

The use of visuals in environmentally responsible interior design

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ABSTRACT: In this article, the author discusses the problems regarding the modifications of contemporary interior design strategies and methodologies that should be introduced into the environmentally responsibility-oriented interior design model. The sustainability strategies, applied to architectural design, combine the improvement of buildings and its parts in environmental performance. This is accomplished mainly through the reduction in energy consumption and the minimisation of objects' negative impact on the natural environment. These main requirements may be achieved through the application of new design methods and tools in the interior design process. The author analysed the possibilities of graphic presentation of sustainability issues including the reduction in resource consumption through reclaiming and reuse, enhancement of performance of a building's mechanical systems, and improvement in indoor environmental quality.

INTRODUCTION

Sustainability strategies, applied to architectural design, involve the improvement of the environmental performance of a building and its parts. This is accomplished mainly through the reduction in energy consumption, and the minimisation of any negative impact on the natural environment. This obliges designers to take responsible decisions about interior design and to endorse the environmental thinking while creating inner spaces, since *there are both direct and indirect relations between interiors and the environment* [1]. Therefore, interior design students need to understand that *each design decision [...] has environmental implications* [2].

The environmentally responsible design decision-making process, including the creation of inner spaces should, thus, rely on the evaluation of every aspect in terms of the possible impact on the environment, as well as on the health of a building's occupants.

Improvements concerning the interior design education programme go beyond the conventional definition of the purpose of interior design [3], still followed by many educators and practising designers. This is described as *...the functional improvement, aesthetic enrichment, and psychological enhancement of interior spaces* [4] in accordance with the prevised and required users' activities.

The proposals presented in this article are for the inclusion of additional explanatory and graphic-based methods into the interior design educational process. This is a continuation of the authors' remarks made on environmental sustainability-oriented adjustments to the conventional interior design teaching methodology, as executed in many higher education design schools [5][6].

The majority of education innovations previously published by the author can be introduced into the existing interior design teaching framework. They rely on the execution of new design techniques and tools, which allow for the comprehensive accomplishment of sustainability goals in the indoor environment.

They should affect, along with multi-disciplinary evaluation systems or software programmes, the development of specific graphic presentation schemes and diagrams to enable the description of possible interrelationship of natural-external and man-made indoor environments. There should be substantial visual content concerning the interpretation of sustainability issues in the project documentation in its design concept phase, as well as design development phases. These aid the understanding of the phenomenon of environmental interconnectedness and the assessment of its influence on the interior design decision-making process by students.

Susan M. Winchip opines that developing drawings that concentrate on the sustainable issues in architectural design *...is a relatively new approach for the design profession* [7]. But on the other hand, it may be seen as a very promising and efficient design tool for practitioners, and educative for students. It offers to design students an opportunity to develop different illustrative techniques as supportive tools in the analysis of sustainable features of interior designs.

SUSTAINABILITY-ORIENTED INTERIOR DESIGN FRAMEWORK

The author claims that the sustainability-oriented interior design model requires adjustments to the existing teaching methodology and the introduction of various learning activities for the interior design students. These should be complemented by modified methods, techniques and design tools, and incorporated into the integrative interior design curriculum.

The term, integrative interior design, indicates the process of design conducted in a specific manner that constitutes:

...method to intervene in the design stage to ensure that all issues that can be foreseen to have a significant impact on sustainable performance are discussed, understood and dealt with [8].

The environmentally responsible interior design addresses the interrelationship of the designed environment, human behaviour and environmental responsibility [9]. It may be interpreted as a complex, continuously evolving managed design process to accomplish sustainable goals.

Among the new interior design methods that are to be included into the teaching framework in order to establish the sustainable design objectives, the author identifies [5]:

- multi-disciplinary workshops;
- comparative analysis of building materials focused on their environmental characteristics;
- simplified life-cycle analysis of building products and materials;
- case studies of completed sustainable interiors and buildings;
- seminars conducted by green building consultants on the multi-criteria environmental evaluation of interior design;
- workshops conducted by practitioners and accredited green building consultants;
- seminars conducted by educators and external consultants on the environmental preference method in the specification of building materials and products.

