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ARCHITECTURAL INTERIOR DESIGN FOR DURABILITY OF INTERIOR COMPONENTS. MATERIAL AND INTANGIBLE CONTEXTS OF SELECTED DURABILITY-SUPPORTIVE DESIGN SCHEMES

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Abstract
The problem of durability is mostly situated in theoretical and practical dimensions within the discipline of architecture in the context of environmental sustainability. Technical durability covers the subject of forming new buildings through embodied energy in building technologies, building materials, and products. The second identified durability framework, defined as emotional durability, concerns the enhancement of the relationship between consumers and products. The paper discusses the interior architectural design for the durability of interior components. The article identifies the supportive design methods to shape interior components while enhancing their durability placed within the two frameworks mentioned above, and analysed in material and intangible aspects, both reflecting the necessity for inclusion of the postulates of environmental sustainability. The research paper recognizes the interior architectural design for adaptive reuse and responsiveness-oriented scheme of biophilic design as supportive schemes for the interior architectural design given the durability of interior components within the material, as well as intangible aspects. The results of the study reveal that the intangibility-related factors dominate in the analysis of responsiveness and adaptive reuse as design schemes to support the durability of constitutive interior components. In particular, the user's emotional engagement, gained through the experience of natural building materials or secondary products introduced into the component's structure, is noticeable in both models. The cultural connotations are among the intangible factors common for the discussed models as well. The quotations from the past engage the users and enclosed within the component's volume, complement and enrich further satisfactory use of components, thus influencing the longevity of spatial objects featuring the inner spaces.

Keywords: interior architectural design; technical durability; emotional durability; adaptive reuse; responsive biophilic design; product longevity

INTRODUCTION

The durability problem is mostly situated in theoretical and practical dimensions, within the area of architectural design in the context of environmental sustainability. It has become an important feature of contemporary architecture and substantially modified the designing process in the discipline. Technical durability covers the subject of forming new buildings concerning embodied energy in building technologies, building materials, and products. Durability should be considered not only as the feature of the integral building as a whole but also as a set of components and materials designed for reuse in the reshaped original building or in a new structure [W. Celadyn 2014].

Durability, already recognized as a key issue for environmental sustainability, is appreciated as a measure in the leading multicriterial evaluation systems. These certification systems, based on the results of scientific research, require the development and implementation of detailed building durability plans. They are mainly the questions of high performance of building systems that, decreasing the possible deterioration of materials and products introduced into the structure, directly impact the long technical building's life. The second identified durability framework, defined as emotional durability [J. Chapman 2009, J. Chapman 2015] relates to the enhancement of the relationship

between consumers and products, remaining "*a user-focused approach to product longevity*" [Haines-Gadd et al. 2018]. This notion of emotional durability as "*an approach concerned with the experience of the user*" [Haines-Gadd et al. 2018] can be transferred into the area of interior architectural design as well. It can be referred to as the built-up of resilient relationships between users and the "*constitutive interior components*" [M. Celadyn 2018] forming a building's internal spaces and assurance of these interior components' longevity. Since interior components can be defined as specific and developed products, their longevity "*needs to be concerned with not only the physical lifetime but also the psychological lifetime*" [K. Ko et al. 2011].

The paper discusses the interior architectural design for the durability of the interior components. The proposed design model, situated within the design discipline of interior architecture, remains in the search for creative proposals to comply with an effective "*working with issues of sustainability through design*" [J. Chapman 2009]. The article identifies the supportive interior architectural design methods to shape interior components while enhancing their durability by being analyzed within the material and intangible aspects, both reflecting the necessity for inclusion of the postulates of environmental sustainability into design methodology. These demands concern the effective usage of energy and management of resources to minimize the negative effect of the building-related activity on natural surroundings, as well as the enhancement of the psycho-physical comfort of the occupants of the indoor environment. The latter is to be assured with the built-up of positive affective and cognitive relationships between end-users and interior components regarded as the multifunctional spatial objects featuring the interior environment. The article addresses the question of interior architectural design methods for the technical and emotional durability of interior components while examining their values regarding the selected constitutive interior components (i.e. partition walls, multifunctional spatial structures to divide various zones of the internal space, suspended or integrative ceiling, raised floors). The research paper identifies the interior architectural design for adaptive reuse [M. Celadyn 2018] and responsive biophilic design [N.A. Salingaros and K.G. Masden 2008], as durability-supportive interior architectural design models within the above-mentioned material and intangible aspects.

