



(REVIEW ARTICLE)



ADAPTIVE AND MODULAR FURNITURE: DESIGNING FOR LONGEVITY AND EMOTIONAL DURABILITY

Anastasia Alexandrovna Savelieva *

Interior and Furniture Designer, Academy of Art University (AAU), San Francisco, California, USA.

* Corresponding Author

World Journal of Advanced Research and Reviews, 2026, 31(02), 1141–1144

Publication history: Received on 13 July 2026; revised on 19 August 2026; accepted on 21 August 2026

Article DOI: <https://doi.org/10.30574/wjarr.2026.31.2.2189>

Copyright © 2026 Author(s) retain the copyright of this article. This article is published under the terms of the Creative Commons Attribution License 4.0

ABSTRACT

This article examines adaptive and modular furniture as a response to the rapid obsolescence of interior furnishings. It demonstrates the relationship between a product's structural flexibility and the length of its life cycle, and analyzes the principles of modularity and repairability. Particular attention is given to emotional durability - the ability of an object to retain value for its owner over time. The article concludes that furniture longevity is determined not only by the materials used, but also by the patterns of interaction and use embedded in its design.

Keywords: Adaptive Furniture, Modular Design, Longevity, Emotional Durability, Sustainable Design, Repairability, Circular Economy, Attachment To Objects, Product Life Cycle.

1 INTRODUCTION

Furniture accompanies people throughout their lives, yet it remains one of the shortest-lived categories of household goods. A sofa purchased during a home renovation may end up in a landfill only a few years later - not because it has broken, but because it is no longer appealing or does not fit a new layout. The volume of furniture waste grows alongside the pace at which interiors are updated. The problem lies not so much in the quality of materials as in the underlying design logic, which is often oriented toward a short consumption cycle.

The concept of adaptive and modular furniture offers a response to this challenge. A product ceases to be a fixed form and instead becomes a system that the owner can assemble, expand, and reconfigure as needs change. A shelving unit can be extended with new sections, a sofa can change its configuration, and a table can fold or unfold depending on the intended use. Structural flexibility extends the service life of an object and reduces its environmental impact.

Technical durability, however, is only half of the solution. An object remains in use for a long time when its owner does not want to part with it. The ability of a product to retain emotional value over time is known as emotional durability. This article considers three related themes in sequence: modularity and adaptability as design principles; longevity and repairability within the logic of the circular economy; and emotional attachment as a factor that determines the actual lifespan of furniture. This sequence brings together engineering and psychological perspectives on the same object.

2 MODULARITY AND ADAPTABILITY AS DESIGN PRINCIPLES

As a design principle, modularity means that a product is composed of repeatable elements that can be combined in different ways. The idea is not new. In Soviet mass housing practice during the 1960s and 1970s, case furniture was designed from standardized units and sections that consumers could combine according to the dimensions of their apartments and their personal preferences [1]. At the time, the economic motive of reducing production costs coincided with a demand for flexibility, and sectional construction became a basic language of domestic furniture design.

Adaptability adds a dynamic dimension to modularity. An object is not simply assembled once; it can change its form during use. Transformable furniture illustrates this logic clearly: a bed folds up against a wall, a table conceals additional sections, and a cabinet can unfold into a workstation [2]. Such solutions are especially valuable in small dwellings, where every square meter must serve two or three functions. The design of capsule-like and minimal spaces relies directly on anthropometric principles and requires precise dimensional calculations based on actual body movement [3].

The relationship between furniture and the human body brings ergonomics to the forefront. The form and functional dimensions of the built environment are inseparable from the proportions and capabilities of the user, and any adaptive solution must be evaluated against this correspondence [3]. In residential interior design, ergonomic requirements become the starting point for determining the height, depth, and relative placement of elements [4]. A module that is uncomfortable to use cannot be redeemed by ease of assembly or visual appeal.