DESIGN TOOLS IN A MODIFIED INTERIOR DESIGN MODEL

The environmental aspects of interior design may be realised in the educational programme with the introduction into the teaching process of tools including [5]:

- green building assessment systems applied during the design development phase for solutions proposed on theoretical recommendations, and conceived in the conceptual design phase;
- environmental classification systems enabling the assessment of building materials and products on the basis of their environmental impact [2];
- laboratory tests conducted by students and introduced into the project specification, comprising the interior structural or complementary components, their acoustical and visual performance, which influences the comfort and wellbeing of inner space users;
- Building information modelling, being the digital model-based design tool assuring cost-effectiveness of the virtual multi-dimensional building models [10];
- illustrative and explanatory resource or environmental drawings concerning the sustainability features of interiors and their components recording the design decisions made in the conceptual phase [7].

Resource drawings are defined as the documents helping *...to clarify specific details associated with unique requirements* [7]. They may become integral elements of sustainable interior design and development. These visual aids may be information supplementing the project concept phase's preliminary sketches and concept drawings. These are designed to explain the interior design detailed proposals in relationship to the building's surroundings, to the building or the closed spaces systems' solutions, to the overall building energy requirements, as well as to climate and natural ventilation concepts.

The development of graphic representation models by students should clarify the possible interaction and interconnectedness of natural and man-made indoor environments. These drawings may become important for the clear understanding of these phenomena and their influence on design solutions. These revised graphic standards are intended to illustrate to students the environmental contextualisation of their interior projects.

GRAPHIC REPRESENTATION OF SUSTAINABILITY IN INTERIOR DESIGN MODELS

The schematic design is the initial phase of the environmentally responsible and sustainable interior design process. The aim is to develop technical and technological solutions concerning the characteristics and expected effects, while optimising the object's performance and providing environmental efficiency of inner spaces. To examine the approach to sustainability and to turn attention to the environmental context of interior design, requires the development of adequate illustrative graphic models. The revisions of the concept design proposals may be accomplished and facilitated with the aid of explanatory plain views, including floor plans, sections, as well as perspectives or axonometric views enabling the understanding by students of the three-dimensional aspects of inner spaces and their sustainability-related features.

The graphic registration of interior design sustainability concerns the interconnectedness of both natural and built environments, and defines the dynamic of their interdependence. It provides the analysis and visualisation of the built environment energy concept outlined in the conceptual schematic design phase, and follows the strategic planning and programming phases [11].

The interior design concept phase, should address the essential sustainability problems. Introduction of specific sustainability-oriented graphic interpretation, in the form of sketches and schema, may facilitate students' understanding of general design problems including:

- Articulation of the complexity of interiors' environmental-responsibility in the sustainable interior design model.
- Indication of sustainable goals to be achieved in the process of interior design along with functional, spatial and formal requirements.

These principles are to be complemented with more detailed project requirements comprising:

- Minimisation of the usage of non-renewable material resources.
- Reduction in the amount of demolition waste, and in the level of embodied energy within the products and furnishings.
- Employment of renewable energy sources, especially acquired from the sun, in the built environment.
- Comprehensive environmental activation of chosen structural and supplemented components of the indoor environment [12].

The sustainability info-graphic modes complementing the concept drawings enable students to understand the creation of specific indoor environment components. This raises the environmental consciousness of specific design problems. The development of various illustrative means is another interior design tool to improve students' abilities in the creation of environmentally responsible inner spaces. Figure 1 is a preliminary sketch from the concept phase of an interior design process and shows a daylight management scheme for a refurbished open space office.

