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Design

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INTRODUCTION

I

[Print Preview of Section](#)

Design, (noun): specific plans, drawings or instructions that contain all the necessary information for the manufacture of a product, process or system; a particular physical embodiment of a product or device.

(verb): the process of converting generalized ideas and concepts into a design as defined above. .

“Design” as both a noun and a verb is a popular, and often misused, term for a wide range of activities and outcomes. It can be both process and product. The difficulty of defining “design” is compounded by fashion and trends. The more popular it becomes, the more it seems to be applied to new activities and outcomes, not always correctly, in order to convey messages of quality, value, status, inventiveness, exclusivity, skill, and modernity. One may refer to the design of supersonic aircraft, mobile phones, art works, television programmes, new cities, computer software, jewellery, clothing, food, packaging, and signs. The list could take up several pages! Even the outputs on the way to these finished products - the sketches and prototypes - can be considered as designs.

Used as a verb design is a conscious activity, guided by aims and objectives. Designing refers to planned and organized actions intended to bring about some predetermined outcome, although there may also be accidental or unexpected results. Design activity usually displays expertise, knowledge, creativity and thoroughness. It has a close relationship with technology, with human needs and aesthetics.

Design activity has had a significant impact on society and culture. Its relationship with mass production has brought design into the homes of people around the world in the form of tools, television, furnishings, consumer goods, and toiletries, among other things. The 20th century saw a dramatic increase in the number of people who earn a living from the professional practice of design. Today designers can be found occupying prestigious posts in many areas of the manufacturing and service industries, particularly where products need to meet the varied preferences and needs of a mass market. Increasingly designers are employed in information design where the products are digital and delivered to homes, workplaces and mobile phones via computer technology. Games, web resources and services are challenging consumer artefacts as the main subjects of design today.

THE NATURE OF DESIGNING

II

[Print Preview of Section](#)

Designing is a process that helps us to be critical of the world as we find it and to do something to change it. It takes us from ‘what is’ to ‘what might be’.
Designing is a process of deliberate intervention and at a simple level we all do it. Expert design requires an ability to combine knowledge and skills with motivation.

Clearly there needs to be expertise in the specialist field which might be rooted in the arts, material sciences, human sciences etc; there needs to be skills such as investigative or creative skills; and there needs to be motivation which might vary from a personal motivation to a salary. Design is sometimes referred to as a problem-solving activity. This is an error, because very rarely can a definitive answer to a design problem be provided. Design problems do not lend themselves to being "solved". Design is a process of resolving complex and often conflicting factors where defining the problem can be as difficult as generating ideas.

Most professional design tasks begin with a brief. The brief outlines, from the client's point of view, the job to be undertaken, with its parameters and timescale. It enables focused discussion to take place between various specialists, and a redefinition of the brief often results after a period of investigation. Many innovative products have resulted from creative interpretation of design briefs. Marketing data, analyses of competing products, and ergonomic research may all contribute to the articulation of a brief.

Designers tend to progress through a series of stages in which the solution (or a number of alternative solutions) is progressively defined with increasing levels of detail. The design process contains sequences of iterative (repetitive) cycles of activities. The construction of tentative proposals is followed by testing, modifying, testing again, and so on. It's for this reason that industrial designers make so many models. Design ideas are quickly modelled in two dimensions (by drawing and sketching) and in three dimensions (in various materials). Such models facilitate examination and evaluation by other specialists, by managers or even by the public (in special "user trials"), as well as by the design team. Following this sketch modelling, further material, costing, or production research is incorporated into the creative development in order to assess the feasibility of the most promising ideas. Only then can robust models or prototypes be built for final evaluation by the client or senior management. A full specification and costing of the product will precede manufacture. Planning and project management are also vital skills. Large corporations such as Sony, the Japanese electronics giant, may have hundreds of industrial design projects running simultaneously.

DESIGN MODELLING

III

[Print Preview of Section](#)

Central to designing is the use of models. These can vary from very simple models used early in the design process, to detailed prototypes made when the design is well developed. Models such as drawings or constructions allow problems to be explored, ideas to be visualized, and intentions to be communicated. These in turn facilitate feedback from a variety of sources such as users, manufacturers, or other members of the design team. Sketches may be used to generate vague or conceptual ideas early in the design process, three-dimensional models are used to visualize and communicate new ideas for consumer products, and full-size constructions, for example of a new car, can be used to facilitate user trials and testing.

The use of mathematical modelling may provide a very quick and cheap means to establish volume, strength, or weight of components. Conceptual modelling—that is, the ability to hold and use models held in the mind—is a vital skill in designing. Engineering drawings are models intended to provide clear and unambiguous

information regarding a design proposal. Increasingly, computer models are used because of their ease of modification and speed of communication. Engineering designers, for example, may use Finite Element Analysis systems to predict the physical behaviour of an object, including points where it is weak and likely to fail. Rapid prototyping techniques such as Stereo lithography and fused deposition modelling can transform digital computer-aided design (CAD) models to tangible three-dimensional models.

