

The Challenge of Designing Camouflaged Indoor Units as Means of Efficiency

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Abstract. Nowadays various reasons consequent to the contraction of the indoor space as; the phenomena of the rapid acceleration of time, the role of the economical issue rather than the issue of the land use that refers to attending the multiuse of the context of the space especially the indoor units. And consequently various meanings have been changed as Living in the sense of belonging to a place is more and more difficult today as one doesn't not belong to one place but to more places at the same time so the context forming the space have to be camouflaged to match every purpose the man need and sometimes match the shape of the space or its size.

But these camouflaged units appeared to be prototypes with no certain criterion insisting the presence of the camouflage as a real aspect in the era, which can solve many problems in the indoor space especially when it refers to the eco efficiency.

So the main objective of the issue concerns the search for the presence of the camouflaged indoor units rather than declaring the criterions of measuring and designing the efficient one.

Key words: efficiency; camouflage; indoor units; transparency, multiuse

Introduction

Camouflage [1] as an adaptation used by organic creations or species means a tool of protection and defense; as the prey can escape from the predator, or it can be a means of a trick the predator can use to catch its prey. And it can be achieved in very different ways as:

- The Resemblance of the surrounding environment
- The use of the concept of the light and shadow
- Reflecting the surrounding environment
- Transparency
- The adaptation within motion

Mainly these aspects seek for one of the following means of concealment as eliminating the shape, eliminating the volume rather than the smart adaptation as using sensors, motion, using patterns or using decoration. And these aspects play an important role insisting the progress of the mission.

At the main time Efficiency: [2] Means the attribute of performance that is measured by examining the relationship between a specific product (an output) and the resources used to create that product (inputs). And under this definition, a provider would be efficient if it was able to maximize output for a given set of inputs or to minimize inputs.

Referring to efficiency in the organic species it is regarded that each application used in the camouflage of animals goes to fulfill its mission without adding extra load to the prey or the predator so it represents efficiency.

But what is the shape of the output needed in this era?

The proposed output could be produced faster with fewer people in less time from people and fewer supplies. But In economic terms, the focus is on whether the output is produced with the minimum amount of each input which is called

"technical efficiency" that concentrates on the need to use the Earth's limited resources in a sustainable manner. Or the resource must represent many other goals as: to have a vibrant economy, to glorify the high quality of life or to produce and consume within the limits of the eco system.

So this aspect concentrates on creating more goods and services with ever less use of resources, waste and pollution which is called "eco efficiency" that enlarged to develop a concept that marrying environmental and economic improvements. And this trend refers to sustainability which hasn't appeared obviously but it achieved a progress.

Then what is the camouflage can be used in the indoor units? And where is the efficiency in such camouflage?

So the issue will be divided into two parts; deducing the means of camouflage adaptation in the indoor units, then measuring the efficiency of camouflaged indoor units. As the main hypotheses concerns that there is a presence of efficient camouflage in the indoor units and it resembles the natural camouflage in the living organisms and the accumulation of all the adaptations of the camouflage phenomenon means the utmost means of efficiency.

1. Deducing the means of camouflage adaptation in the indoor units

Nowadays Sustainable design is the thoughtful integration between the traditional aesthetics of massing, proportion, scale, texture, shadow, and light and needs to be concerned with long term costs; it is based on patterns of production and consumption that can be pursued into the future without degrading the human or natural environment. It is a pattern of resource that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but in the indefinite future.

For these reasons, and the desire to promote sound professional design standards, a thorough understanding of when space problems arise, liability concerns often focus on factors and parties relating to design, manufacturing, and testing of systems and materials, and within these factors and aspects various shapes of units in the indoor space have been designed as proto types , but they can be classified in the same way of the natural adaptation of camouflage; Eliminating the shape eliminating the volume and the smart adaptation and they can be displayed as follows:

1.1Eliminating the shape:

This kind of adaptation can be fulfilled by Transparency and reflectors;

1.1.1Transparency; This aspect of designing the indoor units has been appeared lately in various spaces and by various designers as everyone promotes his talent to show the latest fashion to glorify the natural lighting. as shown in the transparent chairs designed by Gehry as prototypes in his work shop in 1992 as shown in fig (1) as using the bend wood in the way of the bushel baskets. As the ribs form a flexible transparent pattern. [3]