1. MATERIALS AND METHODS

The main research method applied in this study is the critical analysis of literature on the subject of durability in design disciplines with a focus on interior architecture. Moreover, the study refers to the biophilic design focused on responsiveness [N.A. Salingaros and K.G. Masden 2008] that adds to the fundamental biophilic design considerations, questions of sourcing of natural building materials and products, their processing, and their exposure. The main issues of the interior architectural adaptive reuse design scheme [M. Celadyn 2018] are discussed accordingly. These are focused on their impact on the effectiveness of resources management, as well as the relationship between the introduction of reclaimed used building products into components structure and the emotional response of the users about the question of product attachment and its consequences. The analysis is to demonstrate the consequences of enclosure of the design methods mentioned above into the methodology of interior architectural design to enhance the durability of interior components in physical, as well as intangible, aspects.

2. DURABILITY OF INTERIOR COMPONENTS

Durability is "*the ability of a product to perform its required function over a lengthy period under normal conditions of use without excessive expenditure on maintenance or repair*" [T. Cooper 2016]. The durability of physical objects, regardless of their scale, refers, thus, to their capacity to successfully fulfil the purposes they were designed for. In the case of a building, this capacity considers the delivery by these structurally and formally developed objects of functionally valuable spaces for a long time. This can be achieved mostly through carefully developed technical solutions to prevent the degradation of the outer layer of buildings caused by unfavourable atmospheric conditions, and extensive or inappropriate usage. The design strategies are therefore aimed at the avoidance of any signs of the gradually occurring disintegration of the cladding materials. This means preventing the introduction of materials that demonstrate their physical weakness, and tendency to compromise their performance in mechanical or functional contexts.

The main objective of the interior architectural design for the durability of interior components, featuring the building's closed spaces, is to ensure their long-lasting performance. The analysis of durability-oriented design methods has to consider the technical or material, as well as emotional or intangible aspects of the durability phenomenon. Considering technical durability, the proposed design method is aimed at preventing the potential disfigurement of the outer layer of an object which is caused mostly by the synergic

effect of incorrectly selected building materials, poorly elaborated architectural details, unsuitable maintenance, as well as irresponsible or careless usage. The emotional durability is to be assured by the sustaining of the user's attention toward the interior component's appearance and performance conditioned by the mutual empathy between the end-user and the compound product – interior component.

2.1. Technical durability

Measures taken to avoid interior components' excessive and continuous physical degradation, which is a substantial factor to prevent the satisfactory and effective usage of these objects in long time perspective, and assure their positive perception by the occupants, should be preceded by the examination of the following design questions: 1) project category and interior placement in the context of their implications on the material condition of the objects (i.e. prevision of possible changes in internal space location and necessity of frequent dismantling and re-installation of components; 2) spatial organization and zoning in relation to the circulation density; 3) adaptability to allow changes in functional performance or product upgrading; 4) flexibility to comply with potentially changed functional requirements for the interior; 5) evolutive capacity, understood as the possibility of making future improvements within the object's structure; 6) considering the building materials' physical parameters (e.g., bending strength, abrasion resistance) while selecting them as suitable for the design purpose, including development of architectural details.

Other questions directly influence the technical durability of the building's inner spaces and their constitutive components but are related to the building managers' operation course. This problem is equally important in securing the durability of the object. It should be analysed simultaneously with functional and formal demands since the management and maintenance have a great impact on the design project and influence the end user's behavioural mode. Therefore, the design documentation should provide additional directives including 1) an agenda of the cyclic technical inspections within the internal spaces of a building to avoid the risk of premature disintegration; 2) guidelines for the maintenance procedures, specifically focused on the non-structural elements of the object; 3) manuals on the proper use of selected components to avoid their malfunctioning due to hazardous actions taken by the users, that might result in physical damages of the component.

The exemplary design methods to ensure the interior components' technical durability, which are directly related to the question of preserving the embodied energy and embodied materials, embrace the following:

- Assembly methods to reduce the inseparable joints in favour of removable mechanical fixings that assure correct installation of components and enable potential replacement of the damaged parts or further reuse of dismantled parts, reclaimed building materials, or products from the dismantled object to form another interior component. This approach, following the postulates of the Design for Disassembly, is to support the minor or routine repair of the finishing layers of the component, and pointwise easy replacement of used and removed portions, to increase the useful life of the entire interior component;
- Simplicity of formal solutions, realized with avoidance of the object's inexplicable formal complexity;
- Clarity of applied technical solutions to assure access and easy inspection;
- Reduction in the number of elementary parts making up the component to ensure its functionality;
- Avoidance of unnecessary finishing and cladding, especially permanently fixed to the structural elements, that might prevent the pointwise exchange or repair when damaged;
- Construction design suitable for the category of interior component and the presumed duration of the interior;
- Structural honesty, interpreted as the integration of suitable building materials, structural and mechanical systems, and formal appearance of the object, as well as its performance. The clear explanation of the chosen technology is in tune with the solutions of the object's operating mode, as responding to the prior functional and formal demands;
- Material honesty is understood as a selection of specific building materials based on their mechanical properties that are to be respected while developing the object's formal appearance. It allows for avoiding the variety of unnecessary finishing layers in favour of the exposition of the texture of reclaimed building materials;
- Simplicity of the construction concept to reduce the number of various parts completing the object, in order to ease the integration with other parts of interior components and to reveal the original physical characteristics of building materials and products.

2.2. Emotional durability

Another area where the durability of interior components is to be examined embraces the question of emotional durability of interior components, aimed at the search for a solution to delay or eliminate the need for the replacement of objects being in use for some time, by the new ones. Emotionally durable design explores the possibility of establishing deep and sustainable bonds between users and artefacts. The development of an emotional bond with a specific object means that it acquired meaning beyond the fundamental functional issues [R. Mugge et al. 2009]. The objectives of this design for emotional durability are to reduce consumption, to acquire carefully and thoughtfully resources, and finally diminish waste production by elongating the lifespan of products. The main postulates of this design method can be applied to the shaping of interior components remaining multifunctional and compound interior components as well. This is to be achieved by "*increasing the durability of relationships between consumers and products*" [J. Chapman 2006, p. 21], as a result of the consideration of deeper sensorial dimensions of the objects by designers. This requires modifications of the design methodology to extend the traditionally deliberated problems such as functionality, ergonomics, or styling toward more environmentally oriented approaches, where emotional durability is placed. The interior component, defined as a functionally and spatially developed product is to be designed as an object that extends the user's multidimensional experience through the "*information it contains and the meaning it conveys*" [J. Chapman 2015].

Chapman identifies the fundamental issue for the effectiveness of this kind of user-product interaction extending toward the long-lasting partnership. It is the user's empathy strongly demonstrated towards these products, which proves their functionality while presenting the "layers of meanings" that reflect the user's previously gained experiences. The empathy and meaning as "metaphysical factors" make, according to Chapman, the core of the object's emotional durability, that influence the duration of the object's life. The complexity of the product's properties expands the user's emotional involvement and then transforms it into an emotional attachment. This strong connection between user and object, retained by the mutual empathy expressed by the user and a product, finally secures the extension of the object's lifetime. The sustenance of the user's desire to maintain an emotional bond with the object depends largely on the object's ability to adjust to the user's expectations changing in time and thus to prove its continuing attractiveness and usefulness.

Design for emotional durability denotes the object's active role in creating a continuous satisfactory relationship with the end user. The specific dependency of the object upon the user's attention requires the first to build up the model of exchange of reliance and need. It is possible through the object's abilities to adjust over time to sustain the user's attention while disclosing the yet uncovered values or unpredictable meanings. The discovery of the object's potential as continuing in time, lengthening and intensifying the interactive engagement, is a means to maximize the result of experiencing the object.

The exemplary design methods that assure the arousal of stable attachment and benefit in affective-related durability of interior components comprise the following:

- Clarity of structural and technical solutions based on identifying the object's specific part-pillar that regardless of the upcoming technological changes remains intact, eases further repair or upgrading other portions featuring compound object;
- Adapting the object (i.e. offering affordances previously undiscovered) to the user's rising expectations or changing needs occurring in time;
- Providing the object with additional and apparently invisible or irrelevant features, that reveal their hidden functional assignments to be slowly discovered, as well as increase the aesthetic values;
- Building up the specific resilience of the object, understood as its ability to successfully integrate signs of devastation occurring accidentally through its lifespan, accomplished with a graphic composition on its surface being adequate to the presumed purpose of the object.

The emotional and reflective interactions between the end-user and an interior component, stimulated by accordingly applied design methods, lead to the arousal of a stable and long-lasting relationship. The ultimate result of this process is the development of product attachment, outlined as a "*feasible sustainable design strategy*" [T. Page, 2014]. As Page further notices, the development of the emotional ties between users and products "*have a considerable effect on postponing product replacement*" [T. Page 2014] since people exhibit more protective behaviours to products to which they are attached. In consequence, they consider the possibility of postponing objects' replacement as long as possible [R. Mugge et al. 2006]. The authors link the experience of attachment to a product with the product's lifetime. The product attachment is followed by the phenomenon of place attachment that involves affirmative and positively experienced connections de-

veloped from the affective, and then cognitive responses that occur between individuals and their physical surroundings. This concerns especially interior spaces featuring the occupants' nearest environment.

