EVALUATION OF FORMAL ASPECTS IN DESIGN

BY

SATISH PATIL.

GUIDE

PROF. S. NADKARNI.

INDUSTRIAL DESIGN CENTER.
INDIAN INSTITUTE OF TECHNOLOGY.
BOMBAY.

MARCH - 1996.

approval Sheet.

This special project entitled " Evaluation of formal aspects in design " by Satish M. Patil is approved in partial fulfillment of the requirements for the Masters Degree in Industrual Design.

Signature.

Guide.

Internal Examiner.

acknowledgement.

My sincere thanks to Prof. S. Nadkarni for providing me the oppourtinity to work on such an intersting topic.I am grateful to him for his guidance during the lively sessions we had from time to time.

My sincere thanks to Prof. U. A. Athavankar for introducing me to a new language - The product language.

Also my grateful regards to all my friends who helped me in all the possible ways.

Satish M. Patil

index.

1 INTRODUCTION

WE AND OUR SURROUNDING - A VISUAL PERSPECTIVE:

Today we as user are surrounded by thousands of products countributing in our life some or other way. The list of products is endless from tooth brush to sky -scrappers to ..... All products designed to perform certain function physically or otherwise. Vehicles we use are not only for transportation but are also status symbols.The cloths which I wear, shows which class I belong to. I must have wall clock which will not only show time, but will match my sense of beauty and go along with decor in drawing room. The shoe which I wear for going to office will be different from the one which I will prefer for picnic.Thus I have different criterias as to how my shoe should look like in different condition.Electronic equipments in hospitals will look serious, precise as against the electronic equipments in houses which are more playful. Thus under conflicting visual requirements, we live surrounded by complex visual enviornment which is generated by thousands of man-made objects.And at times there are chances that it goes beyond control.

A quote reads-*" We live surrounded by too much visual squalor that is man-made and living in a visual slum is hardly likely to foster the development of a emotional experiences. "* Each product form is designed to have certain aesthetic implications and expressive / symbolic meaning. And if we don't control it there is possibility of visual chos. Before looking at these aspects let us look into the historical perspective of evolution of form and development of humans sensitivity towards form .

EVOLUTION OF MAN-MADE OBJECTS:

All the products are designed to perform certain functions with optimum efficiency. And when we trace the history of human being in the stone age they made arrow heads for hunting which were purely a piece of functional form.These crude functional forms were however refined for maximum efficiency, extraordinary grace and elegance. Apart from it's utilitarian functions, forms were designed to look good. Thus it must be admitted that a purely aesthetic principle of elegance can be combined with , and indistinguishable from, a purely utilitarian principle of efficiancy.

The evolution of hollow vessel is even more interesting and complicated. The first vessels were small pieces of rock with one surface concave enough to hold the liquid. use must be made of gourds, coconut shells,and other natural objects.

However the first vessels were made after the possibility of moulding clay was discovered. First vessels were round semispherical bowls, but the nature of the material inspired variations from the beginning- bowls with lower walls became platters, bowls with high walls became beakers and grain urns etc. Need to cover the bowls need to transferr the bowls led to refining the forms to add cover, lugs/handles. But at some point in evolution the form is refined for it's own sake, or for the sake of function that is no longer strictly utilitarian. The vessels may be used for libations, for holding grains or ashes of dead; and such ritualistic functions can juistify refinements not required for normal use. *What is essential to note is that at some point in process of formal evolution the form responds not only to a utilitarian purpose but also to a spiritual need.*

Thus we have established three stages in development of the form of object of utility

1)Discovary of functional form.

2)Refinement of functional form to it's maximum efficiency.

3)Refinement of functiional form in the direction of free or symbolic form.

SCOPE / OBJECTIVE OF THE PROJECT:

As the title suggests, the project deals with evaluation of formal aspects in design. The project is sub-divided into following areas.

* Defination and description of what is form.

*Aesthetic implication of form.

*Description of visual principles.

*Form as a means of expression.

*Appearance of product-Varied requirement.

*Evalution criteria.

