discussion with a lighting designer. One participant supported the idea that lighterials should be taught in a basic way as for any other material, such as concrete or brick, so that one could understand their possibilities, adding that their incorporation into the design process could help an architectural idea reach higher complexity and intricacy.

Of the participants who disagreed with the idea of including lighterials in architectural education, one felt that these materials should be taught as part of building technology and their teaching should not be mandatory, while another said that they were too costly but that they become more affordable as soon as architecture is more connected to lighting. Some participants did not consider exposure to lighting an integral element of a design, whereas some others worried that students might use lighterials in the wrong way and add potentially excessive information in the space.

From another perspective, lighterials were not yet widespread enough to be equated with timber or steel, therefore it was not appropriate to include them in architectural education. Another participant proposed that there was no need for formal introduction of lighterials into the educational system: if students discovered these materials by themselves that would ensure that lighterials remain special. Further, there was one person who suggested that lighting is an important element in architecture and it is important to understand how it works, not just as an element in itself but also in how to achieve materiality. Finally, one person explained that lighterials should be taught as an optional part of a module since they were not ‘everybody’s cup of tea’.

Figure 7.115: Participants’ opinions on incorporating the lighterials into the architectural education
Chapter 7 presented the findings of the protocol analysis collected from the interviews. The main finding of this study is that *lighterials* influence architectural design results if imported after the development of the architectural concept. More specifically, the analysis showed that all the elements of the design were influenced and that the elements mostly influenced by the application of the *lighterials* are the poetics, the lighting scheme and the materials. Further, the participants of the experiments explained that *lighterials* should be included in the architects' palette of forms and that they see a positive effect in the use of luminous forms as part of the architects’ education. In the following chapter, the conclusions from this research are presented, deriving information from all the studies (pilot study, case study and interviews). Also, the aspirations and the limitations of this research thesis are described, as well as the inconsistencies. Finally, the author discusses the possibility of looking at light as architectural form, drawing on the principles followed in this research study.
This chapter discusses the outcomes of the research and its importance for architectural and lighting design. It presents the aspirations of the research and debates the reasons that make the structure of the main experiment successful, as well as describing the limitations of the research and any inconsistencies that should be taken into consideration in generalising the findings. Discussion of whether light can be approached as an architectural form, examining the validity of this idea based on the results of the experiments and the use of the lighterials, is followed by analysis of the future of architectural lighting design based on the criteria set by this study and on the dialogues of the participants and practitioners in the lighting design industry. Finally, a conclusion summarises the most important ideas and aims of this research study.
8.1 Conclusions

This research study indicates that luminous forms influence architectural design concepts. The analysis of the results showed that, of all the elements that shape architectural space, the lighting scheme and the poetics of the space are the elements that can be influenced the most by the application of lighterials. On the other hand, the transition zones, the boundaries and the circulation of the space are the elements that are influenced the least.

The analysis of the results also showed that most architects were able to incorporate lighterials into their design ideas and, in most cases, this action resulted in the reinforcement of their design idea and the poetics of the space. However, one cannot ignore the fact that participants who used lighterials from the beginning of the design process found them difficult to use and were reluctant to use them (results taken from the case study). This may be because they were dealing with a real life problem and did not have enough technical knowledge about lighterials, which restricted their use. On the other hand, the architects who introduced lighterials at the end of their design process were very confident about how they could incorporate them into their design and what they wanted to achieve (results taken from the interviews). Again, this may have to do with the fact that the architects are generally used to incorporating lighting at the end of the conceptual phase in their designs, and therefore they feel more comfortable working in this way.

However, both experiments suggest that using lighterials helped architects to enhance or to change the poetics of the space. This means that the lighterials helped the architects to express the intention of their design in a better way or more effectively, or to change their intentions. This information is important, since bringing lighterials into the space can dramatically influence an architect’s intentions, and it is therefore recommended that any decision to incorporate lighting in the space in this way should involve further research by the architect.

In looking at the intention of the architect and how it is linked to poetics, this research shows the changes that lighterials can bring to the space and how that can affect the architect’s intentions or decisions. So far the literature has suggested that artificial light can be used for many and various reasons in the space, such as to give form, guide, highlight, create atmosphere, emphasise, transform, stretch, reverse, distort, signify, dim, focus, diffuse, scatter, show presence or contrast aesthetics, or for symbolism or functional
reasons. The results of this study confirm some of the above roles of light, but also add a few more (see Figure 8.1).

The results from both the case study and the interviews agree that architects can use light to create directionality, space division, circulation, effects and connectivity in a space. The data collected from the protocol analysis procedure demonstrated the architects’ intentions of using light for surveillance, uniformity, blockage, blurring, framing and transition. Using light for surveillance could link to emergency lighting in interior spaces, but it has not been an issue so far from a conceptual point of view, where the designer uses light to track people using particular parts of the space. Further, using light to obtain
uniformity is a new approach to the role of light, not in the sense of uniformity of light levels, but instead using light to unify elements within the space or demonstrate a conceptual idea where uniformity is a key element in the design.

Moreover, the evidence showed that lighting can be used to block the view from one space to another or as an obstacle to divert movement in the space. Further, a few of the lighterials gave a blurring characteristic to the light. Some applications involved the use of light as a framing material, rather than a highlighting tool. Finally, light itself was used in the experiment as a transitional element that can link a change from one state to another. These new qualities were introduced into the space through the lighterials, leading to conclusions about using luminous form and light in new roles.

The applications of the lighterials showed that they can correspond with typical architectural forms: lines, planes and volumes and their qualities, such as contrast, scale and pattern. The results obtained from the different studies of this research confirm the hypothesis of this study, which says that lighterials can be perceived and used as architectural forms. This statement is supported by the way that the lighterials were used and the way they were indicated on the drawings.

Based on the findings, the lighterials were used less frequently as lines and more often as planes and volumes. The planes and the volumes differed from idea to idea in pattern, scale and contrast. Further, the approach of light as form became clearer when the lighterials were represented graphically on the drawings frequently as lines, planes or volumes sharing particular characteristics. In the participants’ sketches of the lighterials, some of the lighterials were indicated as linear forms but more often they were seen as two- or three-dimensional frames accompanied by a symbol (such as an arrow) or a letter. The most common way of representing lighterials graphically was by using small lines around the relevant shape, which was either a line or a plane or a volume, making it appear to radiate. This evidence shows that if the designers had to communicate to each other through their drawings the lighterials or any form made by light, they could potentially use these specific graphics.

According to the data, most designers and architects used symbols, such as arrows, dots, letters and straight or curved lines, to indicate lighterials such as polyethylene furniture, light-emitting substances, active and interactive surfaces, Planilum® or glass. On the other hand, almost the same number of participants used symbols inside a frame (a plane) to indicate lighterials such as polyethylene furniture, OLEDs, light-transmitting concrete and
Barrisol®. Then again, several participants indicated *lighterials* such as polyethylene, OLEDs and glass by showing a frame that radiated. Further, some of them drew a pattern to indicate mostly the interactive surfaces and just a couple of them indicated a symbol in the elevation as well as on the plan drawing. Another way in which the architects showed interactive surfaces was by drawing irregular shapes within an area where the surfaces were applied. And some of the participants in the case study used either gradated or uniform yellow colour to symbolise *lighterials*.

From the information received from all the participants in all studies, it is interesting to notice that the majority of participants see *lighterials* as architectural forms and believe that they should be incorporated into architectural education. Further, even though half of the participants who took part in the studies had never used *lighterials* before, they were positive about using them in their future practice and they would be interested to learn more about them, and about lighting in general, as an integral factor in architecture.

To conclude, the data shows that there is a lot of information deriving from the use of the *lighterials*. The fact that particular *lighterials* can be used in a specific way, or that a specific group of *lighterials* can be used for particular reasons, could help architects categorise them for further use. In addition, when considering incorporating *lighterials* from the beginning of the process the participants eventually decided that *lighterials* enhanced the process. On the other hand, when the *lighterials* were introduced at the end of the design process, the architects saw them as interesting and useful forms, agreeing that they definitely enhanced the process. In both cases, the architects were positive about using them again in their future design activity and that *lighterials* should be considered as architectural forms and should therefore be incorporated into architectural education permanently.

### 8.2 Aspirations and limitations

This research explored how *lighterials* could influence architectural design concepts, focusing on the conceptual design process and the result itself. The design process was explored through the testing of a new procedure involving key elements, such as the *lighterials* and the poetics, reflecting on the strategies used. Both the design process and the result were approached through the use of the appropriate methodology, the think-aloud protocol, in order to understand in depth the architect’s intentions. Architectural design concepts are all about the intention that the architects have to create a specific
outcome in the space. When discussing architectural design, the focus is on the architect’s intentions to create a specific space that functions in a specific manner and that potentially has specific poetics, which might be communicated through the design successfully or not.

This study focused on the architects’ design ideas and especially on their intentions. By looking at how the architects dealt with a new factor, the incorporation of the *lighterials* into their design, the study aimed to understand in depth how this would influence their intentions before the end result. The question that arises is whether light introduced into the space as an architectural form influences the outcome, described through the way it influences specific elements that compose the space.

8.2.1 Aspirations

The results show that the introduction of *lighterials* into design concepts can highly influence the elements of the space. Their impact shows that light can change the intentions of the architect in a precise and thus important way. This information is valuable as it shows which elements of the space could be most influenced by the *lighterials* and how, but also how the architect’s intention is influenced. The literature indicates that the introduction of light and therefore of *lighterials* into a space can help architects determine the syntax of the space, the feelings, mood and experience of the user as well as the language and the relationship between the space and the place, the memory or the reactions and the interactions, all packaged in the word poetics.

Combining *lighterials* with the objective of bringing poetics into the space helped architects to think of architectural space in depth and to compose all the elements with the aim of enhancing the users’ experience. This was especially the case when the *lighterials* were considered from the beginning of the design process. The incorporation of poetics into the design process helped architects to construct a story through their design that would add to people’s experience.

In addition, testing the application of the *lighterials* after the establishment of the design concept gave information about which elements of the design could be influenced the most by the luminous forms. Further, knowing in advance how luminous forms can influence the design can motivate architects to use them in particular ways to provoke users’ actions and feelings and to create poetics in the space by the use of light. This research also suggests that the poetics of the space were either enhanced or changed by the application of the *lighterials*. The examples showing that the *lighterials* enhanced the poetics also demonstrate a successful connection between the use of light and the architects’
Conclusions and Discussion

intentions. The examples showing that the poetics were changed demonstrate that architects have to adjust their idea to the new orientation that the light forms bring to their design concept.

This study shows that when the new applications of lighting are combined with the architect’s creativity, they can produce fruitful results in the development of both the architectural and the lighting design concepts. This research, therefore, adds to both fields, since it presents a new way of approaching architectural design in which light can direct and highlight the intentions of the architect.

The different studies conducted in this research thesis aimed to collect information in order to build up knowledge on the use of the lighterials and their impact on architectural design concepts, involving both students in architecture and in lighting design and experienced architects. This variety in the background of the participants gave insight to the research questions from different perspectives and levels of difficulty. It is important to highlight that despite the different backgrounds (architecture and lighting) all the participants who took part in the experiments enjoyed the procedure, claiming that they gained new information from it. Some participants found that the experiment was interesting because it challenged their skills, while others said that they have never thought of working with light in this way and that this process added a new perspective to their conceptual design. A few of them found that the different stages of this experiment, especially the design analysis stage, helped them to analyse their design and understand it better while explaining these elements. Other participants discussed the importance of light in architecture. They expressed the view that this study demonstrates the power of light in the development of a successful architectural project. Furthermore, they argued that lighterials, being innovative materials, could give architects an opportunity to challenge their ideas and build on them.

The participants of the interviews also explained at the end of the experiment that if they had been given the chance to work with the lighterials from the beginning of the process they would have created a totally different concept. This means that the path followed in this research – two different experiments, one with architects working with the lighterials from the beginning of the process and the other with those who did not know about the lighterials and had to incorporate them at the end of the process – was a valid decision, since it eventually showed different results. It is important to take this feedback into consideration since it derives from experienced architects who have worked on architectural projects before.
Moreover, the methodology used in this research study, the think-aloud protocol method, provided the background for gathering real and sufficient data. The data is rich in terms of both verbal and visual material supported by sketches and videos. The use of this method delivered comprehensive qualitative data that could be used for future research studies in architectural design and also in the lighting design field. Further, this data could be used to develop further this research outcome, analysing some particular parts in more depth.

This study also introduced two terms, ‘poetics’ and ‘lighterials’. Poetics is a term that has been used previously in architecture in designing with daylight. But in this research poetics was used to investigate the connection and the composition of artificial light in the interior design concepts. The use of this term has proved to be positive for this study because using it provoked architects to create a story in the space, making them deal with their concepts in more depth. On the other hand, the term lighterials was coined by the author for this study to explain the new lighting applications and materials that emit light in just one word. The architects that participated in this study were enthusiastic and positive about the use of this term because, as they explained, it simplifies but at the same time categorises all these materials that can emit light. The architects also explained that they prefer to categorise the materials as lighterials when they emit light because it is easier for them to use. Finally, the experiment proved that there is a big difference between architects and lighting designers in the way they organise different materials, showing that architects prefer to categorise different materials, which helps their incorporation into design concepts, while lighting designers feel that such categorisation is unnecessary for the development of their work.

In addition, the word lighterials was used as a shorthand word for light-emitting materials or luminous materials. Incorporating a new, simplified term helped the author refer to these materials easily. By using it consistently throughout this thesis, it has allowed the reader to group them instantly as a special category of materials that relate to new applications of lighting. Also categorizing the luminous materials made their characteristics more distinct leading to an easier comparison between them and therefore to exploring them as architectural forms. Further, the development of the lighterials as a special category of materials was allowed due to technological advancements, such as the construction of small in terms of dimensions lamp sources (LED or OLED) and the new ways to construct lamps (Planilum). This categorization will help researchers using new lighterials in the future with similar characteristics.
The term also helped architects to widen their horizons and think of *lighterials* not just as materials that emit light due to the modern technologies, but as any material that is a composite and can embody light. This means that *lighterials* can be expanded as a category and include new luminous applications. The *lighterials* were used for the execution of the experiments and served its role for the intention of this research study, but has the potential to be used again in the future.

Finally, even though this thesis focuses on interior spaces, the same ideas can be applied not only in interior spaces, but at the scale of the building as a whole. The design of forms in the urban context can be composed viewing lighting and architectural design as unified fields as this thesis demonstrates, approaching their surfaces and their volumes as luminous or non-luminous. After deciding to incorporate the poetic factor in this research, this thesis focused only on interior spaces because previous research has stated that most poetic qualities are being experienced in interior spaces (Papakammenou, 2008).

### 8.2.2 Limitations

In spite of its success, there are some aspects that weakened this research process. First, not only did the two studies have a different timeline, but also the amount of information given to the participants differed significantly. For example, the participants in the case study, the MSc students, had the chance to visit the site and to attend an analytical lecture on poetics and *lighterials*. They also had sufficient time on their own to research further on these. For these reasons, the study that focused on the data received from the MSc students was used as a case study, aiming to test some important parts of the interviews that took place in a later stage.

Second, part of the research study was to find out how architects could communicate the *lighterials* graphically in their drawings. After analysing the data of both the case study and the main experiment, the evidence showed that *lighterials* can be presented graphically in the drawings through various ways. Most of the participants indicated the *lighterials* graphically by using a line, plane or volume appearing to radiate. Using such graphics in the future could help the architects distinguish the luminous forms from the non-luminous ones and allowing them to communicate their ideas better to the lighting designers.

