VIRTUALIZATION OF DESIGN AND PRODUCTION

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I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts.

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ABSTRACT

VIRTUALIZATION OF DESIGN AND PRODUCTION

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This study aims to make an analysis on the meaning of products with regards to recent developments in design and production technologies. The notions of the use, exchange and sign values of products are aimed to be questioned and explored through relevant instances within the consumption logic. Mass customization, as an outcome of recent advances in technology is argued through its effects on the meaning and presentations of products within the market. It is also discussed in this thesis how the computer aided design and manufacturing affects the mode of production and how this reflects on the representations of products that we encounter.

Keywords: Computer Aided Design, Mass Customization, Use Value, Exchange Value, Sign Value, Hyperreality, Industrial Design

ÖZET

TASARIM VE ÜRETİMİN SANALLAŞTIRILMASI

Başar Erdener

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Bu çalışma, tasarım ve üretim teknolojilerindeki son gelişmeleri göz önüne alarak, ürünlerin anlamlarını analiz etmeyi amaçlamaktadır. Ürünlerin kullanım, değişim ve gösterge değerleri, tüketim mantığı içinde, ilgili örnekler vasıtasıyla araştırılmakta ve sorgulanmaktadır. Teknolojideki en son gelişmelerin bir sonucu olarak seri uyarlama, pazardaki ürünlerin anlamları ve sunumları üzerindeki etkileri bağlamında tartışılmaktadır. Bunun yanısıra, bilgisayar destekli tasarım ve üretim metodlarının, üretim biçimlerine olan etkisi ve bu etkinin karşılaştığımız ürünlerin sunumlarına olan yansımaları irdelenmektedir

Anahtar Kelimeler: Bilgisayar Destekli Tasarım, Seri Uyarlama, Kullanım Değeri, Değişim Değeri, Gösterge Değeri, Hipergerçeklik, Endüstriyel Tasarım

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1. INTRODUCTION

1.1. The Aim and the Method of the Study

Both the practical and theoretical issues about the objects in our daily lives would persist to be appealing since we inevitably confront their existence and make use of their utility. However, the representations of objects to us within the market relations obtain a quite distinctive character compared to our actual experiences.

Marxist notion of object as a value in the capitalist society constitutes one of the main arguments of this study. The dichotomy of use value and exchange value of products finds its grounds as form and function duality in terms of design. Even if form does not correspond to exchange value literally, we may disseminate the term 'form' as the image or the visualization of the product with regard to our object of study. For Marx, the exchange value disguises or even abolishes use value within the market relations. Besides, Adorno and Horkheimer discuss the same problematic in a broader perspective. They argue that there is a distinctive predomination of exchange value over the use value that explicitly reveals itself under the monopolistic hegemony of capitalist ideology. Therefore the ground of exploration is whether the same scenario is valid for design and designed products in terms of form [image] and utility.

Complementary to Marxist view, recent debates by Baudrillard explains that the object can also be perceived as a sign. In this understanding, the object frees from its material and utility and finds itself within a play of signs in differential relations with other signs. Sign value of objects, as Baudrillard suggests, constitutes the basics of ideological consumption logic. This linguistic perspective is distinctively observable and even reinforced via advertising medium since the advertisements promises through the signs and connotations as Roland Barthes argues.

On the other hand, particular advances in the design and production industry, along with the introduction of CAD/CAM technology and its ever expanding variations, seems to change our understanding of the designed products. The contribution of technology to our lives is apparent in the sense that it contains the power to transform our experiences just as it transforms the design process. The integration of computers into the process is increasingly replacing the conventional tools that have been used previously, in order to save time and investment. The huge memory that computerized systems keep within, gives way to rapid manipulations and alternations in the virtual models generated by the computers. The data of these virtual models can also be converted to another format for hand free rapid prototypes of every geometry. Thus, the capabilities that these computer systems provide result in the decrease in material concerns and entire virtualization of the design and production phases.

The increase in the variations along with the decrease in material concerns opens diverse perspectives for the production firms. Now that they have eliminated the

marketing and production risks, they have the possibility to invest the money on the customization of their products to reach for a broader market. The computerization process also has a great impact on the standardization and mass production concepts of early industrial times. Mass customization strategy seems to emerge as a new paradigm of production since it the technology offers a vast background and database for such type of production management.

The possibility of generating photorealistic rendering of the virtual prototypes via special rendering software is another breakthrough. This point of virtual visualizations is crucial in the sense that they give way to the diminishing of the boundaries between the real and virtual. Baudrillard's concept of hyperreality refers to this type of visualizations since the images implies that they are "more real than real" as Baudrillard puts it. The images which are entirely of imaginary creations without an exact origin are presented as "real" via computer graphics.

These two different paradigms of theory and practice of design are intended to be questioned and explored within an integrated research in this thesis. Therefore, the aim of this particular study is to explore and discuss the issue of objects as images within the specific frame of design and production technologies and their reflections to the dominant i.e. use, exchange and sign values of products. An emphasis will be given on the shift from mass production to mass customization since it is the paradigm where the dominant values seem to be questioned in the very first place. Besides, the computer generated hyperreal images and their effects on the sequence of product design will be discussed in details.

This integrated study is possible when the cases are discussed through actual instances that we may encounter with regards to computer aided design and manufacturing of products. So as a method, it is intended to explore these issues under recent examples from different disciplines of design i.e. product design, architectural design, transportation design. Before examining these examples, the study aims to introduce the different perspectives of relevant technology and relevant theoretical debates to make the consequent arguments more clear.

2. EXPLORING THE MEANINGS OF PRODUCTS

2.1. Commodity as Value

It is clear that the second half of 19th century had been the triumph of manufacturing, distribution and circulation of commodities. Since then, the advertising medium, outrageous demand, adequate (maybe excess) supply, maintenance network, product guarantee, quality management, insurance and finally design have all been celebrating this conquest of commodities. The access to material goods has become so uncomplicated that most of the time we are to choose among many alternatives that happen to be satisfying our so-called (aesthetic, economic, social, technological…etc.) needs. This and "many others of the same" are indications to an inevitable accumulation which simply connotes that we are confronted with an excessive materialized structure in everyday life.

As an introduction to our study of commodities and their meanings, we should first of all have a look at debates on materialization and how meanings of objects around us are conceived.

We are persistently confronted with the same problematic issue of conceiving the world of objects that surround us – this grand issue of meaning of objects for subjects.

> "The entire problematic of subjects and objects in modern western thought is conventionally traced to Descartes' *cogito,* which sees the world in terms of, on the one hand, human subjects (a mind or consciousness which thinks, knows, believes and ascribes meanings and values to the world) and, on the other hand objects (the world seen as 'matter in motion', as a collection of things which interact, which can be observed and grasped in the form of facts, but which are in and of themselves devoid of subjectivity, of mind and spirit, of meaning or essence)" (Slater 101).

However influential this view of Descartes, in the contemporary consumption culture of the time, it will be reductionism to say that the objects around us express no meaning for the subjects around them. It is true that they have no essence and meanings within themselves and these values are only attached to them due to the needs, desires or psychic motives of subjects but on the other hand subjects are not simply using objects but they rather prefer to express themselves through them, transforming their own needs and desires via the object. Therefore, objects are perceived more and more as material subjectivity that is not entirely external but rather complementary for the subjects.

> "[…] humans do not simply transform or use objects according to their self-defined needs. Rather, the world they have made is indeed objective and becomes the new environment in which they live, by which their subjective experiences are formed and constrained and in which they define and refine their needs, desires, projects and plans. […] In transforming the world, we transform ourselves" (Slater 103).

Apparently, speaking of a material culture of men, it depends not only on the actual and tangible objects that are in man's immediate environment but also on the meanings and values that he ascribes to them. So what are these meanings that we attach to objects and how can we recognize them in our daily lives? Are they revealing themselves explicitly or do we have to decipher their existence through further decoding practices?

The beginning point for such a question is Karl Marx's theory of value. Marx recognizes objects from two perspectives: use-value, i.e. its utility, and exchange-value, i.e. the objects' tradability. For Marx there is a hierarchy between the two. As soon as the object is traded, the exchange value expresses itself completely independent from its use-value. Therefore, exchange-value of a commodity hides the use-value of the object, manifesting itself as the dominant determinant of the value of the commodity. For Marx, utility is more corporeal and inherent to the materiality of the commodity whereas exchange value is more ephemeral and abstract. (Boradkar 2) As he states: "[…] the value of a commodity is the very opposite of the coarse materiality of their substance, not an atom of matter enters into its composition" (Marx 47).

Marx's opposition between exchange value and use value depends on his theory of the alienation of labor in production. This may still be relevant for today's researchers. However, more recent works by semiologists, linguists, literary critics and sociologists on human-object relationship deals with the symbolic values of the object besides that of their use-values and exchange-values. Originated in the early linguistic studies by Ferdinand de Saussure, semiotic

study of signs divides the sign into its two aspects: signifier and signified. Roland Barthes takes this study further by his concept of "second order signification system" or "myth".

2.2. Logic of Consumption

The works on consumption of commodities are significant since most of the objects we encounter in our daily lives are produced, advertised and exchanged in a market system. So it is better to recognize the objects within the discourse of consumption since it is apparent that the objects are produced introduced and offered to the consumers through various means and those means have a direct influence on the consumers. Through the contribution of marketing, the objects we consume are transformed into something non- material, an image or representations freed from the regular use value-exchange value opposition and gaining a more complicated characteristic. It is worth exploring the source of these values and under which circumstances they are generated.

> "Not all cultures produce objects: the concept is peculiar to ours, born of the industrial revolution. Yet even industrial society knows only the product, not the object. The object only begins truly to exist at the time of its formal liberation as sign function […] That is to say, the object only appears when the problem of its finality of meaning, of its status as message and a sign (of its mode of signification, of communication and of sign exchange) begins to be posed beyond its status as product and as commodity (beyond the mode of production, of circulation and of economic exchange.) […] For the object is not a thing, nor even a category; it is a status of meaning and a form." (Baudrillard 185)

In one of his earlier works Jean Baudrillard introduces the concept of *sign value*. Consumption of objects is freed from the control of the subjects and gains autonomous differential relations among the commodities. In this perspective, there are no more objects in the consumption process but functionally decontextualized forms and signs these forms keep within.

> "The empirical 'object' given in its contingency of form, color, material, function and discourse (or, if it is a cultural object, in its aesthetic finality) is a myth. How often it has been wished away! But the object is *nothing*. It is nothing but different types of relations and significations that converge, contradict themselves, and twist around it, as such –the hidden logic that only arranges this bundle of relations, but directs the manifest discourse that overlays and occludes it. […] The object-become sign no longer gathers it's meaning in the concrete relationship between two people. It assumes its meaning in differential relation to other signs. Somewhat like Lévi Strauss' myths, sign-objects exchange among themselves. Thus, only when objects are autonomized as differential signs and thereby rendered systematizable can one speak of consumption and of objects of consumption" (Baudrillard 63-66)

Baudrillard's objective is to understand the logic of consumption and to make a typology of objects that circulate within this logic. Taking Marx as basis he proposes to distinguish the logic of consumption from other logics that are to be confusing when they are considered from naïve perspectives and evidential cases.

> "So it is necessary to distinguish the logic of consumption, which is logic of the sign and difference from several other logics that habitually get entangled with it in the welter of evidential considerations. Four logics would be concerned here:
>
> 1. functional logic of use value
> 2. economic logic of exchange value
> 3. logic of symbolic exchange value
> 4. logic of sign value
>
> The first is logic of practical operations, the second one of equivalence, the third, ambivalence and the fourth, difference. Or again: logic of utility, logic of the market, logic of the gift and logic of status. Organized in accordance with one of the above groupings, the object assumes respectively the status of an instrument, a commodity, a symbol and a sign." (Baudrillard 66)

Defining the object of consumption, it has to be freed from its psychic determinations as symbol, from its functional determinations as instrument; from its commercial determinations as product and thus it is liberated as a sign. (Baudrillard 67) This argument can be exemplified with every basic product that contributes to our immediate environment. Nothing can be more instrumental than a car in terms of a rapid and efficient transportation. In the case of market relations, obviously some cars are more costly than their peers depending on the level of performance, technology and luxury– that is what the market offers for target economical segments. Although car instance is far too exaggerated as a gift, let's assume that it has neither use nor exchange value emphasizing the singularity of the moment of exchange and of the gift itself. But as soon as a certain brand of car is transformed into a non-singular sign, an object of status

and reified into a code in the eyes of others, then we may perceive this feature, as sign value and the car, as an object of consumption.

> "This is the natural mode of representation in, say, advertising, which depicts a car not as a social product of human labor endowed with sensuous properties that are of use to people's practical life, but rather as something naturally endowed with masculinity, excitement and modernity., which is endowed with the power to confer these qualities onto its consumer, but which is accessible only through the mystical and abstract relations of buying and owning (the magical mediation of money) rather than through the organic relations of doing and making (through praxis)." (Slater 112)

2.3. Artificial Needs

One scheme for naming the subject-object relationship within the consumption discourse is the concept of 'need' which stands in the middle. For Baudrillard, a theory of needs is meaningless; there can only be a theory of the ideological concept of needs. To talk of primary and secondary needs as in Maslow suggests is not much use either, since it suggests an ideological hierarchy of needs. In all societies, the minimum which needed to satisfy the supposed by primary needs have always been determined by the requirement to generate an excess, whether it be the share of God, for sacrifice, or for economic profit. There have never been "societies of scarcity" or "societies of abundance" since the expenditures of a society (whatever the objective volume of its resources) are articulated in terms of a structural surplus, and an equally structural deficit. An enormous surplus can

coexist with the worst misery. In all cases a certain surplus coexists with a certain poverty (Baudrillard 81).