Fig (1) transparent chairs designed by Gehry as prototypes in his work shop in 1992. [3]

The transparency is also shown in the designs of JDS architects in the display stands which are known as "bench design" acting in a multiuse manner as used in displaying goods as well as sitting units as shown in fig (2), (3). [4] [5]



Fig (2) The display stand designed for the Bruins bazaar by JDS architects in Oslo, Stockholm [4]



Fig (3) to the right and the left transparent units known as bench design, designed by JDS architects in Helsingør, Denmark, are used as display stands and it could be reused as sitting units [5]

Transparency is also shown in the transparent stainless steel chair designed by Bureau des Mes architects, as stands for the usual use as setting unit and it could be used in hospitals for sick people as a lavatory as shown in Fig (4). [5]

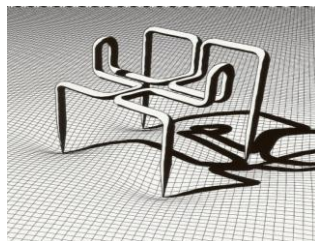


Fig (5) The transparent chair from the stainless steel designed by Bureau des Mes architects. [5]

Other example of transparency is shown in the transparent patterned units used as partitions forming unit zones, tables and sitting units designed by Andreas Angelidakis in Milano, Italy shown in Fig (6) To suite the pavilion that will house the big library of Hangar Bicocca which insists that transparency and multiuse can be used in an extensive way as forming a style within pattern and concealing within this pattern. [5]



Fig (6) The use of a transparent pattern to form various kinds of units as partitions, unit zones, tables and sitting units designed by Andreas Angelidakis in Milano, Italy [5]

At the same time the technology takes its place in promoting the transparency as shown in Fig (7) as the latest fashion of the furniture seems not to be only visionary but also to deal in a smart manner with the surrounding environment, as by the use of the smart materials any increase in the temperature of the room affect the color of the unit accordingly it seems to be an indicator for the user of the space as to use the various systems to reduce this temperature to reach the moderate one. [6] So this example shows the transparency and the smart response to the environmental control.



Fig (7) The latest fashion of the furniture as the use of the smart materials. [6]

1.1.2 Reflectors; these aspects refer to the flexibility as the units designed can match the scale of the person in the used space or the size of the space, rather than it can refer to the reflectance of the surrounding environment as follows;

The flexibility of the indoor units has been appeared in the opened multiuse spaces as shown in Fig (8) as the Unit zones known as Knoll a3 designed by Asymptote architecture could be extended to change its size to suite the size of the space and also it could suite the usage of the zone. [5] So the dynamic motion and flexibility appears in such units at the same time it is semitransparent so it doesn't eliminate light.

