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# The Impact of Adaptation on the Development of Social Space of Contemporary Architecture

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The concept of adaptation appears clear in many fields, the most important of which is in the field of architecture, since architecture is related to time and social variables, so society is the basis for its production and it is the one who gives it its meanings and makes it stable and solid, and it enables it to fade away and end. Adaptation in social spaces enables those spaces to continue and permanently through time, thus achieving sustainability in their architecture and making them effective and vital through the ages. From here, the general problem of the research emerged with (the complete lack of knowledge of the impact of adaptive mechanisms in the social space in contemporary architecture), and a research problem represented by (the lack of knowledge about an approach that clarifies the effect of adaptive mechanisms on the development of social space to reach a sustainable community architecture in contemporary architecture), And in order to reach the objectives of the research in (building a theoretical framework on the concepts of adaptation and social space in contemporary architecture and the mechanisms for achieving it in order to reach a sustainable community architecture using contemporary technology according to the perspective of energy efficiency and natural resources), by making a research design plan using a research sample of spaces And using the comparative analysis between them to reach a measure ruler to build the research hypothesis and reach the results, conclusions and recommendations for future research.

**Key words**: adaptation, levels of adaptation, social space, energy efficiency

- Adaptation concept:

It is related to multiple intellectual concepts and the definitions of the concept varied, as the definitions showed the concept of adaptation with its meaning (adapt to adaptation) and goes back to the Latin term (aptus) in the early fourteenth century, meaning (appropriate

or appropriate) and through the Latin word (adaptare) which means (to join to join or to union or to join), as well as by dividing it (ad) meaning (to) (to) and (aptare) meaning (appropriate or appropriate) (fit). (Ball 2002, Douglas 2006, Bullen 2007) and in French, (adapter) It goes back to its English roots in (1610) to mean (fit something into some purpose) (Harper, 2001, p.1).

- Adaptation in architecture:

It is any intervention or action related to the building to change its capacity, or change its function or performance to suit new circumstances or new requirements, it is the ability to change the small or large in the building (Grammenos & Russel, 1997)

Or it is the building's ability to effectively accommodate the evolving requirements of its context and thus increase its value through the life of the building.

- Procedural definition of adaptation:

It is the process of making the building suitable to the requirements, environmental conditions, or conditions, or it is the ability to adapt or modify the shape, structure, or habits to suit new situations, it is any work or any intervention that requires modification, development or reuse to suit new conditions or requirements.

- The concept of social space:

It is the shared use and perception of space by distinct social groups, as opposed to personal spaces. "Social spaces are produced by societies according to the spatial practices existing within society. Productive spaces are a set of relationships between organisms within space, where social space provides an environmental framework for group behavior; it is flexible and multilayered."

Figure (1) shows social spaces

https://www.definitions.net/definition/social+space, 

- Fundamentals of adaptive design in the social space:

Several factors have been identified for adaptive design, and they provide an evolution, clarity and fusion of ideas, ranging from primitive forms of creation to modern methods, which are divided into three categories: (spatial (broad fit, open plan), physical elements (manufacturing, kinetic architecture, and infinity), and components Building (levels, layers, system design)) (Schmidt III & Austin, 2016, p. 18)

## 1- spatial

### 1- A- Spatial (Loose Fit):

The broad proportionality trend appeared before the time of the rise of modernity and is a fundamental feature of the capacity of pre-modern buildings to accommodate change, it is functionalism, or as it describes (Lerup, 1977) is a behavioral approach to architecture and creates a protective style of architecture to suit a specific behavior (function).

In 1972, (Alex Jordan), president of the RIBA Association, began a search operation within buildings with long life, wide proportion, and low energy, as it was his belief that these three characteristics could define a more sustainable building environment. Thus, thinking can be linked to the plurality of functions in prehistoric shelters and traditional architecture, which provided a wide public space (social space) for activities instead of describing the spatial criteria for specific jobs.