Baudrillard criticizes the conceptual entity of 'need' by making an analogy with the "mana" which is the magical bond that unifies the opposition of subject and object. It is like imagining that there is immanent power (the hau) within the object that haunts the subject and offers him to make use of this internal essence. He explicitly accuses Western thought to employ *copulas* like the mana, vital force, instincts, needs, choices, preferences, utilities, motivations to make a bond between the insurmountable opposition between subject and object. Need is a kind of reductionist, artificial, magical and complementary term which can only explain the subject-object relationship in terms of adequation; functional response of subjects to objects or vice versa. "In fact the operation amounts to defining the subject by means of the object and object in terms of the subject. It is a gigantic tautology of which the concept of need is the consecration" (Baudrillard 70-71)

Therefore, it seems significant to study the reasons behind this notion of need, since as Baudrillard claims; both economic science and political order operate on the basis of the concept of need. For him, needs can no longer be defined within naturalistic-idealist thesis as in anthropological studies like in the notion of "primary needs" but rather they should be defined as a function within the internal logic of the system: "…more precisely, not as a consummative force liberated by the affluent society, but as a productive force required by the functioning of the system itself, by its process of reproduction and survival. In

other words there are only needs because the system needs them" (Baudrillard 82). Further;

> "All the needs invested by the individual consumer today are just essential to the order of production as the capital invested by the capitalist entrepreneur and the labor power invested by the wage laborer. It is all capital. Hence there is a compulsion to need and a compulsion to consume. One can imagine laws sanctioning such constraint one day (an obligation to change cars every two years). (Baudrillard 82)

2.4. Ideology

The logic of consumption is an ideology in Althusser's sense. For him ideology is representation of the imaginary relationship of individuals to their conditions of existence (Althusser 153). Likewise, Baudrillard's debate on the generation of sign-values and needs internally relates to a certain logic of ideology commenced by the capitalist ideal. The ideology which is at work within the current system would inevitably create an atmosphere of endless needs to consume and it would demand compulsory consumption since it is the sole rationale for its persistence. Discussing Louis Althusser's concept of ideology, Mary Klages states:

> "Ideology is a structure, its contents will vary, you can fill it up with anything, but its form, like the structure of the unconscious, is always the same. And ideology works "unconsciously." Like language, ideology is a structure/system which we inhabit, which speaks us, but which gives us the illusion that we're in charge, that we freely chose to believe the things we believe, and that we can find lots of reasons why we believe those things." (Klages 1)

For Althusser, there are two major mechanisms for insuring that people act in subjection to the power mechanisms, even when it's not in their best interests to do so. The first is what Althusser calls the RSA, or Repressive State Apparatuses, that can enforce behavior directly, such as the police, and the criminal justice and prison system. Through these "apparatuses" the state has the power to force you physically to behave. More important for communication studies, however, is the second mechanism Althusser investigates: the ISAs, or Ideological State Apparatuses. These are institutions which generate ideologies which we as individuals (and groups) then internalize, and act in accordance with. These ISAs include schools, religions, the family, legal systems, politics, arts, sports, etc. These organizations generate systems of ideas and values, which we as individuals believe (or don't believe); this is what Althusser examines. How do we come to internalize and believe the ideologies that these ISAs create, (and thus misrecognize or misrepresent ourselves as unalienated subjects in capitalism) (Klages 1)

> "To my knowledge, no class can hold power over a long period without at the same time exercising its hegemony over and in the ideological state apparatuses." (Althusser 153)

All human societies reproduce themselves in this way through a process of neutralization. It is through this process –a kind of inevitable reflex of all social life –that particular sets of social relations, particular ways of organizing the world appear to us as if they are universal and timeless. This is what Althusser means when he says 'ideology has no history' and that ideology in this general

sense will always be an ‘essential element of every social formation’ (Hebdige 364)

Althusser makes a list of some of the ISA’s naming:

- The religious ISA (the system of the different churches)
- The educational ISA (the system of the different and public and private schools)
- The family ISA
- The legal ISA
- The political ISA (the political system including different parties)
- The trade union ISA
- The communications ISA (press, radio and television, etc.)
- The cultural ISA (Literature, the Arts, sports, etc).

Althusser mentions the distributed agencies of ISA and all are specialized and distinct in themselves. However, there are cases that some of these specialized ISA’s may operate collectively. The relevance of the concept of ideology to this study is the light it sheds on the collaborative work of ISA’s in establishing and maintaining a “culture industry” in the sense of Adorno and Horkheimer and to investigate how ideology functions as an inevitable feature of the mass-culture.

2.5. The Culture Industry

The Frankfurt School of critical theory deals with this problematic of mass culture with a deep pessimism. Critical consciousness, for them, attains its basis from an oppositional culture that has an independence from commodification and

rationalizing forces of modernity to generate a critical tension towards it. This negation is the sole productive entity for a critique of the capitalist reality. However, there is a masking that conceals this critical thought or even it has already been diminished giving way to an administered culture rather than a critical one.

> "Culture as a whole has become consumer culture. All culture is now produced, exchanged and consumed in the form of commodities. It has therefore lost all oppositional content and all critical distance from capitalist society with which it is now totally identified. It is produced on a rational and exploitative basis and for mass sales, just like any commodity; it is consumed with alienated social relations. It is part of the system –an affirmative culture - rather than its negation. All consumption, but above all cultural consumption, has become compensatory, integrative and functional. It offers the illusions of freedom, choice and pleasure in exchange for the real loss of these qualities through alienated labor; it integrates people within the general system of exploitation by encouraging them to define their identities, desires and interests in terms of possessing commodities; and it is functional in that consumer culture offers experiences ideally designed to reproduce workers in the form of alienated labor" (Slater 121).

When Adorno and Horkheimer propose the concept of 'culture industry' their purpose is to underline that the production of the culture is part of the capitalist economy, i.e it is a production of commodities (Boradkar 5). In his writings on mass culture, Adorno provides a theory of the nature of the cultural product and its valuation at an appropriate level of discourse. For him, films, radio and

magazines make up a system that is uniform as a whole and in every part. Even the aesthetic activities of political opposites are one in their enthusiastic obedience to the rhythm of the iron system. (Adorno 120) This can be related with Althusser's concept of ideology since the latter refers to an institutional and material logic which works according to the requirements of the economic system. For instance Adorno writes that:

> "The inhabitants, as producers and as consumers, are drawn into the center in search of work and pleasure; all the living units crystallize into well-organized complexes. The striking unity of microcosm and macrocosm presents men with a model of their culture: the false identity of the general and the particular. Under monopoly all mass culture is identical, and the lines of its artificial framework begin to show through. The people at the top are no longer so interested in concealing monopoly: as its violence becomes more open, so its power grows. Movies and radio need no longer pretend to be art. The truth that they are just business is made into an ideology in order to justify the rubbish they deliberately produce. They call themselves industries; and when their directors' incomes are published, any doubt about the social utility of the finished products is removed." (Adorno 120-121)

It may be argued that the identity of mass culture and all these standardized products, mass production is the outcome of advancing technological conditions. Another claim may be that the standardization stems from consumer demands and expectations and that is the reason why they are accepted without any resistance. These assumptions may only contribute to the 'circle of manipulation'

to grow ever stronger. But the real concern is independent from technology because the power of technology is connected with the power of capital in the hands of big corporations and production firms. The formalization in the products can be observed when mechanically differentiated products prove to resemble each other. There are differences only to maintain the fake competition and range of choice. “The universal criterion of merit is the amount of ‘conspicuous production’, of blatant cash investment. The varying budgets in the culture industry do not bear the slightest relation to factual values, to the meaning of products themselves. (Adorno 124)

The term ‘industry’ within the concept of culture industry should not be conceived literally because it has less to do with the production processes but rather it refers to the standardization of the thing itself (Adorno 87) and even the customers and viewers. Perhaps the most critical mode of production is the establishment of pre-defined consumer groups since culture industry does not only offer clearly calculated, classified and standardized products but it also offers these products to a mass of pre-established, defined contemplative and passive subjects –the so-called consumers. It creates music that you would easily guess the subsequent rhythm and films that would end up with familiar screen shots.

> “There is nothing left for the consumer to classify. Producers have done it for him. Art for the masses has destroyed the dream but still conforms to the tenets of that dreaming idealism which critical idealism baulked at. Everything derives from consciousness: for Malebranche and Berkeley, from the

> consciousness of God; in mass art, from the consciousness of the production team. Not only are the hit songs, stars, and soap operas cyclically recurrent and rigidly invariable types, but the specific content of the entertainment itself is derived from them and only appears to change. The details are interchangeable. The short interval sequence which was effective in a hit song, the hero's momentary fall from grace (which he accepts as good sport), the rough treatment which the beloved gets from the male star, the latter's rugged defiance of the spoilt heiress, are, like all the other details, ready-made clichés to be slotted in anywhere; they never do anything more than fulfill the purpose allotted them in the overall plan. Their whole *raison d'être* is to confirm it by being its constituent parts. As soon as the film begins, it is quite clear how it will end, and who will be rewarded, punished, or forgotten. In light music, once the trained ear has heard the first notes of the hit song, it can guess what is coming and feel flattered when it does come. The average length of the short story has to be rigidly adhered to. Even gags, effects, and jokes are calculated like the setting in which they are placed. They are the responsibility of special experts and their narrow range makes it easy for them to be apportioned in the office." (Adorno 125)

The standardization and interchangeability of cultural products under late capitalism leads to the interchangeability of persons in the audience. All Adorno sees in mass culture's consolidation is uniformity, homogeneity, and conformity. As cultural objects become more interchangeable, each one declines in significance, and loses its "aura," hence declines in monopolistic rent. Since the value of the cultural object is based on the monopolistic rent or, to a subordinate degree, on the object's utility, the value of the cultural object should decline as

well. This doesn't occur under late capitalism, however. As Horkheimer and Adorno have put it, "what might be called use value in the reception of cultural commodities is replaced by exchange value."(Adorno 128) How can exchange value come to attain such autonomy in the sphere cultural production? Only through a widespread process of fetishization. The consumer is paying, not for the product but for the packaging. Rather than assessments of value based on the qualities of the product, judgments about the qualities of the product are based upon its exchange value, its price, its top-ten rating. This is the height of commodity fetishism. (Welty 1) For Adorno, if the commodity combines use and exchange value, exchange value deceptively takes over possession of use value. This is distinctively visible in objects whose worth rises exponentially through design. (either of the form or advertising) in spite of the lack of enhancement in its utility value. “The more inexorably the principle of exchange value destroys use values for human beings, the more deeply does exchange value disguise itself as the object of enjoyment” (Adorno 34)

2.6. Advertising as a Medium of Sign-Value Generation

Advertising medium is one of the most powerful tools when we consider the basics of the system to promote and sell the commodities that it produces. If consumption consisted simply in the satisfaction of basic needs or in the rational application of tools and implements, advertising would have no other function but to inform people where they can obtain the tools they require for need-satisfaction, how they should use these tools, on what sort of terms they are available and what sort of effects they have. In other words advertisements

would be plain ‘consumer information’, in a simple and basic sense. However, as a function of modern ‘consumer society’, consumption is much more than that and the same goes for advertisement, which today is much more than the announcement or public notice of the early nineteenth century in which potential customers were informed about the existence and availability of specific goods. (Falk 151)

Therefore, it is significant to understand the contribution of advertisements to the persistence of the consumer culture. What is of concern, however, is how linguistically and socially, advertisements happen to transform our understanding of commodity culture and how they operate in our perceptions.

In terms of social relations advertisements have a structural and systematic function: their sole purpose is not promoting or selling products but they are rather responsible for creating a massive and generalized persuasion of the society. As Zygmunt Bauman states:

> “Advertising copy and commercials are meant to encourage us and prompt us to buy a specific product. Between them, however, they promote our interest in commodities and the marketplaces (department stores, shopping malls) where commodities may be found as well as the desire to possess them. A single commercial message would hardly have an effect on our conduct if general interest was not already well

> entrenched and shopping turned into a daily fact of life. In other words, the 'persuading efforts' of advertising agencies appeal to what is assumed to be an already established consumer attitude and, in doing so, reinforce it" (Bauman 154).

Roland Barthes has studied the cultural and visual meanings of objects in his illuminating book of "Mythologies" and proposed a general theory of 'myth' in a concluding article: "Myth Today". Barthes had been analyzing the advertisements of his time and trying to solve the implicit meanings of advertisements by using the linguistic method. Taking Saussure's linguistic theory as his methodological foundation, Barthes proposed a second-order signification system. He calls it "mythical signification", and argued that it depends on historical and ideological premises. Just as a sign, or the unity of the signifier and the signified, can itself be a signifier of another, connotative signified, further levels of connotation can develop. In a special case, the connotation becomes its own referent and we reach the level of myth. (Gottdiener 15)

Mythical speech isolates itself from history and presents itself as the natural and innate fact. By doing that, it does not reject that it builds on a pre-established signification system from which it takes its strength. For Barthes, "everything can be a myth provided that it is conveyed by a discourse.[…] Every object in the world can pass from a closed, silent existence to an oral state, open to

appropriation by society, for there is no law, whether natural or not, which forbids talking about things" (Barthes 109)

Barthes's most classic example from "Mythologies" is the picture that he discusses on the cover of the magazine "Paris Match".

> "On the cover, a young negro in a French uniform is saluting, with his eyes uplifted, probably fixed on a fold of the tricolor. All this is the meaning of the picture. But, whether naively or not, I see very well what it signifies to me; that France is a great Empire, that all her sons, without any color discrimination, faithfully serve under her flag, and that there is no better answer to the detractors of an alleged colonialism than the zeal shown by this Negro in serving his so-called oppressors" (Barthes 115).

