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Advanced Sustainable Interior Design Concept as Methodological Approach in the Process of Architectural Design

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Abstract: Implementation of sustainable interior design in contemporary buildings is one of the most important parts of architectural design. Scientific research has shown that there is a meaning of incorporation of sustainable advanced interior design, and that the sociocultural, environmental, biophilic effects that this type of interior design has, can be manifested by physiological and emotional aspects of people in the interior design. In the analysis of the sustainable advanced interior design process, it is necessary to identify and define the phases and methods in interior design. The methods in the design process are focused on: divergence (exploration of possibilities and limitations by critical thinking, through qualitative and quantitative research methods for creating new activities towards better sustainable interior design solutions, transformation (redefining specifications for sustainable design solutions for traditional and contemporary design), convergence (analysis of prototypes of possible scenarios for better design solutions leading to gradual or significantly improved design solutions), sustainability (managing the research process, and redefining sustainable design solution prototypes over time), articulation (visual relationships between parts and the whole unit). Sustainable interior design includes several phases, such as information phase, analysis of specific requirements, specification, problem solving, presentation, idea development, implementation and evaluation of the project.

Specific attention in this research has been paid to analysis of sustainable advanced interior design, as a concept of combining natural environment with interior design organization by minimal interior design, flexible interior design, ecological interior design and green interior design, The concept and the principles of sustainable interior design, sustainable green wall system and its benefits in aesthetics and usability of green space, natural look in sustainable advanced interior design, environmental values, biophilia, that create natural environment, increase productivity for the workers and costumers of interior design, define cultural and social values as integral part of the cultural environment, social interaction and artistic presentation. The expected outcome in this scientific paper is to identify contemporary design approaches in sustainable interior architectural design with specific emphasis on green technologies that contribute to the aesthetics and architectural concept of buildings and create application in international educational processes.

Keywords: Sustainable interior design, methods and phases of interior design.

Introduction – Sustainable Interior Design

The interior design process includes activities undertaken by an architect after careful selection of a design solution according to the client's recommendations and needs, considering the sustainability of the architectural project. Design can be considered as a broad activity, where the initial stage involves collection of information after consultation of the architect with the client, and the final stage is implementation of the design project. Interior design is defined as a concept of creativity, as part of human psychology and human being. Apart from the feeling of belonging and security at home, there are more and more highlights on the need for style. A holistic view of individual use of space is applied. Finding and creating a cohesive approach to many problems is seen in finding a solution that unifies the character of the space. Good interior design adds a new dimension to the space. It can increase the efficiency of the daily necessities of life and add depth, understanding and meaning to the built structure.

Sustainable advanced interior design incorporates the following principles: minimal interior design, reflection of the essence of the creative minimal approach reflected through the purity of lines, simplicity of space and balance between architecture and nature, flexible interior design created by adjustable, foldable or movable furniture design or the possibility of replacement parts of the interior design, ecological interior design that follows the principles: reduction, reuse, recycling, recovery.

Sustainable interior design should be created with sustainable products that are reliable, flexible, quality, upgradable, adaptable, suitable for multiple usages and ultimately long-lasting. Green interior design is an interior design that implements natural materials, wood panels, incorporating natural panels and green walls in the interior design. Green sustainable interior design can incorporate and implement two major types of interior green walls: interior green walls also known as bio-walls, vegetated walls, eco-walls, vertical gardens, and living walls as indoor and outdoor walls, composed of individual planting cells attached to a supporting panel system.

Figure 1 Sustainable green interior design by implementation of the green wall systemFig 1.2 <https://www.naturalhabitats.co.nz/our-projects/britomart>Fig 1.1 <https://www.michaelglen.net/atrium>

Sustainable creative and well-understood interior design makes interior space easier to understand, making it an aesthetic, practical and philosophical scientific discipline. The most beautiful built space has a logical and rational connection. Interior architects use green walls with plants in walls, floors and ceilings in order to define volumes and spaces that they combine for sustainable interior design of contemporary buildings. They design structures that have intellectual and practical functions, analyze locations, consider the furniture in detail and create decorative schemes. Interior design architects work with the existing structure, which does not require physical change. Through the use of color, light and finishing in interior design, they transform the appearance of the interior space, and by adding the appropriate function, they change the structure of the building in a different way. Interior architects make projects that vary from purely decorative, to those where there is a structural change. The architect completely organizes planning of the interior space and creation through schemes thus including structural changes that also involve consulting professionals from other fields, such as structural engineers and lighting designers.