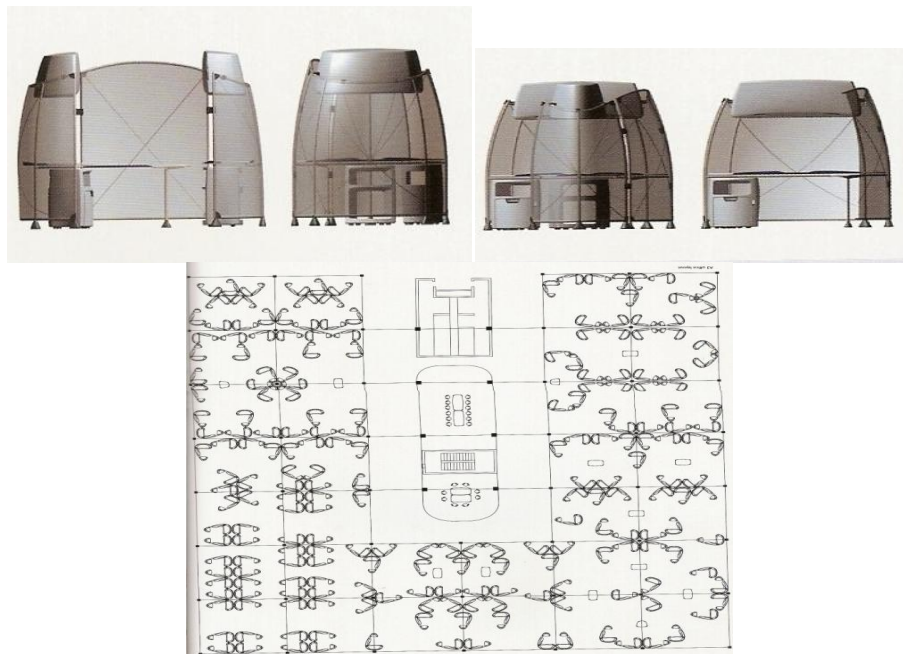


Fig (8) the upper shows various shapes Unit zones known as Knoll a3 designed by Asymptote architecture and down shows the plan for those changeable units [5]

Another type of units known as endless units stands to reflect the space as shown in fig (9) as the Endless and dynamic multi use tables designed by N architects located in the drawing center in New York, USA as they are designed to match or reflect the usage and the size of the space at the same time they are

portable as they are very light made of aluminum, acrylic and MDF as The dynamic motion and flexibility are needed in such units [5]

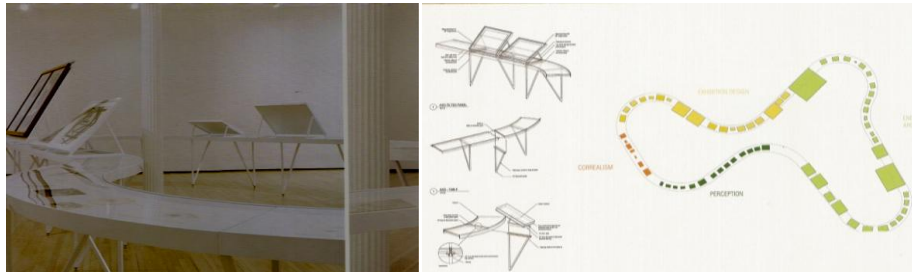


Fig (9) Endless and dynamic multi use tables designed by N architects located in the drawing center in New York , USA [5]

Endless and dynamic units appeared also as sitting units designed by UN studio can stand as circle base units for sitting fig (10) and then can be cut into small units to form the endless units which reflect the shape of the space. [5]



Fig (10) Endless and dynamic sitting unit designed by UN studio [5]

Another shape of the endless units is shown in the Intensive endless unit zone designed for the leam limited fashion store, located in Rome, Italy, fig (11) designed by Catucci; as the continuous multi curvy linear shape stands for displaying products and forming private zone [5], so the multi use aspect is shown in such prototype rather than the usage of the nano materials as the finishing materials as means of the anti print property.



Fig (11) Intensive endless unit zone designed for the leam limited fashion store, located in Rome, Italy [5]

But for the coloration as the reflectance of the surrounding environment the Light weight unit zone shown in fig (12) can stand for an example as it is called poloxygen stand designed by Lava is formed of smart materials can stand by pumping it by gases to reflect its usage at the same time it reflects the surrounding as trees if used in outdoor space. [5] It is related to flexibility as it can be moved from the space easily.



Fig (12) Light weight unit zone called poloxygen stand designed by Lava [5]

1.2 Eliminating the volume

Eliminating the shadow and the counter shading always play an important role in disguising the volume of the organic species, also they are used as applications of camouflage in the interior design units as follows;

1.2.1 Eliminating shadow; as shown in the organic species eliminating the shadow comes by pressing the volume in the surrounding media; the book case shown in fig (13) eliminated its volume by being pressed in the chair. [7]

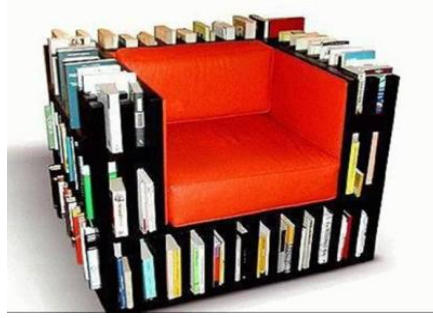


Fig (13) The book case eliminated its volume by being pressed in the chair [7]

Another example for eliminating the shadow is shown in the fitting Unit in Sergio Calatroni Artroom shown in fig (14) located in Tokyo, Japan designed by Sergio Calatroni [4] as it shows an intensive multi use as fit unit zone at the same time it represent a means of storage as designed with shelves at its outer envelope. This unit is movable can be ported to another space. And its shape is curved to deal with the visual emotions.