Thus the image shown connotes in several layers. What was most relevant about the photo was that this sign of allegiance by an African in the French army was itself the sign of a further connotation: hypostatization of colonial subservience and imperialism. (Gottdiener 16)

"Barthes's application of a method rooted in linguistics to other system of discourse outside language (fashion, film, food, etc.) opened up new possibilities for contemporary cultural studies" (Hebdige 361). Barthes's observations of a Citroen model may be illuminating for the discussion of how objects speak for themselves:

> "It is obvious that the new Citroen has fallen from the sky inasmuch as it appears at first sight as a superlative *object*. We must not forget that an object is the best messenger of a world above that of nature: one can easily see an object at once a perfection and an absence of origin, a closure and a brilliance, a transformation of life into matter and in a word a silence which belong to the realm of fairy-tales" (Barthes 88).

Advertising agency offers the products as if they were from a world of absence rather than praxis. They generate legendary signs for the sole purpose of a directed reading. The images of products created by advertisements promise satisfaction for the reader which may be deceptive. As Baudrillard claims, the representation generated by an advertisement perfectly matches with the idea of sign-value for consumer products. These captive images transform our sense of function and use into a sign-value. As he states:

> "The image creates a void, indicates an absence, and it is in this respect that it is 'evocative'. It is deceptive, however. It provokes a cathexis which it then short-circuits at the level of reading. It focuses free-floating wishes upon an object which it masks as much as it reveals. The image disappoints: its function is at once to display and simultaneously disabuse. Looking is based on a presumption of contact; the image and its reading is based on a presumption of possession. Thus advertising offers neither a hallucinated satisfaction nor a practical mediation with the world. Rather, what it produces is dashed hopes: unfinished actions, continual initiatives followed by continual abandonments thereof, false drawings of objects, false drawings of desires. A whole psychodrama is quickly enacted when an image is read. In principle, this enables the reader to assume his passive role and be

transformed into a consumer. In actuality, the sheer profusion of images works at the same time to counter any shift in the direction of reality, subtly to fuel feelings of guilt by means of continual frustration., and to arrest consciousness in the level of a phantasy of satisfaction. In the end the image and the reading of the image are by no means the shortest way to the object, merely the shortest way to another image. The signs of advertising thus follow upon one another like the transient images of hypnagogic states" (Baudrillard 177).

3. EMERGING DESIGN AND PRODUCTION TECHNOLOGIES AND METHODS

3.1. Contribution of Technology

Remarkable innovations taking over the conventional means of design and production seem to change the whole course of manufacturing and marketing strategies of products. Among these technologies, apparently, the most outstanding transformation has been executed by the introduction and spread of CAD-CAM (computer aided design-computer aided manufacturing) technology which has changed the timing and spatial conditions of design and production. The imperfect drawings have been replaced by precisely calculated vector lines which can be machined directly by the intelligent 5 axis CNC (computer numeric control) machines without much complementary craftsmanship. This computer based technology simply implies the replacement of various standard designer tools with a simple software and advanced machines which provide both the ability of a virtual formation and the actual execution of pieces. The historical background for CAD-CAM technologies still remains ambiguous but it is appropriate to define its foundations back to the introduction of computers. As soon as the computers are integrated into the production processes, CAD-CAM developments became a serious concern for manufacturers since the more advanced they are, the more time and expenditure on manufacturing of products is decreased. Without referring to any detailed historical background, it is

important to understand how this technology operates and why it is significant for our study.

This technology basically refers to two main elements which are computer aided design and computer aided manufacturing respectively. While computer aided design refers to the design, analysis and visualization of products, computer aided manufacturing refers to the download process and hand-free production of the CAD. Depending on the knowledge and expertise that these two steps require, diverse disciplines have to collaborate for the process such as designers, architects and engineers. What this technology offers range from the manufacturing of consumer products to the making of molds and heavy industrial applications. Transportation design, architectural design and products design are all integrated with CAD-CAM.

As Webster points out there are three levels of sophistication when we apply computers to the visual design process:

1. Two dimensional graphics and drafting
2. Three dimensional 'architectural work, characterized by involving, for the most part straight lines and flat planes
3. Three dimensional 'product design' work, requiring smoothly curved, twisted surfaces. (Webster 2)

The differences between the modes of computer application depend mainly on the differentiation of the disciplines. But recent perspectives and debates on

professional issues along with new technology offer an integrated usage of all these three. This means an architect may use curvatures and smooth surfaces and represent them in two dimensional graphics just as a product designer does. Due to the breath of the topic, most of the relevant instances will be considered around the notion of product design and architectural design.

3.2. Focus on Computer Aided Design

In one of the brochures that IBM Company delivers for a promotion of CATIA CAD software, it says:

> "Invest in IBM PLM (Product Lifecycle Management) to make your business flourish - Optimize your product development process from concept to rollout. Cut time-to-market by months, even years. Reach the market demand at the right time with the products consumers demand. Become a company that offers product designers the tools to view the entire product development picture in real time. Speed both new product and those already in the pipeline with effective virtual prototyping and testing. Encourage more innovative thinking by analyzing an expanded number of design choices. Design products right –the first time. Design products faster. Share them with your customers sooner. Wipe out idle time in your existing process. Use design time more efficiently. Enable your engineers and designers to complete tasks in minutes instead of hours and days."

Computer aided design has been used in design applications to generate 2D and 3D virtual models of products, visualize their appearances and mechanically analyze their structure. Depending on the outcomes of these simulations and

analyses, these applications also constitute data of the products for production. There is advanced design software that is to perform these particular duties such as realistic rendering and product simulations. These are not just to prepare the piece for production but they are rather to test, simulate, animate or make a realistic visual rendering of the design which thus becomes more and more free from material concerns and turn into representations and images. Now, most of the graphic design, architecture and landscape design are first simulated through the screen, presented to the customers and then executed as real.

Efficient communication is essential for any kind of design process and it is this sort of communication that the products come out without any misunderstanding and defects in the production process. Technical or non-technical drawing is therefore, "is the tool that designers use to 'talk to themselves' as well as the means by which they externalize their ideas and communicate them to others" (Baker 30) In the case of conventional design processes, the media for a product designer or architect consists of sketching, technical drawing, perspective drawing, rendered perspective drawing and modeling. Except for the modeling part which is also performed manually, all the others are dependent on the basic instrument of drawing. What the computers have done in principle is the perfection of these drawings, perfection of calculation in vectored forms and generation of a virtual model which is perfected according to certain mathematical formula on the virtual world.

Complementary to the perfection of drawing, the software also has the ability to animate and simulate the mathematically drawn models. Structural analysis,

mechanical assembly simulations, animating mobile parts and mechanical durability tests are all opportunities that the digital media offers for the design of consumer products. This implies that, once you have a virtual model (prototype), you may detect all the steps towards the actual production by eliminating most of the potential problems through the use of singular or integrated usage of computer software.

Stages of Architectural Design Activity

With Traditional Media	With Computer-Aided Media
Drawing	Drawing
Rendering	Rendering
Modeling	Virtual Modeling
	Animation
	Simulation
	Virtual Reality

Fig.1 Stages of architectural design activity (Sanders 75).

3.2.1. Conventional Modeling versus Computer Modeling

The significance of models is unavoidable in arts, architecture and product design. Just after the step of generating a product idea through rough sketching and technical settings, the designer is to make a form out of his ideas. The construction of these surfaces would be more efficient only if the designer has the chance to observe it in 3 dimensional forms rather than 2 dimensional drawings. Keeping this effective design method in mind, most of the designers use this modeling tool either in scale of in full scale models for an actual

observation. Baker explains the reason for the designer to work with actual models:

> "The artist's and designer's ability to create has not always been confined to a two-dimensional surface. Three-dimensional work has been a major form of expression in both fine art and design; in this context drawing is confined to a subsidiary role and employed only as a means to an end: Three dimensional objects have also dominated crafts, and, latterly, engineering and architecture, with models and maquettes used for scaled-down or full-size representation. The physical model, in both art and design, plays an important part in the development, presentation and storage of an idea. In the development stage, the model has to be capable of rapid change and not simply a way of storing the design idea in three-dimensional form. It is very important that alterations and variations can be made easily; the model must not constrain the design process simply because of time and energy expended on its making. If it is the case it can militate against the ability of the model to absorb adaptations. It is conceivable that the very quality of the final design and the efficiency of the product could depend on the ease with which the physical model can be adapted" (Baker 48).

Designers use various materials for building their models but the important issue is to make material decision according to an option that he may execute quick changes on it. For instance soft foams and clay are used in transportation design modeling so that it is possible to define the surfaces instantaneously without wasting too much time and effort. However, how flexible the materials would be,

actual models still create adversity and complications for the model maker so that he may have to make a series of models to achieve the final visualization.

That is the point where computer models gains advantage over conventional modeling since the adaptability of the model is apparently one of the most significant features of a virtual prototype. It is not meant to say that actual modeling is now an outdated method and have completely left its place to virtual prototyping but the ‘undo’s and ‘redo’s of computer jargon play a crucial role in terms of modifications. The memory of the software easily lets the user to follow each step clearing up potential hesitations on the drawing process. The option of possessing each and every step of the model helps the designer to make series of models in a shorter period of time compared to a conventional model maker.

However, the two methods are never the same and they vary in terms of working style, perception and spatial approaches. The differences mainly originate from the observation of real and virtual forms and the viewers standing points. Baker compares the two methods as follows:

> “In looking at a physical model, the viewers are not fully aware of the complexity of the relationships within an object. They stand at a certain distance from it, at a certain angle to it, so that only certain aspects of it show. As they move around, other views are seen; if more detail is needed, they move closer, while moving away provides them with a more general view. All of this is normal behavior when viewing a model, and, most importantly, it occurs as a series of unconscious actions. It is so much part of everyday experience that, when looking at an object, viewers are not aware of their spatial

> relationship with the model in anything like these terms. However, when the real-world is translated into computing terms, all these factors have to be calculated to establish the same kind of three-dimensional readings that are normally expected. The difference is that when using a computer the calculation has to be driven by conscious choice. The user has to decide exactly what the spatial relationship is between him – or her and the object. This is what makes three-dimensional computer modeling often so complex. Not only does the design model have to be built in terms very different from its physical counterpart, but information that is normally assumed must be consciously supplied. In addition, the physical model has other characteristics, such as surface, texture and the effect of light. If these are added – as they must be to reinforce the realism of the computer-generated-image – then the situation is further complicated" (Baker 52).

The computers provide the designer with the tools of instant manipulations and modifications of the work but on the other hand scaled or full scale models offer him a clear spatial observation. None of the each excludes or inferiors the other. Conversely, integrating both methods into the design process is a positive approach but the favoring of one method over the other obviously depends on the design and production consequences.

3.2.2. Photorealistic Rendering and Hyperreality

> "Early three-dimensional computer systems displayed simple shapes by tracing outlines of all the edges, forming an often ambiguous 'wireframe' image. However, as the objects displayed become more complex the viewer had great

> difficulty in understanding the images; software was therefore written that removed a line if it was hidden behind another line. The convincing representation of solid surfaces was the next breakthrough. And so the three-dimensional modeling systems began to climb to the level of photorealistic representation that is seen today" (Baker 50).

While designing a product through certain software, you can observe the mathematically drawn lines and surfaces real time on the screen. You may manipulate the image, rotate, pan, and zoom in and out so that you may observe every small detail on the drawing. However, one of the most exceptional features of some advanced CAD software is their ability to make a photo realistic rendering of products that could be perfectly presented as inseparable from a photographic image. This may be illustrated as taking a snapshot from a perspective view. By adding material, texture, surface, color and environmental lighting, you may visualize a realistic effect. (Fig. 2 and Fig.3) It is even possible to make animations and simulations by using a similar method of editing the surfaces.

This is the crucial point where computer simulations gain a philosophical perspective since the boundaries between the actual and virtual, real and simulated diminish. The designed product is represented as an image that has no connection with reality but presented as real which has strong connotations to a situation of the *hyperreal* as Baudrillard suggests in his book "Simulations and Simulacra".

For Baudrillard, in the world of late capitalism, reality and its connections has

Fig.2 Photorealistic rendering of a chair

been lost and even made impossible. Reality has left its place to a virtuality however this virtuality is not a reflection of a dominant ideology but "instead it is something that continually reproduces social and political programs lead by the hyperreal." (Sargın 13) Baudrillard claims that modernity is an historical background that depends on relations of production along with the reign of industrial revolution. But on the other hand virtual world is the time of information and sign systems depending on modeling, codes and cybernetics. Therefore, in such an era, reality seems to diminish and the virtual seems to take over it revealing itself as the element of the real. But these two are never the same so Baudrillard names this point as "hyperreal" which is "generation of a real without origin or reality" (Baudrillard 1).

Baudrillard tries to explain the concept of hyperreality regarding by a Borges fable in which we read the map of the Empire so perfect that it covers the real surface of the Empire. The map frays as the empire declines. The reality and the abstraction decline together. For Baudrillard it is allegoric because it possesses a 'second order simulacra' regarding the representation of the territory of the Empire. But he uses this fable to illuminate its contrast with current circumstances. As he states:

> "This imaginary of representation, which simultaneously culminates in and is engulfed by the cartographer's mad project of the ideal coextensitivity of map and territory, disappears in the simulation whose operation is nuclear and genetic, no longer at all specular or discursive. It is all metaphysics that is lost. No more mirror of being and appearances, of the real and its concept. No more imaginary

> coextensitivity: it is genetic miniaturization that is the dimension of simulation. The real is produced from miniaturized cells, matrices, and memory banks, models of control and it can be reproduced an indefinite number of times from these. It no longer needs to be rational, because it no longer measures itself against either an ideal or negative instance. It is no longer anything but operational. In fact, it is no longer really the real because no imaginary envelops it anymore. It is hyperreal produced from a radiating synthesis of combinatory models in a hyperspace without atmosphere" (Baudrillard 2).