The above-mentioned basic design methods to accomplish emotional durability, remain by the sustainable approach to design, claimed by Walker [S. Walker 2006, S. Walker 2010]. His concept emphasizes the essence of usefulness as a crucial factor for the final appearance of the object. He includes in the design methodology the inventive, still very demanding, and aesthetically provocative proposals referring to the requirement for "resourcefulness" in design. The claim for the cautious and rational usage of available material substances is mostly directly linked with the emotional aspect of the durability of interior components. The design approach is aimed at overcoming the dissatisfaction of users caused by the accumulative aging process and the growth of signs of wearing on the objects. They are to prevent them from becoming prematurely obsolete, both emotionally and aesthetically, and thus being subject to replacement by new ones or discarded.

The design methods referring to the concept of resourcefulness, as substantial for the positive perception of the object in a long-time perspective, comprise the following:

- Lack of precision in execution of the outer surfaces of interior components. This design technique, apparently proving the low quality of workmanship, if carefully planned and creatively explored, allows for the achievement of emotionally engaging and aesthetically appealing components;
- Lack of finishes in new elements or reused parts integrated with them or reclaimed materials being only cleaned up or refreshed, as means "*to absorb wear and tear in a way that does not detract from the overall appearance of the object*" [S. Walker 2006, p. 87];
- Roughness of the outer surfaces, considered an innovative means to protect the surface from premature deterioration caused by the accumulation of the signs of wearing that might critically affect its appearance. The growth of additional scratches on the object's surface, considered integral elements of the outer layer, does not provoke the user's dissatisfaction followed by the replacement of the component;
- Exposition of stains, decolourisation, scratches or small defects occurred throughout the technical life cycle. Deliberate, broad exposition of effects of the intensive usage of the reclaimed objects, if thoughtfully and creatively executed, influence the users' perception. It attracts unexpectedly and severely their attention, then raises their curiosity by making indirect but evident references to the continuity and inevitability of the natural aging process. This design method allows for the absorption of wear and tear, thus becoming a driver for the aesthetics longevity as another element that defines the complexity of the notion of durability of objects.

3. BIOPHILIC DESIGN FOR RESPONSIVENESS

The biophilic design is to create a positive, multidimensional, and valued human experience of nature within the built environment, in particular in building closed spaces. Biophilic design is to transfer this association with nature into the approach for designing the built environment [S.R. Kellert 2005, S.R. Kellert et al. 2008], in a search for a reconciliation of humans with nature. The concise analysis of literature on the leading biophilic design schemes, which might be named as a dimensional model [J.H. Heerwagen and B. Hase 2001], valorisation model [S.R. Kellert et al. 2008], or application-oriented model [W. Browning et al. 2014, W. Browning and C. Ryan 2020], reveal certain similarities within the frameworks concerning the biophilic design methodology based on the creative imitation of the shapes, forms, patterns, and processes observed in the natural environment allowing them to identify biophilic design attributes. The aforementioned biophilic design models aim to eliminate harmful transformation and degradation of the natural environment caused by the effects of human activities while diminishing the growing alienation of humans from their natural settings. The application of biophilic design determinants into the design methodology, as described in the leading schemes, therefore, enhances reaching the goals of environmental sustainability.

The responsiveness-oriented design approach is to "*support the biophilia hypothesis from independent directions*" [N.A. Salingaros and K.G. Masden 2008]. The biophilic design for responsiveness underlines the phenomenon of specific exchange of information between humans and their nearest environment featuring buildings and their surroundings, as well as interior spaces and their components. This process of specific data transmission is to emulate the formal complexity of natural objects through the investigation of the physical characteristics of introduced natural, renewable materials. It assures emotional engagement, the process of decoding the multidimensional messages provided by the objects, and subsequently the

user's sense of belonging. The design model explores ways the material substance is implemented to form objects patterned on nature, to provide them with a direct and intense experience of the relationship between the built and natural environments.

The responsive biophilic design respects fundamental postulates for the introduction of nature-related patterns and attributes into the built environment. It addresses the questions of the physical characteristics of natural building materials and information-related questions resulting from materials aspects while proving their potential in shaping components of clear responsive appeal. This model combines patterns referring directly to the natural objects, processes, or phenomena (e.g., diversity in textures of natural resources, hierarchy, complexity) as well as patterns making references to the appearance of material texture or addressing the manufacturing and working techniques.