Venturi (& Scott, 2004, p. 89) transforms the architectural maxim (form follows function) into (form assimilates function) to be more appropriate to the dynamic world and to provide symmetry with a variable space. That is, the broad proportion approach allows for larger space selection and less pre-selection about space use. The issue is the laws, regulations, structural costs, and overall building height restrictions. This means that building developers try to pack the largest number of floors within a predetermined height. While horizontally, many developments have remained dependent on an industrial standard program that relies on spatial efficiency to reduce costs and allows for a strong program of pressure often on a given site.

This concept became a central principle for all the pioneering modernists, including Mays, whose role elevated the concept to a "global space" as a widespread internal space that benefited from all widespread maintenance by reducing structural elements. Here one can see the merging of the two spatial concepts - (broad fit and open space).

Lewis Kahn built on the concept of Mays van Doroth by proposing to separate the serviced spaces from the serviced spaces as a way to reduce barriers and thus it is widely applied in (Richard Medical Laboratories) in (Christensen, 2008, p. 61) Figure (2)

As the movement and the course of services cores) are signed on the perimeter of the laboratories. Likewise, the Center Pompidou Center is

another example, as it extends to a sea (75 m) and shows services and external movement, while everything is designed to be movable.

The principles of open plan became popular in the twentieth century, influencing the office environment in the 1940s that led to the steel structures of deep-plan buildings served by mechanical air-conditioning. (Schmidt III & Austin, 2016, p. 20-21)

Ehrenkrantz & Wachsmann later developed building systems that include all services within the roof space and divided lightweight structures with demountable partitions (Weston, 2011) Figure (4)

Figure (2) Les Corbusier's design for Maison Domino (Free Scheme)

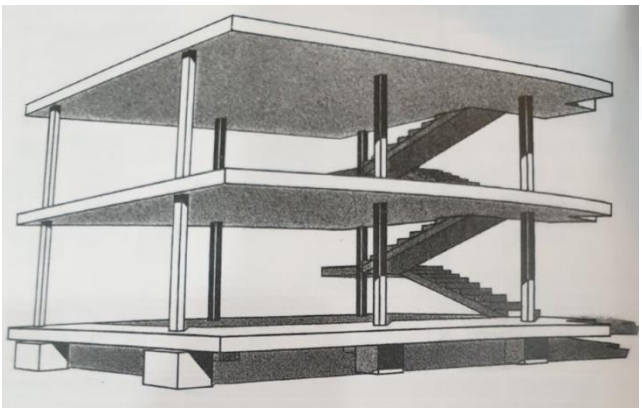
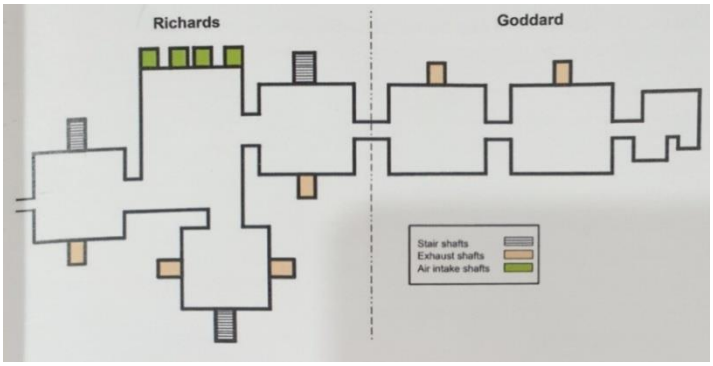
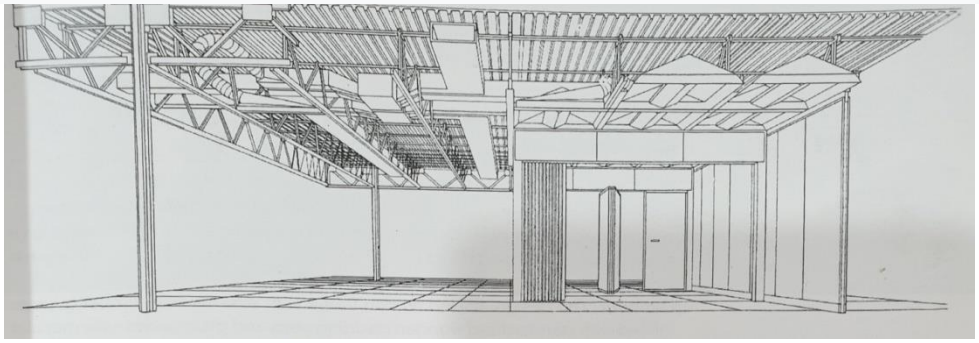