For Baudrillard, imitation is completely different than simulation. It is apparent from the quotation that he makes from Littré as follows:

> "Whoever fakes an illness can simply stay in bed and make everyone believe he is ill. Whoever simulates an illness produces in himself some symptoms" (Littré qtd .in Baudrillard, 3).

The former still has connections with the reality since the illness can be objectively understood by medical and scientific studies. At least a clear examination might be executed to reveal the trueness of the illness. However, if the person is claiming to be ill of some sort, then he makes the scientific rules invalid for an objective explanation. It would be hard to tell if the person is really ill or imitating to be ill that makes the situation exactly paradoxical; the patient is both ill and not at the same time. If a symptom can be produced, writes Baudrillard, then symptoms can no longer be seen as the facts of nature and medicine loses its meaning.

Fig.3 Photorealistic render of an environment

When we apply the Baudrillard's concept of hyperreality to computerized product images, we may recognize that what we observe from the screen has freed itself from the connections of reality turning into a mere simulation. The primary ground for this is the fact that the product, whether it is on the course of designing or entirely finished, has never existed before. It is a complete creation of the designer revealing itself as the one and only. However it is still a sort of digital data and by the assistance of the advanced renderings techniques of computer graphic software, it starts to pretend to be real and existent. The scale, texture, material and lighting that the user applies on them all contribute to the fake reality that the image represents. To simulate, says Baudrillard, is to feign to have what one does not have (Baudrillard 3). Therefore, the designer creates a world through the computer to make a reality that does not exist.

3.3. Focus on Computer Aided Manufacturing

Computer aided manufacturing (CAM) refers to a mode of instruction codes read by computer numeric control (CNC) machines to generate a desired shape which is designed by CAD systems. However CAM technology does not only produce geometrical shapes but also it is capable of controlling, regulating and managing the production process. This capability obviously stems from their rather rational, calculated and computerized structure. Fellows classifies the CAM applications as follows:

- Automatic test and measurement
- Data logging and production level data collection
- Automation and process control

- Numeric Controlled (NC) machining
- Production management and stock control (Fellows 44).

Most of the CAM applications work in accordance with the data provided by the CAD. As Howard puts it, the integrated works of CAD and CAM technology is a sort of 'marriage of many engineering disciplines (i.e. product design) and manufacturing disciplines' (Bowman 1) they are both computer hardware oriented but they are equally dependent upon specialized software united through a common database.

According to the CAM Guidebook of 1983, a simplified interpretation of the content of the term reads as follows: "CAD/CAM is simply a general name or umbrella term for the many ways the computer can be used as a tool to help design, make and sell all kinds of products. More specifically, CAD/CAM implies the automation of this process." (Kochan 198)

3.3.1. Conventional Product Cycle versus Computer-Aided Product Cycle

Compared to the conventional product cycle (fig. 4), the computer aided product cycle (fig. 5) does not propose quite distinguishing differences except for that the data is kept in computer files. The interactive interface contributes to every step of computer aided product cycle which means the direct usage of computer technology throughout the designing and manufacturing processes.

However, fig. 6 stands for a more advanced type of engineering product cycle that aims to get use of the product database. The obvious feature of a

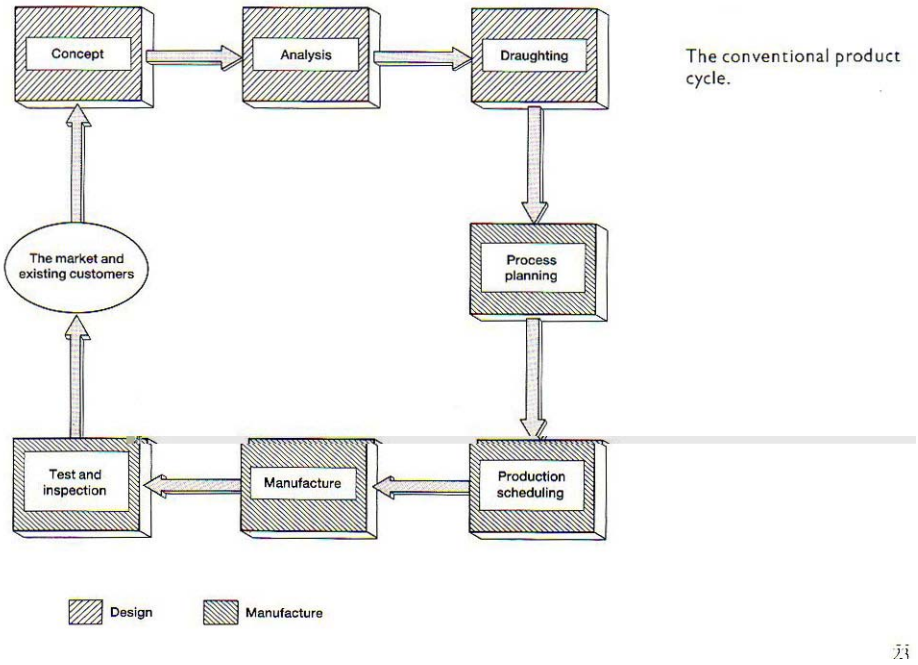


Fig. 4 The conventional product cycle (Ingham 23).

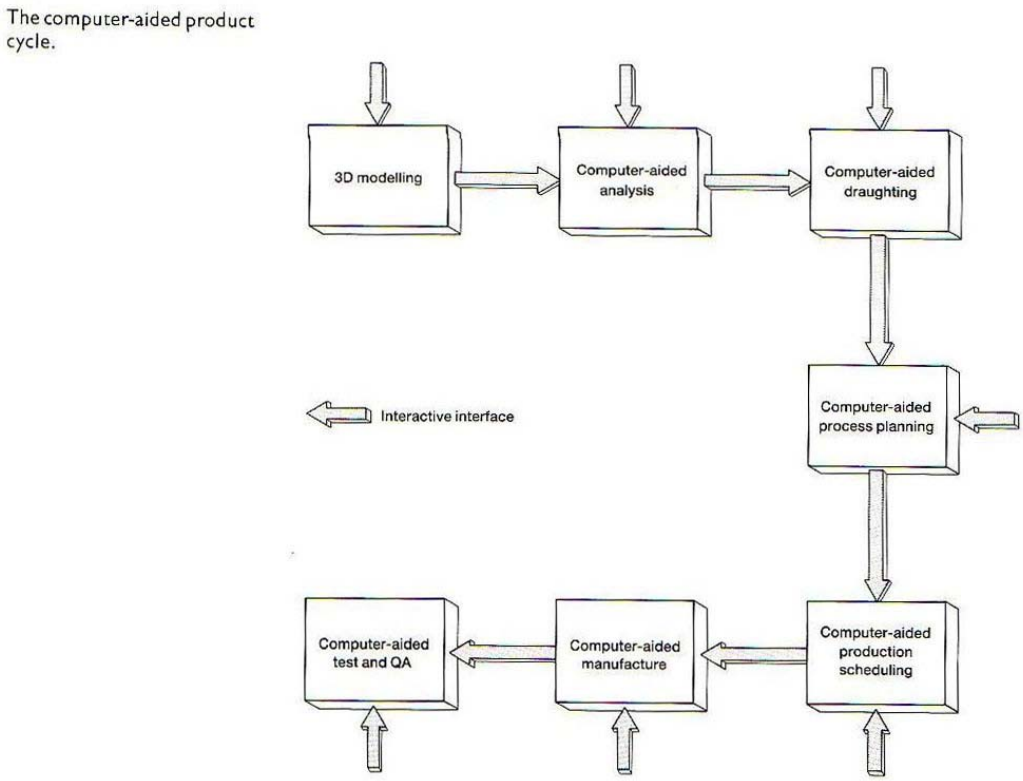


Fig. 5 The computer aided product cycle (Ingham 24).

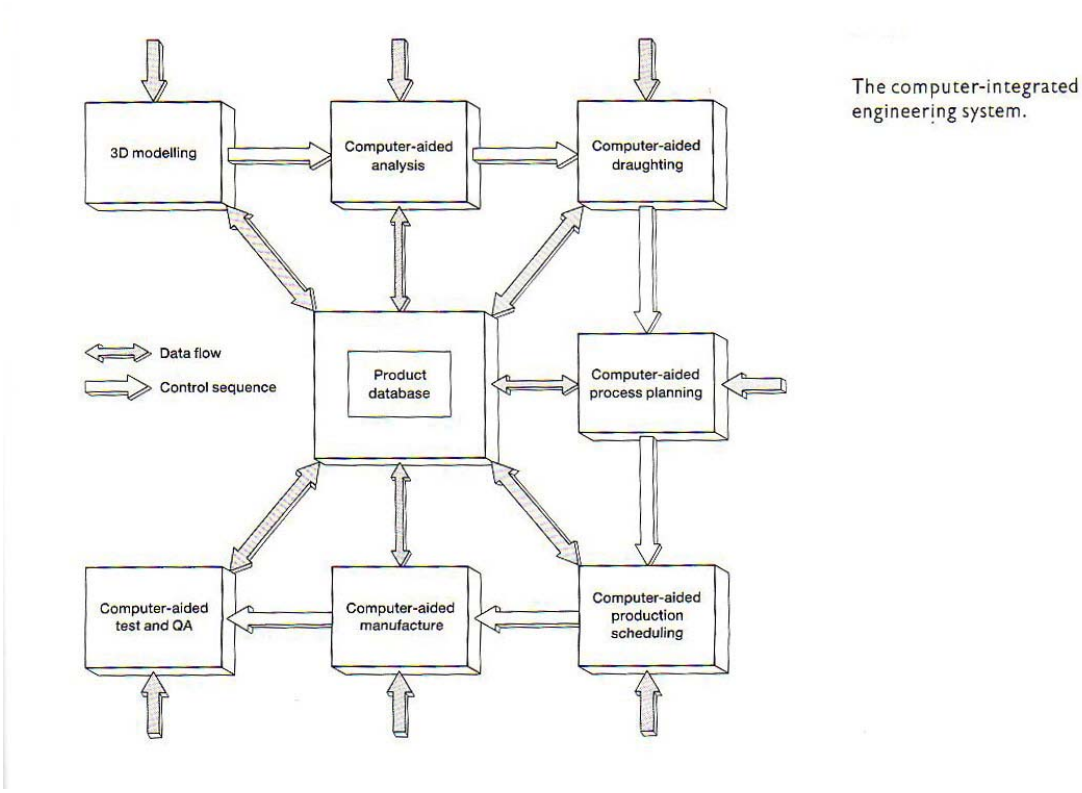


Fig. 6 The computer aided engineering system (Ingham 24).

computerized system is the memory that it keeps inside the system. As long as the company stores product database within the system, there is always a potential information flow from the common database to each and every step of the product cycle. Notice that the conventional product cycle contains the mass marketing of the products whereas the others lack it. This is a deliberate emphasis to mean the flexibility of the CAD/CAM systems since the computer aided systems may provide faster changes according to the demands whereas conventional type has to rebuild all or part of the cycle again for a new demand. Besides, computerized system uses lots of advanced tools such as rapid

prototyping (RP) for a more customized type of production however conventional means lacks adequate memory for such type of production.

3.3.2. Benefits of CAD/CAM

CAD/CAM integration is certainly unavoidable for production companies for their innumerable benefits. Warman cites the six primary benefits arising from the use of computer integrated technology as follows:

1) More accurate drawings: the accurate geometry provided by CAD systems means that the checking of drawings and the production of various dimensions is greatly simplified. This, coupled with the use of layering technique, enables assembly or tolerancing problems to be addressed.
2) Redrawing eliminated: component drawing often occurs in non-CAD environment. Operations such as jig and tool design, manufacturing planning and parts catalogues can all make use of the single accurate geometry held within the CAD system.
3) Rapid changes and updates: the production of new components based on the existing ones is very fast and alterations can be rapidly implemented and checked. In many organizations, the main activity is the reshaping of existing designs rather than producing new ones.
4) Variety reduction: using a CAD system and a good parts classification system, it is simpler to extract existing drawings to determine if old parts can be used within new products.
5) Parametric design: CAD provides the opportunity to describe components by parametric dimensions, so by inputting actual values, new components can be quickly produced.
6) Faster drawing production: this aspect is generally treated as the key factor in any justification of a CAD system. Various

> sources supply productivity ratios for different drawing types and drawing activities. The realization of sensible productivity ratios will occur only after a system can be used for some months (Warman 173).

3.4. Advanced Design and Production Methods

Now that the computer integration to design and manufacturing industry has been evolving at a great pace, there appears a continual transformation in the industry for adapting to this technology. Apparently the flexibility that CAD/CAM technology provides has a direct reflection upon the systems of design and manufacturing. Most of the production companies began to change their production philosophy from a strict mass production to a more flexible system in order to meet customized consumer demands and generate a variety in the product line.

3.4.1. Flexible Manufacturing Systems

There is an inevitable interdependent relation between the market demands and production systems. The more flexible the production facilities are the more customized demand increase in the market and vice versa. Parrish explains the reasons for the change in production:

> "For many traditional single-design products the days of mass production to achieve low-cost manufacture for these mass markets are gone. The new wealthy customers, who no longer need to concern themselves with purchasing only the essentials of life, can insist on individual models of the non-essential goods. The greater numbers of competing producers for product types means that the manufacturers must cater for

these customers' tastes to sell their products. Increased competition since the late 1960s has changed the manufacturing environment for end-user products which were traditionally in the mass production market (e.g. automobiles). Recently the increase in competition has also had the same effect on the piecepart components of such products (e.g. automobile engines and their component parts). Cars no longer need to just look different. They must actually be different. Engine pieceparts are improved or new materials are found continuously. […] To accommodate these requirements from the customers, product suppliers are being forced to change their type of production from mass production to batch-production manufacture, not only in assembly but in the more complex area of machining. Production facilities must not only produce smaller batches of pieceparts but also an increasingly large mix of different batches – simultaneously and economically" (Parrish 31-32).