Design methods to introduce responsiveness, as a substantial biophilia-complementing and supporting approach, comprise fourteen steps identified by Salingaros and Masden [N.A. Salingaros and K.G. Masden 2008]. Among them, some proposals refer to the scale of the interior and its components. They are as follows:

- Reuse of locally reclaimed natural materials from older buildings, aimed to confirm their high informational content. This approach is supplemented with the use of natural unfinished materials to expose materials' texture and colour, to adjust design solutions to various sizes of available materials, and to reduce solid waste;
- Introduction of small-scale objects made with building materials of limited finishing into the newly conceived structures in a way to disclose the concept of construction and parameters of building materials;
- Geometrical interweaving of vegetation and nature-related features with the building fabric to sustain the connection between interior and natural environments. This process of establishing the human-nature relationship is not only emphasized by the number of plants introduced into the closed spaces but also by defining the boundaries of the latter as more "meandering or crenelated".

4. INTERIOR ARCHITECTURAL DESIGN FOR ADAPTIVE REUSE

The interior architectural design for adaptive reuse is based on the reintroduction of reclaimed building materials and products from refurbished or demolished buildings into the indoor environment to: equip them with new functions, add to a new formal value, and provide them with new spatial context, in the result of their transfer and conversion from building waste to resources enabling completion of new interior components. The interior architectural design for adaptive reuse is based on the analysis of the values of reclaimed parts, and follows the traditionally defined adaptive-reuse design method and its' belief that "*understanding of the inherent qualities and conditions of a building or site can provide clues to the redesign of the place*" [S. Stone 2019, p. 2]. This model considers the "*issues of memory and anticipation, discovery and recognition, the current need to belong*" [S. Stone 2019], that remains the domain of adaptive reuse in its most traditional understanding as an adaptation of the existing building structures to the new functional requirements. The interior filled with components made with well-recognized used parts provides occupants with the "*sense of spatial identity and experience of homeliness*" [L. Świątek 2009]. An object completed with the secondary products affects its user through the "*information it contains and the meaning it conveys*" [J. Chapman 2015]. The deeper examination of the interior component designed according to the adaptive reuse interior architectural design can lead to a mature consideration of the design concept based on "*rationalization and intellectualization*" [D.A. Norman 2004].

The reintroduction and formal assimilation of the reclaimed building materials and products within the structure of constitutive interior components is achieved without their prior significant reshaping or reprocessing. The whole process requires prior assessment of the "mining" potential of existing buildings and their internal spaces, as well as a qualitative evaluation of available resources and inquiry on the assembly techniques used formerly. The inter-setting scheme of interior architectural adaptive reuse involves building materials or products recovered from dismantled or deconstructed building structural elements and then re-introduced into the inner space to complete newly conceived interior components or refurbished ones. In the case of an intra-setting scheme of interior architectural adaptive reuse, the building materials reclaimed from the dismantled interior components are retained within a closed space to form other objects. Both the above-mentioned design schemes, refer to the question of effectiveness in the use of building materials, and comply with the "*environmental urge to adapt and transform combined with the need to build human experiences, rather than construct new things*" [S. Stone 2023].

Among the design strategies of the interior architectural design for adaptive reuse are the following: 1) Inversion, meaning the broad acquisition of available reclaimed building products from refurbished or demolished buildings understood as the superior design principle aimed at the building products reversal from costly reprocessing, recycling or final disposal; 2) Inclusion, meaning the fragmentary inclusion of salvaged building materials or products as means of exercised flow of resources between indoor environment and natural surroundings; 3) Integrity, meaning the established unity of building components and interior components, to enable exploration of their material and semantic potential. The introduction of reclaimed elements-building products within the interior components structure stimulates unconventional design approaches focused on the accommodation of salvaged materials and products to assure formal consistency and high performance of components.

The exemplary design methods include:

- Design for Display to attract users' attention through the appearance of reused building materials;
- Design for Interaction to build up knowledge on the impact of components on the natural environment;
- Design for Connection to provide users with evidence of their contribution to environmental integration due to the components' selection based on the adaptive reuse model.

5. DISCUSSION

The two design schemes: adaptive reuse and biophilic design for responsiveness were examined in this study given their role in architectural interior design for the durability of interior components. The finishing layer of the internal wall was indicated as the exemplary interior component chosen for the assessment of biophilic design for responsiveness and adaptive reuse design scheme as interior components' durability-supportive design method, concerning the material and intangible aspects of durability.