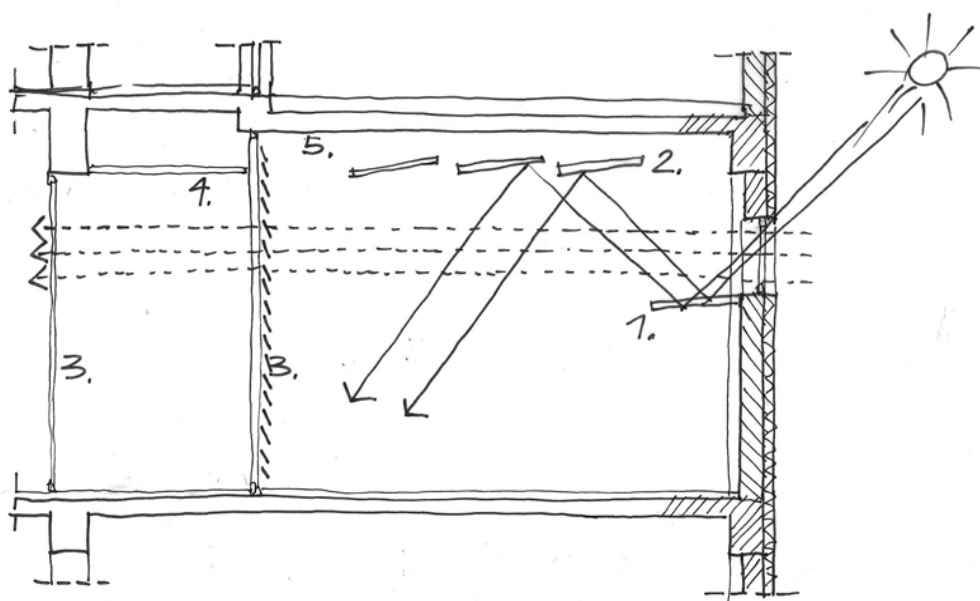


Figure 1: Daylight management scheme for a refurbished open space office (Source: author's drawing).

The interior structural and complementing components' setting for equal daylight conditions is achieved by the redirection and transmission of daylight due to the installation of:

- translucent inner light shelves;
- movable reflectors mounted to the ceiling;
- glazed partitions and space dividers equipped with adjustable horizontal translucent blinds;
- reflective finishes of suspended ceilings;
- reflective finishes of the integrated ceiling.

These issues can be crucial for the achievement of sustainability and are illustrated in the concept phase of the design process in the form of resource drawings mentioned above. The environmental drawings may demonstrate sustainability features as follows:

- Environmentally activated structural and supplementing components of the indoor environment and their impact on the enhancement of building systems' performance (i.e. partitions or internal walls introduced as thermal storage walls to minimise consumption of heating energy; inner devices in the efficient distribution of dispersed daylight through the redirection and transmission of daylight to spaces distant from glazed walls (see Figure 1 for examples); minimisation of consumption of electric energy).
- Adaptive reuse or recycling of selected interior components specified in the design concept documentation with emphasis on their material content and methods of construction enabling their future dismantling and reclaim, thus assuring effective resources management (see Figure 2).
- Layout enabling effective ventilation (i.e. space layout assuring the unobstructed airflow, partitions and space dividers' configuration; dimensions permitting natural air exchange; cross ventilation and related reduction in the usage of mechanical ventilation systems).
- Layout enabling effective daylighting.
- Furnishings, equipment settings, and possible adjustment assuring the efficiency of installed sensors recognising occupancy in closed spaces and controlling the lighting system's energy consumption.
- Interior components' setting for the improvement in comfort levels for occupants (i.e. increasing the usage of reflected daylight; reduction in the light intensity and elimination of disturbing contrasts causing glare).
- Layout assuring the occupants' acoustical comfort (i.e. reduction in sound level, increase in sound insulation, speech privacy).
- Layout and furnishings arrangement assuring the users equal access to valuable outside views.
- Location of spaces designed to store recycling containers.
- Materials and products to be collected daily to be recycled.

