National College of Art & Design

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The Effects of Computer Technology on Industrial Design

by

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Introduction

The danger in writing about the effects of technology on our lives is that in the amount of time it takes to even write the word technology it has changed. Computers are becoming so popular that now they are nearly as common as televisions. It has been said recently, at a technology show in Germany, that the computer industry will soon exceed the automobile industry. The pace of technological change has never been so rapid, and the potential that technology has for altering the way we live has never been so great.

The development of computer technology into the workplace of the industrial designer has rapidly changed the traditional methods of designing. Forthwith is an analysis of how the technology came into the work-place of the designer and how it effected their designs.

The development through time of this change has been studied, acknowledging how the industrial designer worked before and after the involvement of computers. It also deals with how the information technology age has come upon us so promptly and is about to change our lives so dramatically and rapidly that we will not know what has come upon us. Anticipating the difference between design students when they graduate from university. Acknowledging how computer technology has changed the way designers work, think and the conclusion of their designs, if it indeed has changed at all? Has computer technology restricted designer from fully developing their imagination in the design sector of today?

The most beneficial literature was in the form of articles in newspaper supplements and design magazines. With the every increasing knowledge of technology newspaper articles served the best information. The literature that was most advantageous to my research was found in newspaper supplements and on the Internet. The Sunday Business Post, and The Sunday Times series of publications in relation to computer technology, were of a marvellous assistance in the research of the topic. With technology it is so rapidly progressing it is difficult to keep up with it in information from books and journals as by the time they are published the technology is more than likely changed, updated or replaced by something better. Designing the Future, The computer Transformation of Reality, by Robin Baker (1993) gave great insight into the development of computer technology through the ages. Describing the process and its effects on the design industry. Outlining the advantages and disadvantages of certain aspect in the electronic age in relation to design. Design magazine had numerous articles over the years that discussed this topic also and gave a wider view of the topic in relation to different designers around the world and their thoughts on the subject. This is where the point of view of designers is comprehended.

Chapter 1: Design Before Computer Technology

Before the introduction of computers all drawing and associated work was done by hand, from start to finish. This process was very time consuming and the completion of one project took a number of years to finish and test and then get onto the market. Taking the example of Ettore Sottsass, studying how he designed the first electronic typewriter for Adriano Olivetti in 1958. The job was given to Sottsass in 1958 but the Valentine typewriter (fig. 1) was not in production until 1969. A lot changes in ten years and the design itself could be out of date. As Sottsass himself once said:

> In 1958, the engineer Adriano Olivetti invited me to design the first typewriter to be made in Italy. For me, at that time, electronics were a kind of tragic, mysterious deity, and I designed machines that were completely enclosed with sheets of aluminium. And when after ten years the system was finally perfected, electronics became miniaturized and this system no longer served any purpose (de Noblet (ed.) 1993, p. 263).

Ettore Sottsass is a designer that got tired with what was there and decided to change to some extent the way designers were working. When he achieved this through many years of work with numerous products he continued to transform design. It was a slow process in which the product was designed in and brought on to the market. One would have had to be very much ahead of his time to have a good idea, develop it and then bring it to the market in ten years. With technology changing so rapidly a product like a typewriter in 1958, which the computer has now made practically obsolete, would have had to be very advanced in its conceptual stage. The process started with pencilled sketches and then the development process would be entirely completed by hand which is why it took such a long time to conclude one project. There was a tremendous amount of thought and care involved in the completion of a project because if anything did go wrong it would have been drastic and correcting it would have taken a lot of

painstaking hours of hard work and the time of completion would have been much more distant.

Fig. 1 The valentine typewriter with the bucket casing which it slots into.

Ettore Sottsass along with Perry King designed the Valentine typewriter for Olivetti.

> Carried by a handle attached to the back of the typewriter itself and covered by a Ferrari red, ABS bucket case into which it dropped, the Valentine was the first machine to attempt to treat mundane office equipment as a fashion accessory (Jones, 1992, p.64).

It was marketed as a desirable consumer product rather than a piece of prevalent office equipment. Yet there was nothing innovative about the technology in the design of the Valentine typewriter, it was all down to fashionable styling. This in its own right is quiet remarkable as it did take ten years to design and the fashion trends in the late fifties and early sixties were the most dramatically changeable of the past decades. This was an experimental project for Sottsass as he often pursued projects of this nature,

"...gaining a reputation of being years ahead of his time" (www.x-com.de/busstops/sottsassbio.). For this reason he succeeded in the design of this remarkable typewriter.

His ideas are rather conceptual and this is why many students are attracted to Milan to work in his studio. They are attracted by how he designs products differently and started the avant-garde design in Italy. His designs are short term and could be developed into something that could be a classic essential design.

> ...Sottsass attempted a fusion of technology, aesthetics and social philosophy. He was, and is committed to technology and its potential for liberating society, and he is not naive where it is concerned. He realises that to design the body of a calculator one needs to know and to understand how it functions internally, and yet he still manages to keep technology at arm's length in order to see how uninitiated users will 'read' the forms of the complex mechanical objects that surround them. It is the ability to combine both knowledge and innocence that makes Sottsass such a successful industrial designer (Sparke, 1982, p. 62).

Much design is going in this direction as less time is being spent on them but are required to be more complex. The role of the designer is seen as it is becoming easier with so many easy to use computer packages. But in fact it is more complex as many other aspects become involved such as engineering and graphic design.

In today's world of design, however, to take ten years to complete a project of a typewriter, without technological advance, would not gain anyone any sort of influential position in history or even a foreseeable future. Even though the Valentine typewriter did fail as a product

> ...because of technical mediocrity. Perhaps that's true. But its basic mechanism was market proven. In hindsight it seems instead to have been several decades ahead of its time, using technology fundamentally inappropriate to what was and still is a good idea (Jones, 1992, p.64).

Therefore the computer and its programmes have become an essential part of the designer in the work of today.

Before the involvement of computer technology on our lives the industry of design and innovation worked at a rather slow pace thus the extent of error was marginal, to have a product run according to a time plan. The procedure involved numerous drafting's of several concepts, each of which took many months work to complete to achieve an acceptable standard. Consequently the introduction of computers to the industrial designer allowed for an expansion of work to be accomplished in a shorter duration of time.

Chapter 2: The Development of Computer Technology for Designers

The industrial designer creates full-sized three-dimensional prototypes of products for reproduction by machine. This work is becoming less time consuming for the industrial designer because of computer technology. During the mid-1980s the gap between elite and commercial design narrowed considerably with the advent of microprocessors, a range of new products had to be given appropriate forms, while older types of products, now much reduced in-size, had to be substantially redesigned. Computer-aided design itself promised to transform the way designers worked. The 1980s will thus be remembered as the decade when computers firmly established their position in the commercial fields of art and design.

Computers slowly made there way into the workplace of the designer. The introduction of a variety of packages which conveyed a whole new aspect in design made the process much more efficient and beneficial to all involved. When the skill of using these computers and packages had been adapted the task of design and development slowly became easier. Along with this came a lot more pressure on the designer to conform with the tasks of many other professions, such as engineers, manufacturers and to an extent graphic designers, that they had not before encountered. This made the role of the designer change in some ways but at the same time the designer kept its own attributes. Initially the phenomenon of computers in the workplace was a vast jump in the deep end as all drawings had to be "put on file" and the task of learning the skill of their operation for some was terrifying.

Much learning has to go into the process of gaining knowledge of all these different computer programs and packages and they are ever being up-dated and modified which

a lot of the older generation are being scared away by or simply cannot take into their grasp the whole field of change in technology. A whole new set of skills must be learned in the disciplines which support product design. The methodology of the learning process in product design has changed immensely because of computer technology. To succeed in design these skills have to be learned and designers must work towards controlling the total environment which helps to define a product.