The benefits of the architect's original work integrate modern design methods, which focus on the needs of the user, the use of basic research methods to verify evidence for sustainable space in the interior design, using brainstorming as patterns to visualize design ideas, increased cooperation of the design character with other disciplines. The great challenge of interior design as a discipline is the use of

methods and the attempt to create common values, creating synthetic character as an area of research and action. This allows the design to be extremely malleable in nature, borrowing ideas and concepts from a wide variety of professions of sustainability.

Methodological Approach in the Process of Sustainable Advanced Interior Design

Design methods have an impact on architectural design practice and education. The challenge of sustainable advanced interior design is to transform individual experiences, frameworks and perspectives into a common, comprehensible and transferable area of knowledge. According to Victor Margolin, there are several reasons that will cause difficulties in the functioning of the design: the criterion for displaying knowledge represents a symbiosis of design discipline and interest, the intellectual capital of design and wider scientific pluralism has a focus on a common value system, individual research in design focuses too much on individual stories of the like view, rather than on a critical mass that has shared values.

The design process includes several activities, which are subject to a carefully selected solution that fits the client's request. The process does not apply exclusively to interior design, but is applied in all forms of architectural design. Design can be a broad linear activity, which has a starting point where the client makes the initial contact with the architect and an ending point, when the project is implemented. In the process, different tasks are interrelated and interdependent, so as the elements in the solution of the design. Thus, various tasks are applied in the unique nature of each project. The design process is not standardized for every solution and it is necessary to develop an understanding that is validated by individual projects being worked on.

Analytical Approach in the Process of Sustainable Interior Design

The analysis is relevant through the distinctive parts of the interior project process. The early stages of the depth of design work involve approaching the scale and complexity of the project work. It is necessary to define the time and resources required to complete a project, which is the basis for creating a proposal by the architect. Part of the work in this phase includes the format and content of a presentation that will be shown through drawings and will be visually prepared over the time

required. Once the client has agreed to the proposed design in the first stage of presentation, the initial presentation of the architect continues through the design process. During the information phase, the architect talks with the client about his requirements. The analysis is linked to the general understanding of the project, whereby the architect has a starting point for further work, which leads to ultimate connection of information into a whole. In other situations, the architect sets priorities and reaches a compromise with the given information. Almost all projects contain elements of compromise. After completion of the analysis, conclusions are drawn related to the style and content of the project through which a concept is created. This is how ideas and project content are generated.

The analysis and the selection process of integration of sustainable advanced interior design with implementation of the green wall system should include analysis of the following advantages of the interior design space: aesthetics and usability of the green space where interior green wall systems provide additional green area in the interior design, creating natural look of the sustainable interior design, whereat, the natural character of the interior green walls provides relief from the concrete construction in interior design, where specific green plants for indoor space are: moss and other plants that don't require much direct sunlight. Indoor plants must be tolerant to low light intensity, they prefer a relative humidity level between 50-70% for good performance and are adaptable to temperature ranges.

Figure 2 *Specific green plants for indoor space: moss and other plants that are tolerant to low light intensity and don't require much direct sunlight*

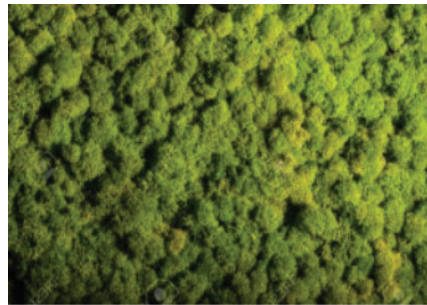
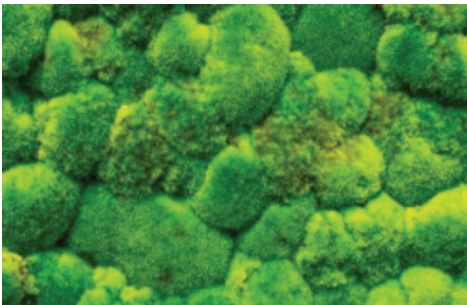