Fig (14) The fitting Unit in Sergio Calatroni Artroom located in Tokyo, Japan. [4]

1.2.2 Counter shading; this property extends for converting the volume to two dimensional phases as shown in the table which is apparently is seen to be of one purpose as if it is exposed to light it seems to be of two dimensions but really it is used in an intensive purposes as shown in fig (14) [7]

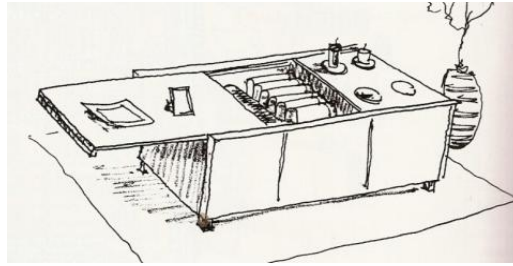


Fig (14) the counter shading in the table [7]

Counter shading is shown in the bed which seems to be a wardrobe as shown in fig (15) and its stairs appears to be a book case as all the units used in a manner of the multi use one [7].

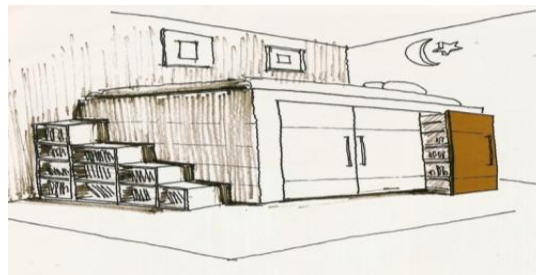


Fig (15) The bed seems to be a wardrobe [7]

1.3 Smart adaptation

Most of the natural species have sensors; motion, using patterns, using decoration to be used for confusion, also these adaptations are found in the indoor units as follows:

1.3.1 Motion; it appears in the bed unit which disappears in the book case shown in fig (16) as The units of the room designed to convert the room to a multipurpose one as once it can be used as public room and once more it can be used as a private one [7].

Also this property can be shown in the stair case which appears to be a set of wardrobe as shown in fig (17)



Fig (16) The bed unit which disappears in the book case [7]



Fig (17) eliminating shadow in the stair case [7]

The stairs are formed of units for storage , As Intensive multiuse units at the same time it represents eliminating shadow

1.3.2 Using patterns; this property means repetitive designed units used to be accumulated to represent the final volumetric indoor unit with endless design which stand for usage or stands for means of partitions as shown in fig (18) as the Play ground for life designed by Designliga as the unity of the pattern used to design the context of the kids bed room and these units of the kid's bed room are multi used in an extensive way as used for sleeping, storage and playing [5].



Fig (18) the Play ground for life designed by Designliga [5]

Endless patterned design is shown also in the digital origami gallery designed by LAVA- fig (19) which represents the eco efficiency within the mutual deal with

the environment and the economy. As 3500 recyclable cardboard molecules represent endless and dynamic sculptured unit zones in the space referring to the extensive flexibility rather than transparency can absorb heat and moisture from the space [8].

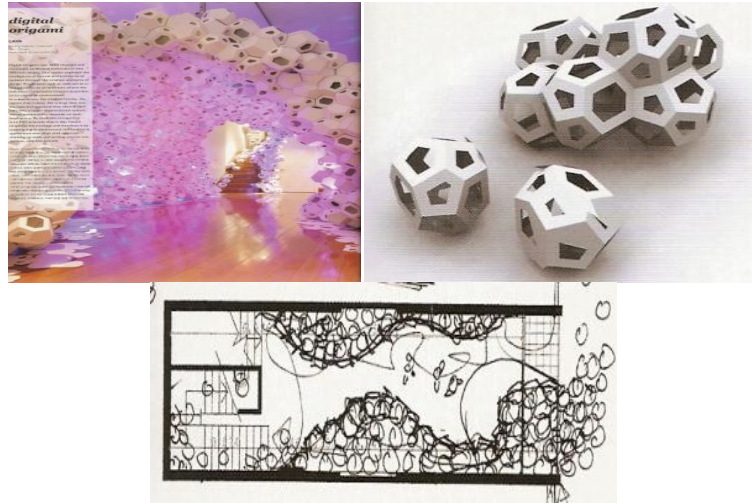


Fig (19)Endless designs – in digital origami by LAVA as shown in the indoor and the plan [8]