2.1 The Development of Computer Aided Design

Computer-aided design (CAD) has been called the "new industrial revolution", as it has revolutionised the way designers work and think about their input into the design process. In CAD, designers use specialised computer software to create models that represent the geometry and other characteristics of objects. Such models are analysed by computer and redesigned as necessary. This allows for flexibility in studying different and daring designs without the high costs of building and testing physical prototypes.

Computer-aided mechanical design is most often done with automated drafting programs that employ interactive computer graphics. Geometric information is entered into the computer to create basic elements such as points, lines, and circles. Additional constructions using these elements include drawing tangents to curves, creating rounded corners, making copies of elements at new positions, and much more. Elements can be automatically moved, rotated, mirrored, and scaled, and the user can zoom in on details. Computerised drafting is faster and more accurate than manual drafting and makes retrieval and modification easier. CAD systems have replaced drafting boards in thousands of design firms and are an essential part of a designer's studio.

Computer-aided design was initially introduced into the workplace of the designer to enhance the productivity. It was meant to enrich traditional methods, then slowly it became an essential tool for the designer in their work. Computer-aided design techniques are now a standard procedure in design practices. It was in the 1970s that the development of computer databases to simulate the three-dimensional aspects of design were derived in the University of Utah. This was primarily accepted into the automobile industry because of its efficiency over the traditional method. The responsibility in designing an automobile is horrendous, with the aid of CAD numerous layers and wire frames may be used in conjunction with the other facilities available in CAD to fulfil the project. This process made the design and manufacturing in the automobile industry easier for the purpose of drafting, modelling and testing materials and other functions that were before done by highly trained technicians.

Easy-to-use design systems are becoming available to meet the needs of today's designers and to enable them to work equally effectively in 2-D or 3-D. Autodesk, the world's largest developer of CAD software for the PC, has developed Autodesk Mechanical Desktop (AMD) with the challenge of uniting the 2-D and 3-D design process. AMD is a powerful, fully featured parametric solid modeller with nurbs surfacing capabilities, which can be used as a stand-alone product or as the hub for even more advanced third party applications.

2.2 The Development of Model Making Techniques

Apart from a few designers with the facilities to build prototypes, the majority have to rely on the ability to draw to sell their ideas to those who control the purse strings. This is hard for those short on graphic skills but long on ideas. Such ideas become less

saleable than those of the sharp operator, short on ideas but able to present the slick rendering. But nowadays the majority of this work is done with the aid of a computer.

Another representation technique that is gaining favour is called solid modelling. A solid model represents an object's solid nature and not simply its external appearance. One solid modelling technique builds up complex parts by combining basic shapes, called primitives such as boxes, cylinders, spheres, and cones. Realistic shaped images of the model in properties such as weight, volume, location of the centre of gravity, and surface area are calculated automatically. A computer technique called finite elements analysis can be used to evaluate the structural performance of the part when forces are applied.

Increasing emphasis is being placed on conceptual models based on technical, production and marketing factors to arrive at production specifications. The computer makes it possible to create and visualise various alternative solutions before making concrete models and putting the final product into production. "Desktop manufacturing", a relatively new process, enables a designer to fabricate a plastic model directly from data stored in computer memory. One such system uses a laser to fuse plastic granules together layer by layer until the model is achieved. Expert systems will help designers to consider, not only function, but also manufacturing consequences at early stages when designs can be easily modified. With sophisticated software, industrial designers will be capable of doing much of the work of manufacturing engineers.

"Working Model" is a full-featured Windows software package that lets one quickly create fully functioning "soft prototypes" of even the most complex of designs. This package can accurately simulate almost anything that moves - from an automotive door latch to an internal combustion engine. The possibilities are limited only by the imagination.

Models of future objects have to be created to varying degrees of complexity in the field of design. It is time-consuming and expensive to modify them. Moreover, most large models that need to be scaled down are not at all realistic, because of their reduced scale. To remain competitive in the 1990s, companies must respond quickly to market needs and deliver quality products at lower costs. Computerised modelling certainly allows the designer to produce quick accurate models instantly but to change the design and make numerous models can turn out to be quite expensive. "Solid modelling is still not widely used by designers, not least because much of the software is based on an engineering rather than a concepting paradigm. Make no mistake, rapid prototyping will force designers into a rethink about computer modelling" (Maier, 1994, pp 37-40).

The role of the designer is expanding because of technology. In the past, models could be bound together just by hand and eye and could be changed during the model-making stage quite easily, now because of computer modelling one is forced to work everything out in great detail.

> The advantage of using the computer is that it allows us to do so much more, so much more precisely. And as a result, the responsibility on the industrial designer is so much greater. The computer forces us to work out things we never used to do precisely in a GA (general arrangement drawing). Our role has expanded - we now have responsibility for the primary 3d computer model on which all else is built (Langton, 1985, p. 47).

2.3 The Development of Rendering Techniques

Colour rendering is another area of industrial design where the computer is taking over. Through the use of 3-D studio almost any pictorial image may be stored in a computer and manipulated and rendered according to the users wishes. Almost any computer may be used to generate pictorial images (fig. 2). All that is required is a graphics software program and input-output devices adapted to the nature of the images. A basic PC system, with a keyboard and colour monitor, can execute fairly complicated graphics programs, making it more accessible to any designer to get good quality graphics for simple rendering's or for presentations. Other input-output devices, such as printers, colour plotters, electronic sketch pads, and video cameras, can enhance the computer's graphic capabilities.

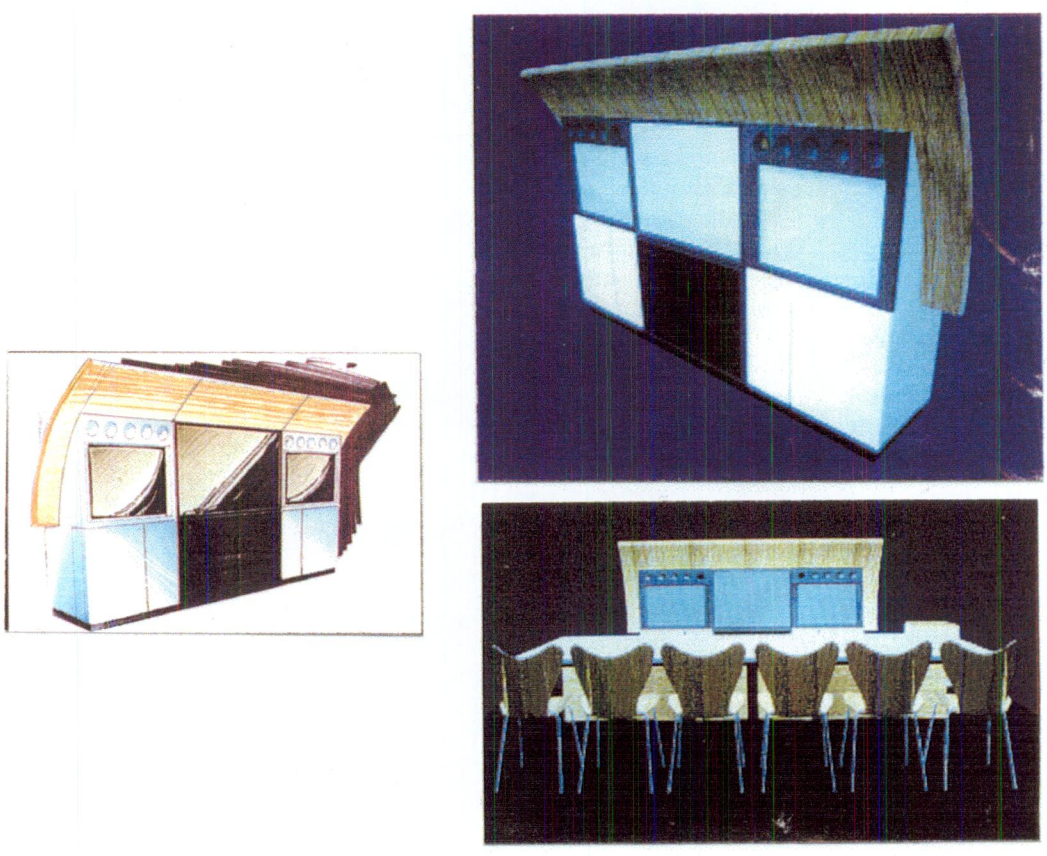


Fig. 2 The difference between a hand rendering and a computer generated rendering.