Fig 2.1 <https://inhabitat.com/moss-walls-the-newest-trend-in-biophilic-interiors/moss/>

Fig 2. <https://belcat.hu/en/products/preserved-green-walls/moss-wall-economy/>

Project Development in the Process of Sustainable Interior Design

The development basis of the project is the most important phase for the architect, where the individual can put special emphasis on the project. This is the phase of the project where the client's needs and requirements are transformed into a practical and aesthetic design solution. Ideas are generated and created in the way of a real situation. The development of the idea and the realization can be used to show the experience of the architects. Interior design represents a process of solving problems from a large number or complex aspects, by adding aesthetic values, as well as ergonomic characteristics of elements, functionality, structural aspects, sustainable constructional aspects by choosing adequate materials.

Sustainable design is an approach to design, products, environment and society that is aimed at minimization of the negative impacts on the environment, society and economy, while demonstrating longevity of materials. Sustainable design strives to create project solutions that meet the needs of today and, at the same time, do not threaten the needs of future generations and do not exhaust natural resources. In sustainable interior design, more attention should be paid to the design of spaces themselves, considering the position and size of the windows, which are closely related to the amount of heat, transparency and light in the interior, followed by selection of environmentally friendly materials such as natural stone, wood, bamboo, which is a good substitute for wood that grows quickly and is used in the production of design materials, energy efficiency, renewable energy resources.

The ecological acceptability of materials does not depend only on the material, but also on the way the material is obtained, used and finally recycled. Thus, their entire life cycle will be seen. When using sustainable interior design, materials that are natural will be chosen by the architect, such as wooden or marble floors that are environmentally acceptable and do not contain chemicals and dyes, quality materials that will be long-term and will not require intervention in the near future. Wood, natural stone, marble, granite as well as sustainable furniture that can be easily redesigned and reused will also be used. Indoor air quality and water pollution will be considered, as well.

The project development work can sometimes be part of a thinking process as a result of practical work, where different architect's experiences are considered. The development covers the process when the architect incorporates the client's requirements into a creative project process. The client, at this stage, expects to see

the conceptual sketches of the project, the architectural design considerations, as well as the basic planning of the interior design space, and the development of the decorative ideas, enabling the architect to produce visual representations of the project proposals. The client can also obtain a complete design solution, development line, space planning, decorative details, as well as developing drawings and work. At this stage, many different parts of the project's development are completed. Interior design space planning is a top priority. In this phase of work, the planning of the interior space, as well as the inclusion of ergonomic needs, are a priority for the architect in creating balanced and effective furniture that is connected to the functional needs of the user. The architect has the task of finding sources of furniture, finishing elements and natural materials that are selected in function of their aesthetic and practical adjustment to the sustainable interior design concept, as well as the limitations of the interior design space planning.

Sustainable design can be fluid, changing and expensive and can lead to a final project. Sustainable interior design as an advanced principle in the design process of interior design incorporates the following principles and advantages: noise reduction since interior green walls provide good sound insulation, creation of a quiet living space and more pleasant surroundings in interior design of buildings of different functions, enabling cleaner air and CO₂ reduction in interior design with green walls with improved environmental values, absorption of high temperature, which can lead to reduction of the cooling load for the building, incorporating biophilia as an instructive bond between human beings and nature, where plants and nature improve the self-value of workers, reduce stress, and provide links between past and present as a social relation between people and nature.

Figure 3 Aesthetics of sustainable green advanced interior design with green walls that provide additional green area and natural look in interior design



Fig.3.1 <https://www.phytowall.ee/eng/mosshill.php>

Fig.3.2 <https://www.phytowall.ee/eng/mosshill.php>

Fig.3.3 <https://etterem.hu/nika-etterem>

Fig.3.4 <https://www.verticalgardenpatrickblanc.com/realisations/dubai/sofitel-palm-jumeirah-dubai>

The project and gathering information are an important stage in the architectural design process. The project development drawings help in defining the final idea and finding a solution to the articulated design. An important segment for architects is to make quality drawings, which will be able to show the design process in details. Plans often use the first technical drawings, and the exploration of the first planned options should be considered in three dimensions, with elevations, sections or perspective showing other aspects of the interior design space. Once the project is presented to the client, and the client has approved the work date, other technical drawings will be needed for the progress of the project. The drawings, which represent the construction details, ensure the design vision for the realization of the project. The architect's job is to make decisions and prioritize requirements. In some situations, the most appropriate solution will be the most

practical, and in other situations, the most aesthetic solution will win. These assessments can be made during the design and concept process.