Fig. 3 Spaces diagram of Lewis Kahn’s work (white squares) and service space (colored spaces)



Today, the approach has become synonymous with office development and is often part of (the shell and core) of the basic structure approach that separates the basic support of the infrastructure (phase 1) from the structure to the fit of a particular concern (phase 2), where the basic development links the open plan with the concept of building levels.

Figure 4: Service design for SCSD schools in California 1989



Therefore, there are two axes of space (wide proportion and open plan) and are present in harmony, where the first reinforces a large scale of space and the other promotes the removal of permanent objects or objects from space, and they both coexist well in dealing with pre-modernity in terms of spatial processing and are also related to physical parts.

## 2- Physical parts (component and capacity design):

### 2- A- Industrial Architecture (Manufacturing):

One of the requirements of modernity was the expression of modern technology, and thus for many, industrial architecture provided a faster

construction and a consistent repetition system. An example of this is the Crystal Paxton Palace that was quickly constructed in London, before being dismantled and rebuilt in the suburbs of Lambeth, where the design used an iron structure with intermediate wood columns filled with standard wood cladding units and glass panels, and the modular unit was installed according to the size of the glass panels. .

The moving parts of these buildings aim to accommodate multiple activities within a single space, and thus this view of adaptability can be described as an attempt to do more with less.

Jean Prouv'e was a strong proponent of linking architecture to its production methods and the transfer of manufacturing techniques to architecture. Its standardized industrial components (mostly aluminum) were often movable or demountable, giving the user freedom of choice.

Many have used the metaphor (Les Corbusier, which is a house, a machine to live in) and transformed it into a literal aesthetic, and thus the form is not the result of the functions in which it is or the surrounding context in which they live (Davies, 1988, p. 22), and is often referred to as a factory. (Reliance Control, 1967) for electronics designed by Rogers & Fosters as the first high-tech building to display its foundational characteristics well with a fixed rectangular floor plan, with an exposed structure, non-renewable components and an undifferentiated plan. The potential which allows any type of function to occur in it as well as it is supported by a diversity of use of (animated / configurable) elements.

Thus, high-tech buildings adopted the concept of incomplete or open shapes, allowing the building to grow or smaller as needed.

Monumental architecture structures aim to remove the fixed theory of functionalism and embrace social change by enabling organic growth through the evolving requirements of society (Sharp, 2005, p. 36). Today, openable structures are used that are used for temporary (movable) structures such as tennis domes and exhibition pavilions. Such as Sir Norman Foster 1971's Computer Technology Ltd. and Frei Otto Openable for Rotterdam Expo 1958 and Nicholas Grimshaw Eden 2001 project.

Components and systems have appeared in buildings that can respond to user conditions or the environment at the end of the twentieth century and the so-called smart buildings that include buildings, spaces and building departments, where the building management system or the hardware and software automation system provides a system to control the mechanical and electrical systems within certain ranges and timetables. Various (such as ventilation, lighting, and security). The systems allow buildings to automatically adapt to the prevailing user needs and environmental conditions, as these systems have become common in buildings by turning on and off lighting, as well as opening and closing doors and modifying heating and cooling conditions (Schmidt III & Austin, 2016, p. 28).