Systemic compatibility is another feature of the modular approach. An individual element is designed not in isolation but as part of a family in which components are compatible in dimensions, fittings, and materials. Such compatibility allows an owner to purchase additional sections years later, replace worn parts, and reconfigure the composition without replacing the entire product. Standardized fasteners and dimensions transform a set of separate objects into an open platform that can be expanded over time.

Flexibility also has a downside. Excessive versatility can compromise convenience: folding mechanisms add weight and additional points of wear, while the pursuit of transformability makes a design more complex. The designer must balance adaptability against reliability and the number of possible configurations against the simplicity of each one. A successful solution is one that an ordinary user can reconfigure without special tools or technical skills.

3 LONGEVITY, REPAIRABILITY, AND THE CIRCULAR ECONOMY

Furniture longevity has two components: physical durability and renewability. A strong but not repairable item becomes useless the moment the first serious failure occurs. A product is designed in such a way that individual parts are replaceable and can remain in service much longer. Repairability is established at the drawing stage through adhesive joints, accessible fasteners, and detachable rather than replaceable fronts and fittings.

This approach fits naturally within the circular economy model. In contrast to the linear pattern of “produce – use – discard”, the circular approach creates a closed product cycle, improving resource efficiency and extending the useful life of goods [5]. Closed-loop systems are increasingly being used in global practice and are gradually displacing wasteful linear logic [6]. For the furniture industry, this means moving from selling disposable items to maintaining products throughout their life cycle.

Modularity directly supports circularity. When a product has replaceable blocks, a worn or worn out element can be removed from circulation independently rather than being removed along with the entire item. The circular model emphasizes reusing and recycling components while separating consumer welfare from the amount of resources consumed [5]. A shelving section that has completed its service life in an apartment may find a second life in a different configuration or with a different owner.

Materials and connections deserve particular attention. Natural wood, metal, and high-quality fittings can undergo repeated repair and restoration, whereas inexpensive composites are often designed for a single cycle of use. Choosing durable and recyclable materials increases the initial purchase price but reduces the total cost of ownership when measured across a longer service life. The economic logic of circularity therefore requires evaluating not merely the purchase price but the cost of an object throughout its entire life cycle [6].

The development of service-based models adds another dimension. Rental, subscription, buy-back, and furniture renewal programs shift responsibility for the fate of a product from the consumer to the manufacturer, giving the manufacturer an incentive to design products that are durable and serviceable. Modular construction again becomes crucial because standardized blocks are easier and less expensive to disassemble, repair, and reconfigure. Longevity

thus ceases to be merely a property of materials and becomes a characteristic of the entire production and service system.

3.1 Emotional Durability and Attachment to Objects

Technical durability extends the potential service life of an item, but its actual fate is ultimately determined by the user. Furniture is not only discarded when it breaks, but is also often thrown away because people are tired of it. So designing for long-term use inevitably raises the question of why some items are worth keeping while others are replaced at the first opportunity. The answer lies in the concept of emotional stability.

Emotional durability describes the ability of an object to maintain its owner's attachment over time. Psychology has long recognized that objects can become the material basis of memory and participants in a person's life story. A table around which children grew up, or a chair inherited from someone close, may fetch a value that is not comparable to its market value. Such an attachment can protect an object from premature disposal more effectively than the most durable surface coating.

Design can intentionally strengthen this connection. Creating a harmonious physical environment that responds to human needs is one of the central goals of interior design [4]. Furniture that the owner has personally assembled and reconfigured is considered an extension of the owner's own efforts and taste. Participation in the assembly and the ability to choose the configuration, color and internal organization turns an anonymous object into a personal possession. In this respect, modularity serves not only a technical function but also a psychological function: each act of reconfiguration becomes another investment by the owner in the relationship with the object.

Materials and the way they age also contribute to emotional attachment. Wood, leather, and metal develop a patina over time that may be read not as damage but as a trace of lived experience. An object that ages gracefully encourages attachment, whereas a surface that loses its appearance after the first scratches encourages replacement. A designer who anticipates dignified material aging works toward the same goal as an engineer who ensures repairability.