However, even though both studies demonstrated how *lighterials* could be shown on the drawings with the use of conventional ways of presentation, such as plans, sections and elevations, the interviews show that it is difficult to communicate the poetics in this way, given the fact that *lighterials* were used to create specific poetics. Perhaps the use of
visualisations would be better for architects to express their intentions and this is an idea that should be explored further. An example that shows the importance of communicating the qualities of the space through designs lies in the writings of Robin Evans (1997) on Mies van der Rohe’s Paradoxical Symmetries. Evans, while discussing light and its properties and how it influences architecture, focuses on two principles: the form and the matter. He comments on the drawings of the Barcelona Pavilion, explaining that the drawings of a building do not represent the values that light add to the architectural masterpiece: ‘That is one reason why the drawn elevations give no idea of what it is like, and that in turn is one reason why it was a surprise to find, right in the middle of the pavilion, a slim, opalescent, luminous box of glass … despite its brightness, the luminous box is surrounded by obscurity. Where is it in the photographs, descriptions and drawings of 1929?’ (Evans 1997, p. 256). Even though this example refers to a real life built project, the ideas involved apply to the findings of this experiment. The story or the poetics that express people’s connection to the space and are highlighted through the use of light are not easy to represent in drawings such as plans, elevations and sketches. This means that further research is needed to find a better way of communicating the whole idea.

Finally, it is important to point out that the relatively small number of people involved in these experiments makes the findings difficult to generalise. There were 28 design studies retrieved from the main experiment. But only 24 samples out of the 28 were used for the coding of the data and the analysis of the results. The other four were not included for various reasons. For example, three samples were used as pilot studies to test the site, the timeframe of the interviews and the different stages, which eventually did not follow the structure of the final interviews. And one of the samples had to be disregarded because the architect could not follow the think-aloud method. However, 24 samples is a very small percentage considering the number of practising architects. Consequently these results cannot be generalised; however, they can be considered as information that represents the small number of people participated.

8.3 Inconsistencies

Setting the theoretical background for this research was quite challenging following the decision to introduce new terms to support the literature. Throughout the whole study the two words, lighterials and poetics, were subject to negotiation about the validity of their use in such a research topic and their wider understanding from the readers. There might
be readers who disagree with the terms used even if they have read and understood the reasons why they were used. Further, there might be readers who like the terms used, but they would disagree with the definitions. The feedback received from people from the lighting design field who participated in the case study was negative on the use of the word poetics: most of them believed that poetics was a very abstract term to be used in lighting design, not referring to something particular, and confusing. The word poetics can indeed confuse people, especially those who have never read about it or do not know how it connects to architecture. However, while poetics appears not to be in common use in an architectural context in Europe, in some countries, such as the United States of America, architects and lighting designers frequently use the word poetics when referring to the experience of the space (see, for example, Zumthor 2000; Hamilton 2006; Fortkamp 2005; Van Schaik 1977).

Further, the evidence showed that lighting designers found the term poetics very theoretical in their field since it is a field strongly connected to science. However, as explained in Chapter 3, research that wanted to approach light as an architectural form would inevitably use a theoretical background (Hillier, 2007) and this is the reason why the word poetics was used instead.

A further potential source of inconsistency is that while analysing space the author drew parallels between the elements used by Michel and those used by Suwa and Tversky to analyse space. Nevertheless, there were particular elements in the two studies in which there is controversy over whether they match in the meaning (e.g. pattern or curvature and angles/shapes) or whether they should be enlisted together (e.g. curvature and physical connectedness). Abstracting and analysing elements of architectural space, though, is complex, due to the fact that all elements interconnect, and this can cause misunderstanding of their meanings.

With regards to the structure of the questions used to indicate the elements of the space in the design analysis stage, they were quite complex (as explained in Section 6.3.2). Instead of posing the questions in this way, it might have been more helpful to have divided each question into a number of smaller questions that would give enough information for all the elements. This would allow architects to be more descriptive about their intentions in their concept design and the results of this research would then be based on more reliable data. However, the pilot test studies done before the interviews showed that architects understood the questions about the elements and therefore the questions were not changed.
In addition, including in the list of elements ‘material’ and ‘lighting scheme’ can be regarded as inconsistency. One must expect that since *lighterials* are materials that emit light, should definitely influence both the materiality and the lighting scheme of the space. However, this does not apply to all the design ideas of the interviewees. For instance, in the case of NT, she did not change any of the materials (glass on the walls and barrisol on the special feature on the ceiling), however the lighting scheme she had initially designed could be considered as influenced by the *lighterials*, since after the lighterials request she explained that the glass walls instead of externally lit, would be lit internally. The same idea was also used in the glass reception. With regards to the lighting scheme, CRL’s case shows that even though she imported the light transmitting concrete in her design, the lighting scheme might have not changed, because she had included lighting in the particular elements that were replaced with lighting transmitting concrete before.

Another issue was that some of the data collected by the architects who participated in the interviews explaining their concepts appeared to be inconsistent. More specifically, the language used by the participants to explain their intentions of giving a specific appearance to the space was not always clear. Evans (1997, p. 245) says that ‘the structure of a sentence is not the same sort of thing as the structure of a building’. He believes that the use of a particular sentence to describe the appearance of a space might refer to materials, but the way it is used could imply that it describes the structure of the building or something else, pointing out the case of the Barcelona Pavilion. He explains that *‘if what we seek is appearance, then appearance must be the measure of truth, at least temporarily … Appearance is never the whole truth, but it is true to itself, and it is made more evidently so by the visual arts, especially when they play tricks with sight’* (ibid., p. 248).

This research used the words of the participants as data on their intentions for the appearance of the space and the poetics they wished to create, and the research interpretations were based on these. This had a negative effect on the analysis of the results. When, for instance, the element *important positions/points* was analysed the data was insufficient to explain how exactly it was influenced. There are examples where the participants analytically described what they had indicated in their design as important positions/points, as happens in the case of IS who first indicated a specific point in her design, explaining the important position/point of her space as *‘once you are in the entrance point, where the ceiling compresses more, claustrophobic feeling’*. Analysing this, one understands that for IS, the important position/point in the transition space she designed was located at the entrance because that was the point where a person could see
and feel the distortion of the spatial envelope. On the other hand, the way ADM explains the same question is vague. He said that the important position/point of the space is ‘everything everywhere’, following his concept of designing a space where the forms are voluptuous and the space is distorted through the use of reflective materials. However, when he incorporated the lighterials in the space, it was not clear whether the answer ‘everything everywhere’ was valid; on the other hand, there is no other evidence in what he said to believe the opposite.

On the whole, however, there were only a few cases where assumptions had to be made when the participants’ words were unclear and it was decided to omit these as elements that could be influenced by the application of the lighterials. The only way this ‘faulty’ information could affect the results would be in regarding the order of the elements: the order of those most influenced by the application of the lighterials to the least influenced ones.

A similar situation arises with the study of the poetics based on the sayings of the participants. There were some answers collected that explain the character of the space before and after the application of the lighterials that are unclear. For example, CRL explained that the space she designed is ‘a comfortable space, which feels like you are in the living room. Not very anxious, using natural colours and materials, it makes it more comfortable. The carpet is soft when you step on it’. However, after applying the lighterials, although the description of the space remains the same, the participant said: ‘It is calm, comfortable but at the same time stimulating’. Using the light-transmitting concrete on the walls and the light-emitting substances for graphics on the ceiling, there is not a specific point of that description showing a feeling of stimulation in the space that did not exist before. Further, another inconsistency in the data occurs in some design studies where more than one lighterial is used, making it unclear about which one enhanced or changed the poetics. Again, the design ideas that had major inconsistencies in the information were not included in the final results of possible influence on the poetics.

In addition, as explained in Chapter 3, poetics is a term that packages all the senses that are created by exploring a space. However, the data collected does not provide sufficient information about how the design ideas relate to evoking the senses of the users and in which manner. Taking CRL as an example again, she explained that there would be carpet on the floor which would be soft (touch), she added sounds of water (hearing), accompanied by the light transmitting concrete and the light emitting substances as stimulating elements (sight). But CRL did not mention anything about the smell of the
space. Although an important sense, smell is not always considered by architects and in the context of this study was not considered important. But it is not just the smell of the space that defines the poetics of the space and it is not necessary for the design of the space to reflect all the senses. This is another reason why poetics as a term should be redefined in order to avoid complications.

It can therefore be seen that poetics is a word that requires context, as explained in Chapter 3. In talking about poetics when designing a space, the architects refer to the systematic integration of experiential effects that arise from engagement with the space and its qualities. So, designing the poetics of the space is about designing for stimulating the user and producing a result that will create an emotional relationship between the user and the space.

Finally, taking into consideration the theoretical background of this research, one could say that it involves many ideas that are conceptual. If the same ideas were tested in a real environment, where restrictions from the clients’ side and regulations had to be taken into account, these ideas might have been rejected.

### 8.4 Light as architectural form

This research aimed specifically to show how *lighterials* influence architectural design concepts. The study was an attempt to see architectural design from a point of view where all the elements of the space engage to create a story that enhances the experience of the user. Poetics is an important factor to be taken into consideration when architects design the space because it adds value to spaces. This value has to do with the aesthetic as well as the emotional values that each individual experiences in a space. Moreover, the approach of this research is important because each element that composes the space has been examined separately with reference to how luminous forms have affected it. Further, this research topic is novel because it links light with architectural form by involving critical thinking about luminous environments and conceptual ideas that lead people to using them in an experiential way.

According to this study, one can easily refer to *lighterials* when talking about the association of light with a material and therefore to the architectural form where the material is applied. This relationship becomes stronger when poetics are involved, which makes the idea of the luminous form more advanced than just a luminaire, since light and
form are composed together to serve a particular concept in a specific space. Therefore, in such terms, light and form can be considered as one, since they are composed at the same time, in the same way and for the same reasons.

This means that the architects could design thinking about form as light and light as form. When thinking about form as light, there is a reality nesting there, since an architectural form cannot be visible unless there is light and light can influence the appearance of the form dramatically. On the other hand, thinking of light as a form is more complex. It becomes necessary to consider what form is. Forty (2000) discusses how form has two different qualities: the shape and the idea (or the essence). He explains: ‘One describes the property of things as they are known to the senses, the other as they are known to the mind’ (p. 149). Thinking of light in this way, light and form share a particular shape and together could be introduced into the space as a new element that is manipulated to enhance the poetics of the space and therefore the senses.

Considering light as an architectural form, one could theorise that, when architects design, they could potentially think of a space in total darkness, instead of evenly lit by daylight as usual. Thinking of space in this way would mean that the architects could have the choice to design any line they add to the drawing as a luminous line, creating a luminous plane or volume. Even though this sounds quite an unusual way to approach architectural design, Professor Konyk’s project ON_Air, shows that it does happen. ON_Air was designed in a space where there was no artificial lighting. Therefore the architects had no option but to consider the space in absolute darkness and base their architectural idea on that constraint.

As Professor Konyk explained in an email (2011), ‘I very much consider the materials and the lighting effects in conjunction with the entire design. It is all considered at the moment of its inception’. Since nowadays buildings are also alive at night, both the daylight and the artificial lighting situation should be taken into consideration in architectural design equally, enhancing in this way the conceptual processes.

Further, when architects considered using light as architectural form, they would decide on the shape of the light (linear, planar or volumetric) and they would also have to examine the illumination that this form provides in terms of light levels. Different forms bring different results in the space as Ching and Bingelli (2005, p. 85) explain: ‘[forms] differ according to their relative dimensions of length, width and depth- a matter of proportion and scale’. Ching and Bingelli also associate different types of forms with a different character that they can bring to the space according to the way they are designed. The same thing happens when working with the light forms, which, as the experiments showed,
can bring different results to the space according to their characteristics: texture, pattern, shape, scale and contrast.

Even though the participants did not give much detail about the appearance of the forms, the analysis of the data suggested that the lighting scheme of the space was the element that could be most influenced by the application of the *lighterials*. The use of luminous forms was very challenging for the architects, since they had to consider all the information that the lighting designers would consider if they were designing them. Therefore, the decision to use luminous forms generates some important questions: Is there enough light? Is the contrast too much? or Where will the brightest area in the space be? Even the decision on the hierarchy between the forms of the space would be critical for the final appearance and use of the space. The point is that using artificial light brings questions about the technical characteristics of light. Approaching architectural design in this way is something new that could definitely awaken architects to the complexities of the successful composition of space from a lighting design aspect. And therefore that awakening marks the importance of lighting in architecture.

8.5 Implications for further research

This research topic showed how luminous forms can influence architectural design, meaning the design process and result. However, even though the results showed that *lighterials* enhanced the process, there was not enough information about how exactly they influenced it. The interviews used for this study can be used in the future to understand and analyse the design process in depth. Within this context, methodologies such as the linkography (Goldschmidt, 1995) can be used, in order to break down the design process into smaller units aiming to analyse the links between them. Such methodology will help to extract information about the creativity of the process while using luminous forms, but also to compare phrases in order to understand the reasons of particular design moves in depth (Goldschmidt, 2010).

Further, this research showed how light as form can be used to highlight the architectural concept. However, it focused only on *lighterials* and how these could influence the intention of the architects, the poetics of the space and each of elements of the space. It did not shed light on the texture or pattern of luminous forms or the *lighterials’* geometry, the exact place where they were applied or their light intensity or scale. The scale of the luminous form creates a quantitative differentiation that significantly influences the lighting
scheme. This information is important for lighting designers to consider when thinking about the future of lighting design and co-operation between architects and lighting designers.

Considering architectural and lighting design as linked together in the future makes architects responsible for taking decisions on the lighting scheme of the space. To do so, they need to have knowledge not only of the theoretical aspects of lighting but also of the technical side: lamps and lighting-level calculations. This means that lighting design should be taught as an inextricable part of architectural design. Almost all the participants who took part in the experiments believe that they will use *lighterials* again in their future career and perceive using light as a form combined with poetics as an important factor in architectural design composition that should therefore be incorporated permanently in the education of the architect. At the moment, lighting design is taught in only a few universities worldwide as part of the architecture degree. In most cases, lighting design is taught as a separate undergraduate degree or as an additional module on degree courses in architectural design, interior design and product design. It is also the subject of seminars run by different organisations, such as in the UK the Chartered Institution of Building Services (CIBSE) and its subsidiary, the Society of Light and Lighting (SLL), and the Institution of Lighting Professionals (ILP).

If lighting is taught as an inextricable element of architectural design, then lighting design should be part of the curriculum that is delivered to the students of architecture. Therefore, the architecture curriculum should be broaden to include terms and information about lighting, such as the analysis of the space in elements, considering lighting and architecture together as unified fields (Chapter 3) or information about the different roles of light and how it can influence the design intention. Within this context, students should be trained to consider space both as equally lit and also in total darkness when designing it. This will increase awareness about lighting issues, perception of forms and light and the relationship between space and the user. Students that undergo this training will have the chance to experiment with light and forms and explore how to communicate their ideas through the use of light, enhancing architectural design mechanisms. This would result in delivering spaces that are functional, engaging the user with the design intention.

Architects who lack lighting design knowledge cannot address lighting issues. This means that lighting designers should be working more closely with architects in the development of the concept. The experiments of this research used *lighterials* in different ways. In the first experiment the *lighterials* were included from the beginning of the conceptual phase.
The architects who took part in this study were equipped with the knowledge that a lighting designer should have in order to be able to involve lighting in the composition of the space, considering not only the architectural design concept but also the lighting qualities and functionality of the space. The second experiment involved architects who incorporated the lighterals into their design solution at the end of the conceptual phase, without going into the detail of how lighting could be influential. So the question that arises is, if architects do not have the knowledge that a lighting designer has, at what point should the lighting designer become involved in the project? When architects and lighting designers are working together from the beginning of the conceptual process, they can work on a complete project from the perspective of both architecture and lighting design, following the most appropriate lighting design strategies for the development of the particular poetics and design solution. If this is not an option, then further research is needed in order to determine at which particular point of the architectural composition the lighting designer should intervene in the design solution. The most common approach today is to involve the lighting designer in the design process when the concept phase is completed.