5.1. Durability-supportive features of responsiveness

Biophilic design for responsiveness, while mentioning reuse as one the most promising approaches, directly refers to the question of preserving the embodied energy and embodied materials, as well as extending the technical life cycle of the product. The postulates of limited working, especially in the context of the finishes of surfaces of objects, address the material aspect of an object's durability.

The demand for the implementation of natural and reused parts addresses the emotional durability of interior components. Rationally grounded acceptance of design methods to form interior components is the result of emotional perception followed by cognitive reaction. This design model comprises the exemplary intangibility-related factors:

- Natural environment-oriented connotations within the interior component structure as a source of positive emotional and mental experiences of the presence of natural materials or the "nature analogues" within the structure of interior components and, thus, within the closed spaces;
- Emotional relationship developed through the experience of meaningful and expressive properties of the used natural building material;
- Decoding materials' properties due to the limited finishing and exposure of natural materials texture. This approach provides the users with a more intense experience, and optimizes the amount of information revealed to them.

Biophilic design for responsiveness as a durability-supportive design method to enhance the interior architectural design is demonstrated within the exemplary commercial interiors in Figure 1. The finishing layers of loadbearing walls, partitions, or spatial dividers were chosen for the evaluation, as they are critical interior components defining the inner space and influencing its perception.

5.2. Durability-supportive features of interior architectural adaptive reuse

The durability-related approach of the interior architectural adaptive reuse design scheme, within its material aspect, refers to the following:

- Preserving the embodied energy in materials through reversing the potential building waste from the landfill, their remanufacturing, and reintroduction into the structure of valuable and functional objects;
- Extension of the lifespan of the product through various modes of its application in alternative locations to fulfill new functional assignments;
- Closed circuit of material substance as the ultimate sustainability-oriented design postulate achieved by the potentially cyclic repetition of extracting recoverable materials from refurbished or demolished buildings, reprocessing of the reclaimed products, and reintroduction of material substance into the building.

Biophilic design for responsiveness in patterns	Intangible aspects of interior component's durability	Material aspects of interior component's durability	
▪ Usage of natural unfinished materials to expose materials texture and colour;	▪ Resilience of the object through accommodation of signs of decay (i.e. sound graphic arrangement to hide marks of use);	▪ Structural honesty; ▪ Construction design suitable for the category of interior component and presumed duration of the interior;	
Self-supporting dividing structure made with the locally available natural stone boulders, building Dipoli, Alvar Aalto University, Helsinki, arch. Raili and Reima Pietilä, 1966, renovation 2017, ALA Architects, Fot. M. Celadyn, 2023			
▪ Usage of natural unfinished materials to expose materials texture and colour; ▪ Adjustment in design solutions to introduce the available materials of various sizes;	▪ Resilience of the object through accommodation of signs of decay (i.e. sound graphic arrangement to hide marks of use);	▪ Simplicity of formal solutions, realized with avoidance of object's inexplicable formal complexity;	
Internal wall cladding with solid wood varnished with a dark colour, main hall, Helsinki Music Center, 2011, LPR Architects Fot. M. Celadyn, 2023			
▪ Usage of natural unfinished materials to expose materials texture and colour;	▪ Clarity of structural solution that allow to identify the construction clear principle and to ease possible repair or pointwise replacement	▪ Assembly methods to reduce inseparable joints in favour of the removable mechanical fixings that assure correct installation of elements and enable potential replacement of the damaged parts; ▪ Structural honesty; ▪ Clarity of applied technical solutions to assure access and easy inspection;	
Internal wall cladding with timber battens fixed with steel hinges, entrance hall, Marunouchi Center Building, Tokio, 1984, Shimizu Corporation, Fot. M. Celadyn, 2019			
▪ Usage of natural unfinished materials to expose materials texture and colour; ▪ Adjustment in design solutions to introduce the available materials of various sizes;	▪ Clarity of structural solution that allow to identify the construction clear principle and to ease possible repair or pointwise replacement; ▪ Provision of additional functions and meanings gradually discovered by users; ▪ Resilience of the object through accommodation of signs of decay (i.e. sound graphic arrangement to hide marks of use).	▪ Assembly methods to reduce inseparable joints in favour of the removable mechanical fixings that assure correct installation of elements and enable potential replacement of the damaged parts; ▪ Simplicity of formal solutions realized with the avoidance of object's inexplicable formal complexity; ▪ Structural honesty; ▪ Avoidance of unnecessary finishing and cladding, especially these permanently fixed to the structural elements,that might prevent them from the pointwise exchange or repair when damaged	
Cladding of internal wall in wood strips used for temporary exhibits, Undergraduate Center, Alvar Aalto University, Helsinki, arch A. Alto, 1964, renovation 2017, Architects NRT, Fot. M. Celadyn, 2023			

Fig. 1. Biophilic design for responsiveness as a durability-supportive design method; source: author's drawing

The interior architectural design model based on adaptive reuse offers the opportunity for building up an individual subjective interpretation of the compound object and engagement due to the emotional experience accompanying the first contact with an object, then followed by a gradually developed reflective response. The process of captivating the occupants' attention, and influencing their positive reactions toward the interior components, is assessed within the intangible context of durability issues.