Another example of the endless design with pattern shown in the unit zones designed by Gehry in Conde Nast cafeteria in New York in 1996-2000 fig (20) as these units can give privacy to the user of the space and they are movable to be arranged in various order so as the circulation can't cut the privacy, and such units give the user the sense of the intimate scale as the height of the space is 14 foot high. So camouflage appears as means of matching to the usage, flexibility at the same time it refers to the transparency.

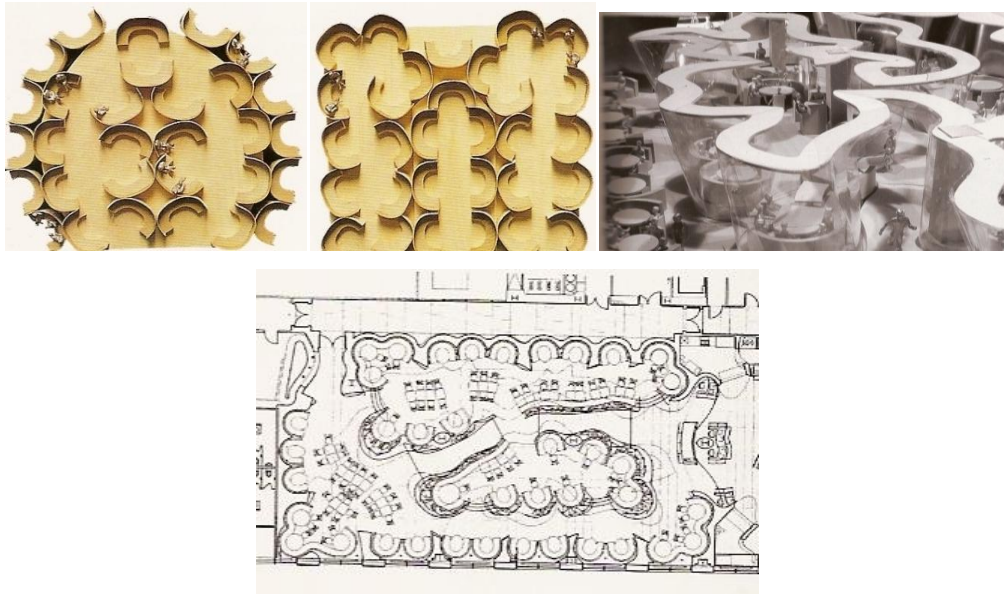


Fig (20) unit zones designed by Gehry in Conde Nast cafeteria in New York in 1996-2000

As upward appears the sample of arrangement and the three d of the units and down wards appears the final plan designed [3]

The patterned design is shown also in the Bookcase named books on earthquakes designed by Smansk design studio, fig (21) as Endless identical modular units forming slops while connecting them to reduce the effort of arranging the shelves of the book case [5] It is related to the flexibility, motion and multi use, moreover reducing energy.



Fig (21) Bookcase named books on earthquakes designed by Smansk design studio [5]

1.3.3 Using decoration; this aspect appeared in Units named beat wave designed by J.Mayer H,architect in Miami, USA Fig (22) used to be of green color and of a leaf design as it can be used in indoors and outdoors as partitions and sitting units suiting the surrounding environment [5]