For Parrish, the result of this highly competitive market leads to the decrease in both product life cycles and their pieceparts. As he summarizes on fig.7, the customers put ever increasing demands on the suppliers.

Customers' demands on suppliers
The highest quality and precision
High product variety
Frequent product design changes
Variable batch sizes
Short delivery times
Competitive prices
Fast reaction to market changes

Fig.7 Customers' demands on suppliers (Parrish 32).

Production facilities ‘must be able to keep pace with these changing requirements’ (31). Considering the demands of the customers, conventional means of mass production would possibly fail to fulfill these requirements. That is why changing the course of manufacturing system seems inevitable.

3.4.2. From Mass Production to Mass Customization

Tseng and Jiao define mass customization as "producing goods and services to meet individual customer's needs with near mass production efficiency" (Tseng, 685). Even this short definition is adequate to predict the strengths and weaknesses of mass customization when we compare it to mass production. However, this term may be seen as an extensive challenge to the mass production and standardization ideals of the early industrial times since it refers to a broader understanding rather than simple production. Mass customization covers design, marketing and manufacturing of a company along with the central management function. It is undoubtly assisted by the use of flexible computer-aided manufacturing systems to produce custom output. Those systems combine the low unit costs of mass production processes with the flexibility of individual customization. In his book called `Mass customization: the New Frontier in Business Competition`, Pine II explains the motivation of the production firms which welcome the new frontier of business as follows:

> ”They [firms] understand that not only can higher quality yield lower costs, but so can greater variety. They have found out that customers can no longer be lumped together in a huge homogenous market, but are individuals whose

> individual wants and needs can be ascertained and fulfilled. They have determined that reducing product life cycles and fragmenting demand can yield powerful advantages for those causing these changes relative to those forced to react to them. Leading companies have created processes for low-cost, volume production of great variety, and even for individually customized goods and services. They have discovered the new frontier in business competition: Mass Customization. In this new frontier, a wealth of variety and customization is available to consumers and businesses through the flexibility responsiveness of companies practicing this new system of management" (Pine II, 6-7).

To clarify the basic idea of mass customization, Pine II gives the example of a fast food restaurant where they used to serve mass produced hamburgers, french fries and drinks. However, recent observation is that they provide half dozen varieties of burgers, sandwiches, salads, spaghetti, pizza along with a variety of soft drinks. It is the same for the automobile industry where Henry Ford's dictum, "You can have any color car you want as long as it is black" had operated for many years. The shift from homogenous markets and neglected demands to a fragmented demand and heterogeneous markets has an extensive impact on the automobile industry. The sole reason for this is the fact that automobile industry being one of the most complex and innovative industries, had to go under an immediate adaptation in order to pursue high competition. Emphasizing design and innovation, automobile firms offers a wide variety of products even within the same model proving to be the most suitable instance of a mass customized system.

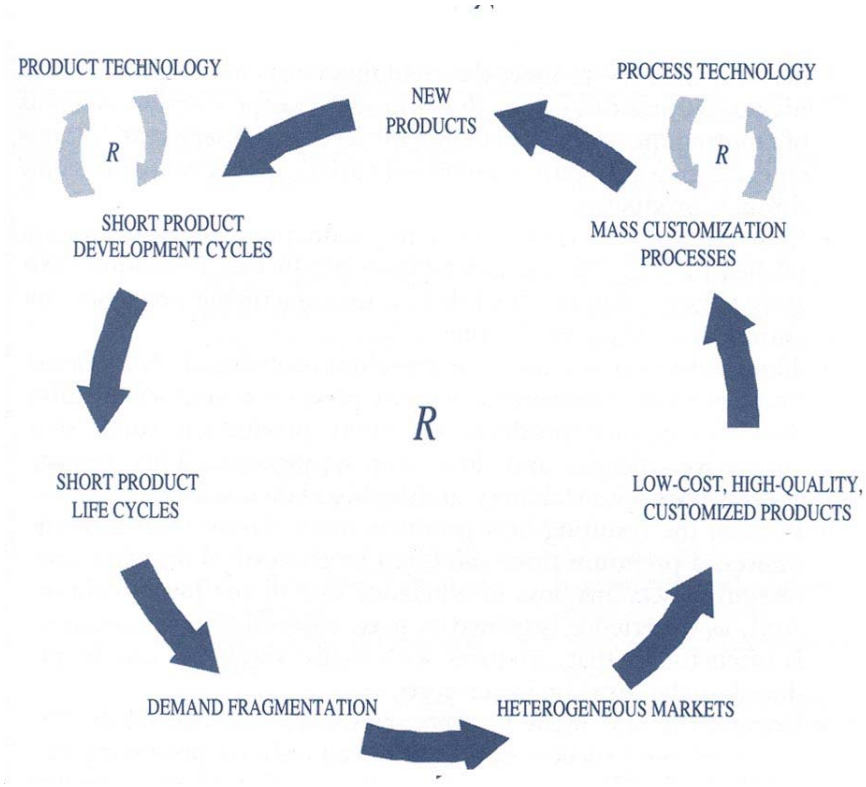


Fig.8 Paradigm of mass production as a dynamic system of reinforcing factors (Pine 27).

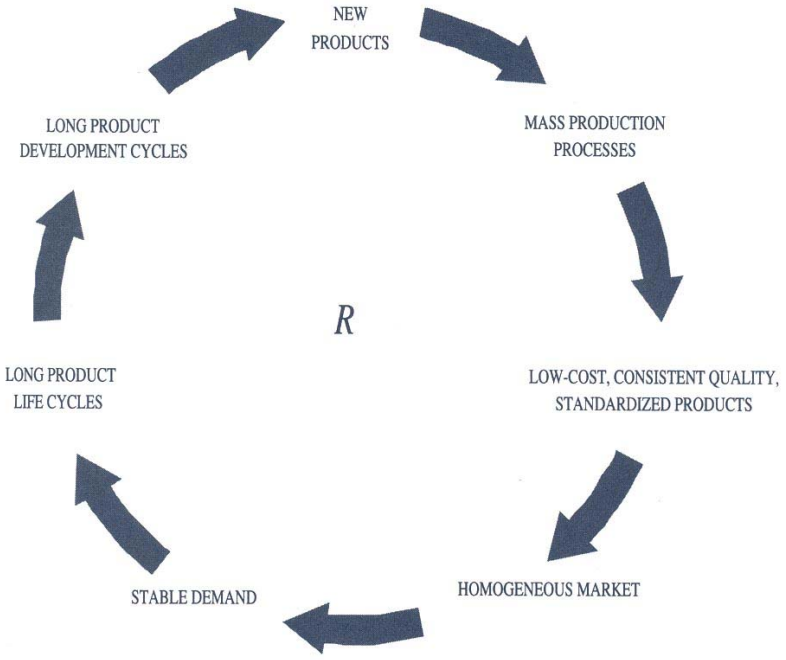


Fig.9 New paradigm of mass customization as a dynamic system of feedback loop (Pine 45).

3.4.3. Rapid Prototyping and Rapid Manufacturing

Although contemporary mass production technologies seem to be satisfactory in terms of production speed, material variety or production costs, they still remain restrictive for the creativity of product designers. While deciding on a product idea (i.e. assembly, form, material and function) a designer always has to consider the limits and possibilities of "traditional" mass production technologies. Taking injection molding as an example, Hague states that "in order to process a component successfully, at a minimum, several design elements need to be taken into account such as geometry (draft angles, non re-entrants shapes, near constant wall thickness, complexity, split line location, surface finish), material choice, rationalization of components (reducing assemblies) and cost" (Hague 347). At this point the idea of using the newly developed Rapid Prototyping technology for direct manufacture (despite the fact that it seems unrealistic as cycle times or material costs for now) looks promising for product designers in terms of "design freedom" (Hopkins 197).

> **"**Rapid prototyping (RP) is a widely used term in engineering, particularly in the computer software industry where it was first coined to describe rapid software development. This term has also been adopted by the manufacturing industry to characterize the construction of physical prototypes from a solid, powder, or liquid in a short period of time, compared to "traditional" subtractive machining methods. This technology has also been variously referred as layer manufacturing, material deposit manufacturing, material addition manufacturing, solid freeform manufacturing and three dimensional printing." (Chua 597)

Prototyping has a crucial importance in product design process. From the early stages of design process, such as mock-up building, to the finishing steps, (i.e. usability tests, physical durability tests, functional experiments) prototypes have proven their value. Although 3D virtual models created with the help of CAD software seems relatively satisfactory for the product designers (Chua 598), this satisfaction does not include all steps of a design process: "In focus groups, ideation groups, and ethnography studies, the invited participants prefer to see and feel the real products, not just look at computer-generated images.[…] Generating perhaps dozens of progressively refined prototypes, the process moves each one a step closer to satisfying consumer demand for a product that works well, is inexpensive to buy, looks cool, and is pleasing to touch" (Wright 36). In the light of this information it is obvious that Rapid Prototyping systems can bring valuable benefits in process of product design in terms of model and prototype building with their high speed of model production, accurate models and simple operating needs.

On the other hand, Rapid Manufacturing (RM) refers to the direct production of finished goods from a rapid prototyping device. "This definition suggests that true rapid manufacturing systems are those that employ additive processes to deliver finished goods directly from digital data, eliminating all tooling." (Bak 340)

Although the mass production of a product is the last step of a product's creation cycle, it has a profound effect on the design process. Factors such as material

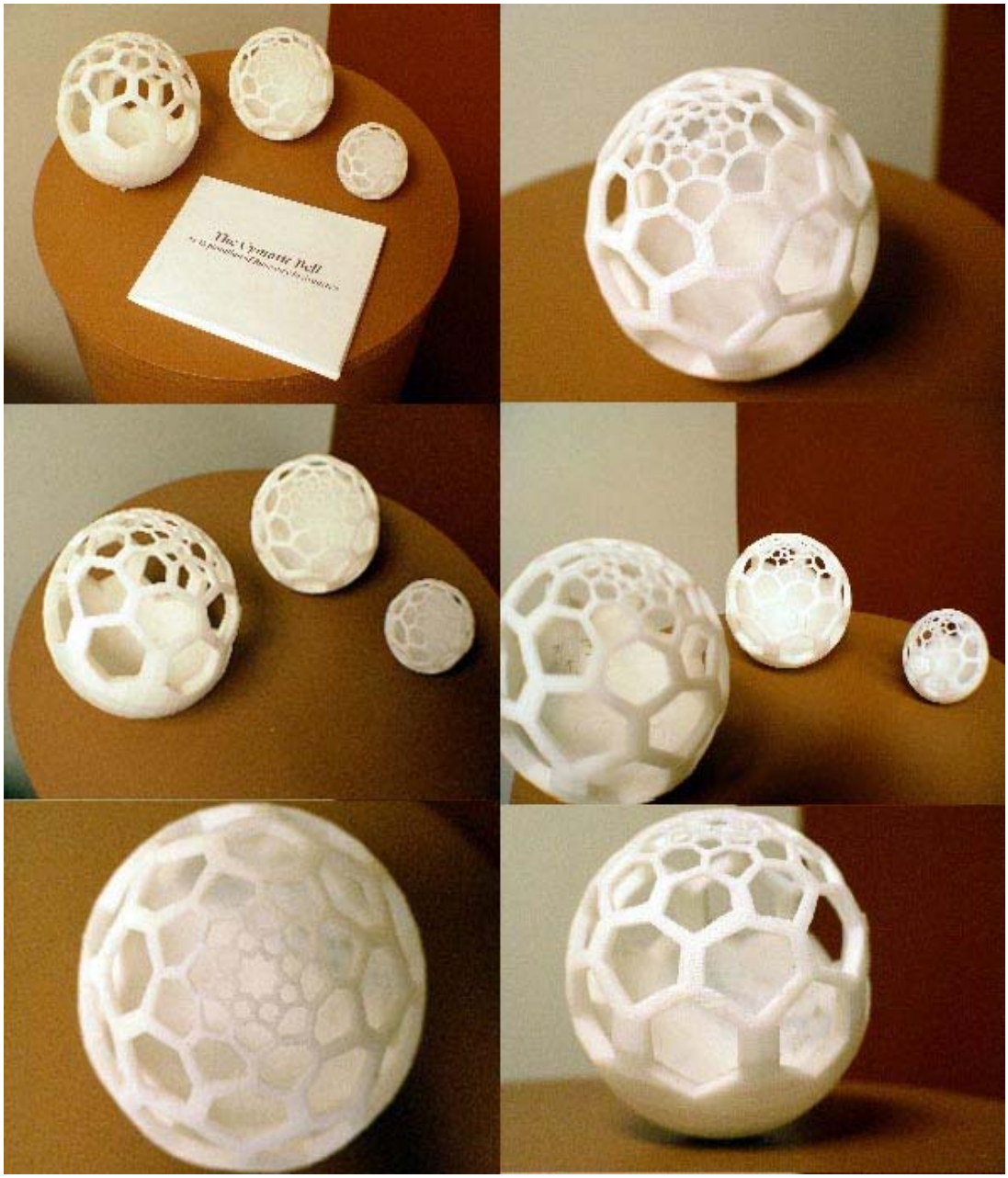


Fig.10 The rapid prototype of complex one piece sphere models.