The exemplary intangibility-related factors of the design model comprise:

- Multisensorial experience of interior components of the complex structure (i.e. composition of new and reclaimed secondary parts) that engages affective reactions is followed by a conscious exploration of the components' features. This encourages end-users to recognize the role of interior components', as objects broadly exposing salvaged elements, in stimulating the users' intensive affective reactions;
- Emotional engagement gained through the experience of the introduced secondary product, as

a means to evoke the users' expressive attachment caused by the services provided. The affective engagement, if sustained by the design solution responding to the object's gradual decay in time, can evolve into a cognitive perception and rationally grounded acceptance of the design method.

- Cultural connotations, related to the experience of the interior component made with reintroduced building materials and products of historical or aesthetic value, provide a sense of cultural continuity.
- Reflective response based on the semantic analysis of the experience of reintroduction into the structure of interior components of pre-used building materials and products.

Adaptive reuse as a durability-supportive design model to supplement the interior architectural design is demonstrated based on the exemplary commercial interiors in Figure 2.

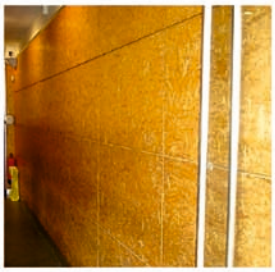
Adaptive reuse in patterns	Intangible aspects of interior component's durability	Material aspects of interior component's durability	
▪ Implementation of reclaimed building products; ▪ Inter-setting transfer of resources (i.e. introduction of reclaimed building products originally featuring building's structure or outer finishing layer to shape interior component)	▪ Resilience of the object through accommodation of signs of decay (i.e. sound graphic arrangement visible on the object's surface to hide marks of current use); ▪ Provision of additional functions and meanings gradually discovered by users;	▪ Assembly methods to reduce the inseparable joints in favour of the removable mechanical fixings that assure correct installation of portions and enable potential replacement of the damaged parts; ▪ Clarity of applied technical solutions to assure access and easy inspection	
Cladding of lightweight partition wall with reclaimed timber shutters, City Market Is-Suq tal-Belt, upper floor of multifunctional public building, Valetta, 1861, renovation 2018, arch. M. Casamonti, Fot. M. Celadyn, 2024			
▪ Implementation of reclaimed building products ▪ Inter-setting transfer of resources (i.e. introduction of reclaimed building products originally featuring building's structure or outer finishing layer to shape interior component)	▪ Provision of additional functions and meanings gradually discovered by users;	▪ Construction design suitable for the category of interior component and presumed duration of the interior; ▪ Avoidance of unnecessary finishing and cladding, especially those permanently fixed to the structural elements that might prevent them from the pointwise exchange or repair when damaged;	
Cladding of layered internal wall with reclaimed and further brushed bricks, main foyer adjacent to the concert hall, Center of Culture, Lublin, arch. Stelmach & Partners, 2013, Fot. L. Nyka, 2018			
▪ Implementation of reclaimed building products ▪ Intra-setting transfer of resources; (i.e. introduction of reclaimed building products originally featuring inner finishing layers to shape interior component)	▪ Resilience of the object through accommodation of signs of decay (i.e. sound graphic arrangement visible on the object's surface to hide marks of current use);	▪ Construction design suitable for the category of interior component and presumed duration of the interior; ▪ Clarity of applied technical solutions to assure access and easy inspection	
Cladding of partition walls with oriented strand board reclaimed from the temporary wooden frame structure and further covered with protecting finishing layer, restaurant, Barcelona, Fot. M. Celadyn, 2015			
▪ Implementation of reclaimed building products ▪ Inter-setting transfer of resources; (i.e. introduction of reclaimed building products originally featuring building's structure or outer finishing layer to shape interior component)	▪ Provision of additional functions and meanings gradually discovered by users;	▪ Construction design suitable for the category of interior component and presumed duration of the interior; ▪ Clarity of applied technical solutions to assure access and easy inspection	
Partition walls with reclaimed ceramic tiles from refurbished roof, Office building Warehouse8B, Madrid, arch. A. Franco Diaz, renovation and adaptation 2011, Fot. Carlos Fernandez Piñar, (Source: https://www.dezeen.com/2011/07/10/warehouse-8b-by-arturo-franco-office-for-architecture/)			