Sustainable interior design should incorporate detailed analysis of the following aspects: architectural project design aspects in interior design- indoor plants as architectural element define the interior space, provide privacy, screen unpleasant views and create natural environment, engineering aspects in interior design - indoor plants can be used for noise reduction and acoustic control, productivity aspects of interior design - increased productivity of workers and costumers in interior design, cultural and social value aspects - plants become an integral part of the cultural environment, artistic presentation and social interaction in sustainable interior design.

Figure 4 *Social, cultural, and productivity interrelation of green interior design in work office area*



Fig 4.1 <https://www.perishablenews.com/floral/gsky-surpasses-500-versa-wall-installs/>

Fig 4.2 <https://www.mortarr.com/project/embassy-suites-hotel-amarillo/>

Fig 4.3 <https://www.greenroofs.com/projects/23-story-atrium-living-wall/>

Fig 4.4 <https://mojportal.mk/neverojatni-vertikalni-gradini>

Sustainable interior design should focus and implement several principles in order to be sustainable and eco-friendly. The advanced sustainable principles include: analysis of the orientation of the rooms in the building and daylight factor analysis, orientation of the windows towards south in order to have passive heating in the rooms, adequate shading in the summer months in order to reduce the cooling costs, energy efficiency of the building, balanced use of artificial LED light and energy-efficient appliances, reduced water consumption and rainwater capture and management for the irrigation systems, natural ventilation and air quality. The chosen materials should be natural, bio-materials that have small environmental impact, can be reused and re-purposed and don't contain chemical toxic materials, which are harmful for the environment. Natural eco-friendly materials that can be used in sustainable interior design are: wood materials, moss, linen, clay, wool, sand, wax, recycled glass, recycled metal.

Project Implementation in the Process of Sustainable Interior Design

The project implementation phase can begin after the client has agreed to the architect's work. That phase includes selection of contractors for the work. In some cases, project management is limited by the laws of a particular country, which determine the level of contribution to part of the process. In any case, the architect's involvement is needed in order to resolve some issues related to the implementation process. A good relationship with contractors and other firms involved in the project can be of great help, and this can be achieved by understanding and solving some problems that may arise during the implementation phase. Knowledge of the construction process, materials and their limitations, as well as local building regulations are important during the construction phase. Complete technical project drawings are vital in communicating with the construction team. During the implementation phase, there may be a need to create new drawings that are related to unexpected situations that arise during the project implementation. The implementation phase of the sustainable advanced green interior design includes the technical detailed project documentation of the interior design technical details that implement natural materials, wood panels, green podium systems, natural panels, and green wall system technical details that are incorporated in the interior design.

Figure 5 Construction detail of a green wall system in advanced architectural interior design