Fig.11 The rapid prototype of a lighting luminarie.

selection, cost calculations, production duration, the complexity of product geometry, proper production details, number of the products to be manufactured creates a constant interaction between design and mass production processes. Even if existing mass production technologies satisfy the industry greatly in terms of production speed, production quota and diversity of materials, they still restrict product designers. The approach of using Rapid Prototyping technology in mass manufacturing process is promising because of its features such as tool less and mould less production, being directly digital data, and having a production logic which provides creating various geometries and details. Hopkins and Dickens summarize that "The idea of using rapid prototyping (RP)

machines for the manufacture of products in high or medium volumes initially seems unrealistic as cycle times, materials costs and capital equipment for processes such as injection molding are generally far lower than those for RP. However an appreciation that zero tool costs, reduced lead times and considerable gains in terms of freedom in product design and production schedules may significantly benefit manufacturing will help in accepting the potential benefits to be gained." (Hopkins 197). On the other hand recent developments in Rapid Manufacturing technologies enable the move from prototype to production economics, this, in turn permits the mass production of individually customized products, generally referred to as “Mass Customization” (Bak 340).

3.5. Designers and Computer Aided Design Technology

According to the ACARD report on ‘Computer aided design and manufacture’, the major benefit of CAD is undoubtly the improvement of designer and draught person productivity. It is argued that the increase in draught person productivity has a positive effect on designer productivity, since the designer is released from the task of producing a detailed drawing, which he may otherwise have had to do because of a lack of skilled draught persons.

Getting used to design through software may be challenging for the designer despite the possibilities that it offers. In the process of design, CAD software influences the designer in a certain manner so that the designer himself starts to get used to think through the screen. CAD software becomes an element of creativity although it does not have the ability. The reason for that is the

designer, from time to time, solves the surfaces and details as far as the CAD software lets him to. Obviously, this emerges out when the user has not got adequate knowledge of handling the software but sometimes the aesthetics that the machine creates replaces the intention of the designer and he is at the end, convinced of what the computer happens to suggest. The most obvious instances take place when the designer starts the basics of his design via computer. This is the moment when possibilities of the software affect the designer the most and the computer integrates into the process as a semi-designer taking over the human idea of a product.

The issue of designing with the software is still under debate whether it provides the designer with excessive capabilities. This is because sometimes it may be confusing to think through the screen rather than making the same calculation or drawing with your bare hand. However, it is valid that the contemporary technology and means of production require an inevitable computer drawing to eliminate the risks of design and production. Therefore, making the design through the screen and executing calculations within software capabilities turns out to be compulsory for the designers. Yet the integration of computers in the design process is up to the working style of the designer in some cases since the computers did not obviously replace all the design methods.

4. RECONSIDERATION OF THE DOINANT VALUES OF PRODUCTS

4.1. Effects of Relevant Technology on the Steps of Product Generation

As computer aided design and manufacturing technology advances at a high pace, various means regarding product generation go under an inevitable transformation. Form the initial design idea to the user, a product has to go through a lot of steps including design, production, design management, marketing, distribution and selling. Each and every step contributes to the process with its own specific know-how and expertise for the sole reason of making profit. In terms of conventional experience, a product has to be designed and already produced to take its place in the competitive market. The presentation of the product is either via captive advertisements or via spatial practice along with an actual experience.

However, computer aided design and the capabilities that it has brought to the competitive arena seem to introduce the production and marketing firms to diverse perspectives. Apparently, a production company, under inevitable monetary concerns, tries to provide its capabilities with adequate expertise that would eliminate its risks within the market. The most significant among these risks is perhaps a potential failure in design or production that would possibly result in a failure in the market. It would be time consuming if the firm has to reconsider the chain of production, detect the defect and try to eliminate it in order to obtain a better result. But if the problem is in the design in a broader

perspective, then the situation turns out to be worse than predictable which may take the firm back to the very initial steps to survive. In this sense, computer integration to the process of design and production offers invaluable risk-reducing solutions for the company. Thus, the companies get hold of the process with a computable control and memory. The perfected calculations through the design process and production eliminate potential failures providing the company with rapid manipulations and decisions. Also the companies gain the possibility of customization of their products that would provide them with a considerable marketing strength.

Putting the benefits of CAD integration for the production process aside, one significant contribution of computers is to the marketing and sales of products. Obviously, conventional perspective demanded the product to be produced or at least prototyped whereas this virtualization of design may certainly disavow the step of production to later steps. We have already mentioned the photo realistic images that some certain software is capable of. These hyperreal images or representations of products seem to replace the actual production in terms of marketing. Now that the designers have the capability of presenting the products as they wish them to be through computerized medium, the marketing strategies has been transformed dramatically.

Both real-time capturing of images through the screen and specialized effects such as texture, material and lighting, would perfectly create the sense of a reality of a product that has not even put into production. By this way, the firms would perfectly present their virtual products to customers and decrease the risk

of potential rejection. Even if the customer demands unpredictable changes on the features i.e. form, function, cost, regarding the product, the memory of the computer could make these changes possible well before production. Customization or even major manipulations performed on the product through virtual means would not only save time for the firm but also save the estimated expenses of production. Obviously, qualified employees with adequate expertise would be favored for this kind of a design technique. Thus, changing the mode of design and production is capable of changing the social and spatial conditions within a workshop resulting in an enormous increase in qualified employees along with a decrease in unqualified blue collars.

Rapid prototyping technology also contributes to the presentation of the products complementary to rendered images. Especially pieces in small sizes can be perfectly executed with appropriate material, texture and color. Thus, rapid prototype presentations vary from rendered representations because they present a reality with its tangible forms and experienced functions. This technology is perfectly valid for industrial design products and obviously works better than simulated computer images. However, there are still limitations in the rapid prototype lathes since they are not capable of producing bigger size objects yet. In the case of macro projects like landscape design or architectural design, for instance, computer renderings and animations are more appropriate tools to make the presentations.

Considering the effects of computer aided design and manufacture on the process of product generation, we may suggest that this technology has a direct effect on

the speed and productivity of firms. With the spread of dematerialized tools of designers, the companies also obtain the chance of marketing their products so long before they prepare their facilities for production.

4.2. Instances under Question

In order to clarify the arguments that have been presented so far, it is intended to give some specific examples from four different design branches. This attempt is considered to be a kind of exploration of how design and production technologies affect different disciplines in terms of their presentations. Special emphasis will be made on the representative images of virtual prototypes and how these prototypes are used to exercise in marketing. These instances have been selected from product design, fashion design, architectural design and transportation design respectively.

4.2.1. Product Design: Virtual and Rapid Prototype of a Lighting Luminarie

The relevant design is the project of a spotlight designed for ZER Electronics Company situated in Ankara. Industrial designer Refik Burak Atatür was the leader of the project from the initial design concept to the execution of virtual and rapid prototyping. The whole course of the design and prototyping has been exercised through CAD/CAM technology.

The design consisted of two complicated plastic parts that hold a halogen lamp between them. Two metal parts on the sides fix the spotlight to the ceiling and stabilize the main body. The outer square plastic part covers the main body generating an aesthetic outlook. The outer part is also designed to be replaceable

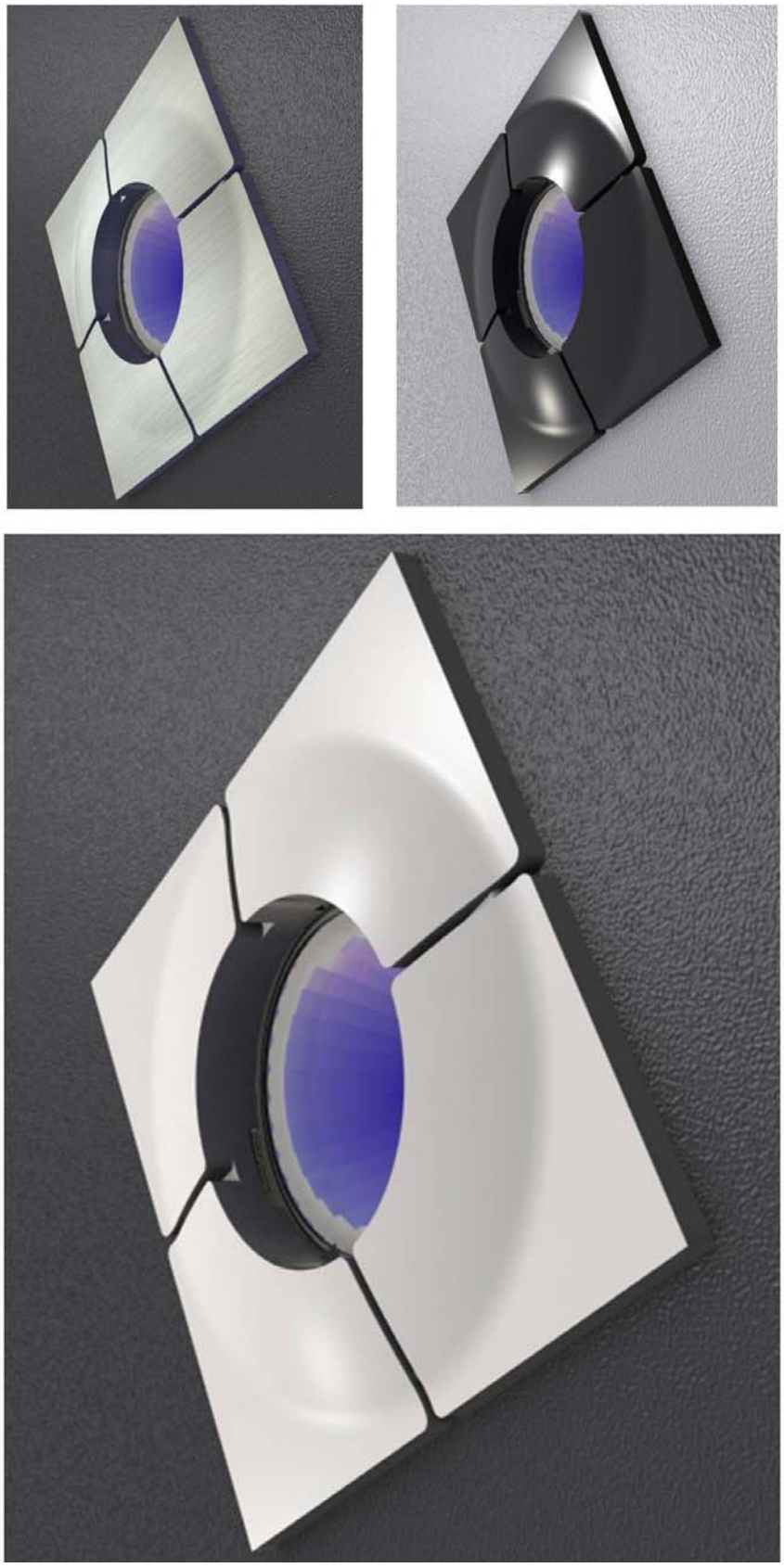


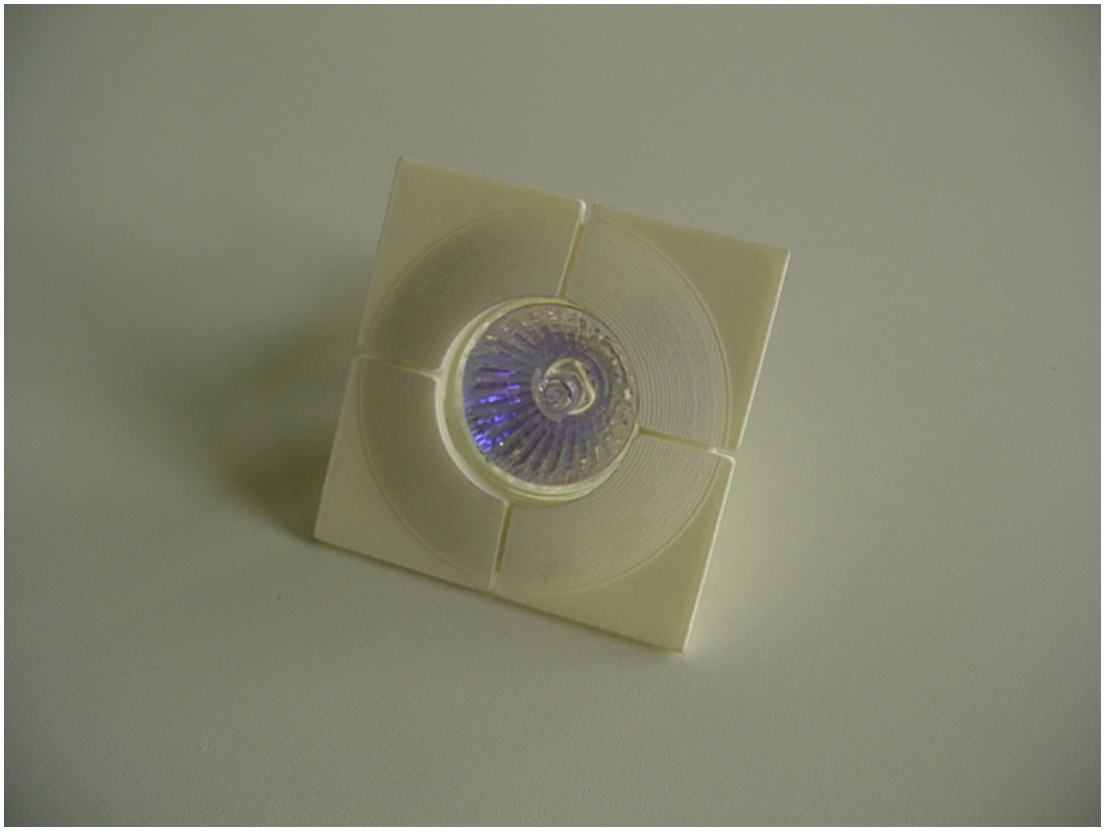
Fig.12 3D renderings of spotlight

so that different covers generate different outlooks on the ceiling. The interchangeable outer parts add a customizable attribute to the design.

Originally, ZER Company has extensive experience on a different branch of lighting which is the lightbars for police and ambulances. When the general manager decided to start an architectural lighting project besides the production of lightbars, the first thing that he had to do was to employ industrial designers and provide high performance computers for them. After some serious marketing research, the design of a spotlight has been chosen as the initial project.