Furthermore, this research study sets the background for lighting designers to be more conceptual in the way of thinking and composing lighting. By incorporating the poetic factor in their education, lighting designers would create spaces which are not just sufficiently lit, but spaces where lighting is used to communicate the architects’ design intention in a more obvious way, engaging the users. Within this scope, the results taken from the interviews give an idea about how a lighting scheme can influence the design intention of the architect. That means that lighting designers should take the poetic qualities that accompany the architectural idea in consideration and build their proposal on it, whilst working closer to the architects.

But how should lighting designers approach lighting design in the future? In an interview for Mondo arc (Petty 2011), Kit Cuttle discusses the future of lighting design, explaining that in the last decades the field of lighting design has been approached, on the one hand, mainly from a scientific and technological point of view, with lighting designers trained to think ‘in numbers’ in the belief that this is how they can provide a better environment to meet human needs; while, on the other hand, he says, there are lighting designers who reject ideas of measurement and calculation and try to take a more intuitive approach to how people respond to light in an attempt to achieve very atmospheric spaces. However, Cuttle suggests that ‘You start with human perception, seeing lighting not as the force that makes things visible, but the force that influences the appearance of everything you see,
and you have to be able to move from there right through to a technical specification. That is the point where I think a lot of lighting education fails’. Cuttle also suggests that the future of lighting lies in considering the needs of the users and the lighting levels that arrive at their eyes, by focusing not on the numbers – the lighting codes – but on the design of an environment where the surfaces and the walls would act as reflectors for light into the space. Again this implies that lighting designers should work more closely with interior designers and architects (Cuttle 2010).

The study of this research coincides with Cuttle’s suggestions in three ways. First, it incorporates the term poetics in order to encourage lighting designers to move away from simply aiming for correct light levels in lit environments to considering the experience of the users and their needs in designing an inspiring environment. By involving poetics, this research intended to invite lighting designers to get closer to the architecture of the space and use light to engage the user in what the architecture proposes. Second, this research deals with light as an architectural form, which creates a need for architects and lighting designers to work closely together during the development of the concept idea. The third way in which this report corresponds to Cuttle’s views is that, just as Cuttle’s attention moves away from the light source itself to concentrate on the surfaces of the space as crucial elements to transfer light, in this study the focus is turned away from the light source to the planes and the volumes of the space as part of the lighting design technique.

However, further research is needed to obtain information about which surfaces can be used in a more efficient way to reflect light in the space, especially when lighterials are used. Moreover, additional research should be done in order to find alternative materials to the lighterials or to expand the category of lighterials. Taking the ideas of the participants in the pilot study into consideration, the data showed that the students were interested in using materials that emit light through different mediums. These mediums could be water or other liquids, foam or steam. Future research in this direction would provide important information about using such applications in architectural design. Additional research could also show how the design idea would be affected if the lighterials’ energy were to be corrupted; what happens to the architectural design concepts if the lighterials fail? Extra research should show what changes this failure would bring into the design concept and how differently the space would be perceived and experienced without the light.

Finally, further research could throw light on how lighterials should be presented graphically to people involved in the design procedure: architects, lighting designers,
electrical engineers and electricians. This research study gives an insight into how lighterials could be represented in a conventional way but further research is necessary to give special consideration to their connection with the intention and the poetics of the space.

8.6 Epilogue

This study aimed to collect information about light-emitting materials or lighterials and how these can influence the architectural design. It showed that lighterials can have the strongest influence on the lighting scheme and the poetics of the space, the materials, the stimulating elements and the important positions, but they can also change the brightest and the darkest parts of the space, and, to a smaller degree, they can influence the connecting elements, the colours, the circulation, the boundaries and the transition zones. Further, the evidence showed that the poetics of the space can be either enhanced or changed by the application of the lighterials.

This report was an effort to approach lighting design in a similar way to how architects approach architectural design, enabling the lighting design concept to share important parts of architectural composition such as poetics by also taking into consideration the role of light and new technological advances in materials and lighting in architectural design. The new applications of light incorporated so strongly into the architectural design concepts show the multi-level approach of architecture as an art, as a science and as both of these. The conclusion of this study challenges architects to manage the new information coming from lighterials’ technological innovation, aiming to create spaces that could inspire people, but it also helps readers to understand the pivotal role of light in the architectural synthesis. Further, this research showed some new ways of using light into the space: for surveillance, uniformity, blockage, blurring, framing and transition.

This thesis sets the background for its readers to understand that lighting is an inextricable element of architecture and to therefore consider it as an integral piece of the design procedure. Finally, this research turns the architect’s focus towards poetics as a crucial conceptual tool. Lighting is approached as a form that significantly influences people’s senses, and it is hoped that this research provides the basis for further critical thinking about how architects could use lighting in the future.
Appendices
Appendix I

Unit 1 Brief

'This year unit one will challenge our modern concepts of form and matter; concepts, which we believe, have lead to a rupture between nature and the built environment. In search of a new experimental architecture, we will investigate forgotten and discredited ancient techniques used in alchemy, where form, matter and spirit, were inextricably linked.

Alchemy, a practice combining laboratory method with magic and divination, is the predecessor of modern chemistry. The alchemists’ beliefs focused on transformation and change and they performed elaborate experiments to convert one form of matter into another through transmutation. Unlike modern science, transmutation was not based on objective quantifiable givens, but on an interpretation of cryptic texts and extraordinary symbolic imagery. Air’s significance as a ‘spirit’ was fundamental in alchemical practice, but was slowly forgotten as empirical methodology became prominent in the 18th century. Spiritus or pneuma meant literally ‘breath’ and could be applied to a vapour, gas or disembodied spirit. The atmosphere was understood as a reservoir of soul, a source of breath for all living creatures. This breath, however, could also transform into matter and alchemists believed that metals were made of two exhalations rising up through the earth: one moist or vaporous the other dry or smoky. We see the forgetting of air as the point when matter became measurable and controllable, and ultimately lost its ethereal dimension.

By studying what modern science has forgotten, our aim is to develop a new architecture for the future. Our designs will derive from an investigation of radical architectural materials, ideas of transformation, and the rekindling of air as an animating force. We will seek an architecture where micro- and macrocosm are entwined through a study of surprising and unexpected materials, chemical processes, aerodynamics, electromagnetic fields, explosive reactions, allegorical symbolism, light and colour theories, and by harnessing the residues of matter such as dust, smoke and toxic emissions’.

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'Space,' as experienced emotionally, is not isotropic. Through processes of mental projection and association that are deeply rooted in the collective unconscious and the individual psyche, different attributes of space, both within nature and in man-made environments, are invested with psychological connotations that are not intrinsic to them but have a profound effect on us. We can be deeply moved by space. Different psychoanalytical theories propose various analogies between the structure of the psyche and the structure of space, but associations are not stable. They vary from individual to individual and they are open to interpretation and creative license: it may well be the case that dark underground spaces release unconscious fears in most people while bright elevated spaces are more likely to trigger feelings of relief and elation, but it is up to us as designers to challenge conventional associations and archetypal symbolism, play with them, reverse them if we wish, as Hitchcock does, and invent our own.

Architecture is therefore immersed in a spatial milieu that is not psychological neutral but loaded a-priori with emotional content. To the contextual "emotional landscape" of the physical environment in which they are set, individual buildings add, intentionally or not, their own “psychospace”. Strangely, architects are usually reluctant to engage with the psychological dimension of space and seldom design buildings with the deliberate intention of provoking and manipulating emotions, while poets, writers and artists, particularly theatre and film directors, will unashamedly spin narratives aiming to resonate, intellectually and emotionally, with the reader and the audience. Actors provoke emotional responses: can a building, in this sense, "act"? Can it seem to be plotting some action? Can it project it's own sense of being, its personality, agenda, ambition? Can it play with you? Can it mess up your mind, send you off on the wrong track? Does it enhance your feelings or reject them, rather than remaining indifferent and leaving you indifferent? Is this the next mutation in the evolution of architecture, a sentient extension of biomorphism into the fascinating realm of artificial intelligence and personality? These are some of the questions this programme encourages you to ask.
The brief is to design an environment that induces a strong psychological reaction: agoraphobia, claustrophobia, fear, panic, anger, aggression, irritation, impatience, surprise, wonder, curiosity, amusement, suspense, desire, delight, happiness, wellbeing, love, tenderness, ecstasy, etc... You are to use dramatically the whole palette of physical means that are at your disposal as designers in order to affect the observer’s senses and mind: sight, sound, touch, etc... Your design can concentrate on one emotion or play on a range of complementary or contrasting emotions. The psychological intent can be outrageously explicit or subliminal, as long as the project does not exhibit emotional complacency. It should not be numbing and insipid, as most buildings are. It should be singular, intellectually stimulating and create a new emotional landscape within the city. It should be, as Baudrillard calls it, a "Monster". It should fire things up, capitalise on the fact that the observer's mind lies "on the edge of chaos", in a fluid state of expectation, prepared to experience emotions never felt before, willing to be disturbed.\(^7\)

\(^7\) The Bartlett, Faculty of the built environment (2009) BSc Unit 18 [Online]. Available from: http://www.bartlett.ucl.ac.uk/architecture/programmes/units/unit18.htm [Accessed 25\(^{th}\) November 2009]
Appendix III

Case Study Brief

MSc Light & Lighting
The Bartlett

MAJOR DESIGN PROJECT: One Canada Square, Canary Wharf

The area known as Canary Wharf is a result of regeneration of this part of London after the decline in the role of the London docks. In 1980-81 the London Docklands Development Corporation was formed with a threefold purpose 1) to bring land and buildings into use, 2) to encourage industry and commerce and 3) to provide housing and social facilities to encourage people to live and work in the area. By December 2007 the working population was around 93,000. Construction began at Canary Wharf in May 1988 and by November 1990 the steel pyramid had been completed on one of the area’s signature buildings, One Canada Square. Some basic data concerning the tower at One Canada Square follows:

- the tower has 50 floors and is 244m (800 ft) high
- the tower has 3 960 windows and 4 388 steps divided into four fire stairways
- the tower has 32 passenger lifts divided into four banks each serving a different section of the building
- the exterior walls are clad by 370 000 square feet of Patten Hyclad Cambric finish stainless steel
- average floor size is 28 000 square feet
- the aircraft warning light at the top of the tower flashes 40 times a minute.

The project concentrates on the proposed refurbishment of a typical quadrant of a typical office floor.

1. Aims

- You are asked to provide a series of lighting design concepts for a typical quadrant of a floor in One Canada Square which is part of a rolling programme of refurbishment. Concepts are intended to demonstrate appreciation of the various requirements raised by the managing contractor (CW Construction) and to convey your ideas as the principal elements of an overall strategy for lighting of the following areas: 1) the lift bank lobby 2) the corridor adjoining the main entrance to the floor quadrant 3) the reception and 4) the L-shaped quadrant of the floor (marked in orange on the plan). The client wishes to provide a sustainable, attractive environment for future tenants which may include financial institutions, legal firms or media organisations. Guidelines concerning minimum standards are contained in an attached document Canary Wharf – Minimum Standard Developer’s Finish, but as indicated by the CW Construction representative, John Daly, imaginative concepts that propose to work outside these guidelines would be acceptable if justified strongly. The design should address the following points:

- the ceiling planning grid is 750x750mm
- maintained illuminance on the horizontal working plane is 450-500lx
- floor to ceiling height is 2750mm
- the recess above the ceiling is 150mm
- partitions to accommodate cellular offices would be located on the perimeter, typically 3000mm wide and 4500mm depth
- previous successful controls strategies have been dimming and Passive Infra-Red (PIR)
- luminaire systems installation should comply with BS EN 60598 Luminaires and the requirements of Building Regulations Part L Conservation of Fuel and Power
- energy target is 1.5W/m2

The proposal will be developed by working in design teams.

2. Research procedures
Acquaint yourself with the existing context – drawing on your visit to site. Sketching is strongly recommended. Acquaint yourself with the site and assess the existing daylight availability. Develop strategies/options to meet the brief and employ design and prediction techniques (manual, model and computer) to test options. Evaluate the results and refine your options. Prepare design concepts and illustrate these in such a manner that the management contractors can readily comprehend your proposals and how these relate to the proposed structures. Prepare a forecast of target illuminance values derived from electric and daylight sources and demonstrate how these would be achieved particularly under conditions of variable external illuminance. Consider the question of lighting control and segregation of the spaces and the possibility of a combined daylight/electric light control philosophy. Present your understanding of the integration of the lighting within the building and its relationship with the interior design, fabrics, finishes and uses of the spaces.
Appendix IV

Questionnaire

Personal Information:

Name/Surname:

Profession field:

Company:

Gender male ☐ female ☐

Age <20 ☐ 20<35 ☐ 35<50 ☐ 50<65 ☐ 65< ☐

Nationality:

Date:

Answer with Yes or No by ticking one of the boxes.

1. What type of character would you say that the transition space you have designed is?

2. Did you incorporate ‘poetics’ in your design?
   Yes ☐ No ☐
   If yes, was this process:
   ☐ Challenging………………………………………………………………………
   ☐ Obstructing………………………………………………………………………
   ☐ Interesting………………………………………………………………………
   ☐ Difficult…………………………………………………………………………
   ☐ Confusing………………………………………………………………………..

3. Did you enjoy the architectural design procedure with Lighterials, which you were assigned to work with?
   Yes ☐ No ☐

4. Have you ever used Lighterials before in any of your projects?
   Yes ☐ No ☐
5. Did you find *Lighterials*:
   - Important
   - Useful
   - Interesting
   - Difficult
   - Irrelevant

6. Did you think that *Lighterials*:
   - Hindered the process
   - Didn’t affect much
   - Enhanced the process

Please tick where appropriate and explain your reasons.

7. Do you believe that the use of the *Lighterials* enhanced the poetics of the space?
   - Yes
   - No

Please explain why.

8. Would you use those *Lighterials* in your future career?
   - Yes
   - No

Please explain why.

9. Would you include those *Lighterials* into the architect’s toolbox permanently?
   - Yes
   - No

10. The use of this type of materials in architecture is becoming common. Do you believe that these types of lighting applications should be incorporated somehow into the architectural education?
    - Yes
    - No

Please explain your reasons.

11. Please write down any comment you feel it is important for this study.

Thank you for your time.
Appendix V

Lighterals Form
Top section of the form enlarged and rotated.
Bottom section of the form enlarged and rotated.
Appendix VI

Interviews Brief

**Inspiration**

“Poetics” is considered to be a very important issue when designing an interior space. ‘Poetics is the experience of inhabiting, the experience of negotiating a passage through the world in time and space’. In others words Poetics refer to the ‘story’ that a certain architectural space can tell. This ‘story’ depends on the overall character of the space which is set by its geometry, proportion, penetration, level change, circulations, zoning, materials, patterns, lighting, colour, and it reacts on people’s feelings, mood and therefore on the use of the space.

*Private House Spa by Carmody Groake Architects (2009)*

*Piano Concert Hall by Zaha Hadid Architects (2009)*

*Indoor Slide (2004)Alex Michaelis’*

**Design Task: Transition Space**

You are requested to design the transition space between two spaces, space A and space B. Your architectural proposal should be linked to the purpose of the spaces (A and B) where this transition zone leads. You are not required to design the two spaces (A and B), except if it is part of your overall design proposal. The function of the two spaces is a .................................................................

The design of the transition space has to provide: a waiting area, information display, the profile of the company and appropriate infrastructure for interaction with the reception staff.
**Existing Architectural Details**

- The interior space exists on the 53rd floor of a skyscraper and its area is about 150m².
- The floor to ceiling height is 2.9m.
- You must design the interior partitions, surfaces, walls, floors, providing information about their materials, colours and pattern.