Electronic "paint systems" use a palette on which the designer renders the image with a stylus or light pen while watching a colour television monitor to see the actual image being produced. The colour monitor will also show the designer a wide selection of colours, a variety of print fonts, and various shapes such as circles, squares, and triangles.

External images can also be entered through a video camera and digitised, so that they may be altered in size, position, or coloration. The more-advanced graphic systems will also permit animation of the images to form a moving sequence. This program is very helpful in the demonstration of a new product or idea, also an important part of a good presentation.

The increasing use of electronically generated images presents an opportunity for any designer with good ideas to show them as highly finished rendering's - which are also workable because they are built in a mathematical form. Yet the essential requirement for three dimensional electronic design systems is that should not form a barrier between the idea and the translation. But the term "user friendly" has been widely misapplied to nearly all the systems devised so far, these are generally regarded with a high degree of suspicion by those brought up to express their ideas with pencil and paper. To meet the reservations of the average designer Evans and Sutherland have produced their CDRS (Conceptual Design and Rendering System) which is a quick and easily understood additional tool for general use in the design studio.

In spite of its complexity, the three-dimensional computer model is becoming an impressive and powerful new tool. When used effectively, it can provide a new

relationship between designers who think in three dimensions and their designs. The three-dimensional computer model has become the touchstone of many industrial design practise.

Quite a lot of items are going digital lately, for instance the camera. The digital camera has been around for years but were very expensive. On the market at the moment are digital cameras that are affordable. Images are saved digitally and can be viewed quickly on a computer, if not instantly in a built-in display on the back of the camera. This allows one to save the images that are want and delete the ones that are not. One need never think twice about taking too many shots of the same subject. Until now, the biggest drawback to cheaper digital cameras has been the poorer picture quality delivered by grainy, low resolution detail. However, advances in technology are constantly pushing storage boundaries so that even the cheapest digital cameras will eventually offer remarkable resolution. They are of course "user-friendly" as well as computers. They can store up to two hundred shots at a time which can be downloaded onto a PC or Mac hard drive. These can then be incorporated into presentations, documents for printing, or even recorded onto a video tape. They make the whole process more efficient and cheaper. Presentation techniques are now unlimited with the technologies racing to the market every week with something better than the predecessor or even a new concept.

Chapter 3: The Integration of Computers into the Work of Industrial Designers

Two aspects of a personal computer have changed the working lives of designers. The first is desktop publishing, which has brought professional level graphics to the average PC. The second is a generation of drawing programs which allow the individual to perform tasks which were once restricted to expensive, and often highly unionised, print shops. For an outlay of well under ten thousand pounds, any designer can now proof and design professional-quality full coloured rendering's, technical drawing's etc. and then, when the job is finished to the clients satisfaction, send the files to a printer where they will be processed and turned into final concepts. When the work is approved by the client they may receive it within hours of approval. Whereas up to a few years ago it took a long time, and the quality wasn't as good. Today the designer themselves can make sure everything is right before it goes to production.

3.1 Designers No Longer Work Solely with Pencil and Paper

Computer technology has changed the way the designer works immensely. Up to a few years ago, when a student graduated from art college the primary tools of their chosen profession, industrial design, were the same as they have been half a century before: pen, ink and a standard array of physical drawing tools. Today drawing boards stand in corners of studio's and in there place are computers, an essential tool in a profession that has raced into electronic design over the past few years. The computer has become very important for the industrial designer, conventional design work has just gone out of the window. It takes too long and it's too expensive.

Working with pencil and paper has not yet been completely abandoned, the initial stage of the design process is still done in the traditional way. In the initial stages of design

work pen and paper are still preferred (fig. 3) by the majority of designers. It is found that to put things down on paper the ideas run more freely and efficiently. Although this does create problems as the pages have a tendency to be scattered around the working area. After this stage the involvement of the computer is extensive.

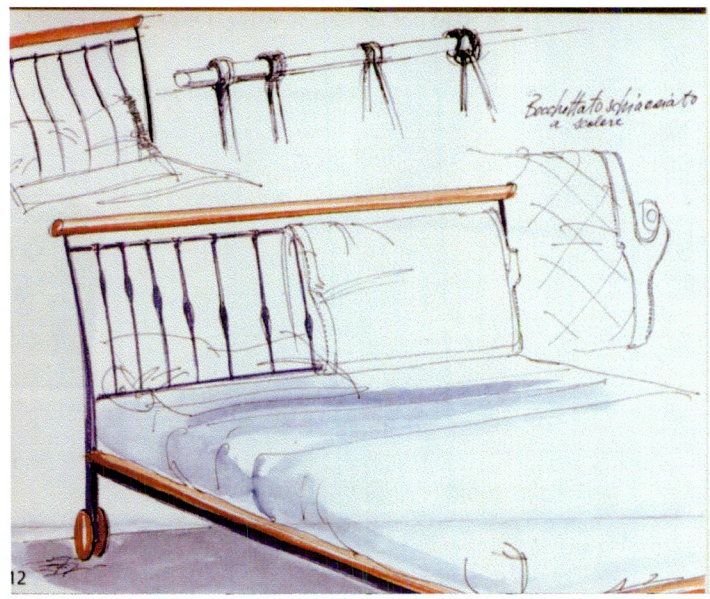


Fig. 3 Concept of a head-board of a bed by Giuseppe Casarosa, 1996.

In 1986 the Ford Motor Company started to use CDRS to reduce pre-production times. The Ford Fiesta was the model that the chose to work with. In 1993 the first results were evident (fig. 4).

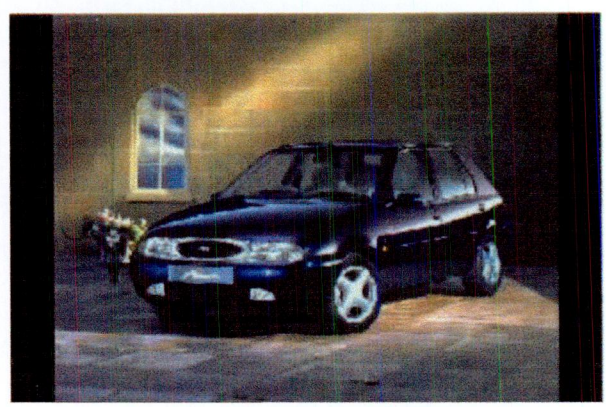


Fig. 4 A computer generated rendering of the Ford Fiesta developed on CDRS.