However, the thing that the company lacks is enough efficiency in the production line since it is a company that leads a batch type production rather than mass production. These limitations in the production line would possibly affect the production of lighting project but somehow these limitations were neglected in the first hand. The main concentration was on the development of the project.

All of the concept generation and engineering of the design were developed via 3D modeling software with all its complicated details and analysis calculations. Obviously, engineering assistance was received for material selection and structure analysis. At some certain stages, rapid prototyping technology was integrated to the process so that the structure, assembly and the form of the product can be tested. The data stored for the virtual model is converted to another format that the rapid prototype machine can encode so that virtual model is transformed to an actual model without any complementary application. The



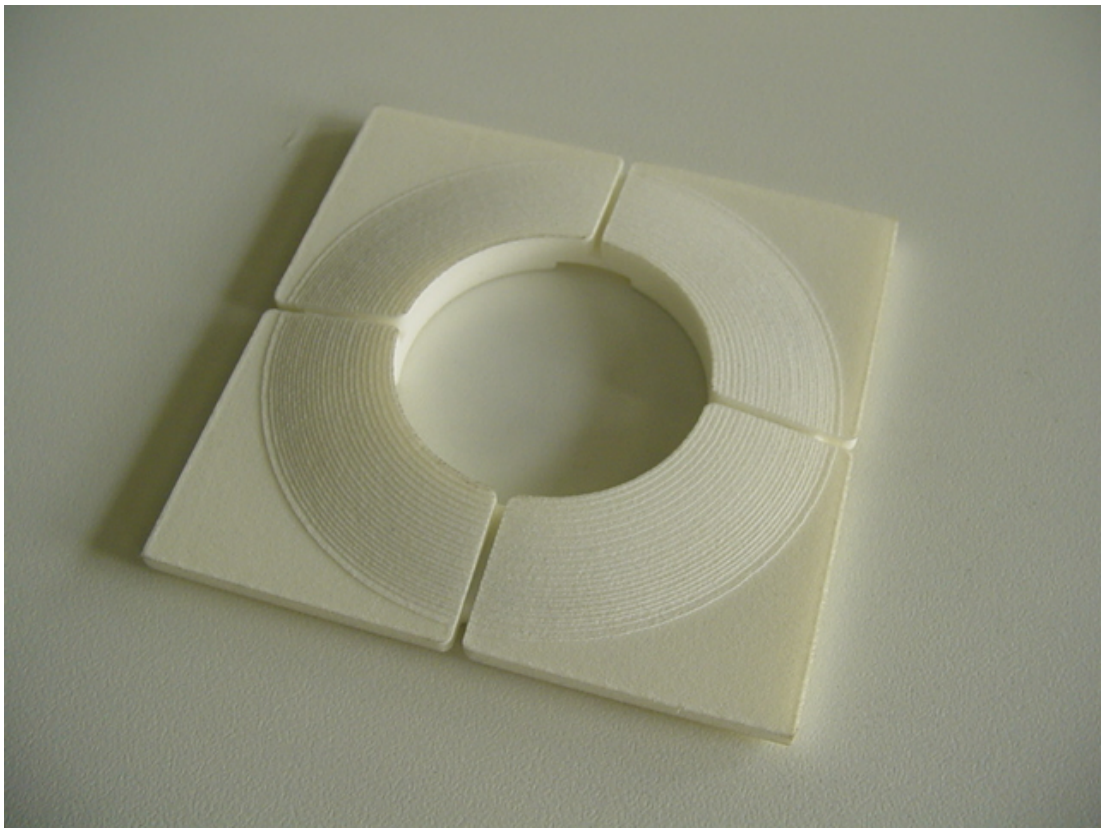


Fig. 13 Rapid prototype models for the spotlight

small dimensions of the project were rather appropriate for the making of rapid prototype models. With the feedback from the tangible models, the project continued in order to solve the actual problems observed on the prototype model. Then the designer returned back to computer model and made the required transformations and demanded another prototype for another testing.

After a series of computer models and rapid prototype applications, every detail of the spotlight has been resolved and the design of the project has been finalized. However, now the company faced with the problem of the inadequate production facilities that had been neglected before. The question of 'how to produce such a big batch' remained as an inevitable question mark because spotlight manufacturing demanded a sort of advanced mass production facilities due to the number of demand in a big building. Besides, architectural lighting market expects considerably large quantities of products one at a time which does not seem possible for ZER Company to handle.

In order to solve this problem, the company returned back to computer models and decided to have computer renderings of the form and details of the product so that they would at least have something to show to the potential customers. The general manager decided to market the product with the computer renders and the latest rapid prototype model so that the company would have orders from them to produce demanded batch.

It is quite noticeable that all the investment throughout the project is on the expertise i.e. industrial designers, engineers, and a high performance computer

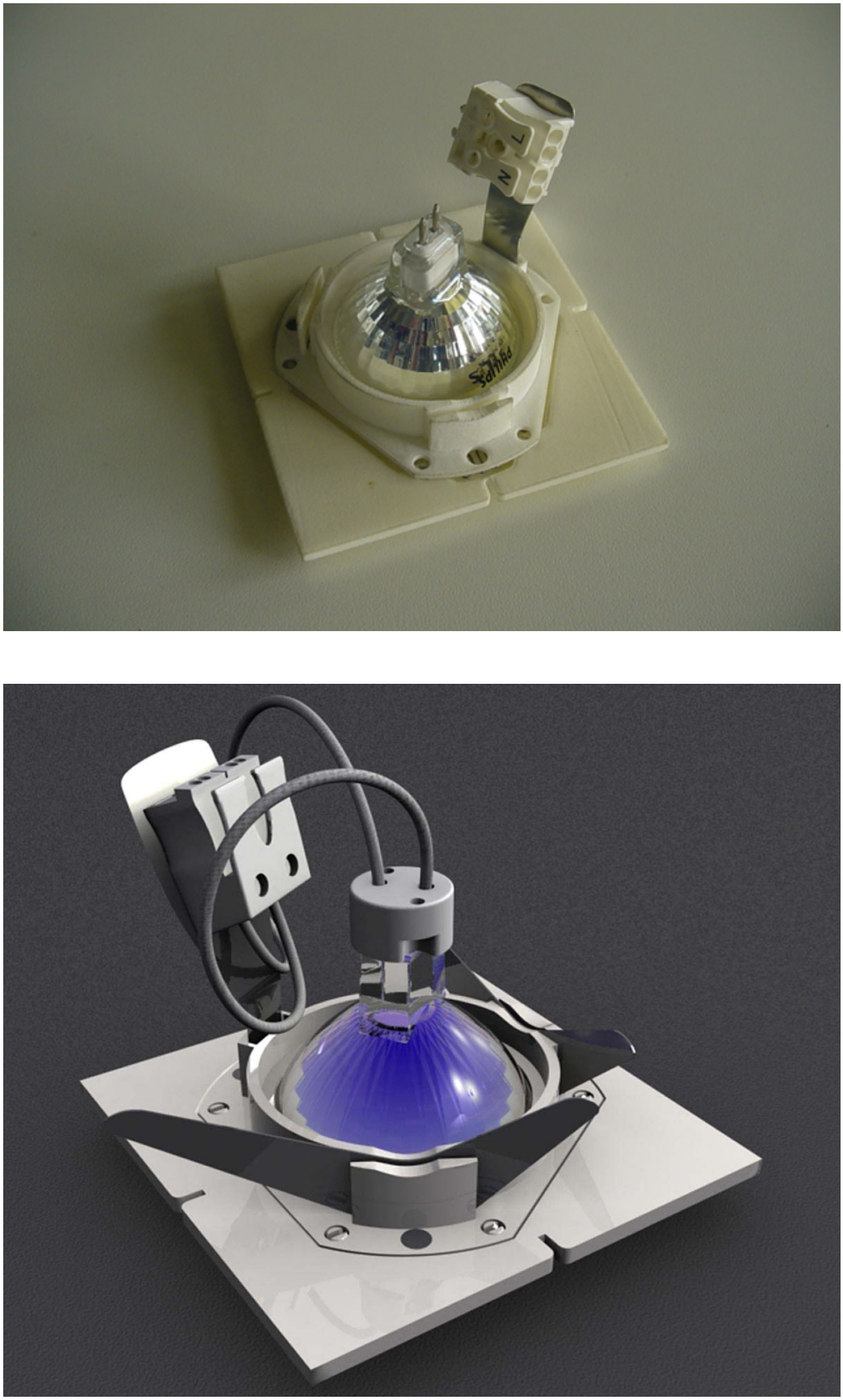


Fig.14 Rapid prototype and computer render of the spotlight

system. The process as a whole excluded the production facility except for rapid prototyping which is also another converted format from the CAD. Even the presentations to the customers were performed through realistic renderings of the spotlight.

The company has not started production yet and this does not seem possible unless they have a batch type order from one of the customers. Only then the company will start to reconsider its in-house facilities and decide on whether producing it within the workshop or order production from outside.

4.2.2. Fashion Design: Customized Trainers through Computer Models

Adidas, being one of the most popular sportswear company, has recently initiated a project called "Mi Adidas" to produce customized trainers for consumers (introduced in 2002 on a wide scale). This customization and orders can only be performed in specialized Adidas shops all over the world because the consumption process is quite different than buying standard mass produced shoes.

The official website of Adidas explains the customization process in three steps. In the first step, the customers' feet are scanned via a foot-scanning system to determine the exact length, width of each foot. The uniqueness of each foot, whether one of them is bigger than the other, is transformed into computable data for the best-fitting trainers. As a second step, another computer integrated system determines the pressure distribution of each foot to find out what performance features you need. All these results are reviewed by experts after the data is

transformed to a computer system. Once customers have chosen personalized function and fit, they can test the shoes before heading to the final process of design. The very last step consists of the material selection, base structure determination and surface graphics with customized colors and individual embroidered monograms. All these steps are performed with the help of a configuration system, a PC-based sales kiosk leading the customers and the sales clerk through the whole customization process. The system also visualizes the results and connects the point of sale with the fulfillment system.

Fig.15 Steps of Mi Adidas customization

Berger and Piller explain the mass customization (MC) of trainers as a two-stage process:

> "Product architectures and range are fixed during a preliminary design stage linking overall company strategy to manufacturing capability. Here, the solution space of an MC system is set. The second design and development stage takes place in close interaction between the customer and the supplier. Here, the capabilities of the solution space from the first stage are turned through adequate configuration tools into a specific customer order. This process is called the elicitation of MC system. The supplier has to interact with the customer to obtain specific information to define and translate the customers' needs and desires into a concrete product specification. However, instead of just listening to the customer, in many cases customers are performing this design (configuration) by themselves on a tool supplied by the manufacturer. The selling process turns into a co-design process" (Berger 43).

4.2.3. Architectural Design: 3D Renderings and Animations of a Residential Area

The relevant architectural project is called the "Mashattan" project which is carried out by Taşyapı -one of Turkey's leading Construction Company. The premise that the project is planned to be built on is in Maslak-İstanbul which is a famous area for its business centers. Besides, regarding the spatial conditions of the premise, it is situated at one of the crossroads in Istanbul that has connections to main roads leading to the city center. Thus, it is one of the most popular architectural projects in Turkey, not only for the high standard buildings that it

offers but also for the living conditions that it promises. The project is promoted with the slogan containing ‘luxurious residential area’ and the firm presents itself as the ‘expert’ of luxury in Turkey.

The size of the land is 140.00 m^2 and the construction area would fill approximately %7 of the premise. The rest of the land is reserved for natural parks and recreation areas. The project consisted of ten tower blocks and each of them is designed to be thirty-three floors. (Arkitera, 01 March 2005) Regarding the research that has been done, the project seems to be perfectly resolved and ready to be executed and already most of the rooms has been reserved or sold to customers.

Just after the project is approved, the construction of project has been initialized by June 2006, and it is aimed to be finished in 36 months. But long before the construction, the advertisements of the project were released via various media like the internet, newspapers, and television. The obvious side of this promoting style is the visual language that it uses. Apparently, the project is not materialized yet but still the virtual images and animations of the area are promoted. These computerized images seem to be satisfying the potential customers because the visualization of the project has been so perfectly generated that it creates the atmosphere of an actual residence and recreation area. You can even encounter the aerial view or imaginary people living in this virtual project in the advertisements (fig.17).

Fig.16 The aerial view of Mashattan from İstanbul

Fig.17 Computer image of the Mashattan project

The conventional method for architecture and construction industry is to promote the building via scaled models that they present in their offices. However, with the introduction of CAD rendering and animation software, this conventional method has been replaced with a more persuasive one. In the case of the latter, these recent techniques that the Taşyapı Company uses, promises the consumers the life style that they will experience through the still or animated images.

The computer animations of buildings that are shown on the television go through the buildings as if you take a virtual tour within the area. This type of visualization is another tool that the companies favor to present and market their project long before the actual construction. Therefore, the integration of CAD becomes the inevitable means of both design and promotion of design with its capabilities.

4.2.4. Transportation Design: 3D Models and Prototypes of a Car

Automotive industry is one of the most competitive industries with its advanced production means and complex management structure. The concentration and investment on design and R&D are enormous compared to other industries since the companies have to spend effort for more efficient, aesthetic and economical models. The competition between the companies makes the situation more challenging. Thus, founding and pursuing a production plant for the automotive sector requires a vast investment as well as adequate expertise and technique.