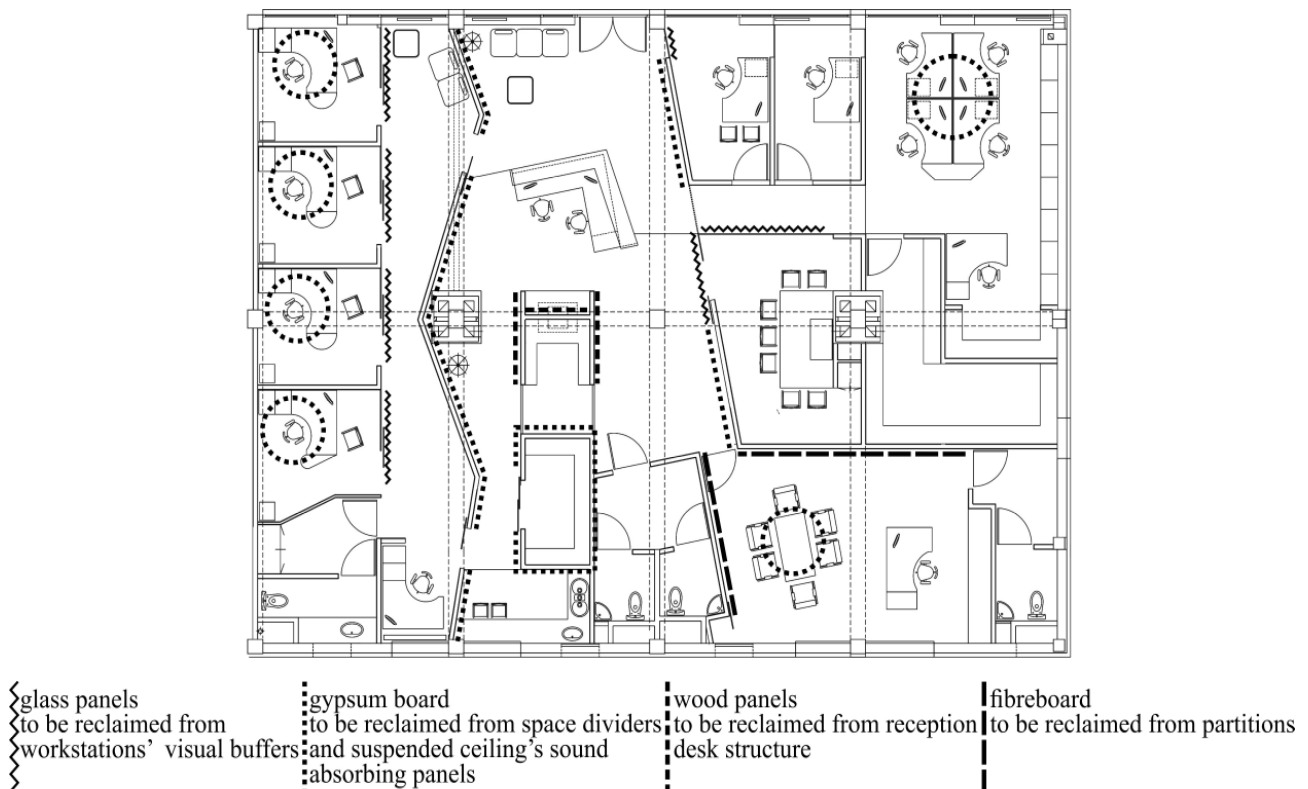


Figure 2: Resources management scheme for a refurbished open space office (Source: author's drawing).

Figure 2 was prepared during the concept phase of the interior design process, and shows interior structural and complementing components' solutions with a focus on materials specification. This indicates the potential for reuse or recycling.

The proposed techniques for environmental activation of interior components, undertaken by students, help lead them towards a sustainability-oriented and innovative approach in the design process. Visuals regarding the environmental stimulation procedure in the creation of components, including the enhancement of building systems' performance and related reduction in the operating costs, demonstrate the value of multi-functionality as a design strategy.

The information regarding possible interior adaptation and transformation, should be focused on these components and their parts for adaptive reuse. This may be realised by an indication of those building materials and products, furnishings and fittings that may be incorporated into the new inner space elements.

Reclaiming building materials and products from the existing and refurbished interiors, and their further usage, is essential for the implementation of sustainability in environmentally-oriented interior design. Even if the existing building does not undergo frequent modifications and refurbishments, the life cycle of inner spaces, which constitute one of the building layers, is relatively short [13][14]. Therefore, designers have to consider the multi-faceted consequences of materials and product specifications in their sustainable interior projects since ...*building interiors are changing constantly throughout the lifetime of a building* [11].