2. AESTHETIC IMPLICATION OF FORM

THE IDEA OF APPEARANCE:

What exactly is good appearance and what are characteristics of product that we would call beautiful? Unfortunately a satisfactory answer has never been found. The nearest one can get is that it gives us an idea of why some things are ugly, while others are beautiful. Aesthetics, i.e the study of beauty is concerned with these questions. In it's pure meaning, the word "aesthetic" applies to the qualities of fineness or beauty of form such as structural precision, texture, proportionate harmony, etc.works on personal thoughts and feelings.

An image or an objects is generally described as elegant or splendid when it's structral and surface characteristics are in accord with this a priori relationship existing between parts we then perceive unity of the form.

Appearance can only be evaluated subjectively, as it can be equated with visual impression given by it's basic properties. It is not possible to draw up rules that will ensure beautiful products, but on the other hand we can give some guidelines or criterias.

Speculation on why certain articles can give an onlooker an aesthetic experience has always engaged humanity. Some people have found beauty in nature, others in strictly geometric shapes, and others again in swelling curves, garnish colours. These people may be allright in their way. The difference in taste of different people could

often be the reason why some articles are felt to be beautiful whiles others are not. However if something is really beautiful most people can agree. Therefore it must be possible to find certain characteristics that are common to the feeling which gives one an aesthetic experience. Our response to (appreciation of) form can be (is) consisting of two parts.

1) Rational response.
2) Emotional response.

The purer the form, the more rational we can be about it. Whereas the more the form is complex, ambigious the more it seems to affect latent feelings and intuitions which are not easily rationalized.

THE FIGURE - GROUND RELATIONSHIP:

At any moment in perception there is figure on a ground. We percive spatial relationship in depth between the lines and the ground . Perception depend upon the fact that the ground has become a "space" a three dimensional area. For perception and particularly for space perception, there must be a figure on a ground. Then tension is created between positive and negative
(the figure & the ground) and we perceive.

Form and Space stands in a complementary relationship in a perceptual situation.

DEFINATION OF FORM

Various ways in which form can be described is given below.

1) *Form* is a perticular organisation of shape capable of arousing the emotional and ideational participation of the beholder.

2)*Form* is nothing other than the tangible expression of reality and when this truly coinsides with reality it is in consequence true, it is in consequence beautiful.

3)*Form* is a group of element perceived intheir totality, as it were; and not as the product of any chance assemblage.

OBJECTS (FORMS)

Based on structural qualities of form, the objects can be classified as

i) Skeletal objects.

ii) objects of mass.

STRUCTURE OF THE OBJECT:

Analysis of the principles of structure provides a basic experience of form and leads to three important aspects of perception.

i) Knowledge of form structure helps us to understand how the shape we see is made.

ii)How structure determines the shape, and ultimately how function enables us to give more meaning to the object.

iii)Structral analysis of form leads to discover that spatial context of an object - the space in and around it - is very important.

ESSENTIAL CHARACTERISTICS OF SKELETAL OBJECTS:

I) A skeletal object unlike an object of mass, constitutes a number of parts joined or flowing togethar as a series of limbs.

2)The linear structure of object defines the space which the object occupies. A skeletal object breaks up the space around it very considerably through the extension of limbs.

3) An object with skeletal structure can be represented by a number of lines moving in different directions, but all connected to main stem. The connection may be joined in what we call an "articulated system" or free flowing in a continious system.

POSITIVE AND NEUTRAL SPACE:

In skeletal objects or in branched objects the skeleton, or structure moves in such away that, space around it is not treated uniformly.

There are some areas in space such that they are shaped positively by skeleton, and are immediately part of our perception of form, which are called as positive spaces.

Spatial regions, which are not concretely defined and are not immediately part of our perception of the form but are detached from it are called as neutral spaces.

OBJECTS OF MASS:

Objects of mass and volume possess a major characteristic which tends to intrude first on our perception .This is the movement and shape of their surface areas. In the first, our perception of mass of objects is aided by the linear relief of it's surface.

Objects of mass can be broadly classified in to two types.

1) In first type the object can be described by continious surface directional line. These lines move all around the object and shows us the curves and the planes of the mass.