**Constraints**

- Acknowledge the entrance to the space.
- Acknowledge the peripheral corridor and design the way it connects to the other spaces or the transition space itself.
- Consider artificial light (and if necessary natural light) and how it connects to the architectural design.
- Ensure that the transition space makes an appropriate connection to spaces A and B.
- Make the ‘story’ of the space obvious in the architectural design concept package.
- Consider the poetics and the feelings or messages that the transition space will communicate to the visitors.
Time allowed is 15mins. In this timeframe you are required to develop the architectural concept and submit the following sketches:

- Plan
- Section
- Perspective Drawing

The windows will be covered with blinds for most of the day.
Appendix VII

Interviews Timeline

Duration

**Introduction to the experiment Stage**

0’-5’ Design brief reading by the designer. Answer questions regarding the brief from the designer. Give the plan, sections and perspectives to the designer and explain further.

**Design Concept Stage**

5’-20’ Design development. This time includes thinking time, pre-sketches creation and working on the concept. The designer is expected to design the space and submit plans, sections and sketches. Meanwhile the designer has to explain what she/he is doing.

**Design Analysis Stage**

20’-25’ The designer will be guided to indicate on his concept package specific elements.

**New Request Stage**

25’-30’ Introduction to the new client request and the *lighterials*. The designer spends some time going through the *lighterials* and their applications to see how he can use them. Questions about *lighterials*.

**Revisiting of the Design Concept Stage**

30’-40’ The designer applies any changes to the design. During this process, she/he has to explain the reasons for the application of these changes. At this point it is important the designer expressing any difficulties.

**Questionnaire Stage**

40’-50’ The designer is expected to complete a questionnaire.

**Total Duration**: 50 mins.
Appendix VIII

Interviews Drawings

Plan of the space in scale 1/100.
Three dimensional perspective of the space.
Appendix IX

Design Analysis Stage Questionnaire

Element Questionnaire

1. Can you indicate the **boundaries (sizes, spatial configuration)** including the **subspaces** of the transition space? *(purple)*

2. Can you indicate **important positions / points (views, symmetry, clarity, proportion, distortion)** for interesting visual effects? What is the **visual perception (far/lined up/ adjacent/ remote)** of these effects? Are there any **axes (penetration)**? *(blue)*

3. Are there any **connecting elements (spatial banding, physical connectedness, level change, curvature)**? *(red)*

4. Can you please indicate the **circulation** of the space? *(yellow)*

5. Can you please indicate the **transition zones**? *(black)*

6. Which elements do you consider as **stimulating elements (things)** (e.g. to encourage movement)? *(green)*

7. What type of **materials** do you use? Please indicate where they are used in your space. *(light blue)*

8. What **colours** do you use? Please indicate which colours you are using and where. *(gold)*

9. Can you explain the **poetics (character/ feelings/ interactions)** of the space? *(none)*? Can you please explain what feelings *(reactions)* it creates to the users?

10. Are you using any **patterning (shapes/angles)** in the space? *(orange)*

11. Are there any particular points where you are using **light**? *(pink)*

12. Can you please indicate the **brightest and the darkest parts** of the space? *(very light blue)*
Appendix X

Lighterials Request

The client’s request is as follows:

The client wishes to include lighterials to the transition space in order to enhance the character of the space. These materials can either include artificial light in their volume or they can connect to light in numerous ways. These materials are called light-erials in order to be strongly distinguished from the solid, no light related materials. The client would like to promote his space and make it different to similar transition spaces which are placed in the skyscraper. The lighterials that you can use are:

Lighterials that emit light

a. Electroluminescent Tape, Wire, Panels
b. Organic Light Emitting Diodes (OLeds)
c. Light Emitting Substances
d. Planilum®

Lighterials that which can connect to a light source

a. Active and Interactive Surfaces
b. Barrisols®
c. Polyethylene Volumes
d. Glass Panels
e. Light Transmitting Concrete
f. Riverstone Bricks®
g. Scintilla Lumina®

The client wishes to use in the space at least one lighterial. Please revisit the design and make any changes that you require in the space in order to better communicate your idea. These changes can include the boundaries of the transition space, the materials and the colours, any patterns you might have used, the lighting design or even the initial concept idea of the space. At this point you can develop your existing drawings or create a new drawing package.
Appendix XI

Lighterials Presentation

**Lighterials**: These Materials will be Called Light-erials in order to be Strongly Distinguished from Opaque, non Light related Materials.

**Lighterials that emit light**

- Electroluminescent
- Organic Light Emitting Diodes (OLED)
- Light Emitting Substances
- Planilum®

**Lighterials that connect to light**

- Active and Interactive Surfaces
- Barrisol
- Polyethylene Volumes
- Glass
- Light Transmitting Solids
  - Light Transmitting Concrete
  - Riverstone Bricks
- Scintilla Lumina®

Electroluminescent Products
Organic Emitting Diodes (OLED)

Light Emitting Substances
Planilum®

Active & Interactive Surfaces
Barrisol

Polyethylene Volumes
Glass

Light Transmitting Concrete Riverstone Bricks
Scintilla Lumina®
Appendix XII

Summaries of Interviews

ADM

Exhibition

**Design Concept Stage:**

First I should ask myself the question what exactly is a transition space and how that would be. Transition is a dynamic thing that happens between A and B. How you go from A to B you can see it with two different ways: first is some kind of dynamic where you could move from space A to B and second the space moves and you stay in place travelling without moving that happens when you twist the dimension. That question—twisting spaces—is a area not explored and difficult task, in a way you deform the space in a way that you see yourself in multiple places in the same time you would have certain spots or volumes, or facilities or functions be kind of voluptuous form or reflective with a kind of distortion reflective surfaces where you would stand in specific points and see yourselves in all different places.

How is this related from that to the spaces you would always have some functional hype rational space that it will be modified in specific period of time you will always have orthogonal spaces which have to reorganized every day, the space that attract the people and should have an identity is the space between the transition spaces.

You would have a smooth transition from spaces A and B to the center which will then start to deform from orthogonal to more voluptuous space. And then you would have these cocoons which you can either walk in-between or sit inside of them. It's more about the concept idea and later organizes it in a different way try to bend the space between the two entrances after the lift.

An important question that arouses is: would you consider this an easy task to move from space A to B or kind of wait that this space deforms from space A to B and what type of experience you want the central space to have. They are as big as you want them to be. These volumes can be small as seating elements. Or bigger as tables or full height where you can walk in this cocoon and be part of it. And then you would stand in one point and you would be able to see your reflection there and here and to the other cocoons.

In the point of entry is the reception a. Inner the space you find another one such as Amazon forest there is a person that waits for you: at a it's a traditional way reception address to people who come from outside and the b is in the center that leads to everywhere address all three points. Generate sequence of random volumes with given parameters for example the program of the transition space depending what happens in there or what type of relation the transition space has to spaces A and B/ all cocoons have a functionality.

**Design Analysis Stage:**

- **Boundaries** – No explanation.
- **Important positions / points** – Everything, everywhere.
- **Connecting elements** – Everything. That's why they are there.
- **Circulation** – No explanation.
- **Transition zones** – All spaces in-between the cocoons.
- **Stimulating elements** – The external faces of these cocoons would be the ones that would stimulate you, it will be the ones distort yourself.
- **Materials – Colours** – Cocoons made by laminated Mylar is a foil used in sailing – has the type of surface of the foil. Floor and Ceiling: epoxy resin, industrial epoxy gives you super smooth singular continuous surfaces colour white.
- **Poetics** – It would be an adventurous space, when you are invited to explore, maybe not necessary a pleasant thing. When architects create spaces everybody thinks that they will create nice and lovely spaces but this space can make you feel dizzy they can evoke feelings that you have never experienced before. I don't know what feeling this space will create to people, maybe pleasant maybe unpleasant, very disturbing feeling.
- **Pattern** – The pattern will be the reflection of the people on the cocoon material – would have the reflectivity of these volumes.
- **Light Reinforcement** – I can assume that even in daytime in these dark spaces you would have artificial light because they are voluptuous. The light is where these volumes touch the floor, they can be enhanced in the evening by putting up light there.
- **Bright vs. Dark spaces** – The exterior of the cocoons vs. the interior and center point of the cocoon.

**Re-visiting of the Design Concept Stage:**

Lighterials – I can incorporate light into the walls of the cocoons, mirrors that become invisible when you open the light to still have this continuous space of mirrors not to break up the concept and start dividing the surfaces with light solid surfaces. I would propose having the entire volume with this system not every volume a couple of them, in the night they could turn to be luminous volumes. One single volume of light and then they would continue reflecting on the other surfaces even more enhanced this effect of distortion so you would get the image of science fiction movies where the rail is faster than light: this type of effect of stars that make light very dynamic nothing else added// volume lighterial the form serves the function in the sense that describes the poetic element and then comes the functions of the other spaces.
Summaries of Interviews

ADM

Exhibition

Plan

Element Diagram in Plan

Section

3D Sketch
Design Concept Stage:
Since it is a leisure you need some privacy for the restaurant, I guess it should be some barrier, I don’t know what material but it should give mystery, people won’t be able to look in there, semi-transparent, see people dining but not the exact details for that. See people sit/drink/enjoying the view, I don’t want to break that view - or better put a lower barrier, something I leave it very vague for the moment. You need someone to tell you where to sit obviously so you have a reception area which normally should face the entrance because you are facing someone who is coming towards you, rather than have the back to you, that’s very rude. We can have a low level reception here - or even be smaller than that, this should be the stand of the maître taking you to your sit, so you have your tables here (restaurant) what else do you need, just a little light above the maître, I won’t put something to block the view, you might need some sofas, again you don’t need to turn your back to the view, be in some angle, have small table, have some funny furniture. Sketches referring: these partition walls like a curtain or oriental Japanese behind this you could barely make out the tables which would have very light local on them, you would see the luminous surfaces of the tables as glowing disks of the people seating behind, this would be a nice atmosphere - and then you would have some space from the ceiling it would be like floating panel. So on section it would be like a suspended panel with mesh, that dimension would be approximately 20-30cm and the same above this would be the person seating behind it. Seating space: which I imagine it to be organic shape sofas but like stools - extended stools that you’re seating here, you can turn your head behind and forward, to see the spectacular view out of your window. The lighting here will be very low, so that you will have visual access to the view, would have small tables and tiny spot lights and a small table lamp and the other as well. You would need a person standing: I will make something science fiction you would have your maître, he has his book and you have a curved niche bright lit, to notice him directly when you enter, everything behind him would be backlit as well and have fluorescent battens in there or LEDS or any specular surface like gold and then you have spot lights above it and you light to face of the guy as if he is an actor. You can have the same e type of curtains in diverse, create spaces for the bar, that would give you privacy like Pompidou and the bar would be open plan, spots over the tables and the same effect as the restaurant uniformity, same story, same logic. You have a feature that blocks your way to the bar but you have to cross it so it has a mystery to it (in curves) somehow they will have some openings here, the curtains can be dark colour glass – or purple dills and the spot would be above to give a nice glow. The tables to the bars – pods, and also I need a sign when you come in the first thing you see is a self illuminated – would be placed somewhere like here – big illuminated letters of the name of the bar, 2m high with small LED’s or fiber optics all over it, style of interior decoration, dark velvet curtain behind it.

Design Analysis Stage:
Boundaries – All around the space and another type of boundary the perforated panel.
Important positions / points – First, to see the logo – the people who dine – the maître – the waiting area, second the seating area and third as you approach the maître and you see a little bit of the bar area.
Connecting elements – The same panel or the way it seats next to the window – the materiality links them – two different functions- the logo is the same and the colours.
Circulation - No explanation.
Transition zones – There is between the waiting and the seating area, plus the entrances to the spaces.
Stimulating elements – Light above mete, glowing, above seating areas and above tables and the landscape outside.
Materials – Colours – The panel with glass in cyan, high speculative niche for the maître and high illuminated panel, velvet curtain behind to be absorbing, dark materials I want it to be dramatic so the light would be accent- dark velvet furniture, dark wood for the tables, where there is no windows I will put the curtain around – floor marble dark, close to black, ceiling paint the same colour as the marble.
Poetics – It is atmospheric. I want to create a mood of going out, it has a bit of mystery because you can’t see what is there behind the panels, the light is sparkling, it would attract your attention but not overload you with information. The feelings of anticipation, you are here to have fun and the mystery: where people are seating? Where does the music come from?
Pattern – The panels are the same, curve elements and velvet curtain.
Light Reinforcement – A very narrow beam above tables’ spots and glowing objects.
Bright vs. Dark spaces – The tables, all the rest dark.

Re-visiting of the Design Concept Stage:
Lighterials – I will add light transmitting concrete to the corridor between the restaurant and the corridor, entrance, the light at the corridor would be strong so that I could see a theatrical projection of people. I will replace the high specula material behind the maître with scintilla lumina, something that would allow seeing something behind but not clearly and at the curly elements the same logic. All these would make the environment joy, fun, social and convivial.
Design Concept Stage:
First I would like to set up the circulation. I will create a transition space in between. I would like to create destinations and paths. It is important for me to have visibility of the offices. If it’s a transition space, many people come in and walk through. They have different destinations and aims and where they get to: pick up the main lines, because I don’t want to block any corridor. You come in or you want to see the reception but not super frontal.
The areas A and B are two different departments, so two different waiting areas which each one relates to the relative space. The offices you don’t want them to be totally open, so translucent walls or pendant screens that filter the view. You can see through a little bit, you can walk through but you can’t see on the desk. On the seating area there are tables, at the back, a bar. The areas have carpet so that people should feel comfortable seating in as individuals but as groups as well.
On the walls, the signage and screens create a pattern but opaque, with openings inside or aluminium. On the holes are placed brochures and magazines. The furniture is not too soft. So people won’t fall asleep, but they can be social. Also there will be organic shaped furniture. The carpet is softer that people would feel comfortable. The floor is made by stone. There are some lines to show the movement, you can show the lines as graphics on the floor.

Design Analysis Stage:
Boundaries – It doesn’t have a boundary in some areas.
Important positions / points – If you sit in the meeting rooms you can see through the walls about what is going on in the transition space and the opposite walls.
Connecting elements – The walls and all the screens.
Circulation - It is very important part of the concept.
Transition zones – When you enter, you realize that you are in a different space and the same when you exit. Also transition areas are the areas where you get seated, reception area, because you feel you arrived somewhere. The material changes as well.
Stimulating elements – The screens attract attention by hiding something. It’s even more when it gets narrower. It makes people feel they want to get in there and the seating area with the carpet attracts attention.
Materials – Colours – In the seating area, there are shades of yellow and orange flocked in one part and in another part, shades of red and purple, the same on the sofas. At the walls glass reinforced concrete, white finish, where you can do many patterns. On the floor, timber and on the reception white corian. All is white apart from the waiting areas where all is in colour.
Poetics – Playful, curious, a positive space.
Pattern – There is a pattern on the screens. Also the shapes of the furniture have a pattern. The lines on the floor create a pattern as well.
Light Reinforcement – Lines on the ceiling. On the top of the carpet bubbles hanging, it gets more intimate when light comes down further and spots on the reception.
Bright vs. Dark spaces – The reception vs. the entrance.