The Fiesta is basically a re-body on the existing model. The new model is a curved version of the older one. This is made easy with CAD/CAM. Curved lines are introduced by sweeps the use of a node point which can move freely around the screen, influencing the lines curvature, or alternatively by the use of an extendible cursor which tightens the curvature of contour lines as it is shortened.

The shapes of cars at the moment all seem very much similar which is blamed on the use of electronically generated design. The quality of presentations has improved due to CAD and electronically run renderings, but this also disguises some inadequacies. This is how designers make their designs look amazing and sell their ideas.

So much has been achieved in design relying on brain, pen and paper up to now, computers and their operators face a huge challenge from part successes of the old methods and total acceptance of this new method will only be proved by time. It is certain that speed of design, calculation and finalisation is obviously achievable by computer. Whether the creative and imaginative powers of the human brain can be totally replaced still remains to be answered by competitiveness and demands of the future.

New computer technology is currently revolutionising existing forms of dialogue between people and computers: Virtual Reality. Virtual Reality makes three-dimensional computer graphics possible, thus creating extremely attractive perspectives - both for visual simulation and for dialogue between people and machines. It is already possible to take a trip by Virtual Reality into houses, offices, furniture, objects, workplaces and lighting conditions and experience them before they really exist (fig. 5).

Designs can be tested, modified and optimised in the planning stage without loss of time or materials. All possible colour versions can be simulated interactively by the system. Professional designers can therefore alter layouts, examine the colours and materials of the object, define the texture of the different components and even portray photographed parts in their future positions to test the effect they achieve. The effect of daylight or whether computer workplaces are glare-free can all be checked in advance also.

With Virtual Reality it is possible to create a perfect draft design of an object very quickly. Virtual Reality has many advantages, some of which are - all objects are portrayed and react in three dimensions, - it is possible to make objects interact, i.e. to create dynamic simulations, -the user can participate in any phase of the virtual scene and - objects can be observed either as "mice", close up, or as "giants" from a distance. The whole area of Virtual Reality has opened up new domain for the industrial designer, with a broad scope for extravagant presentations in much less time than previously required to complete.

Fig. 5 An example of Virtual Reality.

3.2 Time and Cost

In this era of short-term thinking, products of a long-term envisioning must be applied. Using a computer is much more time and cost efficient. Designers can now complete a job within one week as did Martin Brady in designing a hand mixer in just one week (fig. 6). "Designed, developed and approved in one week, using computer-aided modelling and rapid prototyping techniques. Production units were available in just eight weeks" (Caffrey, 1996, p. 6).

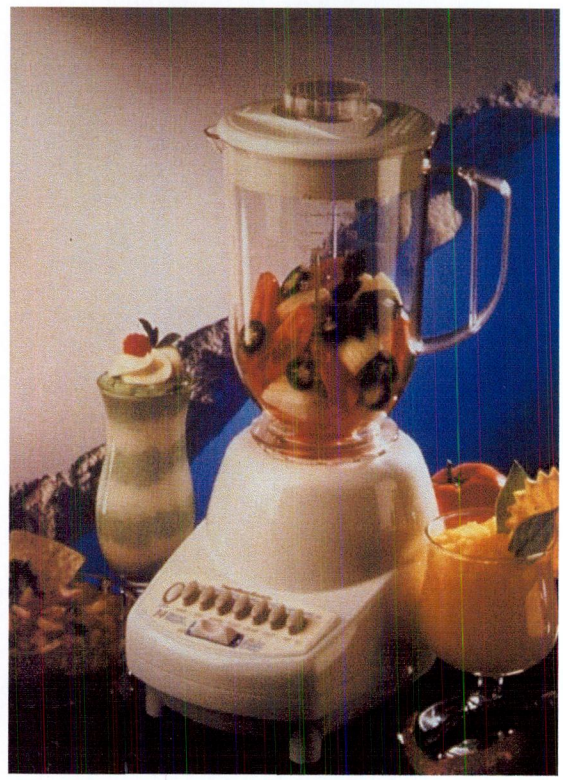


Fig. 6 Blender designed by Martin Brady.

The realities of the impact of new technology on the way designers work is changing in many different ways both good and bad. Now there is much more work involved in the role of the designer. There is an increasing amount of pressure on designers to produce products more efficiently and this leads to more pressure on the designer to design much more products in a much shorter space of time than ever before. This means that

role of the designer. There is an increasing amount of pressure on designers to produce products more efficiently and this leads to more pressure on the designer to design much more products in a much shorter space of time than ever before. This means that there is less time going into the thought and development of designing leading to bad design. Not necessarily bad aesthetically but bad in its function, or vice-versa.

A tremendous amount of products presently are made from plastic because it is cheaper to produce and to sell it also allows great versatility with the design of the product. But shiny plastic products look terrible after they have been scratch or used on a daily basis. Today's objects are made to look good on the shelf and shine nicely to catch the consumers eye. The problem with today's design is that form and colour are the most important aspect.

Each year designers feel that they always have to be doing something so they recycle old ideas and change the aesthetics leading to non-originality and non-design. It is non-design because the products are designed in such a way that they are pretending to be beautiful, have meaning and attitude but in reality do not. The products of today have no meaning but enormous amounts of visual appearance demanded by society. Products must gain meaning once more.

All the advantages in technology seems to be saving time and making it cheaper for the consumer in the long run, the computer has changed the design process and the way designers work immensely. Today designers work on a computer the majority of the time, because it saves them a lot of time and money, which is very important in today's industry to be efficient in one's work. The use of computer-aided design is extremely

accurate which is vital when it comes to manufacture because everything is computerised and needs to be highly accurate.

In the end, it's time-to-market that will make or break one's product. Not time-to-design, not time-to-analyse, not time-to-manufacture. To remain competitive in today's market companies simply must respond quickly to the needs of the user and deliver quality products at lower costs. Change is necessary to survival. Technologies which enable real enhancements in product design and manufacturing cycles are what are needed. Packages such as Silicon Graphics are beginning to recognise this and developing programmes for the designer to speed-up the whole process of getting onto the market efficiently.

While computer technology brings great benefits to the industrial designer it can also cause problems. The main disadvantage being cost. To buy all the latest equipment and keep it up to date can be very costly. Over ten years ago if someone was needed to do some extra work, all that was needed was some space in the corner. Today they are going to need some expensive computer equipment just to get on with the job. The development of computer software is what makes the computer industry have continuing high costs.

Each year several new packages are up-dated and each company wishing to be on the competitive market must purchase these and keep there equipment up-dated constantly. This is a very expensive procedure but a step that has to be taken for today's competitive designer. With these packages the graphical designer is becoming

unspecialised and many people in other professions see it being achieved in their own office on their desk-top. This is what technology is changing.

Another minor problem is that computers have a tendency to "crash" or break down and loosing many months or even years of valuable work that can not be replaced or would take even longer to restore. Also with the rise of the Internet your privacy might be threatened with hackers finding personal information that may be stored on computers in banks, government offices, personal computers etc.. Another disadvantage is that there is less interaction between individuals. People will not have to meet face to face for much longer because all transactions will occur over the Internet or a form of telecommunications. Even in the office or studio each computer is operated by an individual, making everything more individualised.

These disadvantages are only a minor thing to consider, in reality these problems are being considered everyday by computer manufacturers and they are trying their best to overcome them. Some people would say that not being able to type was a problem but everyone can learn this skill in time or IBM have come up with a solution. Voice type dictation has come to the rescue. Without touching the keyboard one can produce typed words on screen merely by speaking into a microphone on a headset. This new technology opens up unlimited vistas of communication possibilities for all those who, perhaps through disability, are simply not dextrous enough to type. The computer alone opens up a whole new field for disabled or handicapped people in every walk of life.