However, a recent example attempted to challenge this view. The relevant design is a prototype car called ‘İmza 700’ which has been designed and prototyped by

the English design firm, CMAK. Actually CMAK, as a consultancy company, has developed the project for a Turkish marketing firm JETPA in 1999. Being one of the biggest marketing companies of that time, JETPA declared to found a car factory and to invest 2.7 billion dollars on a production plant situated in Siirt, Turkey. (Hürriyet, 31 October 1999)

Despite the contradictions in the publicity, the project of the model 700 has been finalized with its rendered images and these images had already been printed in daily newspapers with the slogan of "Turkey's first global car" (Türkiye'nin ilk dünya otomobili). The advertisements were so persuasive and affirmative that it had a great impact in the public as they can see the ready car with its name and logotype in front of them. The image of the car and advertisements seemed to clear all the doubts about the idea of producing the car in Turkey. On the other hand, the lack of the promised production plant and promised investment of production was still confusing.

The prototype of the project was made public in October 1999 when the publicity turned out to be a show and it was broadcast live by most of the television channels in Turkey. One of the two working prototypes that the CMAK Company has produced for JETPA was standing on the stage. Among appreciations, praises and promises, the car was introduced to the public. At the beginning of the year 2000, the first steps of the global Turkish car were taken and İMZA 700 was introduced to the European market with its display in Geneva Car Fair 2000. Perhaps that was the very last time that the public saw İMZA 700 or even heard any news about its fate. The remains of the enthusiasm and

Fig.18 The virtual model of the İMZA 700 project

Fig.19 The prototype of İMZA 700 displayed in Geneva Fair 2000

expectations that it had created within the public are some printed virtual images, two lost prototypes and records of a live broadcast publicity show.

4.3. Reconsideration of Dominating Values of Products within the Market

Regarding the three examples that have been presented before, one can obtain a general idea of the effects of computer aided design systems on the design and marketing of the products. However, if one has to make a thorough analysis out of these instances exploring the common points, one will find out more than the simple idea of the impact of CAD throughout the process. Actually, this technology has transformed the whole course of design and presentation of design in various fields. The virtualization of design has not only affected the marketing strategies but also has influence on the consumers so that one can generate new dimensions on the topic. Two main arguments can be raised considering the instances of ZER Electronics, Taşyapı Construction Company and JETPA.

4.3.1. Reconsidering the Sequence of Product Generation

All the three projects had the one common point: they had gone through processes of integrating computer aided design but they have not finalized as mass produced or constructed.

In the case of the spotlight, the company is trying to market a product by presenting its hyperreal images with a prototype that only resembles the product in form and assembly. However, it is not for sure that the company would somehow succeed in production in the later steps. Despite a possible failure in

mass production, at least the project is already pretending to be actual through the computer images.

The Mashattan project is also a kind of promise for the customers. This promise originates from the well established computer images and the reliability of the company in public. Certainly, several agreements with suppliers and workers may have been done in advance for the construction. However, considering the marketing of the residential area, the point is not about the real buildings and plants but of a virtual one that is promised to be constructed. Again, we observe nothing more than photorealistic computer images and animated images.

The conditions are worse in the very last example of İMZA 700. The JETPA Company with its invisible production plant and invisible workers promises to produce the global car of Turkey. The only starting point of this imaginary factory and fantasy investment is the two prototypes and some computer generated images. We may observe neither any production facilities nor any attempts to do it but on the other hand the scenario has been perfectly performed through the live broadcast publicity shows.

Thus, the production of actual products or buildings is not compulsory anymore to market the products. Companies should not have to produce their products in order to sell them, but conversely, they make profit out of the technology they use since the technology offers adequate information for the consumers about the features of a product or building. It is already declared that most of the Mashattan tower blocks has been sold so far, although they have just started to

build the blocks. Therefore, the possibilities of computer aided design and computer graphics are enough to persuade the potential customers.

Conventional means of product generation is to design the product first and to produce it. After the design has been resolved and the first batch is produced, then the company starts to market the product via advertisements, slogans and quality guarantee…etc. the last step was the sales and sometimes, marketing stage was collaborating with the sales to minimize the time spent on making profits. However, with the vast integration of computer within the design and manufacturing, this conventional sequence of product generation seems to be altered. Now the marketing process seems to take over production. Moreover, sales have been initialized well before production in the case of Mashattan project.

The production process is disavowed because working with material tools instead of cheaper expertise would eliminate investment risks in the first place. Secondly, it would eliminate marketing risks when we consider the ZER Company example. Despite the enormous lack in production facilities, the hyperreal images that are presented to potential customers save the company from unnecessary investments like mould making, assembly expenditures, craftsmanship and more importantly production time. It would be just the same if JETPA, ignoring the invisible production plant and invisible employment, got adequate demand and positive attitude from the market. Although the whole project turned out to be a dream, at least the company had the courage to present some sort of a designed product through images and prototypes.

All the design and production applications and ideas that have been mentioned, lead us to the point that material concerns in production industry seems to be secondary after the computer integration. The primary concern is always a design idea followed by a strong marketing strategy in order to make sales for profit. Whether the product is mass produced or not is not a concern both for the producers and customers. That is because the designers and the producers have confidence in technology. Rapid manufacturing (RM) techniques have already promised them to be able to produce geometry of any sort. Now that the companies confide in production technology, the persuasion is not through actual experiences but through promises of computer generated images and visualizations.

4.3.2. Reconsidering the Value of Products within Market Relations

> **"**Integrating customers in the elicitation process requires a dramatic shift in our perspective of value creation. While users and customers have no part within the traditional chain framework, in a mass customization system consumers are getting a new role – they are integrated into the process of value co-creation. Customer integration is defined as an economic process in which customers take part in activities and processes that used to be seen as the domain of the company. Mi Adidas's customers are becoming – at least partly - co-designers of their personal pair of shoes" (Berger 44).

The relevant instance of Mi Adidas offers a very distinctive mode of marketing strategy which is a direct example of mass customization. The entire computer

aided modeling of feet and customized production for unique cases reveal the advanced computerized techniques in the process. What Berger tries to explain is the additional value that the consumers transfer to mass customized products However, this instance is important for our study since it has complementary or even challenging ideas against the use value, exchange value and sign value of products that has already been discussed referring to early Baudrillard's work.

Through the logic of consumption, Baudrillard has suggested that the object of consumption should be considered under the logic of sign value of products. It consisted of differences; they have been autonomized and they are in differential relation to other signs. Only then one can speak of the object of consumption. He tries to reveal this relation with symbolic objects with a comparison between a wedding ring and ordinary ring:

> "This [the wedding ring] is a unique object, symbol of the relationship of a couple. One would neither think of changing it nor of wearing several. The symbolic object is made to last and to witness in its duration the permanence of the relationship. Fashion plays as negligible a role at the strictly symbolic levels at the level of pure instrumentality. The ordinary ring is quite different. It does not symbolize a relationship. It is a non singular object, a personal gratification, a sign in the eye of the others. I can wear several of them. I can substitute them. The ordinary ring takes part in the play of my accessories and the constellation of fashion. It is an object of consumption" (Baudrillard 66).

This sign value of objects, reinforced by the advertisements and various marketing tools, turns out to be the sign of prestige, fashionable outlook, and luxury in relation to other sign objects of consumption. For Baudrillard there are no more objects but a differential play of signs that circulate within the system.

However, Mi Adidas project stands as a challenge to this idea since it promises uniqueness for the best fit in your feet. Through the integration of computer models, the project makes you to fit in the virtual model of your own body. It is the ultimate point where the sign value could reach: "this product is made just for you ". But Berger and Piller points out to an ambiguity in the design process:

> "Many MC approaches implemented in practice are based on offering a tremendous amount of variety and choice. But there is still only very little understanding about the perception of choice and the joy or burden of co-design or configuration experienced by customers who often have no clear knowledge of what solution might correspond to their needs. At times these needs are not even apparent to the customers. As a result, the customers may experience uncertainty or even perplexity during the design process. […] A customer orders from supplier and often pays in advance for a product she can only evaluate in a virtual form and has to wait days, or even weeks to receive it" (Berger 44).

Therefore, even virtual models and assured high performance and best fit does not clear the consumers' minds regarding the use value and exchange value of the trainers. Although they are made to choose among pre-established design catalogue according to their computer models of their feet, the process does not

disguise the predomination of exchange value over the use value as Adorno has put it in the culture industry. However in mass customized systems as such, the voice of the use value is echoed through the uniqueness of production for your body because it reminds us the traditional mode of production. On the other hand, one cannot speak clearly of the restoring of use value in the process of mass customized consumption because the worth of the product rises dramatically in relation to other trainers. This rise is apparently dependent on the computerized design and manufacturing system that the company governs. Thus, the computer integration inside the process seems just to speed up this predomination along with an increased promise in utility.

Regarding the object of consumption as a sign value, the customized and unique trainers can be considered as a sign since it is still a consumer product but of a different sort. It is obviously different than the ring example because what you wear is not simply a piece of fashion anymore that you can substitute as easy as a ring. On the other hand it does not imply a singularity at all. It is the ultimate point of the sign, and the differences that it promises. Distinctive in itself, the trainers are the sign of yourself (or your computer model) in the eye of the others. From this perspective the sign value seems to be reduced to one element which is yourself. But on the other hand, it is this particular world wide known company i.e. Adidas who produced these shoes for you. This is the point where the product restores itself as a sign in differential relation to others.

Sign value of objects as Baudrillard suggest are explicitly manipulated and exposed in the form of advertisements. What Barthes did in 'Mythologies' was to decode the implicit messages and connotations within the advertisements of the time. Therefore, the advertisements, in their basic sense, are the agency of promises. Whether it be signs or connotations of diverse types, the aim is to persuade the customers to buy the products that are presented to them. However, with the introduction and spread of mass customized products along with a superior computerized technology, the final message to deliver to the customers is themselves. Regarding the Mi Adidas, no other shoes can fit better than what they offer to you. This offer is apparently different than the simple freedom of choice. The latter has been formed through the contemplative and passive attitude of the consumers whereas the former is more than a promise. Therefore, the Mi Adidas project gives way to reconsideration of the dominant values of products since what it promises seems to transform the recent debates about the value creation and representation within the market.

5. CONCLUSION

The integration of hyperrealistic computer visualizations and the emergence of mass customized method of production have considerable influence on the dominant values of products and their circulation within the market. We may observe a vast virtualization in the design and manufacturing process that result in the decrease in material concerns and increase in market segregation. If one assumes an entire mass customized system in all sectors of production, this market segregation would obviously reach an extreme point where every self constitute an individual market. That is actually what rapid manufacturing (RM) promises for soon.

However, there are already recent industrial cases where this mass customized production is exercised. The means for this type of production is obviously dependent on the virtual modeling that are generated, manipulated and alternated through technological terms. Thus, we may perceive that the emergence of technology and its capabilities transform the standardization and unification ideas of mass production into a disseminated and diversified type of mass customization.

Obviously, mass customization as a new frontier comes along with its own system of design, marketing and sales strategies. Conventional means of mass production require an optimum design solution to answer the needs of a

homogenous market and right after the design phase, the production had to be performed on a very wide standardized scale to reduce production costs. Now that the design and production is over, the company has to market the product in order to compete with rivals and make profit out of the sales. One obvious method of marketing is the contribution of advertisements that would probably play with some connotations to motivate the customer to buy that certain product. After (or during) the sales is performed, the company initiates a brand new R&D of another model to be able to remain in the market.

In this type of relation, the use value is disguised as soon as the product finds itself in the market where exchange value of the product dominates as Marx puts it. Advertisements even reinforce this phenomenon and object is liberated as a sign. This differential relation with other signs determines the value of the product.

However, in the mass customized instance, the specific design integrates the customer as the collaborator of the process. Having confidence in the capabilities of manufacturing, the actual production is disavowed giving its place to the marketing and even sales of the design in the very first place. Obviously, this attitude derives from the virtual tools of the designers and producers. Therefore we may observe a distinctive replacement of sequence through the product generation which is quite different from the conventional methods of mass production.

Through the customization of design, the dominant values of products also go through a sort of transformation. In this case, the use value of the product is emphasized in the sense that the production firm promises the user for the best fitting, form or performance. By doing that, obviously, the worth i.e. the exchange value of the product is boosted. However this emphasis in the use value of product does not simply reveal itself since the use value, in this case, transforms into the sign value of the product. The customized production for the self, whether it is the best fit or demanded form, would rather contribute to the sign value of the product other than the basic use value. The promise for the unique production is also liberated as a sign in the eye of the others but a sign that refers to an ultimate point. When we consider the advertisements of a customized product, the ultimate and only point to be emphasized would be the phrase: “this product is just for you”. The sign value of the product seems to be reduced to one and only promise which is customization. This situation handles the case of value production distinctively different than the mass produced objects.

However, even if it is mass customized or mass produced or executed via any other mode of production, the product as a value does not correspond to an absence. The objects still preserve their values so that the capitalist idea of selling in order to make profit does not undergo a transformation. According to Marx, capitalism has to produce new technology in order to persist. Therefore, even if this study explores a variety of new technology that makes us reconsider the values of products, the end still remains the same. So, mass customization

through virtualization of design and production is just a new tool for capitalist logic.

Apart from the transformations in the mode of production, there is the issue of representation of products via hyperrealistic images. These virtual forms of images also have direct influence to the sequence of product generation. Now that the tools of the designer and producer have been dematerialized with all of its forms, the product presentations also is executed through virtual means. Even if the production firms do not have the adequate ground for production or customization, they have the new technological tools to market their virtual products. Besides the issue of practical concerns, these images also challenge the boundaries of real and virtual. Apparently, this challenge is valid in all the other fields that integrate computers, but in the specific example of design and industry, the contribution of the computers is significant. Instead of our actual experiences with the products, these hyperreal images make promises and assurance to the consumers although they do not even exist. All these visualizations and presentations of products as images that have been questioned and explored in this study reveal the emergence of a virtualization in design and production. This particular situation inevitably challenges us to reconsider both the practical and theoretical concerns about the objects around us.

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