Re-visiting of the Design Concept Stage:
Lighterials – Electroluminescent tape to create dots on the ceiling which follow the lines on the floor. I will also use interactive surfaces. You see when people walk through. The dots on the ceiling show where the path should be and people on the floor create their own.
The walls are made by soft wall, but it could have a pattern and parts of it could be luminous so they would become more volumetric. The pattern they will have will have holes where you can put magazines clothes.
Summaries of Interviews

ANP

Plan

Element Diagram in Plan

3D Sketch

- boundaries
- important points
- connecting elements
- circulation
- transition zones
- pattern
- lighting
- bright vs dark areas
- lighterals
Design Concept Stage:
The space is divided already. At the central the entrance is placed. And either you choose to go towards the right hand side or the left. So the transition space is a crossroad. So what I want to do is to separate the paths. The rest of the space is the reception, the seating area etc. I would need a few partitions so that people wouldn’t be able to look through the spaces A and B. In a similar way, the same lines should follow this as well but in another lower level, at the reception. That one could close the waiting area. There will be a structural movement, robotic kind of. What number do you have – you will move there exactly. The seating area is placed behind the reception. The partitions in general will have height 1.80m. The rest of the floor will be raised for 20cm. The seating area is organized with a waiting area for the space A and another one for the space B. The reception is in a raised floor at the 10cm.
At the waiting area, there is a bar with stools so that people can sit and look outside at the view. Anything informative, logo, history of food is written on the partitions.

Design Analysis Stage:
Boundaries – No explanation.
Important positions / points – Whatever has height, because the rest of the space is clean. The point of this design is that you are standing in an upper level and you are looking outside so that the elements are important and the partitions as well, because the partitions have to look attractive since they will block the view towards the exterior space.
Connecting elements – The tables, as the element that intrudes into the space the most and it is repeated and these are the common element between the two transition spaces that lead to spaces A and B relatively. All the rest of the elements are different to each other but the tables are all the same.
Circulation - No explanation.
Transition zones – It is the space in between the tables and how the rest of the space communicates with spaces A and B. It is the path that a person does by himself and then he is guided to his seat. The black transitions permit each person to do his own transition and he will break the design’s very organized one.
Stimulating elements – The windows. If they shut down even though they block your view to the exterior, they still act as stimulating elements that they are there and you can’t look outside.
Materials – Colours – The reception desk and bar: corian aubergine colour. The partitions are made of plasterboard, white finish. The floor on the raising level is made by rtine industrial style, white. The rest of the floor is light wood and the tables are aubergine but the chairs are multicolored.
Poetics – It is light and playful. Not corporate at all. It’s like an adult’s kinder ground.
Pattern – Patterns on the blinds. They are not plain. Every side has one continuous image which can be seen when the blinds are down. A very abstract pattern not very defined image.
Light Reinforcement – Linear light on the corridor to direct movement and connect spaces. Spot lights on the tables.
Bright vs. Dark spaces – Receptions vs. entrance to the spaces.

Re-visited of the Design Concept Stage:
Lighterals – The partitions are made by scintilla lumina. It blocks the visual aspect. There would be interactive projection on the tables and the reception desk. It creates visual stimulation, visual interest, either discreet or complicated.
It turns the space to playful. The reception has the name projected on the bar rather than the maître calling. There is a distinction: two different transition spaces with two different projections that identify one space from another.
Summaries of Interviews

Plan

Element Diagram in Plan

3D Sketch

boundaries
important points
connecting elements
circulation
transition zones
pattern
lighting
bright vs dark areas
lighterials
Summaries of Interviews

**Design Concept Stage:**
Creating a space that might be gathering together people in a comfortable way and at the same time, doesn’t allow you to see what’s going on in other spaces that are why it has a round form. At the same time I would like to have some natural light as well although there are blinds. I have to have a reception, placed centrally, the obvious thing. I don’t want to keep people away from the natural light. I can place seating space here, sofas.
At the same time they can look gets some idea about what’s going on, even though they can’t see the space. It is important to keep an eye on the desk, want to see the person that gives information; don’t want to feel isolated that you are forgotten. Avoid have seating places in the middle, but around is better; it gives the idea seating in a living room since you have to face other patients waiting. I chose to create a round space because it’s comfortable and not abandoned. The walls are made of plasterboard. The reception is enclosed. The door indicates people shouldn’t get into the space. The desk in the middle it has flowers or something. In the middle of the space there is a two sided sofa.

**Design Analysis Stage:**
Boundary – No explanation.
Important positions / points – Seating areas and the entrance.
Connecting elements – The doors because this is what separates and the curve wall creates communication when you open the door see nothing than a wall.
Circulation - No explanation.
Transition zones – No explanation.
Stimulating elements – The borders of the space and their form.
Materials – Colours – Light blue ceiling plaster. Floor: lime stone cream with the reception desk the same. There is white leather sofas and wooden table dark brown. Carpet is dark brown. The walls are made with plasterboard cream white.
Poetics – A comfortable space, which feels like you are in the living room. Not very anxious, using natural colours and materials, it makes it more comfortable. The carpet is soft when you step on it. On the walls are TVs for information.
Pattern – There is no repetition.
Light Reinforcement – Light next to the wall, spots for people to able to read. I can also have a spotlight in the middle and at the reception.
Bright vs. Dark spaces – Not specific ones.

**Re-visiting of the Design Concept Stage:**
Lighterials – I will use of light transmitting concrete, try to have the sounds of water, the concrete will be cream colour. Create double wall because you don’t want people to look in the waiting area. The table would be made of light transmitting concrete.
Also I will use light emitting substances on the ceiling, on a type of drawing on the ceiling. It is something retro, which starts from the edge of the window and expands towards the interior of the space.
Summaries of Interviews

CRL Clinic

Plan

Element Diagram in Plan

3D Sketch

- boundaries
- important points
- connecting elements
- circulation
- transition zones
- pattern
- lighting
- bright vs dark areas
- lighterials
Design Concept Stage:
The space is too big, too empty, and too open. Frame the entrance will make it more narrow-have intricacy because it feels you just came in and very large void, there is just one entrance, one entry point. It would be more interesting to have options - experience with museums.
The first thing is to be more than one way, to experience different roots. You enter there is a space to collect information then define entries-exits to and from spaces A and B. Maybe it should be a secondary area. You don’t need any of the windows- more spaces – than one bigger. You enter there is a screen at the end with information. Full walls seem separate the spaces so you set boundaries, enter one way exit the other. Informative waiting area feel relaxed, so informal seating frame people’s more leave center open.
I like corridors that bring you in larger spaces. The partitions can be lower. The back of the partitions are the highest 2.9 and the lowest 0.45m. Furniture should be in the same language. Put the wall in the windows to block out the light.

Design Analysis Stage:
Boundaries – There are some corridors which might be part of the corridor/ the back is a gallery part, everything that looks in the center would be the boundary.
Important positions / points – There furniture looks cool. When you enter the space you get the atmosphere it has. A play is between tightening and opening up of the spaces.
Connecting elements – The two volumes, the same language they have, they can work together according to the theme of the gallery.
Circulation - Waiting area with interesting stop positions and seating areas.
Transition zones – The corridors. You start seeing something from the gallery, it’s hard to define – decide as you approach to openness or closeness.
Stimulating elements – The entrance because you enter somewhere different you establish your mood, it’s something new.
Materials – Colours – Wall of lacquered plasterboard, white glossy and the reception and the screen at the back built into the wall, white seamless integrated. Furniture made with light wood, something warm. The floor is consistent in gallery white ceramic, store tile. Ceiling is white.
Poetics – Formally interesting, organizes circulation, different types of interest, open up or close- adventurous – not to see where you are going. It feels contain, self-enclosed.
Pattern – There is on the wood furniture, because all the space is white.
Light Reinforcement – All the walls fro down to up. Feature lighting in the seating area and above reception. In general the space is dark with white bright walls.
Bright vs. Dark spaces – Receptions vs. corridors in the middle the seating area.

Re-visiting of the Design Concept Stage:
Lighterials – Interactive surfaces when touch the walls and above reception and seating area.
Luminaires made from glass transparent sheet with pattern.
Design Concept Stage:
What I find disturbing is that you are disconnected from the outside, you may feel that way because of the height, you don’t have a sense of exterior and interior space.
I want to make the experience when you enter and you have an immediate view to the exterior — maintain an alignment to the exterior and the windows, if I had design the tower I would have considered it. Reception area, where people wouldn’t feel comforted, a loose one not in front of you and an information wall that it is in the side of the door — more than an open waiting area, I would put info and company profile, would break it down to the seating area for more private talks.
Reception is used on a screen for the seating area and then has a direct view to the exterior. The whole zone shall be treated as transition area. Create a very low space when you come through, like a threshold to make people focus on the wall with the information that would allow for some intimacy into the reception area and then very bright area, waiting that is broken up in smaller area, sliding doors connect spaces A and B. Floor almost residential, wood different for the waiting area.

Design Analysis Stage:
Boundaries – No explanation.
Important positions / points – The moment that you step up from inside – the way that dark and light contrasts, open up to the bright and open space.
Connecting elements – These windows push it along the path when someone walks within the space all the circulation follows the exterior – the perimeter.
Circulation - Zone entry, reception area, first phase, information and then the circulation is this passage.
Transition zones – It’s about a threshold, distinction between the reception space ad waiting area.
Stimulating elements – This is a piece of furniture, a box that connects information in one and the other side / one feature are this one element.
Materials – Colours – idea of a wooden box, warm material, dark wood to create a contrast with the bright side, dark material and a gigantic bookcase, rest white polished marble (floor), ceiling white plasterboard to make the space bright, furniture leather furniture, dark brown base the other furniture pieces white, they are floating.
Poetics – Something very sophisticated and elegant, quite quiet, something serious with the quality of the natural wood, a material that gives the sense of warmth and seriousness.
Pattern – In terms of sequence there is always a first and last, like waiting areas, strong movement from one area to another, from one point to the other/ pattern on the wooden floor.
Light Reinforcement – On the ceiling (look section) very discreet – linear on the ceiling – pendant above tables- brought in scale, and some down lights in general.
Bright vs. Dark spaces – Above the tables and the information area vs. the rest.

Re-visiting of the Design Concept Stage:
Lighterials – I want to make a real transition, from the reception to the seating area, light transmitting concrete so that when someone comes in and look through they can see silhouettes and light come through from the perimeter and in the evening the whole box would glow, the selves, integrated with a way not the same in reception on the right back more private.
Summaries of Interviews

HDR
Exhibition

Design Concept Stage:
There is rigid and repeatable façade. Light coming in strong shadows nice view. This area could be smoothening up a bit. Trying to create a different feel, I separate this space from all the other spaces. There will be offices to follow that grid would have a slightly different character when you come into the space, so you wouldn't have the same rigidity – so trying to do something that is more efficient. There would be a layer that would be transparent that would be translucent so that light comes in different. It would be nice if you could have different characters so that you could have a bit of planting to give it a different zone up there and luxury, putting the skin to create different zones because it's a very open space, like waiting zone. It would be nice to put some elements that would try to avoid paying too much attention to the façade and responding too much, you have to work with this a bit more regular, create different areas that people can wait – you have a relationship to outside. Small and tighter areas would lead you to spaces. Walking along the center you have some views, it's just a zone separating the windows to the skin. Perhaps you can use it to see slightly through. It would be nice to have something a little more intervene here, but it depends on how the rest of the space works. The skin would allow light to come in to have more orientation, it's nice to have something else in this area, like a buffer zone to almost ignore what's going on in here (between window and skin) and some translucent wall and have this low queue object floating and a couple of benches. Also have some display around the reception so that people can start moving around it. Reception area in the middle, it makes it easy to orientate and see it with low key elements. The one side 8 skin would be higher one should strip off the ceiling. This would be important to get rid the ceiling tiles get more ceiling height/full height translucent walls. You could have different type of waiting areas. Out of the skin you could have pocket gardens seating behind so they could be like buffer zone behind. You could add some display (behind the reception desk on the wall) freestanding walls not touching the ceiling (section explaining) it emulates around, has a different rhythm, in the space you have some plants within the space in some spaces you have screens. It is almost a translucent space, is much innervated space, you see different grid, even different apacities as well, it's very green. Nice and calm.

Design Analysis Stage:
Boundaries – Physical in terms of where you can go to is the skin limits – first layer visually, then the zone is the second layer that defines the zone that there is opaque glazing. Not one clear boundary.

Important positions / points – it depends on the radius of these objects – some areas are more enclosed in terms of different zones reflective material: perhaps some natural light coming in – look from one space to another and get some interesting reflections.

Connecting elements – The skin itself – the story that is told once you go along but I don't think it is necessary / what unifies them is the shape of the space.

Circulation – There is freedom of move, not specific, not different moves.

Transition zones – No. Just one is slightly darker than the other.

Stimulating elements – Continuity of this opaque glazing and the lighting that it creates different quite interesting atmospheres and the boundary helps because it creates enclosures you can't see everything in first view, you need to discover

Materials – Colours – The ceiling is exposed exposed concrete white. The floor is linoleum or really thick carpet, soft and bouncy less office type / light grey. Translucent polycarbonate glass for the skin, always light comes through but leaves some shadow behind. Furniture is built in elements: a reception desk, some stools, people can take them around with them. Bench of reception white painted timber. Generally everything is neutral and plants give you a shade of green, the display is colourful so it becomes place of interest, the furniture quite neutral, neutral are all elements in general.

Poetics – Calm, introvert thing (translucent skin) you don’t see too much of what is going on outside the skin, it doesn’t prepare you its high up floor. Very good quality that this design ignores but too many things happen in the exhibition space, to clean your brain before enter. Atmosphere: preparation, calmness and free of mind.

Pattern – Pattern of vertical screen of how wide they are/ and on the ceiling in terms of how your space is lit, fluorescent across the ceiling mounted.

Light Reinforcement – The light should be entirely independent that goes beyond the boundary of the wall following its own rhythm and won't be directional, trying to lead you somewhere.

Bright vs. Dark spaces – The brighter part is the window vs. towards at the door at day / different light levels, reflective materials so the light would be rich at night.

Re-visiting of the Design Concept Stage:
Lighter/terials – something that works with the natural light that comes in as strong shadows - make it more enclosed. I would use polycarbonate on skin and reception to make light more even and continuous at day closed and at night lit.
Summaries of Interviews

HDR

Plan

Element Diagram in Plan

Section

3D Sketch

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Summaries of Interviews

**Design Concept Stage:**
The first things I think of these spaces is that are all the same. I have a feeling that all of these spaces are the same and I can get lost very easily. So the main thing is the perception you get of the space if you are a person who works there or someone who is visiting (clients and famous people). You need direction when you get in, towards a lit space because you come in from a dark space so there should be a tunnel where the space opens up and people understand where they have to go. The other spaces are more subtle, the ceiling can be lower, so you increase the sensation of pushing people towards that direction where the ceiling increases eventually to 2.9m.

But then you can have some tangled spaces which lead you to the sides if you really know where to go that are not visible from the entrance. But when you start walking you can see them lead you to the other areas where the offices are. This type of tunnel, the windows should be open so you can walk to the lights and at the front it should be the reception and the waiting area. The ceiling raising towards the windows and lower towards the entrance walls are dark maybe black and they change to white towards the windows gradually, because you come from this completely artificial and compressed lifting area and you have been in the lift for a white so you have the feeling of a compression.

The walls are filtered with different door, which lead to different places where people work, after the walls there are other enclosed areas like dungeons, which connect to each other all at the main area. There could be different type of offices, where you are led through other tunnels created behind the walls. As the doors open you can see what’s going on and the fact that they are many doors open, increase the curiosity of what’s going on behind.

The design of the space gives you the feeling that you have to start walking faster because you feel trapped. If the space widens you start walking slower, if it becomes narrow you are walking faster. So people almost running from the lift and then start slowing down and then faster towards the light. The space is more compressed and there is the tunnel which acts as a filter area.

**Design Analysis Stage:**
Boundaries — One side differs from the other, the one is more diffused.

Important positions / points — Once you are in the entrance point, where the ceiling compresses more, claustrophobia feeling.

Connecting elements — The floor finish, which is the same in all the transition space.

Circulation - First are the visitor, then the people who work there. The circulation has to do with the speed of walking as well.

Transition zones — The place where the ceiling is lower and it feels uncomfortable being below it. Higher is only in the reception area and in the seating area.

Stimulating elements — The ceiling.