Chapter 4: How Technology Effects the Way Designers Work and Think

There is an increasing emphasis on being computer literate going into the work-place now, as it is difficult to find a design that does not use a computer system for creative work in one context or another. Computer-education in second level is becoming very popular, as is in third level where it is almost necessary.

The way in which designers work and think has changed to a certain extent. Before the introduction of computers into the studio of the designer the output of design was of a rather linear form. Whereas since the involvement of computers the output has been of a much more curved format. This is because of the ease and efficiency of this technique to use with the aid of computers and model making processes.

4.1 The Difference Between Graphic Designers and Industrial Designers?

While both the industrial and graphical design students are in college they learn basically the same skills. At third level in an industrial design course students are firstly thought how to draw, render, model making etc. then thought how to use CAD, 3-D studio and other such processes. By learning in this way their train of thought is of a three dimensional form. Today's students who graduate have had practical experience in the use of computer tools; many have gone on to gain influential positions in design organisations, where they have invested in the technology. Since industrial design graduates are trained in a three dimensional way they often are preferred over graphic designer graduate for a position in computer graphics, for example, in advertising on television and other areas of the multimedia. Today there is very little distinction between an industrial designer and a graphic designer the industrial designer has a three dimensional mind where as a graphic designer works with two dimensional design.

Even that is becoming more common between them because they are both working on a two dimensional screen anyway.

The graphic designer is loosing its role in the design profession. The role is being incorporated into other areas, such as industrial design. With so many packages available the smaller business person can now customise their company with logo's, stationary and advertisements with ready to use templates. Industrial designers also design the graphical information on some products, skipping the step of the graphic designer. The area of development for the graphic designer is in the world wide web. Graphic designers are going into this area designing web pages but this is not solely for them. Computer programmers and every field of design is taking the opportunity to work in this area.

4.2 Has Technology Limited the Ideas of Designers?

It has often been claimed that the computer cannot be used by the industrial designer as a tool in industrial design - it is said to restrict artistic creativity and freedom. In reality, however, while the computer cannot replace any of the industrial designer's qualities, skilfully used it can be a useful tool. Vision is perhaps the first prerequisite for successful design, and vision is also important in utilising the capabilities of the computer. The computer has not changed the way the designer thinks to a great extent. What designers were doing before the introduction of computing they are still doing. The kinds of drawing and modelling employed are still conceptually the same, and the affect of computing on the nature of the final product has been marginal. The process by which products are conceived and represented has simply moved from traditional materials to electronic ones. The introduction of the computer into industrial design

was required to close the gap between reality and the illusion displayed on a two-dimensional surface. In order to do this, it had to understand fully in three dimensions, otherwise it would not know what to do when asked for a different view of the object. The designer only needed to make the object look real from an angle, but the computer data base had to simulate all the dimensional properties of the real object.

Computing is approached as a medium in its own right. The medium of computing throws up the possibility of entirely new disciplines, demonstrating the full potential of the new technologies. When it is used unconventionally within design to explore the limits of what is possible and desirable, the computer as a medium is taking designers into new areas of work that require very difficult attitudes and skills. To create some pattern these new areas have been divided into two groups. The first consists of multimedia, virtual reality, interface design, and design for visualisation. The second group includes rapid prototyping, digital publications, and neutral networks. All of these represent particular views of the design future, occupying areas in the overlap between art, design and computing. This division is intended to clarify the contribution they have made redefining the boundaries of design expertise.

The impact of computer technology on the conception of objects and product aesthetics has not made much of a different to the industrial designer. The industrial designers mind works in the same way as it always has and computers can not change this. Their concerns are purely with the human factor in design. The designer acts as the representative of the user. Their task is to adopt the product to the most appropriate form from the user's point of view, with the main emphasis on aesthetic form, functional properties, and ergonomical aspects. From the consumer's perspective, the

industrial designer contributes to the quality of the product. From the manufacturer's perspective the quality thus achieving is an important factor in competitiveness. Their inherent visual skills, their ability to synthesise, as opposed to analyse, their understanding of the needs of end-users: these qualities mean that they have a vital role to play in supplementing the efforts of the natural sciences, which have so far failed to provide new and ingenious solutions to the problem of humanising the technology.

The role of the designer is now more complex than ever before. Each year new packages are being released and designers need these to succeed in today's rapid growing market. The computer technology movement is growing so rapidly that designers have not yet been able to fully cope with it and use it to its full advantage successfully. The design of the past ten years, in particular, has been rather bland. This is because designers are becoming less aware of what the user wants and needs. Designers of late have paid too much attention to aesthetics rather than function as is seen in much of the designs being produced by Alessi and Starck (fig. 7). The function of the product is what should be of the utmost importance to designers but is being ignored to an extent. The pressure to produce products and get them onto the market so quickly that the function of the product is not getting the attention it should be. Instead aesthetics are being dealt with to sell the product, if it looks good it will sell. As Philippe Starck stated:

> Look at that object, it is manifestly excessive. So react, ladies and gentlemen, and play therefore let us invent new things; let us reinvent our lives. In fact, I am a true functionalist and I know what my objects are for. My Lemon-squeezer for Alessi (fig. 8) has never been used to press any lemons, just maybe to start up a conversation between the young bride and her mother-in-law. My first chairs, like the Dr. Sonderbar, which you couldn't actually sit in, were never made for that purpose, but to signify their belonging to a certain cultural family (though I find starckmania ridiculous). I work more as a semeiologist than as an aesthetician. I flit from one medium of expression to another (a chair, a house, a

boat, a toothbrush), only to show that things can be done differently (Burkhardt, 1998, p. 87).

Fig. 7 The inappropriate designs by Alessi and Starck.

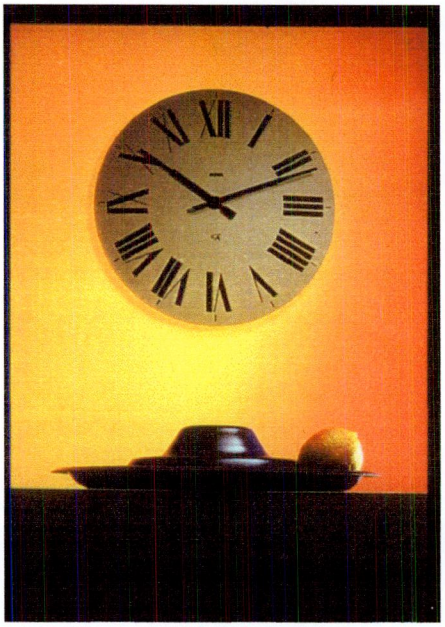


Fig. 8 The unusable lemon-squeezer by Philippe Starck

One reason for this turn in the design of products is the lack of communication between the designer and the end user. Communication between the designer and user is less and less, even communication from one designer to another is minimal. This leads to

dull bland design. Design is not a science but is a social activity, designing for people. Designers need to keep in touch with the users to fulfil 'good design'.

Some of the traditional methods like the initial stages will stay for some time as designing is not a physical manifestation but mental. While sketching the designer is thinking about the products function, environment and end user. Whereas if brainstorming on a computer thought is placed on how to physically draw the product on the screen rather than thought being placed on the product itself. When designers were in an environment designing in a shared studio space their surroundings were much more comfortable and discussion of various products took place regularly sparking off numerous ideas. This scene is now disappearing with designers communicating with their computer and with people via the Internet. The loss in communication is concluding in a dull, boring format of design.