2) In second type, the surfaces are smoothed and polished. It is the change of the tone - light and shade - over the swelling curved surface area that defines the objects volume. This movement of light and shade, over the surface revales main directional plane or curves, as does the continious surface line in the first type. Thus tonal values used to express mass may be called as continious surface directional tones.

The relationship planes and curved surfaces as well as the plane or curvilinear directional inclination of the surfaces, as primary aspects of our perception of mass and volume.

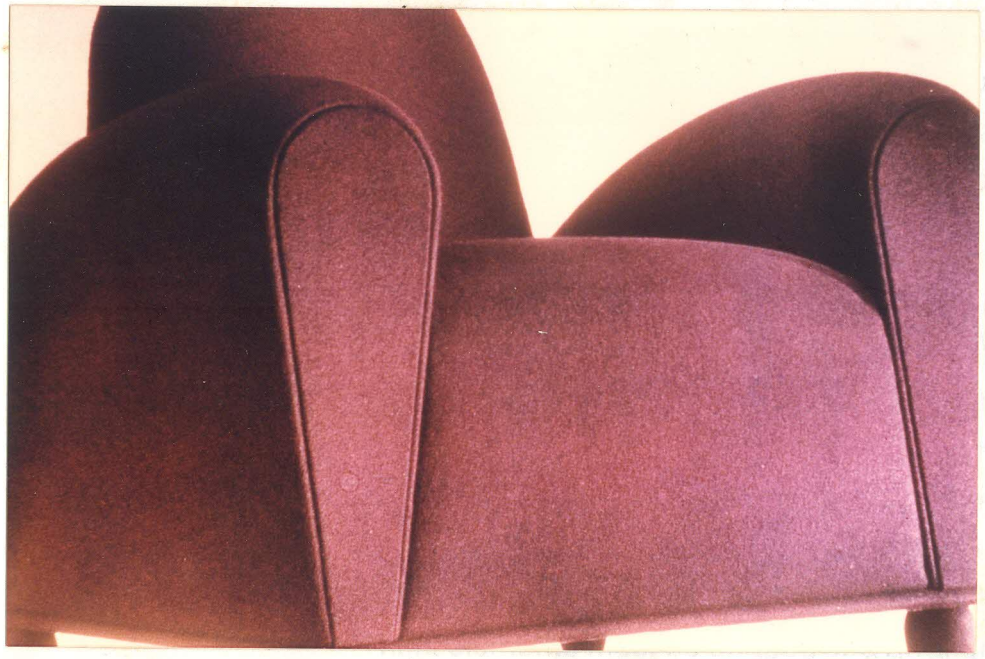
There are two kinds of volume that exists independently of each other or can exist side by side as properties of same object. A stone is mass volume; An egg or a snail shell is a space volume. But volume must be defined, and this is another important function of continious surface directional line or tone.

3.VISUAL PRINCIPLES

To evaluate any product form visually / aesthetically we need to access various visual chaceristics of the products. Unlike exact sciences there is no perticular answerr available to access a visual character e.g. for music system, various different proportions can be aesthetically pleasing, depending upon other factors such as use, enviornment, actual form, desired expression etc. Hence we can say that application of visual principles is contextual and form specific. Now let us discuss each principle one by one.

1. UNITY:(VISUAL UNIFICATION):

The form must be complete, where the separate elements and details belong together in a logical and harmonic way. There must be no elements that stand out as if they did not belong and that arouse questions or surprise. It will also be unfortunate if the product looks as if some part is missing. A harmonic unit may be achieved if the component elements are related in some way, e.g. by common form (basic shapes, curves etc), similarly in surface texture, and choice of colours etc.