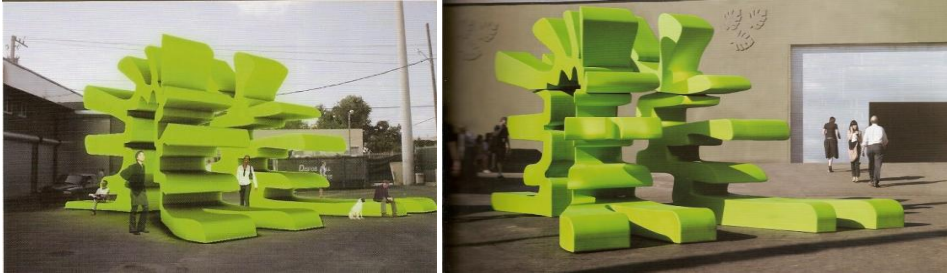
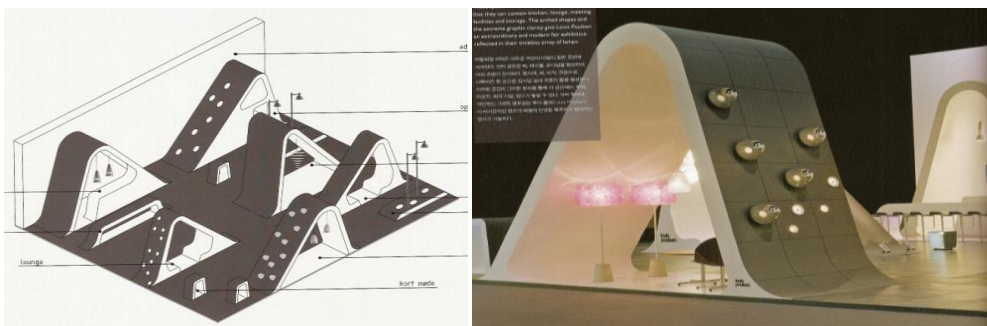


Fig (22) Units named beat. wave designed by J.Mayer H,architect in Miami, USA [5]

Special unit zones- called light waves stands for the decoration adaptation designed by JDS architects in Frankfurt, Germany Fig (23) , as the indoor space satisfying the usage of sitting with privacy, as well as they can be used for exhibiting various kinds of lamps to make an extraordinary and modern fair exhibition reflected in their timeless array of lamps The same unit zones can be used in the outdoor space with various order to fulfill the usage of the urban space and the call of nature, as they represent a hilly landscape [8] so it shows that Camouflage as usage in indoor and outdoor represent an extensive multiuse.



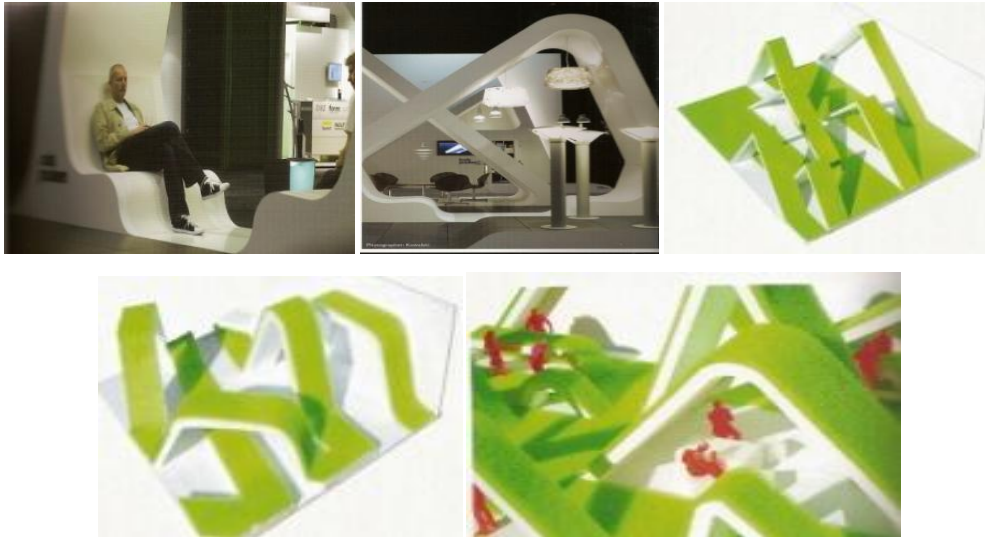


Fig (23) Special unit zones- called light waves designed by JDS architects in Frankfurt, Germany [8]

2. Measuring the efficiency of camouflaged indoor units



The previous prototypes shows that there is a presence of a camouflaged indoor units and they resemble the natural camouflage in their adaptations, but to measure their efficiency as economically or environmentally two numerical analysis will be done on the whole prototypes displayed before. As the main hypotheses concerns that the accumulation of all the adaptations of the camouflage phenomenon means the utmost means of efficiency at the same time gathering between the economic efficiency and the environmental one means ecoefficiency.