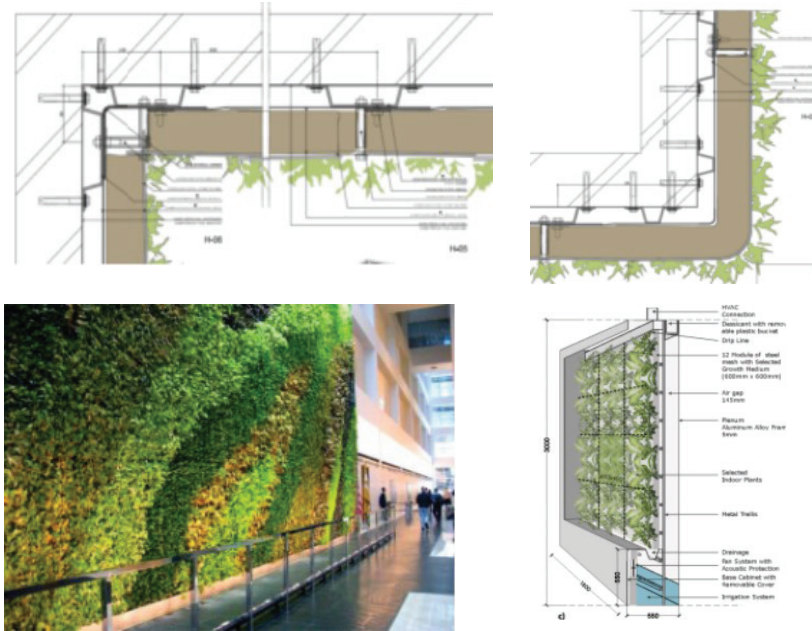


Fig 5.1 <https://www.archiexpo.com/architecture-design-manufacturer/indoor-green-wall-31361.html>

Fig 5.2 <https://www.archiexpo.com/architecture-design-manufacturer/indoor-green-wall-31361.html>

Fig 5.3 <https://www.artcuturedesigns.com/preserved-faux-plant-walls>

Fig 5.4 <https://engineeringdiscoveries.com/vertical-garden-systems-green-wall-details/>

Evaluation Phase of the Project in the Process of Sustainable Interior Design

Evaluation is an important phase before reaching the implementation phase of the project of sustainable interior design. Reviewing the project work is a good way of developing the project. From the client’s point of view, the design process is complete once the implementation phase is over, but it is also important for the architect to evaluate the project.

The sustainable interior design process encompasses several methodological phases such as:

- Divergence by investigating the possibilities and limitations of legacy conditions, applying critical thinking through qualitative and quantitative research methods to create new understandings towards better design solutions,

- Transformation by redefining specifications for design solutions that can lead to better directions for traditional and contemporary design activities,
- Convergence by possible scenarios for better design solutions that make a gradual or significant improvement of the initially inherited state,
- Sustainability by managing the research process, and redefining prototypes of design solutions, continuously over time
- Articulation by the visual relationships between the parts and the whole project.

The purpose of the design methods is to see the essential characteristics, which will allow creation of more solutions in order to achieve better experiences for the users. Systematic study of the situation through design methods enables a careful understanding of the inner nature of things during the design process. The design process phases in the sustainable advanced interior design include the following: preparatory design phase, design brief information phase by gathering information, researching needs, requirements and design goals, analysis of specific goals of the project design, research for related design solutions, specification by determining the requirements of an idea solution for product design specification, problem - solving solutions by conceptualizing and documenting project design solutions, presentation of project design solutions, project design during production, developing project design by continuation and improvement of the designed solution, testing of the designed solution, post-production design through feedback of future projects, implementation by introducing the project design solution with technical details, evaluation and conclusion as an overview of the process and results, including constructive criticism and suggestions for future improvements, and redesign phase where all stages in the design process are repeated during or after the production process.

The degree of the sustainable project design valorization includes: design process, method, model, theory and evaluation. It is important for every architect to continuously set the stage of valorization of his work. Project design is primarily a cultural phenomenon, and its evaluative models and bases are seen in the development of an integral theory. The possibilities for an integral theory of project design start from an objective evaluation. The valorization of the project design represents a segment of the cultural production. The standard areas of action of the design practice, as three-dimensional functional objects, are usually placed in the area of visual communications. Today, project design is a broad term, and in its meaning, it covers the relationship of the creative process, as a segment of creative production.

Modern Architectural Education on Sustainable Interior Design Development, Department of Architecture, Faculty of Engineering, International Balkan University

Architectural education for sustainable interior design development is currently a very important theme for research in the context of architectural and urban environment.

The objective and scope of the presentation from architectural studios and projects developed by students of the Department of Architecture, Faculty of Engineering at the International Balkan University.

The title of the architectural project is: Cultural and Educational Center, advanced course in Designing Interior Space at the master studies, International Balkan University, student: Esra Kilic, mentor: Assoc. Prof. Dr. Viktorija Mangaroska, developed sustainable green project with green landscape and parterre organization and advanced sustainable interior design.