VISUAL UNITY ACHIEVED BY FINELY BLENDING DIFFERENT PATRS

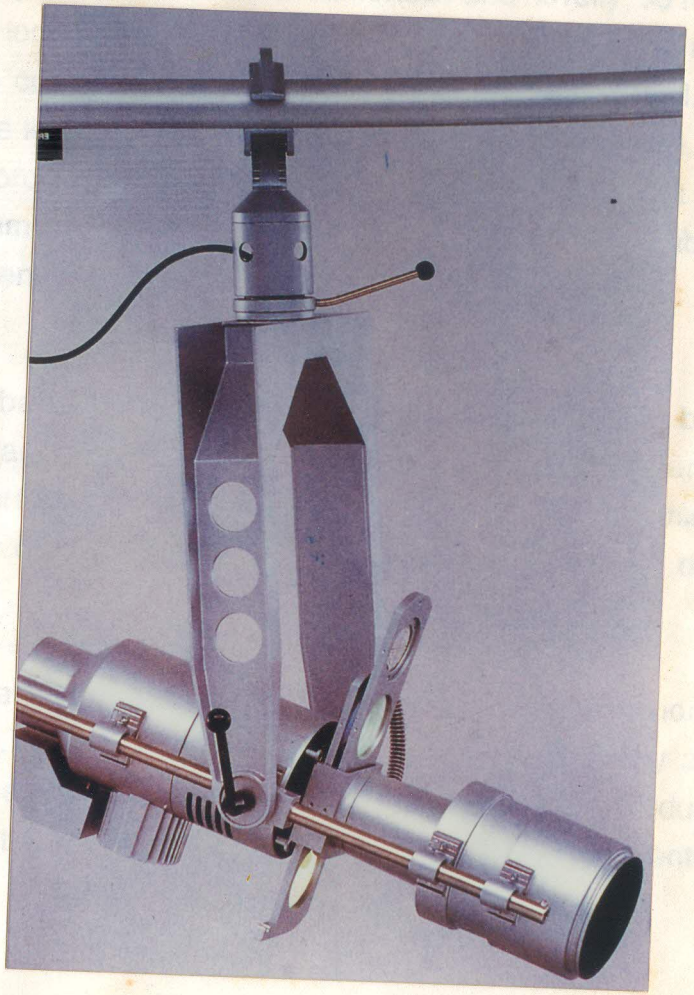
2.ORDER:

The form / product must possess a definate order in itself. The order can be established based upon various factors

The highest degree of order- strict repetition will however often become monotonous, a free and more varied order can make the product an exciting sensual experience. The degree of order of product that is most suitable depends on the complexity of the product, in the sense that the more complex the product , the higher a degree of order is needed. The visual order can be established by simply carefuul arrangement of sub assemblies or selection of definative forms.

3. VISUAL BALANCE:

Various form elements when moved towards each other, we notice that at certain distance, they seem to belong together and form a group. The idea of group is fundamental to our visual perception. If we study a no. of elements in a group, they will affect each other, apart from seeming to belong together. We will feel that the elements are visually more or less in balance. Visual balance may be achieved by symmetry, or it may be asymmetrical. In the latter case the component elements must be shaped and arranged in relation to each other in such a way that these seems to be the same 'weight' on both sides of an imaginary central line.



VISUAL BALANCE - FEW EXAMPLES..

4.RHYTHM:

The essence of rhythm is the fusion of sameness and novelty; so that the whole never looses the essential unity of the pattern, while the parts exihibit the contrast arising from the novelty of their detail. A mere reccurrence kills rhythm as surely as does more confusion. In short, rhythm is order with variation. Rhythm may be carried out by variations in parameters such as arrangements, dimension, number and form of elements.

5.PROPORTION:

Man has always been preocupied with the idea of a connection between proportion and beauty. There are examples of ideal measurements for beautiful females, and for instance the golden section, which is mathematically determined ratio between two lines A and B defined by

$$A / B = B / (A-B) = 1.618$$

Thus ratios such as 2:3, 3:5, 5:8, 8:13 etc are closer approximations of golden section.These proportions are applied in great many areas. Repeated use of certain proportions in the elements of product may among other things results in the appearance of same elements.

VISUAL RHYTHM- A MUSIC STAND.

FEW PRODUCTS WITH AESTHETICALY PLEASING PROPORTIONS.