Materials — Colours — Shiny metallic sheet black glossy walls. The floor is black linoleum. The ceiling is made of plaster black finish. If everything is black the end of the tunnel is white. Furniture are block compact pieces, massive, just a few of them when you wait, not a lot of furniture.

Poetics — Ascetic, minimal. Is more about how you feel rather than indicating to you somehow what to feel. It is an abstract space with simple lines. They lead your behavior without knowing why.

Pattern — Dramatic effects of the gradient of the light on the walls, on the metallic sheet perforated. Almost nothing in the entrance and then it becomes more perforated towards the reception.

Light Reinforcement — Same in the seating area faking natural light during the night.

Bright vs. Dark spaces — The seating area is more relaxed more comfortable vs. the tunnels are the darkest.

Re-visiting of the Design Concept Stage:

Lighterials — I will use interactive surfaces where people touch and it responds with light on the floor. Just a few light on the entrance tunnel because it would be a few people, more into the waiting area and reception. You have some type of story when people move into the space.
Summaries of Interviews

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Element Diagram in Plan

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3D Sketch

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pattern
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lighterials
Design Concept Stage:

Loads of green that would be a delusion, keep only the two windows in the corner open the rest are closed. A table, in a very baroque style, and a couch I would use for seating area. Need more trees to direct movement to the corner place the couch between the trees. The table should be small- a game between the scale of the trees and the furniture. It’s not high enough for chandelier so I should have floor lamps old fashioned street lighting in smaller scale, the trees block all the light which is good, but need additional light street light is between offices and reception and will tell you where to go. The VIP entrance is through the long corridor. In general the space would look like a jungle.

Design Analysis Stage:

Boundaries – No explanation.

Important positions / points – Seating between the trees – point of emotional because it is an interior space and you don’t expect to sit in-between trees. The tiny table very interesting in terms of proportion and style in the middle of the building’s space, the table is very ornamented.

Connecting elements – The trees, but are they considered as architectural elements.

Circulation - No explanation.

Transition zones – No.

Stimulating elements – The trees.

Materials – Colours – Trees – as tropical as possible like jungle very bright greens. Ceiling white plasterboard no lights nothing, floor white silvery very glossy, big format tiles, landscape style, furniture baroque gold velvet

Poetics – Elegant without being intimidating, should be cool, feels cool- cold weather like, because the trees make difference being outdoors which you are not temperature wise, more comfortable, friendlier environment.

Pattern – Corridor nice pattern on the floor for VIP, nothing else just the same white silver floor tile.

Light Reinforcement – No explanation.

Bright vs. Dark spaces – The lights next to the trees.

Re-visiting of the Design Concept Stage:

Lighterials – I will replace the windows with oled so that the trees would seem backlit, this way they will create a smooth shadow, also they will seem brighter and their colour would seem better. I would also add oled on the columns next to the window floor to ceiling.

Use of planilum, I would create a skyscraper of doughnuts in piles. These would add beauty to the space and also more even illumination.
Summaries of Interviews
Design Concept Stage:
Transition area: The function is not so rigid it can be waiting area or a playground for children who wait. So it could be something to do curve or island helps the space with people to interact, because they can spend lots of hours. The rest of the space could be according to the grid, but this space for children would be something free. First we need a reception desk, we use round everything. The area facing the window can be a café, around the reception there can be seating/ sofa waiting for the clinic. Different sizes of islands, the furniture (circle) are moveable. The area has storage/ a café/ a waiting area to be served/ it is a children’s clinic. We can put some play, slides, to create a play area: a slide, a spinning wind, it can have some landscape as well. Have some pumps on this area, some are higher some are lower. The café can be higher, trying to use the level to divide the place, to give a character- enter – go down to rest and sea – go upper to eat or have a coffee. The change in the level is done smoothly (like British parks). The square thing seems to evolve from the ground and all have the same language- not something free standing.

Design Analysis Stage:
Boundaries – No explanation.
Important positions / points – When you enter looking at the overall area you see the area slopping down or another going up – see the play ground and the café- because you are higher and you can see all down. Everything is seamless- might not notice the difference in the level but I might be the colour that changes the different islands and distinguish different areas.
Connecting elements – Break the connection between the clinic and the transition space that’s why I’m trying to make it smooth and more welcoming and have one language with the rest.
Circulation - Register, wait for a while, find out how much time they use the space. Are you an adult or a child? Each makes different choices. They separate one goes to the playground another to the café – meet to go together to the reception – collect point.
Transition zones – Would be where the level changes.
Stimulating elements – The circles the rounds they are like islands and there seems to be like there is no boundary, they create an interaction between them.
Materials – Colours – The reception: floor: yellow linoleum light timber for the furniture made by the same hard material. Play area: floor: carpet darker brown. Café area: floor timber light. Furniture made by foam so it can be sculptured they emerge from the ground so brown. The ceiling is all around light cream.
Poetics – Hard material relates to the rest of the clinic. Play area is soft, cozier. In the café the furniture is light white timber, for a very relaxed atmosphere. In general there is a playful atmosphere, like in TV.
Pattern – Especially in the waiting area it can be circles, pattern and different gradient of brown/ the circles relate to the furniture. In different areas other circles like rings like it is the negative of the circles the waiting area – in the reception area. There is a variation of rings which is done by yellow linoleum.
Light Reinforcement – Light inside the furniture that comes out like the top glows. In the reception we can have inside the material or below towards the floor some light. There is light on the back of the sofa to light the wall, spotlights as well. Also changing suspended sculptured above the tables.
Bright vs. Dark spaces – The reception, the entrance, light from the reception, wall and the darkest the waiting area.

Re-visiting of the Design Concept Stage:
Lighterials – Interactive floor in the play area so kids can have fun when they play and walk around there. Light can change relate to the number of people sit on it or colour changes or cost glass that glows. Polyethylene volumes in the reception, a glowing plastic box at the reception it glows it attracts attention.
Summaries of Interviews

Plan

Element Diagram in Plan

Section

3D Sketch
Design Concept Stage:
Transition space is all about orientation, a choice towards spaces A or B. Spaces A and B are blocked off – they are in different colours to be more distinctive. A huge wall which would have the company’s profile and some sort of front desk could have a waiting area next to the window behind the wall. The wall becomes larger lead you to the space. The orientation is given by this big wall. It can be spoken have doors to lead you to the main waiting area and another two waiting areas each one for each space in front of the wall.
The entrance itself will be moved a bit inside so that you have to re orientate and look for the exit. The waiting area next to the window is gone, leaving the spaces for functions. Two different materials are used: one from half reception towards space A and another from half receptions towards space B.

Design Analysis Stage:
Boundaries – No explanation.
Important positions / points – When entering into the space, there is a trap effect. When you stand in the middle you think that you are in a cage and the only option you have is either going to A or B.
Connecting elements – The partition walls clearly the reception desk which will be split in half – with the wall the floor. In terms of material, gradient, colour.
Circulation – No explanation.
Stimulating elements – The inner door when entering into the trap.
Materials – Colours – One for everything for each side. For one carpet and different colour and the same colour on the wall it is like an envelope from green to red or white to black. B=white and A=black. The colour relates to the furniture in the office. It is a constant layer that turn from A to B into black and a grey line in the middle.
Poetics – It’s like a tunnel. Or better like a corridor, because the corridor always gives you the option of two ways. They would feel trapped in a corridor where they have two options.
Pattern – Everywhere as part of the material to make it more uniform. There are square patterns which changes into a circle. The pattern allows you flexibility. If you only have colour it restricts the concept of the design.
Light Reinforcement – Light on the desk- but lit cubish- the only element that is lit. Extrusions of the patterns on the wall and the ceilings becomes the luminaires for the space.
Bright vs. Dark spaces – The reception vs. the walls. To help orientation because the space has no direct natural light – light comes on when you enter to spaces A and B.

Re-visiting of the Design Concept Stage:
Lighterials – Polyethylene volumes on the desk and paint on the wall pattern.
Summaries of Interviews

**Design Concept Stage:**
I am trying to understand the space in 3D. I wouldn’t put many interior walls because it would divide the space and make it smaller and smaller. I’m trying to create an open space with minimum partitions.
When you enter you have people on the left hand side and the right hand side. You need some privacy in both sides. You need to receive people who go both ways, using the lines of the space. If I put a lot of space in the seating area I will confuse people, but if it will be just one it will be more obvious were to move when they enter, they are open to the space and view.
There are no partitions just the space in the corner as I would like to leave the space when you enter open. The ceiling will be low in order to differentiate the space. Below the low ceiling are the reception and the public space. This way you always look towards the exterior space. I will place the reception furniture next to the glass façade there are the desks. Also people who work there can go there too. The chairs are movable. Also the panels can create an enclosure or openness. At the end there can be a gallery as well.

**Design Analysis Stage:**

- **Boundaries** – No physical boundaries. The ceiling is the attraction, just something to attract in a very simple way.
- **Important positions / points** – All around it especially the semicircular approach.
- **Connecting elements** – The walls, wherever you are in this transition space you feel you are in the same area.
- **Circulation** – No explanation
- **Transition zones** – Going from the public space to the private one.
- **Stimulating elements** – Moving panels, everything could be open or closed.
- **Materials – Colours** – Ceiling: plasterboard, fake ceiling, white. The table in the reception and tables in general made of glass transparent and wood light for all the furniture. There are panels with graphics on them about the company. They are made off plasterboard full height very thin, in two or three rows. A mechanic way will be used to put them altogether. You can click a button and pull them to the end. Open them towards the space A or the space B or both.
- **Poetics** – Light space, lively space, attractive in a way especially the low ceiling. There is transparency, an open feeling to the exterior.
- **Pattern** – Keeping the same pattern of the panels, repeating the same dimensions on the panels.
- **Light Reinforcement** – Back tables light on the ceiling. Light point inside the panels, the light goes around the whole panel it can be dimmed down or turned off.
- **Bright vs. Dark spaces** – Light on the panels vs. dark in the middle

**Re-visiting of the Design Concept Stage:**

- **Lighterials** – The panels could incorporate lighting, they can be used to throw light towards the corner. The one side only – the other side would be solid. I will make the one side of Oleds not in every panel because they are different rows you would have some with light others without. This might link with the function at the corner, exhibition, gathering or meeting. It will be created a play between the lit and non-lit.
- Polyethylene furniture will be used, lit behind the panels in organic shapes – people are seating and reading – on the other side seats are not lit – this shows some privacy – dimmed volume would show – not to disturb. Chairs behind the panels – lit in another level to create another level of privacy of light. Privacy and focus is what the light reacts to – changeable space according to the need of the clients.
Design Concept Stage:
People need a break zone to separate them from the mentality of the different rhythm. Using the raising floor differently and gentle but you will feel this change when you are walking you are aware of it and it leads you to a specific area. Risen floor, but not so much that you can step and can go straight from one space to the other.
I will try to work with the geometry, turn it into an origami pattern would be interesting. I will create a ramp which you can walk across, but the ramp will lead you into the zones, more transition space, seating area etc. The ramp is not very high that people can move from space A to space B directly.
I will create three separate zones: one central to separate the consumer from the picture, the activity, the situation he is. Another is the changing room. In another zone there is the seating area where they can sit down and discuss. I don’t want to break the freedom of moving from one area to another and the ramp doesn’t restrict that.

Design Analysis Stage:
Boundaries – No explanation.
Important positions / points – Two of them. One: because of the entrance, the other: because you make the decision where to go and what to do, and the other one: because of the view.
Connecting elements – The ramp.
Circulation – Gentle overlapping of ramps allow many different moves. If you follow the ramp you move. If you set a target you move towards it with no restriction.
Transition zones – There is one that of the ramp which appears very expanding.
Stimulating elements – The way you spend time in the space and set it through your movement. It is on the people’s choice: either they choose the inconvenient path or just walk through the ramp: the strong directionality but not strong enough, it can allow you to break it if you want to. It works geometrically.
Materials – Colours – The floor is grey concrete. Ceiling is grey painted. Furniture is orange textile, something soft velvet style.
Poetics – Calm and settle. Gentle as well. It’s not a strong effect. You need to spend time and be sensitive to feel the space
Pattern – The geometry of the space itself, the windows and the columns.
Light Reinforcement – The light should follow a geometrical pattern. Use lighting to make the ramp have a connection with the ceiling but remove them from the walking areas.
Bright vs. Dark spaces – The center zone is the brightest vs. the seating area.

Re-visiting of the Design Concept Stage:
Lighterials – I would use the oled to cover the columns.
Design Concept Stage:
There are panels around the space something that allows light to come through. 2.0m height partitions – they become framing devices for some sort of reception desk here and here – that becomes a lounge area with seating. Exhibition for advertisement for your business is on the panels - all around.
The space is unified, a buffer zone. The purpose is to allow for a number of functions. Two reception desks, residential atmosphere in general, two different seating one of each not only art wall – partitions light come through and some openings that allow pure light to come in. It acts like a buffer zone between the shell and the inner space.
There is wood type furniture - flexible furniture – more residential. Full height some walls, also sliding doors to come in there is a series of glass panels - textured panels.

Design Analysis Stage:
Boundaries – They are set by the fixed full height partitions and the rest of the windows, two boundaries, and the one set by the panels.
Important positions / points – The panel wall is kind of a buffer and permutable and functional and you can see through – the back path is more private where you can take a call.
Connecting elements – There are not. It’s like an independent space, like a third space.
Circulation - No explanation.
Transition zones – Between the panel and the buffer zone and the buffer in front of the panels – when you choose a path you walk through the panels. The rest is seating like a holding area.
Stimulating elements – The panels.
Materials – Colours – There is a residential quality, elegant gallery. Panels: series of wood frames and white plasterboard walls – surface for art. Furniture: simple, clean, doesn’t distract from the walls- black dark or grey blue or chocolate. Ceiling: white. Floor: dark and wood floor.
Poetics – Residential quality, elegant gallery.
Pattern – is how the materials come together is about using the wooden material and the plasterboard and the way they come together. Also it is important the pattern on the panels.
Light Reinforcement – Gallery type lighting. Track spots, table lamps, floor lamps, lighting for framing devices, for full height wall – for wash – cube slot – down light above each coffee table.
Bright vs. Dark spaces – No explanation.

Re-visit of the Design Concept Stage:
Lighterials – Apix Oleds get fitted into the task lamps - an elegant shape minimal decorative element. Do some interesting pattern on the whole light pattern as an emboss – create a pattern – white plasterboard background lit logo perhaps create a texture with a pattern through light maybe its Oled or paint. A gradation of the colour of the carpet in the middle, light emitting substances pigment which can be graphically put onto the floor and on the ceiling.
Summaries of Interviews

MRC

Design Concept Stage:
Get an understanding of the space and see what I can change and what not. Eliminate stuff I need to consider now. So transition space has to function as well: people come in: there should be a reception desk straight in front and then some seating area.
You want to seal the space at the offices – so not too noisy and heighten it up a little. You come in the reception and then some seating area and a display, trying to zone it, you want to have a small kitchen where all people mostly visitors and receptionist can grab a coffee, some islands that are seating area they are round elements, walls would be round elements that would interact with in the islands and would lead people to the passages towards spaces A and B. There are storage units as well, especially in the entrances of the spaces A and B, behind these walls is always storage display. Full height walls from this side it was boards and display stuff on it.