Figure 6 *Architectural project on Educational and Cultural Center, advanced postgraduate master study course: Designing Interior Space II, student: Esra Kilic, mentor: Assoc. Prof. Dr. Viktorija Mangaroska*





Fig 6. Architectural project on the Educational and Cultural Center, postgraduate advanced master study course: Designing Interior Space II, Student: Esra Kilic, Mentor: Assoc. Prof. Dr. Viktorija Mangaroska

The goal and objective of the architectural project is: improvement of educational and cultural opportunities by promoting ecological content, education for raising public awareness about nature conservation, opportunity to get knowledge directly with biodiversity and natural resources, with modern innovative approach, organizing educational eco-exhibitions in sustainable advanced interior design.

Figure 7 Sustainable interior design of the restaurant, architectural project on Educational and Cultural Center, advanced postgraduate master course: Designing Interior Space II, student: Esra Kilic, mentor: Assoc. Prof. Dr. Viktorija Mangaroska, postgraduate studies at the Department of Architecture, International Balkan University

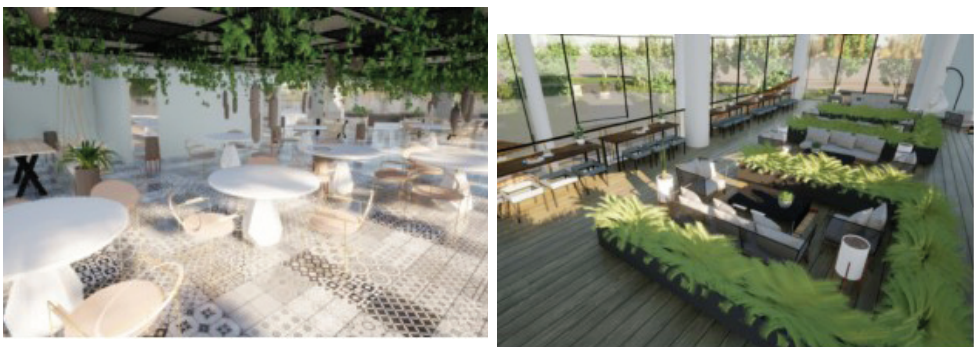


Fig.7 Sustainable interior design of the restaurant in the architectural project on the Educational and Cultural Center, postgraduate master course: Designing Interior Space II, Student: Esra Kilic, Mentor: Assoc. Prof. Dr. Viktorija Mangaroska

The interior design of the restaurant is an advanced interior design with natural materials in the restaurant, namely, wood paneling on the ceiling which absorbs sound and green panels to capture the natural look of the walls. In addition of being lightweight, they are designed in harmony with each other in the design stages and can be easily adjusted to an appropriate size, as desired. The green panels are with cost-effective materials that provide sound and heat insulation of the building. The restaurant has a terrazzo flooring, durable material with unlimited design possibilities. The color scheme shows an analogue color design between the green walls and the wood panels.

The restaurant interior design represents a sustainable advanced interior design with natural materials in the restaurant that include wood paneling on the ceiling which absorbs sound and green panels to capture the natural look of the walls. In addition of being lightweight, they are designed in harmony with each other in the design stages and can be easily adjusted to an appropriate desired size. The green panels are with cost-effective materials that provide sound and heat insulation of the building. The restaurant has a terrazzo flooring, durable material with unlimited design possibilities. The color scheme shows an analogue color design between the green walls and the wood panels.

Figure 8 *Analogue color design and sustainable interior design in architectural projects at the advanced course on Designing Interior Space, student: Esra Kilic, mentor: Assoc. Prof. Dr. Viktorija Mangaroska, Postgraduate studies at the Department of Architecture, International Balkan University*



Fig 8. Analogue color design and sustainable interior design in architectural projects at the Advanced Course for Designing Interior Space, student: Esra Kilic, Mentor: Assoc. Prof. Dr. Viktorija Mangaroska, Postgraduate studies at the Department of Architecture, International Balkan University

The architect's organization and composition of materials includes natural materials: wood panels, marble floor in the lobby, modern neutral Armstrong ceiling, green wall organization. Opposite to the wall, a metal structure with a glass wall is planned. The architect has chosen bamboo materials to radiate warm energy from the interior design and enlighten the environment. The atrium space design makes the environment look natural and green, benefiting from both daylight and visual beauty.