6. LINES AND PLANES:

Occasionally when form elements are put together unexpected visual effects will arise. The visual impression obtained when looking at a unit is not just the sum of impressions from the elements. These influence each other visually. The visual effect is the reason why one must pay attention to the lines and planes in product, so that form design can be created where these are in relation to each other. The quality of unity and order depend on the run of the lines and planes. One therefore usually tries to give the prominant lines in the product the same character, e.g. straight lines, curves, and lines at certain angle

Visual contuinity and flow of lines and planes is necesscary to create a harmoneous effect.

7. SURFACE TEXTURE:

There is a tremendous relationship between visual sense and tactile sense, between looking and touching.

Surface texture is usually an indication of the nature of material itself, and so provides palpable introduction to the physical substance of form. Use of surface texture can be done effectively to express certain functional qualities e.g. use of rough texture can express rugggedness of power tools. Reflection from smooth surface texture can be used to highlight contours of the form.

8. DYNAMIC RELATIONSHIPS:

(TENSION, EQULIBRIUM,STATIS)

1) The spatial extension of a single form creates a stress between form and space, and that this stress involves a time factor as a surface travels from here to there.

2) When several forms are present in a region this stress is aggravated. In addition, the forms develop, stress relationships between themselves as they impinge on each other and thus crowd the space field.

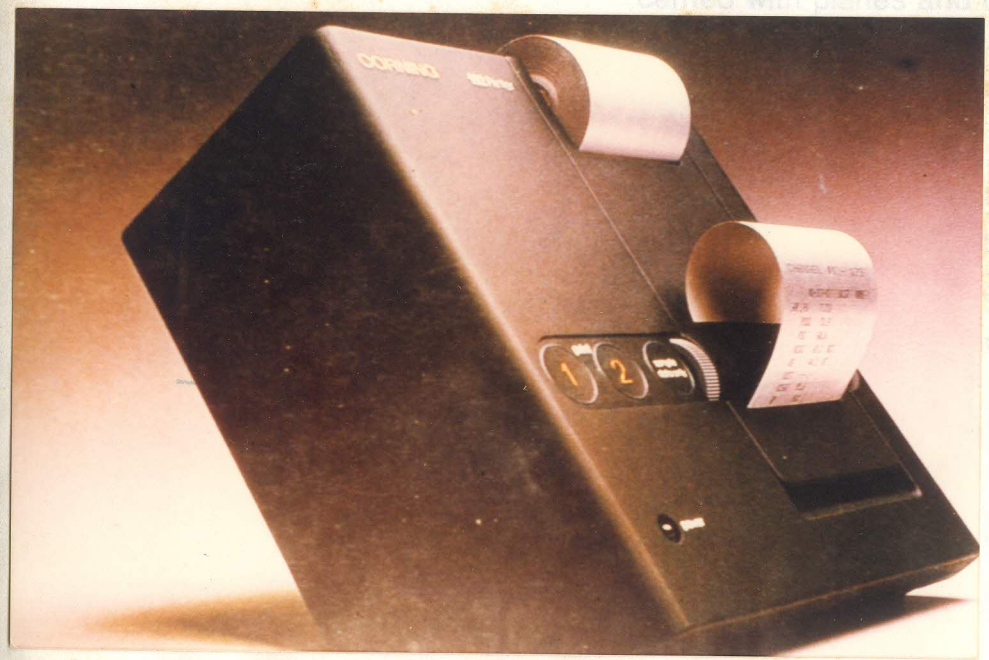
When these various stress relationships are forceful, multi-directional, in restless opposition, and unresolved the word ***tension*** will apply.such situation represents impermanence and instability.

Equilibrium is forceful and active stress relationship, in which a balance of power is achieved, when such a resolution represents permenance and stability.

Statis is stress relationship which implies complete stillness, the absolute static, in which the dynamic potential for spatial extension and for positional change is completely removed. Form and space become fused into a crystallized homogeneity that can never be broken.

The movement of lines activates the space around it and the speed is implied by time -space factor- that is the time it takes for the eyes to traverse it's length.

Thus few observations can be made regarding dynamic relationships as below.



VISUAL INSTABILITY | **TO CREATE INTEREST.**

1)The dynamic life of form is plastically realised through their spatial extension.