Design Analysis Stage:
Boundaries – No explanation.
Important positions / points – Features are the islands – they could be very bright elements or something and the backdrops of these windows, view etc.
Connecting elements – The storage units, they define the space and they are tight together.
Circulation – People who work and people who are visiting.
Transition zones – The zone you enter into the offices and the entrances you get in, and the interaction between the shapes and the functions and the colours of the islands.
Stimulating elements – The islands, because they are the feature elements which they define the space, they eternalize moving around them and they attract attention because they are colorful.
Materials – Colours – The islands: timber outside hard leather seating inside and something soft like carpet to bring people inside. Walls: Velcro that you can stick something easy to change – depending on what you want to exhibit: the storage walls is the same just with doors that open to put stuff inside. Floor: soft fabric cause wants to be cozy – atmospheric, people who work there have coffee at this area like a fluffy carpet/ white carpet and the rest carpet of the islands yellow, red and green, the Velcro has colour itself its purple. Ceiling: like rough concrete light grey.
Poetics – cozy, multipurpose, inviting, playful, colourful, and different from the boring office set up. I want to create the feelings of openness, creativity, and light full and bright space.
Pattern – All are uniform because of the colour pattern is on the display walls, where they can create windows on them, like pattern – could be landscape or portrait etc.
Light Reinforcement – Back lit partition wall, light below the benches (in the islands) and in reception.
Bright vs. Dark spaces – The inside of the islands – in the interior of the windows of the partition walls is the darkest and the wall – backgrounds of them are bright.

Re-visiting of the Design Concept Stage:
Lighterials – Interactive surfaces – have that on the fabric for seating so to give a glow around it and low shimmering light and as soon as someone seats there it becomes bright, apply it on the floor seat and back so that a ball of light when you sit in. People look in silhouette and in traces of movement like a light path which fades and close after I leave the island.
Scintilla lumina is placed on the reception which sparkles when you enter and attracts attention and it has colour behind it so the plastic seats in front of it.
Led light across the walls when you move it moves as well, attracts movement it will be dark and when I move the whole surface it becomes active by using a monitor or something. This could be made by the soft wall of polyethylene. Quite nice because the place will be in dark if there is no interactivity in there and nobody is in. sparkles along the outside – they shout for attention – the spaces change from light full to dark and light full again as if it goes to sleep and wakes up.
**Design Concept Stage:**

The way I see this connection is to create a view between those two corners that are not visually connected yet. I want some kind of movement, a sort of landscape that would direct your movement from one space to the other. This landscape would be used to sit down, to wait for an appointment.

The surface behind would be rounded and would be reflective material that bounce the image up and down, there would be a visual connection that way between the two areas A and B.

There are two categories: one stating seating and another movement. The corridor space where you have the moment, most of it happens here it has the reflective material or glass mirrors. The landscape is creating the furniture ceiling - is a reflection of the landscape and would emphasize this enclosure and movement. The reception desk is the first thing you see when you arrive, the same language of this reflection area and link it this way to landscape.

**Design Analysis Stage:**

- **Boundaries** – No explanation.
- **Important positions / points** – The reception desk / the panels behind the landscape / the enclosure point in-between and the upper seating level.
- **Connecting elements** – The panels / the landscape and the reception.
- **Circulation** – No explanation.
- **Transition zones** – Mid transition space (stop) choice seat or move and the moment you have the transition of spaces / visual connection standing on the landscapes / seating.
- **Stimulating elements** – The enclosure – stimulated to act (move) and upper parts of the seating area – stand and look / the upper positions could allow for more interaction with everything.
- **Materials – Colours** – The landscape - soft wood tactile / walls surfaces, reflective metal, aluminium same in reception / ceiling repeat the wood landscape shapes soft material like fabric use maybe painted or soft fabric – green like grass.
- **Poetics** – I am trying to allow for two types of inhabitation: a static and a movement / the material allow for tactile connection with the space or by touch / the colours relate to natural colours that react on the feelings of the people / relaxed / relates to natural organic shapes / can enjoy this moment of transition / materials used to link.
- **Pattern** – No pattern.
- **Light Reinforcement** – In each of the steps seems like elevated or floated one from the other on the bottom of the reception as well.
- **Bright vs. Dark spaces** – The landscapes vs. the enclosure.

**Re-visiting of the Design Concept Stage:**

- **Lighterials** – Interactive surfaces on all the steps, the different platforms. It is because in order to allow these moments to be more interactive and active because this is the moving area and needed more action.
- i will use polyethylene furniture to the whole surface, light coming from the bottom. It is very sharp and bright and then more diffused, different up to down the reason is to attract the attention when people enter.
Summaries of Interviews
Summaries of Interviews

Design Concept Stage:
Trying to orientate the entrance and the transition space to this angle when you enter you have a reception desk just in front of you and then you are directed to the view, pointed, double aspect view in a high level and you can divide the walls and more towards spaces A and B. There is a transition space, an office that has double doors and information on the reception desk. The ceiling would be slightly low. You could have some seating in the corner where you can have a rest, bench is better than a number of tables and chars. I believe that a transition space should be plain and simple.

Design Analysis Stage:
Boundaries – No explanation.
Important positions / points – The view towards the city, next the reception desk – they will be surprised to see the view.
Connecting elements – The doors.
Circulation - No explanation.
Transition zones – The view, the corner and the zone in the waiting area.
Stimulating elements – The view.
Materials – Colours – The floor is dark concrete black shiny / ceiling: matt, white stucco matt same as walls / seats black leather and the reception too. Everything that is sticking out from the ground is black and from the ceiling white.
Poetics – Slightly contributive and kind of not too many crazy forms, just simple also striking to announce your arrival, a full stop. It gives you the feeling of the essential arrival/ like yes I am here a punctuation mark when you are walking from space A to space B.
Pattern – The binding of the black and white elements.
Light Reinforcement – Light in the center. You don’t exhibit something so you don’t have to worry about levels unless there is an installation in the center where is the spotlight, also spot lights above reception.
Bright vs. Dark spaces – The corner vs. the reception at day and at night the opposite / a swap of the light character.

Re-visiting of the Design Concept Stage:
Lighterials – Wall constructed in polyethylene, like emitting light themselves, gradient of light with more light towards the reception as a point would give the impression about what is happening in spaces A and B. Electroluminescent tape around the view to create like a 2d box.
Summaries of Interviews
**Design Concept Stage:**

I would like to make simple the outline of the space. I’ll make sure that the transition between the transition space to the spaces have a continuity. But you close if you want privacy or soundproof, so I introduce partitions that can be open but closes as well, separate and connect. This area will be the seating area before you go in to take a view and as you come in there would be another seating area as well. In the middle something to play with the ceiling, the notion of the big ceiling would have a feature, a glowing area which will some down as pendant reception next to the entrance.

At night it will become very dark so I introduce an effect of skylight. The seating area is restricted with the pattern slightly from the rest of the transition space. I will use full height partitions, again the idea of something you can close or open as the other side. The seating area is continued in the same way in the restaurants in order to create homogenous with the rest of the floor when doors are open. The partition, visually is not solid, it has texture but you see through, glass with screen on top to make it a bit less solid. The same language is used in all partitions.

The feature on the ceiling will be illuminated with colours, floating ceiling, simple like barrisol. You don’t see the detail; it is recessed in a little bit from the ceiling. It will look like a glowing sky. It will be, warm white and white cool, it depends on the occasion. But using low level furniture make a contrast to the background. I will put cozy furniture to look to the view.

**Design Analysis Stage:**

**Boundaries** – No explanation.
**Important positions / points** – The central feature: overcast sky. Sofas have a nice design, a neat design. Back door entrance, people always look at the door of people to come in and also you need to have an interesting exit in order to finish it off.
**Connecting elements** – The skin at the boundary and how it relates to the space. If you link it with the language of the materials that you use or the elements it would help.
**Circulation** – No explanation.
**Transition zones** – Where the feature is.
**Stimulating elements** – First is the central feeling. I will do it subtle. It won’t be stimulating but it will evoke some feelings because of colour, because it is beautiful. Second is the seating area will be introduced a texture that would make it stimulating.
**Poetics** – It is elegant and atmospheric. The feelings I want it to be introducing, welcoming. This is very nice fine restaurant, see people chatting etc.
**Pattern** – Repetitive elements also rhythm in the windows, having that as well in the partitions, will reflect to the ceiling in terms of proportions feature. For the floor: same material different pattern.
**Light Reinforcement** – Ceiling feature, which can be seen from the outside, it enhances the shape of the room. During the day the feature has white cool light. At night the light will be warm. Dark glasses on the column and the blind will be closed. It will be lit or it will be horrible. Light the blind add light on the floor to coat up with dark glasses we have. Also something to bring coziness like low level light that gives ambient light and warmth and cozy, all quite dimmed in my head.
**Bright vs. Dark spaces** – Feature and partitions which are lit with down lights vs. the entrance when you enter or exit is dark.

**Re-visiting of the Design Concept Stage:**

**Lighterials** – The partitions, instead of lit externally, it would have glass with light concealed. The light can be incorporated into the panel. This idea is applied to all partitions. Also, instead of normal reception it can become a little glowing box and accommodate those spaces. The glass with integrated light very soft light with texture, a very interesting pattern, like a volume of light and that can be replicable to the seating areas tables. Barrisol on the ceiling feature.
Summaries of Interviews
Design Concept Stage:
I am thinking of designing something that would guide you from the point 1 to the point 3, that would make a loop and again back into the same path, something continuous which would be conveyed from the wall to the floor and then to the ceiling. It would be something like a ribbon which ravel and creates a kind of seat or the display or the reception so that there would be a point where the ribbon would close and tie. Well the ribbon, whenever it is straight it would be something on the floor or on the ceiling and it would link to the circulation and when it is a curve it would be something more softly and something less directive. The straighten piece of ribbon would be placed next to the windows in order people be able to walk on them, then it would make a loop and at the point of the loop it would have information desk. When the ribbon is vertical, it would climb on the ceiling and it would create display information. When it is 'on the ceiling' it shouldn't touch the ceiling but it would be just a few centimeters lower. The part of the ribbon which is display, it would have some for display and it would hang. I am thinking of it like a translucent glass, a light tape that would make people follow it or a metal glass tape.

Design Analysis Stage:
Boundaries – The entrances and the exits, the horizontal ribbon which is on the ceiling or at the floor.
Important positions / points – When you enter and when you exit.
Connecting elements – No explanation.
Circulation - No explanation.
Transition zones – The reception area where is the entrance and the orientation. Also behind the reception this part, where you change the use from the retail to a seating area and therefore you are changing your mood.
Stimulating elements – The change from the horizontal straight part to the curvy vertical one and the change from the horizontal part to a seat.
Materials – Colours – The ribbon would be like a light strip, a reflective surface, maybe like a glass mostly and at the seating area, it would be an opaque milky type plastic but not lit, in order to distinguish the circulation from the use. On the floor, there is concrete grey and the same on the ceiling. Therefore there would be the milky bright and the milky dark and it would have a gradient loss of light between these two.
Poetics – Dynamic, positive. I would like it to create a positive energy feeling to the visitors, bright, playful but at the same time pure not so impressive. I would like this feeling of having something next to you to accompany you.
Pattern – No patterns.
Light Reinforcement – Light on the circulation part on the floor.
Bright vs. Dark spaces – Display vs. seating area.

Re-visiting of the Design Concept Stage:
Lighterials – I would place Oleds in all the horizontal parts of the ribbon, those on the floor and on the ceiling. Also i would place interactive surfaces on the seats so that when someone seats it would lit, also the same on the reception desk, so that the surface would light when they would pay money.
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**Design Concept Stage:**

Transition seems between two spaces at least and includes the entrance, so that means I can create circulation towards spaces A and B. The bar is visible from the entrance and the restaurant needs more space, to be more private. I need visible reception something in-between. I am concerned about the corner. I don’t want to block the view with the reception.

I think you shouldn’t be able to walk straight to the entrances of the spaces A and B but walk until the end of the transition space and then go to the other spaces so that means that these spaces should be blocked. At what point I can place my entrance to the other spaces normally when I do a circulation. I tend to be curvy, I want them to feel that they enter to the space. An opposite space would mean the opposite, I would make it from narrow space to an open so they are not afraid to walk in. And I place my reception in the large part of the curve so it won’t ever be blocked, to have space to breath.

I treat the bar as a waiting area as well one partition shorter than the other one. The partitions suddenly go down, disappearing. They don’t touch the ceiling there is a group of 25cm when you walk, you discover the private room, when the transition wall reduces height. The other one is a wall at the same height as the table that separates the space from the bar that decreases in height as well. The sequence of the experience is: first discovering what’s going on (reception and bar), second the transition to the bar and so I go to the restaurant in terms of visual perception. In the entrance the space is dark and the rest is light. You would tend to discover the front. The people shouldn’t feel enclosed at all that’s why the gap from the ceiling to the wall, because I want them to feel the totality. The transition space shouldn’t divide but should transition. The materiality of the wall it comes from very intense pattern, and suddenly lighter pattern, to a very light one, with even light penetrating inside. From dark to light down at the end is more neutral. In the entrance it is darker.

**Design Analysis Stage:**

**Boundaries** — Elliptical.

**Important positions / points** — This would be like: first you enter, then you move inside and then you exit. First you see the totality, and then you look at the wall, sigh and the reception and then forget about it.

**Connecting elements** — The wall, the shape of the wall, the thing that both are curvy in the same way.

**Circulation** — No explanation.

**Transition zones** — Kind of enclosing the circle.

**Stimulating elements** — It is the wall behind the reception, because it will have the texture.

**Materials — Colours** — On the sofa: soft, textile, darker to suit floor. On the partition behind the reception, dark wood, with pattern Arabic. The pattern opens up and there is contrast with the light used. The table is dark wood. The other wall would be dark wood. Floor: grey limestone. Ceiling: should be cinnamon. There is different gradient. C1. Dark grey. C2. Medium black. C3 brightest black grey. So that you can see the view even more.

**Poetics** — It is formal. It is proper, elegant or sober. I want to show a degree of freedom not classifying. I don’t say you can’t go beyond these walls. I suggest instant transition towards the spaces but also creating a controlled area that offers a degree of privacy. It is delicate concerning about what you want but protective as well towards the clients.

**Pattern** — On the wall behind the reception there is a pattern.

**Light Reinforcement** — Spot light above reception. Light around the wall should be in the border aiming down, framing the wall of the reception.

**Bright vs. Dark spaces** — Edge windows vs. the entrance, both at day and night. Artificial light would relate and follow the natural lights contrast.

**Re-visiting of the Design Concept Stage:**

Lighterials — I would enhance using the lighterials the design more at night time. Whatever light quality I had in daylight I can have it in a delicate way within the material. I would put light emitting substances. I would like to have a light pattern with the wood as paint, the light following the wooden pattern.

I would also like to add a volume with light, in a point where you can see it. And change the sofa to the light volume, so I would use the polyethylene furniture.
Design Concept Stage:
I will start with assumptions of what space A and B is. Treat them the same way. I assume that the space is equally organized. There is transparency and I have to make use of the daylight as much as possible. You need to interact with reception and the waiting area. It would be in an island a portion of which island would be the counter and people can sit around it. First there is the reception, then the seating area and finally the display. When you seat I want to look at the display which is central and then I make my choice. I want to create a shortcut service to go straight to the offices or to go to the reception first. When I am seated I feel more orientated and central.

Design Analysis Stage:
Boundaries — No explanation.
Important positions / points — The entrance: when you first enter you should have immediately the perception that a space is organized centrally and you have to go to the center. All the waiting position has the perception of different planes in depth. You can see through spaces A and B and people who sit on the opposite side.
Connecting elements — The seating elements. That’s because it’s continuous. It reads continuously in both sides.
Circulation — No explanation.
Transition zones — All the circulation space. The one covered in yellow. The definition of transition for me is between two static actions. So here it is the transition when you enter the reception, the seating area and other spaces.
Stimulating elements — I would design this space stimulating for the people who have to wait. So, the information panel is the stimulation, because it is the closest to the waiting area and it’s the only element that can entertain.
Materials — Colours — The materials have to rely to the spaces. Everything is white — except from the seating. A colour that stands out. Not a bright one. Leather in black. The top of all the seating area and the top of the counter, black and the rest white. There are plants at the back behind the seating area. They won’t have big leaves but can see out like a garden.
Poetics — Aseptic space. It doesn’t have hierarchy in the form. Or just at first, then there is. There is no front and back, there is what you wish. The way to enter but then you can move around as you wish. It creates a well defined boundary between the waiting area and spaces A and B. On the other hand the visual connections are preserved, when I am somewhere I can see the end of the space.
Pattern — It’s a rhythm that starts if I am looking at the section and this is A and B, there would be a rhythm of tables and the design fits into this rhythm. There is created a variation of this rhythm from regular to slower to dense.
Light Reinforcement — Lighting around the seating area and I would make sure that the counter has enough light. I would hide the lights behind the screens pointing down on the counter and have down lights on the ceiling which will focus on the seating area so people can read the book.
Bright vs. Dark spaces — The seating area and the reception vs. the entrance.