4.3 The Difference Between Pencil and Computer Aided Design

The ongoing question of pencil-aided design versus computer-aided design still haunts industrial designers. It all goes back to how the final product will look in a presentation. The preliminary product concept presentation to a client is obviously crucial, since whether or not the client is going to award the project to that designer is likely to be based on the quality of this presentation. Designers have been trained in producing polished handmade rendering's, which they spend too much time doing, when they should be solving design problems. Furthermore, the design cycle becomes needlessly long, since the model's visualisation cannot be accomplished until the design is ready. CAD has helped to combat this problem of the time factor in drawing and is also more accurate. When designs are drawn to scale on the drawing board, the

perspectives would often change during assembly. Small alterations in the design would solve both the problems of limited precision and repeated drawing.

The objective in using CAD was to get around the restrictions associated with traditional methods of creating visualisations. Especially with the larger designs, such as workstations, it is difficult to realistically judge designs on the basis of rendering's of one or two time-consuming coloured positions. It is therefore difficult to conceive the client before a prototype has been constructed. A simple animation would be ideal if it could be played on a platform to the client. Designers that require visualisation of a three-dimensional structure, 3-D studio offers surprising competition to the pencil.

The computer has changed the way a designer works because today they are totally reliant on computers to generate their drawings. It is much easier to draw and even think in a three dimensional way with the aid of the computer. The impact of computer technology on product aesthetics has changed. Objects have become much more rounded in past years because of technology. The process to draw an object of many different curves has become so much easier in modern times on CAD. It is also easier to manufacture rounded objects and much more economical.

Computer technology has not completely taken over yet. The primarily stage of the design process is still done by hand, in most cases. Sketching helps the designer generate new ideas. There is much more freedom in sketching the initial concepts and ideas flow easier.

> Sketching with a mouse is unwieldy and inaccurate. The results are unpredictable. You cannot model smooth curves with sharp corners in them. When sketching on paper you do not think about a "sketch-plane"; so you

should not have one in the FSD (Fast Shape Designer) either, it is distracting (Van Dijk, 1995, p. 73).

Chapter 5: The Great Versatility of the Designer in Industry Today

Our tools are so portable and powerful, and our data is so transferable, that there is tremendous freedom to work where and when we want. In addition, we have discovered a whole new form of travel and ways of meeting people in totally new spaces. Through the use of the world-wide web a very small business with only two people working in it can now be on the world-wide market. The world-wide-web is a colourful, visual interesting way of displaying information. It is enjoyable to use and very appealing to the user. The Internet has also cut a lot of the costs in a business. To inform a large number of people of a situation the information can be put on the Net, which cut costs of postage and time greatly.

5.1 The Internet

The latest opportunity for the technically minded designer is the rise of the Internet (fig. 9). In the past designers used to post files and models, which was costly and unreliable. Now one can simply file them on the Net site by a service provider and leave them there to be picked up by a fellow designer or a client. The Net is also providing to be a vital communications medium for sending e-mail and proof files, and a source of design work in itself. More and more Web sites now resemble electronic magazines. Packages such as Quark XPress are starting to develop the ability to save conventional publications as electronic versions that can be uploaded directly to the Web.

The Internet is making it so much easier for any kind of business person to set-up their office any where in the world and communicate to anyone anywhere around the world. The mobility of any designer these days has come a long way in the past ten years, with mobile-telephones and lap-top computers. A designer has nearly every thing they need

now in their briefcase. They can travel much more and keep in contact with all clients through the use of faxes, mobile-telephones, e-mail and the Internet.

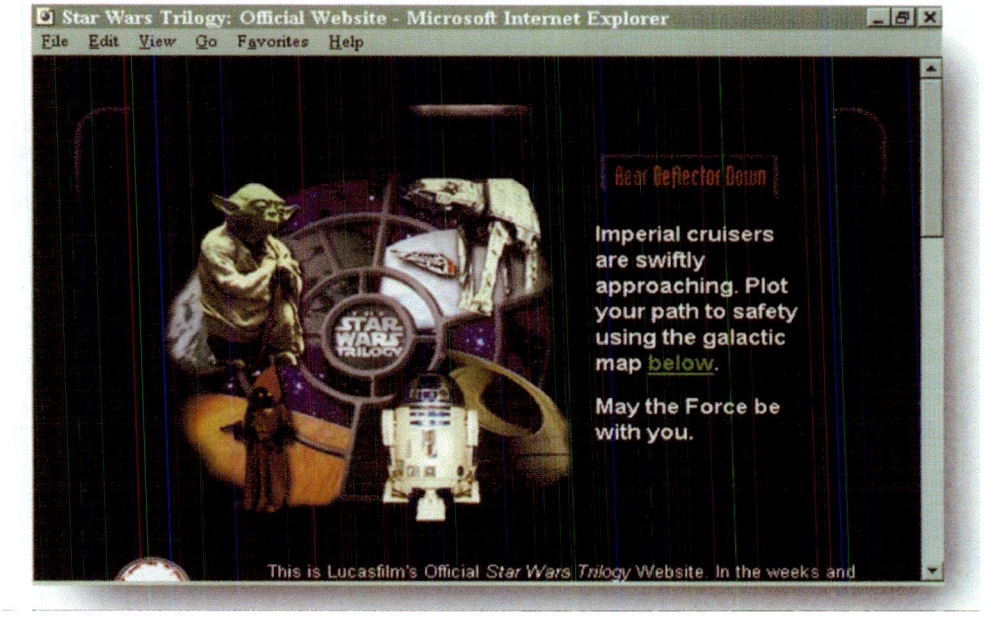


Fig. 9 An example of an Internet page.

Everything in the near future will be related to the computer in some way or another, as the PC becomes ever more popular along with the Internet. Today's PC can perform many minor miracles in offices of all sizes. The Internet has boosted a lot of business both large and small alike. By putting one's designs or company on the Internet the savings made are quite surprising. There is no more large costs to produce glossy brochures that would probably be thrown into a back room somewhere anyway because of items changing on it. Now the content can be stored on hard drive where changes may be made if required and printed as needed. Clients can also be contacted anywhere around the world within seconds. The Internet also makes ones business world wide while they may only have a very small office with a PC and be self-employed. There is unlimited scope with the Internet; its fast, reliable and cheap.

5.2 The Mobile Telephone

The mobile telephone is becoming everything that is needed in a basic office of today with Nokia's latest development. The Nokia 9000 Communicator (fig. 10) allows one to fax, e-mail and web surf as well as being a mobile telephone. Everything one needs in ones pocket. Developments are ongoing with this product, the latest concept entails services such as mobile video calls and the ability to telephone a favourite movie that can be then viewed on the handset screen. The portable telephone is also decreasing in size but has not, as of yet, decreasing in price. One example of this is the Motorola "Star TAC" which has not yet been released onto the market. It weights less than 100 grams and is so small that it may be worn as a pendant and has a discreet vibrating alert. But the cost of this spectacular piece of technology is £1000.

Fig. 10 The Nokia 9000 Communicator.

Thanks to the portable telephone, more than anything, it allows the designer to be more versatile and work from any location. The mobile telephone was one of the first pieces of office equipment to go portable. This allowed designers to be contacted whilst they

were out of the office or travelling abroad etc.. The scope is now unlimited for the designer to work in a chosen location and still be contactable at all times. Which leads to the new notion of the development of the home office.

Chapter 6: The Way Forward

Indeed the way forward is fast approaching us as there are great pressures enforced on designers and technologists as the year 2000 approaches us. For the better part of this century the year 2000 has been the signpost to "The Future" a four digit code for people wearing coloured cat-suits, driving glass bubble cars and travelling by those widespread monorails that we now should be nearly finished building to fulfil what was expected of us future-dwellers.