2)Different types of point to point lines indicate the movement tendencies of objects and the nature of forces which affect their position.

3) The spatial intervals between forms are related to the action of forces on forms in space.

9. STRUCTURAL FORCES AND SURFACE TENSION :

The principles involved here are those of forces and pressures affecting the surface organisation of form. This aspect of form is concerned with planes and curved surfaces, with the external shape of form as surface movement reflects structural pressure and forces.

Surface movement of can be of two types. It can be of gentle and curvaceous or sharp and angular. It is therefore possible to make two statements about surface movement.

1)A series of multi-directional planes producing through their juxtaposition, an angular surface quality where planes meet planes.

2)An undulation of curved surfaces producing a folded surface quality.

4. FORM- A MEANS OF EXPRESSION

PRODUCT FORM- A VISUAL STATEMENT:

Till now we had seen what 'form' is, what are the aesthetic implications of form, and what are the factors which decides beauty of the form. However all products are designed to perform certain functions and hence should not look only beautiful like pieces of art. The product form also needs to be expressive to communicate the function of product. The product form has to make certain visual statement, which is in line with the enviornment it is operating in. All products depending upon their functions can be catogarised as medical, domestic, engineering products. The product form must identify itself to certain catogary to belong to that perticular class.

Thus it is amply clear that apart from certain qualities, product form must also have certain aesthetic qualities.

TORCH TWO DIFFERENT EXPRESSION OF SAME FUNCTION

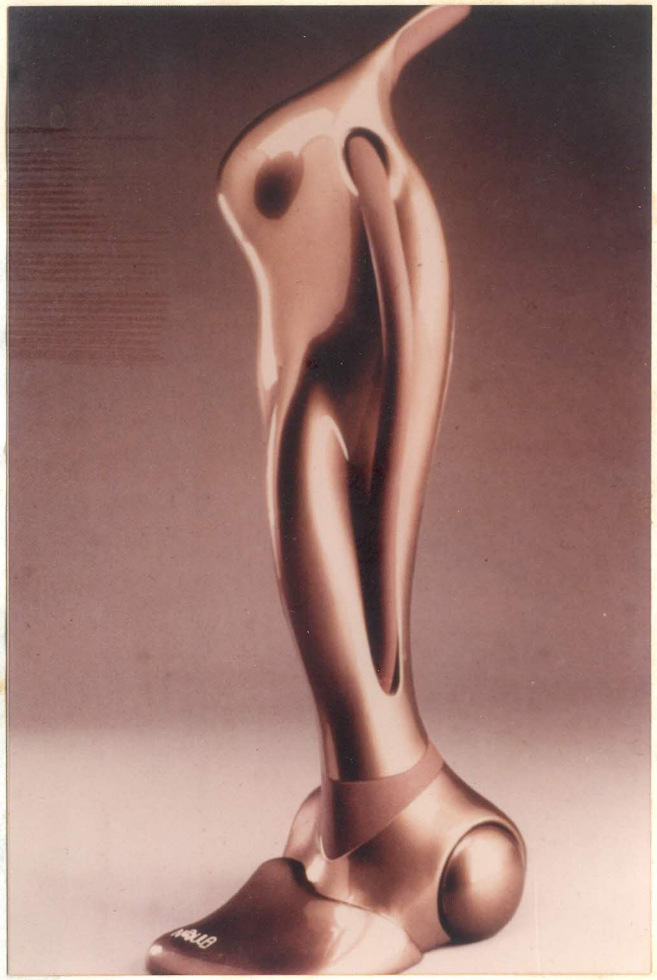
PROCESS OF CATOGARIZATION:

When we see any new product for the first time, making sense of new input, our coding process recognizes specific visual clues in the input to define it's catogary identity. Visual clues play a key role in developing links with stored experiences and knowledge, in prompting categorization and thus accessing the meaning. Thus e.g. if we see a vehicle , by comparing it's visual clues with stored images in the mind we classify it as scooter or bike etc. In process we intellegently neglet the visual clues which are not relevent. Thus if we know the catogarization strategies, we may be able to maintain the freedom of formal innovation and yet develop visual clues and decisions that can potentially prompt the catogarization process. Portable Audio Systems will have certain visual characters which will define it's visual identity. The visual identity (and hence core visual clues) may evolve over the time period such as very rectangular audio systems of 80's are started becoming organic in nature now.