The environmentally responsible designer has to predict future reclaim and reuse of products and design for change and deconstruction within sustainable design strategies. The inclusion of this information into the set of drawings, combining the environmentally oriented characteristics of materials with their functional qualities, may inform interior design.

The enhancement of building systems, including ventilation, heating, air conditioning and lighting systems, is achieved through the layout, structural and material solutions of the interior elements, and requires another specific graphic representation. The illustrations identifying the essential for the sustainability building's performance-based issues, may demonstrate the dynamic character of the interconnectedness of natural and man-made environments. The inner space concept's explanatory drawings may address such questions as: the effectiveness of natural ventilation through the placement of openings along with the inner space arrangement; and the transmission and distribution of daylight with the aid of internal passive mode devices integrated with external glazed walls.

The requirements concerning the optimisation of occupants' comfort level, illustrated in the supplementary conceptual drawings, should articulate the solutions allowing for individual control of the indoor environmental parameters and provide for equal usage. Clients and occupants, to meet the recycling requirements, should be provided with illustrative information regarding the collection of materials or products to be recycled. As well, the location of auxiliary spaces designated to store the necessary recycling containers should be illustrated.

DISCUSSION

Discussed in this review article is the graphic presentation of the sustainability issues and environmental requirements in interior design. The new interior design methods proposed are to be applied within the existing educational framework and should lead to substantial improvements.

The graphic analysis considers the environmental impact on interior design, and active interior components' creation considered in an environmental setting. The design method presented in the article addresses the effects of the interior design process comprising:

- increase in the environmental awareness of interior designers, occupants, contractors and facility managers;
- the necessity for *collaboration and integration across design disciplines* [10] from the initial stages of the interior design process;
- different areas of environmental interior components' activation with the assessment of possible benefits regarding building performance.
- possible modifications, adaptation and refurbishment of the indoor environment with regard to the minimisation of energy consumption and materials;
- effectiveness in the use of the built environment by clients and end users, with the focus on energy control;
- creation of positive attitudes with respect to individual responsibility for the closed spaces' operating procedures and maintenance costs.

Environmental drawings are supplementary to the set of preliminary sketches and conceptual drawings, and are supportive tools for interior design students, as well as for students of related disciplines involved in an interdisciplinary design team. They are also additional databases regarding:

- Resource management through the indication of interior components' physical characteristics, and applied structural solutions enabling the effective dismantling or deconstruction at the end of their life cycle.

- Indication of interior components and their constituent elements to be reclaimed and reused due to their design for durability and adaptability.
- Interior components that enhance a building systems' effectiveness and improve indoor environmental quality.

Visuals in the interior design documentation can explain the meaning of sustainable issues in architectural design, and are another valuable educational tool concerning the environment-oriented components' creation and related inner space and resources management. They allow the interior design students to build performance assessment into their design solutions. This pre-occupational evaluation should be carried out from the conceptual design stage of the integrated design process.

CONCLUSIONS

The main value of the inclusion of info-graphics into the interior design educational programme is to indicate to students the issues regarding the achievement of sustainable goals in interior design, starting from the schematic phase. This objective may be achieved through a concept drawing set broadly introduced into interior design. These provide a visualisation of the ecological efficiency and energy-cost effectiveness of interiors.

The preliminary sketches and concept drawings, produced throughout the design development phase, support the achievement of sustainability goals in interior design and the introduction of environmentally acceptable proposals. Inclusion into the interior conceptual design phase of ...*drawings that should supplement the conventional set of architectural plans, elevations, and sections and are keyed to sustainable features* [7] help the students understand the role that interior components play in the environmentally conscious creation of a built environment.

Educative aspects of graphic methods demonstrating the accomplishment of sustainability goals in the design may raise the environmental consciousness of interior design students. Sustainability info-graphics included into drawing documentation from the beginning of the design process can become a useful tool in the demonstration to students how the fulfilment of sustainability requirements may affect the interior project's functional and formal demands.

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