Designers have ever increasing pressures to gain more knowledge of the Information Technology Age. The amount of products that we come up against each day that belong to futuristic technology is unlimited. The beneficial side for the designer in this is that all these products have the need to be designed by industrial designers. This means that the designer of the future will have multitudinous tasks to deal with, like the information technology sector to start with. The role of the designer is ever increasing and more is expected of them all the time but so far it has been very advantageous for the designer to gain all of the information of the exceeding technologies of today's world. The competition between all the companies to advance the way we live today and sail swiftly into tomorrow's world is creating immense amounts of work for the designer, all of which will see the designer sailing happily into the future.

6.1 The Home Office

Growth in technology advances in every sector particularly in the home which can now be used as a workstation, that we will seldom need to leave. Everything that one needs will be accessible by the use of the Internet. Goods can be purchased and delivered to the door, speak to friends via e-mail, entertain and inform ourselves via multi-satellite

and digital television channels. Perhaps most enticingly, the leaps and bounds in communication technology beckon us towards a time when we will all work from home and seldom, if ever, have to commute into an office. It means we could live anywhere we desired, and for many that invariably conjures up a picture of life in a rural idyll - living the good life from a telecottage in the country, keeping the money rolling in via our ISDN links to clients or to the office in the city and keeping everything urban at arm's, or rather modem's length. But it's a romantic and not entirely accurate notion. The explosive growth of the Internet, with its capability for video and audio conferencing, electronic mail and access to databases, is making it possible for many workers to consider re-basing themselves at home - a field day for designers.

As the trend to work in the home is increasing with great speed, so is the size reduction of the needy equipment, and the combination of previously separate activities. Prior to this, it had been the case where large pieces of office equipment looked very much out of place in the home. There was just so much of it and it was all so tremendously cramped - cumbersome photocopiers, phones, faxes, computers and so on. Now the nightmare of the spare bedroom being embellished with chunky casings of grey plastic and trailing cables are finally beginning to subside.

The idea that technology can allow us to escape the daily grind of city life for the country life may be true, but it could also help to revitalise our cities. With less commuting, the metropolitan centres will free themselves from the human gridlock of the nine-to-fiver's and, with more people moving into the city centres, it is likely we will see a halt to inner-city decay as restaurants, bars and shops seek to capitalise on this new clientele. Perhaps one day we will look back, laugh and shake our heads when we

remember that, as part of our every day, we used to waste so much time and energy trapped in little steel boxes that took us to a place we called work. We even had names for it: 'rush-hour' and 'grid-lock'.

The housing that the majority of working people occupy today is turning out to be pretty useless at accommodating home working, or many of the other technology-driven changes that are upon us. The problem is, not everybody has a home that can readily accommodate such a way of working, and only a handful of developers have so far acknowledged the need for houses capable of acting both as places to live and as centres of economic activity (fig. 11.1, 11.2). Even in an age of silicon chips and digital communications, there seems little evidence that the people who design, build and buy houses have much in the way of fundamentally fresh ideas. Visit a development of new houses and one will see an industry caught in a time warp. Other than making space for the obligatory mod cons, the sorts of houses being built, and apparently most in demand, are steadily traditional.

Fig. 11.1 A place to live and a centre of economic activity.

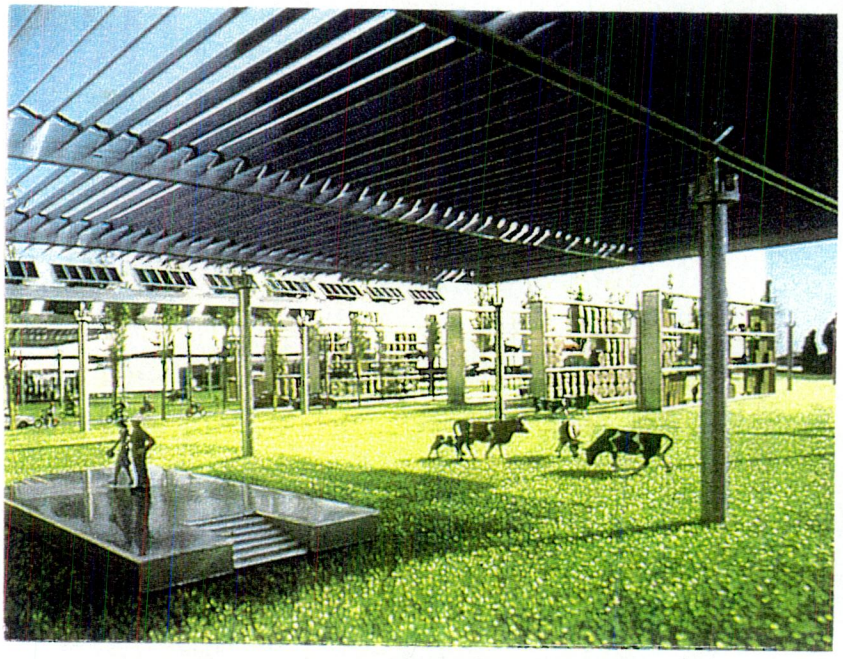


Fig. 11.2 Housing of the future.

The vast development of office space is making it easier and cheaper to set-up office at home, with everything one needs to have an efficiently run business in today's world. The gadgets one needs to fax, photocopy, scan, print, process and talk with are all decreasing in size and price and are available to purchase as one piece of equipment and not as before where each was individually sold and was enormous in size and price. But the latest OfficeJet Pro from Hewlett Packard (fig. 12) offers the consumer a desk-top option including all of the above facilities for the very affordable price of £740. Computers are also seeing a change as they are now available with larger screens and are much narrower in depth, so narrow that they can be hung on the wall like a painting as can the new televisions and hi-fi systems from the Bang & Olufsen (fig. 13) and the Philips ranges.

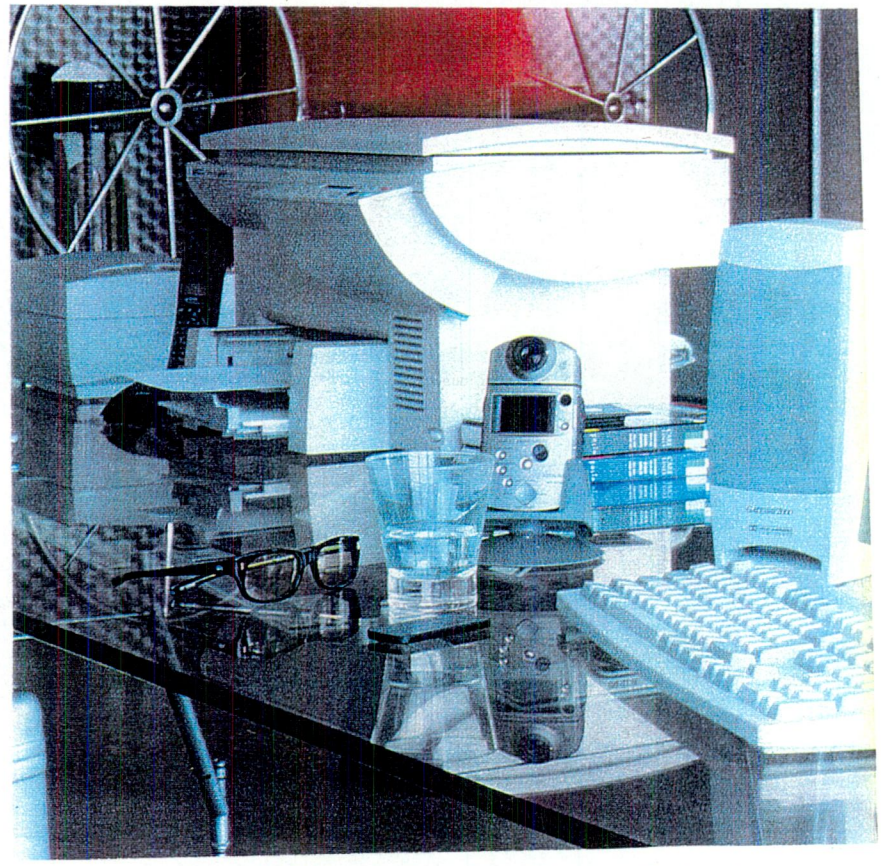


Fig. 12 OfficeJet Pro from Hewlett Packard.