PRODUCT AS A COMPOUND STATEMENT:

Product form communicate certain expression about the product. This communication happens at mental level, as we interprate the forms in certain way. e.g. A sports shoe has to convey sportiness of the shoe even as primarily it has to express shoeness of it. When such product emerges for the first time, the compound concept depends heavily on visual expressions of the new functiional features as it's sementic devices.

PRODUCT CATEGORY- A EXAMPLE.



VACCUM CLEANERS- PRODUCT CATOGARY WITH FUZZY BOUNDRIES

DISCMAN - IDENTIFYING ITSELF WITH MUSIC AND SPORTS

MUSIC SYSTEM MAKING A COMPOUND STATEMENT.

APPROPRIATENESS OF THE FORM:

For the assigned function how a perticular form express it's appropriateness depends on how the form expresses the functional qualities such as ruggedness, softness, preciousness, safety, stability etc. e.g. Power drill has to express it's ruggedness visually through it's form. A car or bike can expreeess it's speed via form. Even operational aspects of products can be highlighted by using appropriate form. Use of lines, grooves or recesses, convex, concave curves can be effectively made to get desired expression.

WHY SHOULD FORM HAVE SYMBOLIC SIGNIFICANCE?

Pure or artistic form would never have been separated from the utilitarian shape unless the mind of man had suddenly perceived a non-utilitaran significance in the shape, a manifesting realization of being. There are three possibilities

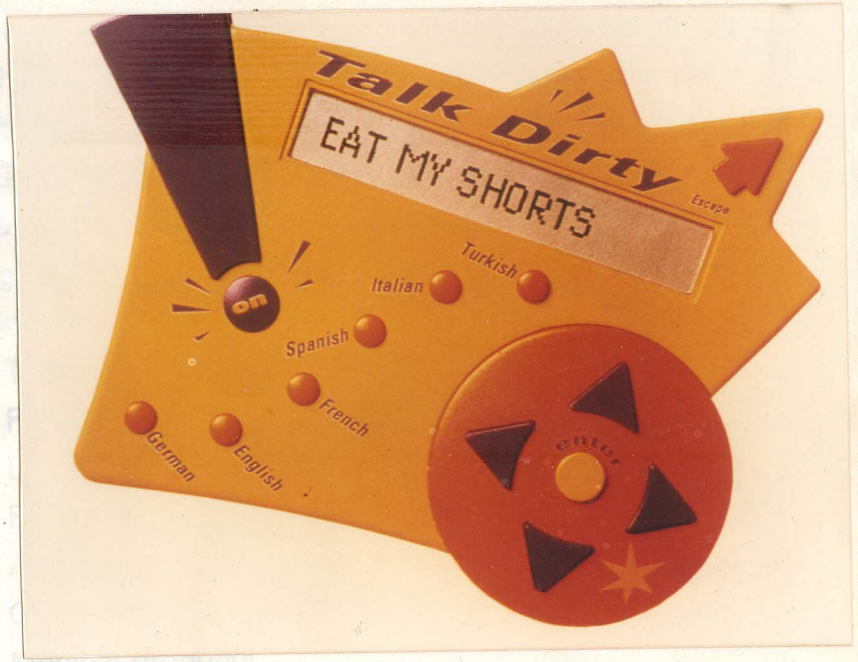
1) That symbolic function developed from utilitarian function - e.g. The Axe used in sacrifices acquired by association a ritual significance in addition to it's utilitarian purpose, and it's form was on that account gradually refined.

2) That a symbolic value was attached to a form because it resembled a natural object- e.g. The unbroken line in the creative male organ, and the broken line in the receptive female organ.

3) That the form itself become significant because it acquired harmonic proportions.