The concept of smart building components has grown to encompass a wide range of components and functions that generate more adaptive and responsive structures enabling real-time changes based on a variety of environmental and human interactions. And according to (Spuybroek, 2005, p. 58) this is the real adaptability that participates in the emergence of the activities themselves. A practical example of this is the columns in the courtyard of the Medina mosque that open during prayer to provide shade for the pilgrims (Figure 5) and this trend increases An imitation of the natural forms of a network of mimic nature of components with the use of continuous feedback mechanisms

Figure 5 How to provide open columns in the city mosque for shade

Schmidt & Austin, 2016, p. 28

- C - Infinite design

The infinite design enables the users of the community to allocate a space for their needs, that is, that the user is rooted in the interaction and not the interaction between humans and architecture, that is, the user

becomes an effective element in architecture and therefore the physical components are only one of the elements that appear in life that create openness and inability On prediction and incompleteness.

### 3- A - Levels:

(Kendall, 2009, p.7) describes the two planes of a building:

Supports (S) long-term use, overall service-related design, heavy construction, long-term investment and long-term mortgage financing.

♣ Construction infill - (I) short-term use, user-related design, lightweight components and short-term investment equivalent to short-term financing.

This is called the SI system, as it was developed in response to the housing wave in the 1960s to empower the user.

User options may include the size of the space or its subdivision, its elements, terminations, and elements of its interfaces, as some examples of design methods that support thinking about the (SI) system are the open frame structure, the middle area of services, and the system filling the interface.

(SI) converted to (OBOM) in 1984 (Open Building Simulation Model) and is still alive as a movement.

IFD (Industrial and Detachable Resilience) is a Dutch government initiative for construction from 1999 (Geraedts, 2011, p. 58), in which industrial resilience works through prefabricated subsystems, more team effectiveness and minimal on-site work. The detachable features focus

on reducing waste with easily removable elements allowing the building to be expanded or relocated.

The main philosophy is that buildings need to be designed in parts, buildings with a long life are obtained by replacing parts with a short life (Utida, 1983, p. 41).

The third development in 1990 is (SI-Skelton infill) which equips buildings in two steps: First (S) (the skeleton) denotes the long-term part. (I) (equipping) social support is the second, short-term step.

## 3- b - Layers:

The concept of layers defines that building elements have different ages that must be constructed clearly, as (Frank Duffy) indicated that buildings should not be measured in terms of material (materials) but in terms of time. (Duffy & Henney, 1989, p.61).

However, if the change is frequent or costly, the changing components can affect more quickly the slow ones. For example, continuous rearrangement of materials may require that the space plan be included at floor height (Brand, 1994, p. 68)

Layers include the site as a permanent entity, the structure (columns, floors, roofing), services (ventilation ducts, water pipes), space plan (interior partitions, secondary ceiling), and materials (furniture, structures). Blyth & Worthington, 2001, p.97 added crust, site, and systems to the Duffy model, while location and crust are synonyms for

the terms brand. This harmonizes well with the assessment (Blaksted, 2001, p. 49) that services consist of several layers and increase their complexity through centralized array components. In addition, services are complex because they are often hidden and embedded in other layers for cost or space purposes. In fact, it is not only the architectural elements that define the layer but the function fulfilled by a group of elements as a whole. The concept can also be expanded to include the urban scale (Friedma, 2002, p. 86

## 3 - c - Systems design:

Christopher Alexander is known as the founding thinker of how to systematically solve a complex design problem into smaller, controllable problems. Alexander (1964, p. 74 )'s approach analyzed "urban home" into subsystems of components and reintegrated them to meet all needs. (Merritt, 1979, p.143) defines nine subsystems: (internal enclosures, external enclosures, structure, vertical movement, plumbing systems, heating, cooling and air conditioning systems, lighting, acoustics) even though the components are not related to a specific subsystem.