Re-visiting of the Design Concept Stage:
Lighterials — I would use barrisol above the reception. This would be integrated with the screens and barrisol again on the top of the receptionist. Also I would use electroluminescent tape to define the edge of the seating area probably on the floor, so I can reconnect this continuity from the entrance.
I would add artificial plants that emit light instead of down lights. I would use light emitting substances to achieve this.
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Design Concept Stage:
The focus would be somewhere that sits people and being educated about the products on offer. I am thinking of some sort of more like a pavilion type structure, with a reception desk and screens and models, one point of focus that would walk in and look at these staff. I would create some sort of a structure that would include all those things as one and would have seating area arranged around it. I don’t know why I am going for a curvature if there is no type of constraint and try to get away from the fact that is this structure. Benches or stalls around the area which has screens. I flush out what this might be on the ground now. I will place a back room for the reception so they can store all the equipment from the screen. It should be a type of partition between the reception area and the main spaces A and B. The way people use spaces they might need to be private. Need some tables and chairs. This is a kind of kiosk.
The façade of the pavilion is some kind of structure looking like it is a floor to ceiling structure, although it isn’t. It is something that seems to provide focus to the room. A rigid structure between the floor and the ceiling, which is a kiosk pavilion and is placed in the center of the space. It has these openings in the outside where you can see through to the kiosk and speak to the receptionist. Desk and structure are all in one. There is an elevation and above receptionist head there are screens and show offers and stuff around big comfortable seats placed all around it. Translucent partitions are there but I don’t want to make this feel as a complete separate room. There would be continuity in the lighting from the center to the main spaces, a way of travelling people through. Translucent partitions because you want to strike a balance of separating the space but the same time give illusion to the space having a hint about what’s going on inside. The tables are important: people would be in the reception floor apart from the receptionist that would have to sit down in the table with the client. The screens integrated into the structure of the kiosk.

Design Analysis Stage:

Boundaries – No explanation.

Important positions / points – The screens and the partition with light integrated into in contrast with the floor and the furniture.

Connecting elements – The partitions that are directed around of the pavilion one way or another. This would provide focus but there will be eligibility between the edge of the two partitions and the kiosk.

Circulation - No explanation.

Transition zones – The character of the space and its purpose changes the moment of moving to the next space gives you this transition.

Stimulating elements – The form of the kiosk itself. From a formalistic side of view, this will draw the most attention.

Materials – Colours – Polished white corian, not shiny, is used on the kiosk. It has an artificiality but not cold as steel. It has an interesting texture as well. The ceiling will be white. The partitions will be translucent (not transparent) an acrylic that diffuses the light, coloured. Furniture is black leather and the floor poured resin grey.

Poetics – Maturity, elegance in the materials and touch trying to create something that leads to the retail store. The atmosphere will be serene. People who walk in would feel comfortable and confident. The architecture of the space is a message that selling the products and are part of the experience.

Pattern – Acrylic material with pattern on the partitions. The pavilion can have a texture and pattern on the corian, different to each other the most visible ones, but not greatly different, more as a variation of the same pattern.

Light Reinforcement – The partitions: colour lights, maybe one colour of light on the corian because it has warm reflect quality that would look very well.

Bright vs. Dark spaces – Service circulation is the darkest. Corian is the reflective that everything else would be dark. The brightest is in the center of the reception.

Re-visiting of the Design Concept Stage:

Lighterials – It’s an informational space. It is all about communication this is why I put these screens above the reception head above the pavilion, but if you have active surfaces which would be part of the surface itself it would be cool, will be above the whole area.

Living Information projecting moving images rather than something that is clerkly. There are Information surfaces. Everyone sits down watch it. It is a utilitarian element that attracts attention and then you have unspoiled form of the pavilion, the walls and the seating area and no other noise.

I would use polyethylene volumes, soft wall like a curtain, kind of opaque, plastic. I want a type of thing which is not seeing through, a restrain material that wouldn’t look like as an archive. Having some light behind create an enclosure.
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Design Concept Stage:
What you always want is a reception desk from the moment you walk in. The corner is quite nice, when you seat there it seems like an airport lounge almost. This is a quite big space, many people, big reception desk and seating area. I place the reception in an axis so that will make you look towards the corner, which should be low level to allow viewing. From the reception people can look both spaces.
We turn this almost like airport lounge, cozy, information, TV screens to tell you where everything is in high level, to get some idea of the media. The plan is open to see through to the other side. The reception is very important because it needs to be central point and see everything and be seen clearly.
Change it into something that it is a waiting area and something it is more social. You need a reason to sit there, so maybe it’s a bar or coffee place, I would almost create something else on this side that would act as a coffee place. You want to become visible, from outside create an enclosure, which is nice and makes café point more obvious. The seating area is for people who work there, if they want to interact with other, some just wait, some have coffee.

Design Analysis Stage:

Boundaries – No explanation.

Important positions / points – This visual is important, the penetration. Whatever it is it will be low level. You don’t want to block the visual connection, something semitransparent, everything is glass. You don’t know where to go, everything is transparent.

Connecting elements – The seating area, create social center, where people can meet and chat and relax.

Circulation - No explanation.

Transition zones – This enclosure path, clearly finding people through into the seating area. Also the area from the transition space to spaces A and B.

Stimulating elements – The furniture. Whatever they are they become a visual background, I would make a huge feature about what there furniture is.

Materials – Colours – All wood, light wood for the floor and soft fabric for the furniture. Perplex for the coffee place, for the bar black timber walnut.

Poetics – It’s like an airport, quite appropriate. There are transitional spaces, spaces where you wait the next thing to happen. I want to make people feel expectant of something, almost adventurous, calm, but something exciting coming up.

Pattern – Is in the fabric of the furniture. Also the arrangement of the objects on the floor creates different patterns.

Light Reinforcement – There is lighting for coffee place, like the mc Donald’s menu, up there with screens. News of what’s going on in the office, or in the world of media. It’s an interactive surface with people who work in the space. Also there are lamps around the seating area.

Bright vs. Dark spaces – The two volumes will be light boxes in the dark which will navigate people. Vs. the corner is dark and spotlight.

Re-visiting of the Design Concept Stage:

Lighterials – I would change the bar into solid and present and I would construct it with riverstone bricks. Also I would create moments and enclosure in the seating area like barrier. Create little domes, make the area feel more enclosure and more volumetric, objects with light on the ground.

Eventually the two objects have different materials because they are two different things.
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- connecting elements
- circulation
- transition zones
- pattern
- lighting
- bright vs dark areas
- lighters
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CRL coding

<table>
<thead>
<tr>
<th>CRL’s coding</th>
<th>Clinic</th>
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<tbody>
<tr>
<td><strong>CRL’s comments on MRE’s design elements after the application of the lighterals:</strong></td>
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<td><strong>Boundaries</strong> – I don’t believe the boundaries change. But I think that the boundaries should include in first place the reception desk since they have the same language - the material.</td>
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<td><strong>Important positions / points</strong> – They can become more distracting so it deviates your orientation too. Or maybe it is a small place for this to happen. You would remember this space as physical presence - you would remember it as a space that has this on the platforms.</td>
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<td><strong>Connecting elements</strong> – The binding elements do not change.</td>
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<td><strong>Circulation</strong> – People visiting for the first time would be curious to touch the surfaces. So if new visitors approach it and children it would change a lot. Being a clinic would attract new visitors. The adults would sit there and there in order to see if something different would happen.</td>
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<td><strong>Transition zones</strong> – Reinforces the transition. You had a transition between the passage and the space - you have difference between the constrained space and the open space so you have light that changes the appearance to the lit and nonlit.</td>
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<td><strong>Stimulating elements</strong> – Lighting can work as stimulating and focal object. It is a complex structure - the landscape - so it will always be stimulating so it will enhance it. If you have lights where you touch it, then stimulating elements would be any areas you touch.</td>
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<td><strong>Materials – Colours</strong> – No change in the colours, but the materials change. She replaced the reception desk from metal reflective surface to plastic lighting element.</td>
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<td><strong>Poetics</strong> – Yes of course the space would become more interactive and energetic.</td>
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<td><strong>Pattern</strong> – The pattern changes if the people touch and responds with light then that adds a type of light pattern into the space.</td>
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<td><strong>Light Reinforcement</strong> – Yes modified the lighting scheme, the lighting is different now.</td>
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<td><strong>Bright vs. Dark spaces</strong> – No, no change. The brightest would still remain the platforms and I am not sure about the reflections, the dark would still be the inbetween space.</td>
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| **CRL’s comments on her own design elements after the application of the lighterals:** | |
| **Boundaries** – Reinforcing the existing boundaries, where the light transmitting concrete is applied. The feel won’t feel as small anymore. | |
| **Important positions / points** – I believe that there is no change. | |
| **Connecting elements** – The binding elements change because applying light transmitting concrete on the curvy walls implies a continuity. People can see what happens behind so spaces bind visually. | |
| **Circulation** – I don’t think the circulation changes. | |
| **Transition zones** – Another transition point is added between point 1 and point 3; in the middle of the reception space looking through the light transmitting concrete wall. | |
| **Stimulating elements** – The new lighting features act as stimulating elements. | |
| **Materials – Colours** – The colours do not change, but the materials do. | |
| **Poetics** – It won’t change. It is a comfortable space, using natural colours and materials. | |
| **Pattern** – There is a pattern added on the ceiling. Also the appearance of the light transmitting concrete has a pattern so that adds to the space. | |
| **Light Reinforcement** – The lighting has changed. Before had lighting being reflected by the walls and from the ceiling and the curvy walls are no longer reflective but lighting elements. | |
| **Bright vs. Dark spaces** – The walls are still lit, so the center of the space remains dark. | |
# Appendix XIV

## Excel Sheet: Elements

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<td>No</td>
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**BOU**  Boundaries  
**IMP**  Important positions/ points  
**CON**  Connecting elements  
**CIR**  Circulation  
**TRNS**  Transition zones  
**STML**  Stimulating elements  
**MAT**  Material  
**COL**  Colour  
**PTCS**  Poetics  
**PTRN**  Pattern  
**LGH**  Lighting scheme  
**BRDR**  Bright vs Dark areas
<table>
<thead>
<tr>
<th>NAME</th>
<th>Function</th>
<th>Poetics before</th>
<th>Lighterials 1</th>
<th>Application 1</th>
<th>Reason for app.1</th>
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<tr>
<td>LT</td>
<td>Banking</td>
<td>lively space/multifunctional</td>
<td>oleds</td>
<td>walls</td>
<td>throw light</td>
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<tr>
<td>KN</td>
<td>Banking</td>
<td>tunnel like / corridor that gives you always 2 options</td>
<td>polyethylene</td>
<td>desk</td>
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<tr>
<td>MRC</td>
<td>Banking</td>
<td>residential quality/ elegant gallery</td>
<td>oled</td>
<td>luminaire</td>
<td>elegant shape/minim decorative element</td>
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<tr>
<td>MCI</td>
<td>Banking</td>
<td>cozy/multipurpose/ inviting/playful/ colourfull/not boring at all</td>
<td>interactive surfaces</td>
<td>seating and floor</td>
<td>increase glow</td>
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<tr>
<td>CRL</td>
<td>Clinic</td>
<td>comfortable residential space/ like living room not anxious/comfy</td>
<td>light transmitting</td>
<td>concrete</td>
<td>effect of water and natural material</td>
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<td>KCH</td>
<td>Clinic</td>
<td>welcoming/ playarea-playfull/soft cozy/ very relaxed in the café/ sophisticated/ elegant/quiet and serious natural materias</td>
<td>interactive surfaces</td>
<td>floor(playarea)</td>
<td>more playfull</td>
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<tr>
<td>EMR</td>
<td>Clinic</td>
<td>make it warm</td>
<td>light transmitting</td>
<td>concrete</td>
<td>create silhouette effect</td>
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<tr>
<td>MRE</td>
<td>Clinic</td>
<td>inside outside space and</td>
<td>interactive</td>
<td>steps</td>
<td>add action</td>
</tr>
</tbody>
</table>

Excel Sheet: Poetics vs Function

Appendix XV
### Enlargement of MRE’s answers

<table>
<thead>
<tr>
<th>Name</th>
<th>Profession</th>
<th>Gender</th>
<th>Age</th>
<th>Function</th>
<th>Nationality</th>
<th>What type of character would you say that the transition space you have designed is?</th>
<th>Did you incorporate poetics in your design?</th>
<th>If yes, was this process:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRE</td>
<td>Architect</td>
<td>Female</td>
<td>20-35</td>
<td>Clinic</td>
<td>Dutch</td>
<td>Space of both movement and static state which interacts with the visitor through visual connection and interactive touch surfaces</td>
<td>Yes</td>
<td>Interesting</td>
</tr>
</tbody>
</table>

Excel Sheet Sample: Questionnaire Results
<table>
<thead>
<tr>
<th>Name</th>
<th>Profession</th>
<th>Gender</th>
<th>Age</th>
<th>Function</th>
<th>Nationality</th>
<th>What kind of character would you say that the transition space you have designed is?</th>
<th>Did you incorporate ‘poetic’ elements into your design?</th>
<th>If yes, was this process:</th>
<th>Did you enjoy the architectural design procedure with Lighterials, which you were assigned to work with?</th>
<th>Have you ever used Lighterials be fore in any of your projects?</th>
<th>Did you find Lighterials:</th>
<th>Did you think that Lighterials:</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRE</td>
<td>Architect</td>
<td>Female</td>
<td>20-35</td>
<td>Clinic</td>
<td>Dutch</td>
<td>Space of both movement and static state which interacts with the visitor through visual connection and interactive touch surfaces</td>
<td>Yes</td>
<td>Interesting</td>
<td>Yes</td>
<td>No</td>
<td>Useful</td>
<td>Enhanced the process</td>
<td></td>
</tr>
</tbody>
</table>

**What kind of difficulties did you face while working with the Lighterials?**

None

**Do you believe that the use of the Lighterials enhanced the poetics of the space?**

Yes

**Would you use those Lighterials in your future career?**

Comments

**Would you include those Lighterials into the architect’s toolbox permanently?**

Comments

**The use of these types of material in architecture is becoming common. Do you believe that the application of these materials into lighting design should be incorporated into architectural education?**

Students should be taught about all materials and possibilities to create different spaces and characters / light is a perfect tool for that

**Please write down any comment you feel it is important for this study.**

Enhanced the process


Gagg, R. 2011. Basics interior architecture 05: Texture + materials. AVA. [online]. Available from: http://my.safaribooksonline.com/book/design/9782940411535/metals/history_and_context0001fX2ludGVybmFsX0ZiYXNoUmVhZGVyP3htbGlkPTk3ODI5NDA0MTE1MzUvMTEz


Konyk C. (konyk@konyk.net ) (23 May 2011) ‘A/N ON_AIR project questions for my PhD Studies’ Email to Vasiliki Papakammenou (v.papakammenou@ucl.ac.uk)


Le Corbusier. 1923. Vers une architecture (Towards an architecture).


Papakammenou, V. 2008. Cross-cultural differences in the perception of poetic. Thesis (MSc), University College London.


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