However the second possibility can be dismissed for sementic reasons because :A form that has significance because it resembles another object is not a symbol, but a sign. A symbol is only a symbol

PRODUCT FAILED TO IDENTIFY THE CATOGARY. (COFFEE MAKER)



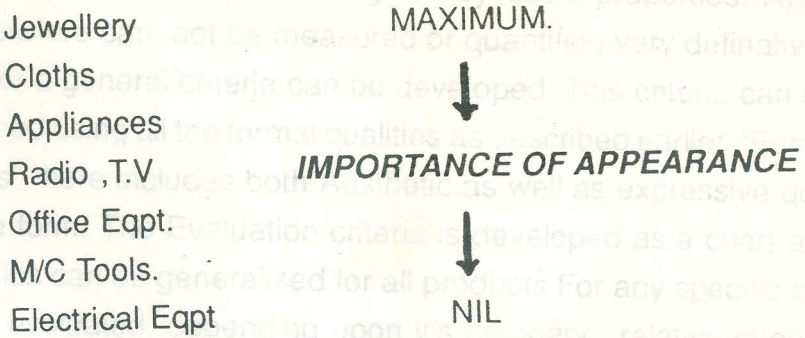
OVER DESIGN FOR THE PURPOSE (SLANG WORDS CONVERTER)

5.APPEARANCE OF PRODUCT -
A VARIED REQUIREMENT.

When designing a product one can not leave it's appearance out of account, but the degree to which this influences the form depends on the type of products in question. For certain products appearance is basic quality. This applies for instance to jewellery, cloths, furnituure. There are also products where appearance can be immaterial or least significant. e.g. carburattors, nails etc. The product can be classified depending upon it's function, and enviornment as

Table top.
Furniture.
Lighting.
Electronic products
Appliances.
Office Equipments.
Medical products.
Engineering products ..... etc.

The importance if the appearance in decreasing order can be shown for few products as



Also different product catogories have certain visual characters which separates them from other product catagories. And it is important as to how certain product form confirms to these visual characters.

6.EVALUATION CRITERIA

Appearance can only be evaluated subjectively as it can be equated with the visual impression given by basic properties. Appearance therefore can not be measured or quantified very definatively, However a general criteria can be developed. This criteria can be established using all the formal qualities as described earlier. "Formal qualities" here includes both Aesthetic as well as expressive qualities of the form. The Evaluation criteria is developed as a chart as shown, which can be generalised for all products.For any specific product to be evaluated, depending upon it's catogary, relative importance of different evaluation factors will vary.It is important to know various facts and notions about the product such as it's function, it's operations,desired expressive qualities etc. Because it governs many aesthetic and expressive qualities.

EVALUATION CRITERIA

AESTHETIC QUALITIES

ABSOLUTE QUALITIES

VISUAL UNITY
VISUAL ORDER

VISUAL BALANCE
VISUAL PROPORTION

FORM-SPECIFIC QUALITIES.

VISUAL RHYTHM
CONTINUITY OF LINES & PLANES
SURFACE TEXTURE.
DYNAMIC QUALITIES

(EQULIBRIUM,TENSION)

EXPRESSIVE QUALITIES

EXPRESSING PRODUCT IDENTITY BY IDENTIFYING PRODUCT CATEGORY IN TERMS OF SOCIO-CULTURAL CONTEXT & PRODUCT ENVIRONMENT

EXPRESSING THE PURPOSE - FUNCTIONAL EXISTENCE INDICATING OPERATIONS / USE OF PRODUCT.

EXPRESSION OF ELEMENTRY STRUCTURAL EXISTANCE INDICATING EXISTANCE OF OBJECT/ STRUCTURAL ELEMENTS / MATERIAL QUALITIES

references

1. A short course in Indusrtrial Design
By Eskild Jialve.

2.Semantic Vision in Design
From Proceedings at Symposium on Design Research and Semiotics, Helsinki.

3.Form, Space and Vision.
By Collier, Graham.

4.Man-made Objects.
By Gyorgy Kepes.

5.Module, Symmetry and Proportion.
By Gyorgy Kepes.

6.Elements of Design- Shape and form.