Figure 9 Sustainable interior design of the lobby and meeting room by use of natural materials in the architectural project on the Educational and Cultural Center, Post-graduate advanced master studies

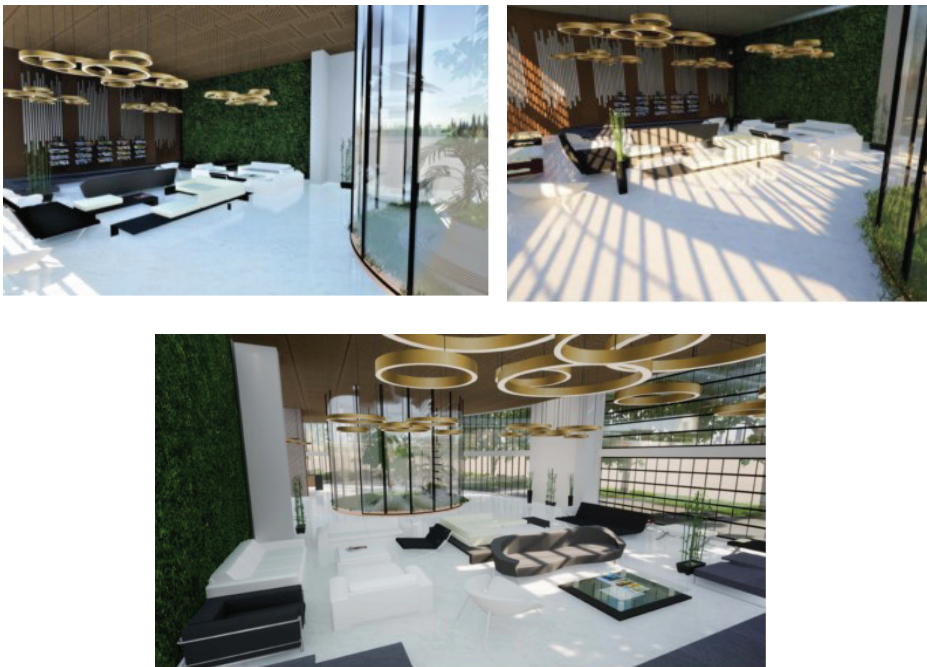


Fig 9. Sustainable interior design of the lobby and meeting room using natural materials in the architectural project on the Educational and Cultural Center, Advanced Postgraduate Studies.

The interior design of the meeting room is defined by bamboo wood panels, which adsorb sound and look natural. They prevent the flow of the sound from the outside to the inside of the meeting room. The meeting room has Armstrong ceiling and floor with marble tiles. The lighting is organized with rectangular pendant lamp and ceiling led light.

Conclusion

The engineering concept in the context of sustainable advanced interior design incorporates contemporary design as modulation of ecologic environments. The current trend of architectural engineering is focused on development of sustainable elements and technologies, 3D multimaterials and synthetic biology processes for different types of new bio-materials designed at micro and nano level to respond to particular conditions. This concept of sustainable interior design in architecture will lead to contemporary transformation of the design process.

The research into sustainability shifts from a technological and innovation process requires contemporary sociocultural and economic transition in interior design. Interior architecture and interior design should develop ecological, green and sustainable approaches as a great contribution to the concept of sustainability. The research study of the ecological and green design concepts, as well as the interior design color theories, within the built environment, of the design approaches to interior spaces, contribute towards interior finishing materials and surface treatment systems towards interior design that is ecological and green. Architects have the responsibility toward future generations to enrich and design contemporary buildings, to understand the significance of place and respond to it. Contemporary buildings with sustainable advanced interior design should create response to their cultural, social, historical, political, economic and physical environments.

Architects have the responsibility toward future generations to enrich and design contemporary buildings, to understand the significance of place and respond to it. Contemporary buildings with sustainable advanced interior design should create a response to their cultural, social, historical, political, economic and physical environments. The expected outcome in this scientific paper is to identify contemporary design approaches in advanced interior architectural design with specific emphasis on sustainable interior design and modern color theories that contribute to the aesthetics and the architectural concept of the buildings and create application in international educational processes.

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