Adaptability also supports attachment by allowing an object to change along with a person's life. A product that can be reconfigured for a new apartment, a growing family, or a different lifestyle does not become functionally or aesthetically obsolete as quickly as a rigidly fixed form. Furniture that grows with a child, or a storage system whose capacity changes with evolving needs, can accompany its owner for years. Emotional and functional flexibility thus merge into a single resource for product longevity.

4 CONCLUSION

Adaptive and modular furniture offers a way out of the logic of short-term consumption. A flexible structure assembled from compatible blocks extends product life, simplifies repair, and aligns with the circular economy and its closed-loop use of resources. Longevity is therefore determined not by material alone but by the entire system, from detachable joints to service-based maintenance models.

The true longevity of an object, however, begins where engineering ends. An object remains in use as long as a person wants to keep it, which makes emotional durability no less important than structural strength. Design that combines modular flexibility, repairability, and the ability of an object to become part of a person's life story creates furniture intended not for a season but for decades. The future of sustainable furniture design lies in precisely this integration of engineering and human experience.

REFERENCES

- [1] Kolosova II, Udod MA. Design features of furniture for standard small-sized housing in Russia in the 1960s–1970s [Osobennosti proektirovaniya mebeli dlya tipovogo malogabaritnogo zhilya v Rossii v 1960–1970-e gody]. Vestnik TGASU [Internet]. 2013 [cited 2026 Aug 20];(4):. Available from: <https://cyberleninka.ru/article/n/osobennosti-proektirovaniya-mebeli-dlya-tipovogo-malogabaritnogo-zhilya-v-rossii-v-1960-1970-e-gody> (In Russian).
- [2] Marufov FO. Transformable furniture [Transformiruemaya mebel]. Nauka, obrazovanie i kultura [Internet]. 2021 [cited 2026 Aug 20];(2):. Available from: <https://cyberleninka.ru/article/n/transformiruemaya-mebel> (In Russian).
- [3] Kolosova II, Shkiro EA. Ergonomics of minimal spaces [Ergonomika minimalnykh prostranstv]. Vestnik TGASU [Internet]. 2011 [cited 2026 Aug 20];(4):. Available from: <https://cyberleninka.ru/article/n/ergonomika-minimalnykh-prostranstv> (In Russian).

- [4] Khoroshilova VO. Ergonomic aspects of design engineering of residential environment objects: living rooms [Ergonomicheskie aspekty dizayn-proektirovaniya obektov zhiloy sredy: gostinye]. Simvol nauki [Internet]. 2016 [cited 2026 Aug 20];(12-3):. Available from: <https://cyberleninka.ru/article/n/ergonomicheskie-aspekty-dizayn-proektirovaniya-obektov-zhiloy-sredy-gostinye> (In Russian).
- [5] Ilina EA. Circular economy: conceptual approaches and mechanisms of their implementation [Tsirkulyarnaya ekonomika: kontseptualnye podkhody i mekhanizmy ikh realizatsii]. Organizator proizvodstva [Internet]. 2022 [cited 2026 Aug 20];(3):. Available from: <https://cyberleninka.ru/article/n/tsirkulyarnaya-ekonomika-kontseptualnye-podhody-i-mekhanizmy-ih-realizatsii> (In Russian).
- [6] Socheeva VE. Circular economic model as a new approach to the problem of sustainable development [Tsirkulyarnaya model ekonomiki kak novyy podkhod k probleme ustoychivogo razvitiya]. Ekonomika i biznes: teoriya i praktika [Internet]. 2018 [cited 2026 Aug 20];(7):. Available from: <https://cyberleninka.ru/article/n/tsirkulyarnaya-model-ekonomiki-kak-novyy-podhod-k-probleme-ustoychivogo-razvitiya> (In Russian).