Fig. 13 CD player by Bang & Olufsen

How the technology of the home office will change over the next 15 years or so is an open-ended debate, and will depend on how communications and home-networking standards change. The future may lie with the network computer, an inexpensive and effectively neutral PC that accesses all the software one need s from the Internet. If that doesn't take ones study into the next millennium, the widely touted concepts of holographic storage (terabyte technology that can three-dimensionally store the contents of a video library into the space of a sugar cube) and light-emitting polymers (intelligent plastics that could form roll-up computer screens and programmable wallpaper) will.

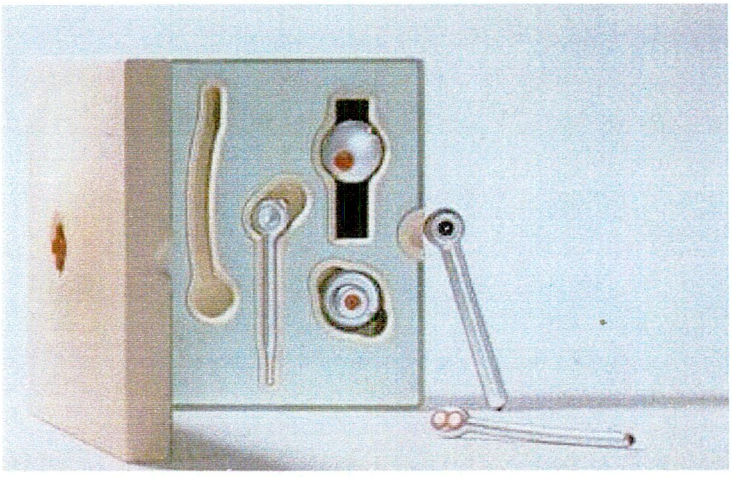
6.2 Philips' Corporate Design

The Philips company have taken on a new image of late that is going to take them into the year 2000 and well beyond. This is an ongoing exhibition, in Eindhoven, intitled "Vision of the Future"(fig. 14). Their brief was about people being the core element in design not solving the problem on a personal level as a designer as is what often happens. It was about solving actual needs and problems and provide user benefits. Moreover the concept had to be feasible five to ten years from now. They saw a gap in the market that "large companies didn't have a real sensitivity as to the effective qualities of people: their aspirations, dreams, hopes, and desires in this coming period. It is very much a technology, driven situation" (Khoidi, www.design-inst.nl/publications/4wm/feiz.html). From this they developed numerous products that are now on exhibit and are going to influence possibly the majority of products to be designed in the near future.

At Philips Corporate Design they realised that the technology to bring us into the next

14.1

14.2



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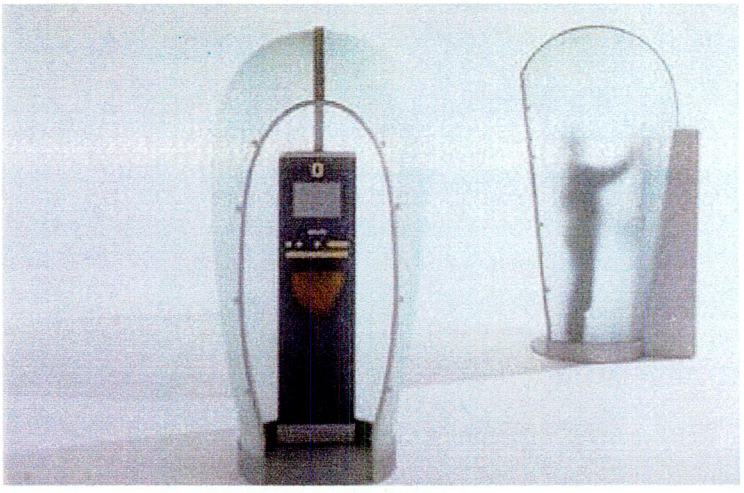

Fig. 14 A small selection of some of the products developed by Philips Corporate Design.

14.1 Emotional containers that have a screen, loudspeaker and scent compartment. They carry a special message that may be played back on screen with sound to the receiver of the gift.
14.2 A medical box with video link to a GP. It features blood pressure wrist band, electronic thermometer and a stethoscope microphone which are accessed remotely, via a wireless link, by your doctor.
14.3 A multimedia kiosk that offers banking services, large screen videophone, printers and access to numerous booking and other information and communication services.

century was there but the need to develop it is growing. They also realised that a lot of improvement was needed from the area of the industrial design, the technologies are there but to take advantage of this and use them in the correct form is the problem that many designers face today.

> The opportunities presented by technological development, the increasingly complex needs and the continual supply of answers, are sometimes useless and actually harmful due to their even excessive choice (who actually uses, let alone really knows about every possible option offered by a videorecorded, stereo, washing-machine or television set?). So they call for a more articulate approach than the traditionally proven one. And that implies the existence of a single antenna, the designer, appointed to pick up, filter and encapsulate in the "right" product the signals of his or her time (Zanco, 1996, p. 67).

There was sixty products devised by Philips for the year 2005 and were developed to a point of giving them a concrete shape, with ideal performances realistically connected to an inventory of technological feasibility's. These sixty concepts are now cropping up in practically every design magazine that is being published. In time many of these products will go into production and will be very successful indeed, not surprisingly as the results were quiet astonishing in comparison to what other companies produced for the same exhibition.

6.3 No Personal Contact

It is not outlandish to believe that by 2025, half of the white-collar workforce could be working at least some of the time at home, with some visiting the traditional office

perhaps only once a week or even less. There is no reason why those working at home should have facilities inferior to those they would enjoy at an office. This leads to the future workforce trapped within their lavish homes come offices, with every transaction occurring over the Internet and its counterparts. To go out and socialise with people face to face is going to be a wondrous occasion.

Increased mobility has weakened our sense of community, of belonging to a particular place and work calls for flexibility. All of this means that the search for role-models and new qualities of life is never-ending. The society of the future is going to have to be socially balanced. There will also be a greater need to concentrate on the basic values and qualities of our lives.

Conclusion

The bottom line in today's competitive markets is that there is an enormous amount of pressure for design companies to improve quality and decrease cost and time to market. The area of computer technology is vastly accelerating its pace designers must keep up with this pace and try to pass it out to achieve fundamental design. Rather than the design that has been thrown out at us recently. Design of the future must not just be another study of electronics enclosed in a plastic form. It must transcend technology and create a unique, personal product with affection and beauty.

In the future designers will be designing products that have technological advances that will be achievable in ten years succeeding their design. The clock will turn where engineers and technicians will be availing of the promising technology that designers have imagined in their products. As has happened with Philips Corporate Design.

In the past twenty years computer technology has come a very long way and has made life easier for a lot of people. The cyberspace movement has been so far a very fast growing movement, which leaves us to ask the question of what does the next twenty years hold in store for us?

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