2.1 The economic efficiency:

It can be detected numerically as detecting the goals the unit can reach as shown in the table below, table (1). As the chosen goals are respectively represented as the various adaptations the unit gain (camouflage adaptations), the various offers can be achieved within it (multi use), the means of mass production (using patterns) and the cost of its materials.

Table (1) measuring the economic efficiency in the camouflaged units

The points of analysis		The examples																							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
camouflage adaptations	1.Eliminating the shape	Reflectors	the reflectance of the surrounding																						
			the size of the space																						
		Transparency																							
	Eliminating shadow																								
	Counter shading																								
	Motion (lightness)																								
	Using patterns																								
	Using decoration																								
The multi use																									
The cost of the	Low cost materials																								
	Less amount of materials																								
	Reused materials																								
The total goals(12)		6.5	5.5	5.5	5.5	8.5	5	7	8	6	8.5	5	4	5	4.5	5	6	6	8.5	8.5	7	5	6	8.5	
The % of the fulfillment of goals		54.2%	46%	46%	46%	71%	41.7%	58.3%	66.7%	50%	71%	41.7%	33.3%	41.7%	37.5	41.7%	50%	50%	71%	71%	58.3%	41.7%	50%	71%	

Remark:  Represent the fulfilling the goal and it is equal 1
 Means that the unit can be designed by this way
and this equals 0.5



The previous table shows that more than 65% of the units displayed fulfill more than 50% of the economic efficiency and 35% represent at least 33.3% of the total economic efficiency.

2.1 The environmental efficiency

This can be deduced by the response to the heat temperature, the response to the natural lighting, and the emissions of the pollutants. And it can be detected numerically as shown in the table (2)

Table (2) measuring the environmental sustainability in the camouflaged units

The points of analysis	The examples																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
The response to heat temperature																							
The response to natural lighting																							
The emissions of pollutants																							
The total goals(3)	2.5	2	2	2.5	2.5	2.5	2	1.5	1	1	2	1	1	1	1	1	1	1.5	2.5	2	2	2.5	2
The % of the fulfillment of goals	83.3%	66.7%	66.7%	83.3%	83.3%	83.3%	66.7%	50%	33.3%	33.3%	66.7%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	50%	83.3%	66.7%	66.7%	83.3%	66.7%

Remark:  Represent the fullness of the goal and it is equal 1
 Means that the unit can be designed by this way and this equals 0.5

The previous table shows that more than 66.7% of the units displayed fulfill 50 % or more of the environmental sustainability as means of efficiency and 35% represent at least 33.3% of the total environmental efficiency.

3. Conclusion

Finally, it has been proved that more work has been done on the so called adaptive design in the indoor units (interior context), and these units can be designed to be able to react reversibly to their surroundings or they can match the sustainable aspect (environmental or economical) over a long period of time depending on their passive and active components, As the camouflage in the indoor units is the means of flexibility as an intelligent deal with the space to achieve the maximum benefit with least amount of loss.

This task requires materials and products with reversible properties called Property determining parameters relevant to the units that can be designed to be changeable in Shape, Color (appearance), size, and function.

At the same time the fourth dimension (motion) becomes part of any design morphology which can enhance the efficiency of the unit design through sensitive use.

So these results in three main attributes of camouflage in the interior units that can interact with surrounding environment resulting in efficiency and they are as follows:

- 1st **Eliminating the shape**; by using the aspect of transparency or reflectors.
- 2nd **Eliminating the volume**; by means of shadow and light.
- 3rd **The smart adaptation**; by using the sensors, motion, patterns or decoration.

4. Recommendations

1. The interior design futuristic visions are essential as such visions in indoor units do contribute to overall development, and encourage innovation to enhance the multifunctional spaces and to match the reduced one.
2. Innovative designs have to be improved by careful attention to environmental aspects since it becomes unacceptable to deal with any context of the space separately from its surrounding environment.
3. Selection and specification of compatible materials and related component systems are essential in the design process. Moreover the visual experience seems to redefine the morphology of the element.

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