Thus, the systems design approach approaches building design by identifying subsets of the elements and analyzing the building into subsets of components. This approach has evolved into parametric software with algorithms to control variables and create complex shapes supported by developments in design methods into industrial methods,

building information modeling seeks to codify, organize, manage, update, and systematically track components through use (Schmidt, 2016, p. 85)

All three concepts - levels, layers, and system design - attempt to balance change and stability by analyzing the building into separate parts. Systems design explicitly focused on creating distinct functions as a means of class evaluation of the formation of social space, while classes functionally blend with the different life cycles of the components, and the concept of level tries to balance materialism with social by understanding that one cannot achieve adaptation without both within the social space.

- Strategies for designing social space for adaptation:

A design strategy can be defined as a comprehensive approach towards a particular way of doing systematic things that can be defined by a set of building characteristics (features and capabilities) and design plans (methods and solutions).

The design strategy provides the designer with a way to think about the resilience of social space and within its urban context. Thus design strategies are high-level processes to approximate adaptability to their design. Design strategies can be grouped into two areas:

1. Physical elements (modularity, simplicity and clarity, long life)
2. Spatial Aspects (Loose Fit, Effective Activity, Infinite Design, Spatial Planning)

From the application of design strategies to select spaces, spaces are evaluated as achieving human comfort as an adaptive social space.

- Elected spaces:

Kentish Town Health Center

Cedar Rapids Public Library (CRPL)

Kentish Town Health Center Building

Building type: Healthcare

Location: London, UK

Year of completion of the building: 2008

Architect: AHMM Architects

Kentish Town suits many users to maintain a sense of community, and the building was constructed with the largest block, creating an overall design concept of pushing and pulling blocks and providing numerous balconies, spaces, light spaces, and connecting and connecting moments throughout the building to help create a sense of community through transparency And the connection, with the additional unspecified spaces, and the engineering established by the concept of (spatial diversity) provided a higher level of rigidity with the ability to move the internal walls, and the services were installed in a manner that provides general comfort to users.

Figure (6) illustrates the Kentish Town building and the strategies applied in it

The following strategies were used to achieve adaptation in the project spaces:

- The strategy of formal diversity in the interfaces
- The studied component strategy

Spatial diversity strategy

Daylight strategy in indoor space

- Optical link strategy
- Huge Space Strategy

## Cedar Rapids Public Library (CRPL) Building

Building type: cultural

Location: USA

Year of completion of the building: 2013

Architect: OPN Architects

The building houses many re-used materials, including historical glass windows and limestone panels for exterior cladding, and the building has three entrances that are accessed from various modes of transport and the southern part of the site is a car park and has been designated as an area for future expansion. All services have been combined in one area, which allows the majority of the space to be versatile over time and the internal space is adjustable in furniture, in addition to flexibility in heights and functionality.

A large section was cultivated to provide a natural environment and an integrated system of rainwater and storing it to irrigate vegetation, and the library was designed to go beyond LEED Platinum by providing glass fronts for solar control and an inner layer of the structure to create a thermal separation. Fig. 7

The following strategies were used to achieve adaptation in the project spaces:

- Building strategy on site
- Communication and linking strategy with neighboring buildings
- Multiple Access Point Strategy
- A good signature strategy

- Social Space Strategy
- Future expansion strategy

- Multifunctional space strategy in relation to inner space
- Space volume conversion strategy
- The strategy of modifying the effectiveness of space from the historical to the contemporary

Figure (7) illustrates the Cedar Rapids Public Library building and the strategies applied in it

## Conclusions

- The social space is a physical or virtual space such as a social center or another gathering place where people gather and interact. Therefore, the achievement of adaptation in it in order to provide human comfort for users, whether through its spatial, formal or functional privacy.

- Adaptability does not require spatial or component repetition. Rather, society tends to preserve spaces well to be distinct and go beyond single use.
- The existence of levels of design for adaptation that determine the level at which the building is managed by applying and testing adaptation principles to it
- With different strategies for adaptive design and by applying them to parts of the building from the outer shell to the inner space through improving the strategy and applying it within the space, the space achieves human comfort and continues to perpetuate it.

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