Fig. 2. Interior architectural adaptive reuse as a durability-supportive design method; source: author's drawing

5.3. Accumulative effect

The analysis was to indicate the scale and diversity of the material and intangible aspects of the durability of interior components shaped based on the above-mentioned design schemes included in interior architectural design methodology. The results of the study reveal that the intangibility-related factors dominate in the analysis of responsiveness and adaptive reuse as design frameworks to support the durability of interior components. The accumulative effect of enclosure of both discussed design schemes is illustrated in Figure 3.

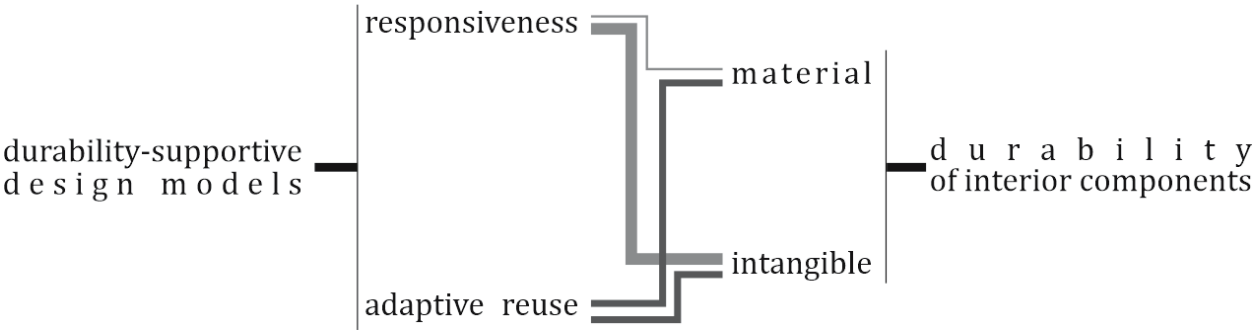


Fig. 3. Responsiveness and adaptive reuse as durability supportive design methods; source: author's drawing

In particular, the user's emotional engagement, gained through the experience of natural building materials or secondary products introduced into the component's structure, is noticeable in both models. The affective engagement, if sustained by a design solution responding to the object's gradual decay over time, can evolve into the cognitive perception and rationally grounded acceptance of the design method based on the systemic implementation of secondary products.

The cultural connotations are among the intangible factors common for the discussed models as well. Their role is meaningful even despite the visible signs of malformation and gradually occurring deterioration of the physical performance of interior components. The quotations from the past, enclosed within the interior component's volume, engage the users, complement, and enrich further satisfactory use of these objects in a long-term perspective. They allow occupants to: 1) reach the reflective level of conscious interpretation of experienced emotions caused by the interaction with reintroduced parts of the objects; 2) build up the user--object relationship on a specific object's "layered complexity" revealing the diversity of material culture-related citations. Finally, they stimulate the occurrence of users' empathy and attachment toward interior components. If these cultural connotations are complemented by individual users' memories and personal meaning attached to the reclaimed building materials and products introduced into the structure of the designed interior components, it might be justified to define these objects as of unique value, and in consequence, increase their lifetimes.

CONCLUSION

The study analysed the accumulative effect of enclosure of interior architectural design for adaptive reuse and biophilic design for responsiveness into the interior architectural design framework. This approach was examined with regard to the range and diversity of durability of interior constitutive components. The analysis of technical and emotional aspects of the durability phenomenon identified the characteristic material and intangible durability-supportive factors within the discussed design methods. In particular, the study revealed both above-mentioned design schemes' potential in stimulation of users' emotional attachment to interior components. The multisensorial experience of interior components built based on interior architectural design for adaptive reuse and biophilic design for responsiveness, affective engagement of users toward interior components, cultural connotations, decoding of materials' properties, or reflective responses were disclosed as drivers to develop emotional durability. The interior components' acceptance, developed as a result of the multidimensional experience and positive reactions to intangible aspects of their appearance, conditions postponing the premature and unreasonable replacement of these spatially and functionally developed building products, as well as the extension of their lifetimes. The interior architectural design focused on the exploration of the emotional-intangible aspect of the durability of interior components shows, therefore,

its potential in fulfilment of design strategy for environmental sustainability through the creation of physical objects of longevity.

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