By modelling a product or system before it is manufactured the designer can weed out poor designs and focus on improving the better ones. Different types of model are used at different stages of the design process. Generally the more detailed and expensive models are used later in the design process. As a means of working with conflicting requirements, modelling can be used to bring certain desired features to the fore so as to examine, evaluate, and communicate a particular “mix”—but, equally importantly, modelling is the vital tool for a “what if” strategy—as in “what if I bring these two or more aspects together?”—and is vital to creativity.

THE HUMAN CAPABILITY TO DESIGN

IV

[Print Preview of Section](#)

Thousands of years ago early cave dwellers fashioned tools and implements to improve their lives. They had a clear objective in mind when they sharpened the edges of flint stones or carved wooden spears to sharp points. They had learnt that the flints made good scrapers for animal skins and furs; the quality of the spears influenced the success of hunting. These early people had no intention of dramatically improving these tools. Clearly, experienced or skilled workers may have made better tools than less experienced or skilled people, but they were not actually “designing” these tools. Their objectives would have focused on making tools that were comfortable or useful for themselves and for them to be as good as the tools they already used. Importantly, they were not thinking of making them in large quantities for other people to use. Only when a widespread system of trading had developed were goods and services produced for consumption by other people.

Designing is the deliberate act of bringing into being new artefacts, tools, buildings, products, or services. It usually results in plans for things that will be made by other members of society although it can refer to the activities of designer-makers such as those in the furniture, ceramics, and jewellery crafts who produce work to their own plans in small numbers. Also, designing usually implies an outcome that will be used by people other than the designer. A wide variety of products, from cutlery to cars, have been designed for use by millions of people, who have their own individual sizes, shapes, and preferences. It is possible for people to plan and make things for themselves—somebody may decorate a house after a careful consideration of colour schemes; knit a jumper with a preferred style of pattern on the front; or prepare a new meal with strange or exotic ingredients—but they would not necessarily be designing. Designing implies a learning—not just from experience—but as a result of a deliberate inquiry into previous examples. In this way, new knowledge can inform and improve subsequent outcomes. Cave dwellers did not design tools, but human beings have evolved design skills over a long period of time and it is not always easy to identify what may be described as design. The application of beads to form traditional patterns on clothing worn by Native Americans may not be regarded as design, whereas another American may be hailed as an expert

designer, and win fashion industry awards for the design of similarly patterned clothing for the mass market or the wealthy. It is the intention of the person or persons responsible for coordinating the activity that is the important indicator. For the Native American, the decoration may imply status or identity and the beads may follow precise and traditional patterns. For the modern designer, the work may have involved a process of seeking compromise between conflicting factors such as price, materials, time available, market demands, manufacture limitations, user needs, and the wishes of the retailers. The modern designer rarely works alone and is often required to liaise with other specialists from many different fields. In practice, the distinctions between designers, craftspeople, engineers, artists, scientists, business people, marketing consultants, and technical specialists are blurred and are becoming more so.

DESIGN AS A PROFESSIONAL ACTIVITY

V

[Print Preview of Section](#)

Although some design skills have been in evidence since the earliest times design as a profession is relatively new. It is possible to recognize design in the work of the planners of the Gothic cathedrals; the inventions of Leonardo da Vinci; and the projects of master engineers such as Isambard Kingdom Brunel or Thomas Telford. However, the roots of the design professions are closely bound up with the roots of manufacturing industry. As such they can be found in those countries whose economies were based on a system of mass manufacturing and mass marketing, namely the United Kingdom, and, subsequently, Europe and the United States. The Industrial Revolution in the United Kingdom in the late 18th century gave rise to a vast increase in the capacity of industry to produce and distribute manufactured goods. In England, the textiles and ceramics industries were among the first to acknowledge the marketing advantages of using artists to apply decoration to a wide range of mass-produced artefacts, such as fabrics and plates. These industrial artists had no influence on the product form, usability, or method of production, and so can hardly be termed designers. Nevertheless, the establishment of a relationship between artists and industry was important. The professions of engineering and architecture were well established by the 19th century, but design remained a loose amalgam of various trades and professions including artists, craftspeople, manufacturers and retailers.

PROMOTION OF DESIGN IN WORLD

VI MARKETS

[Print Preview of Section](#)

The value of design has traditionally meant different things to different people. In the Arts and Crafts Movement of the late 19th century design was associated with a rebellion against the social and cultural poverty of mass manufacture and mass marketing. In Germany, in the early 20th century, design was the focal point for a unification of industrial artists, manufacturers, and retailers. In 1907 Peter Behrens established an important design relationship with the German electrical manufacturer Allgemeine Elektrizitäts-Gesellschaft (AEG). In the years following World War I, tutors and students at the Bauhaus school of design made a significant contribution to design education and the design of products, furniture, textiles, and architecture. Most notable are Walter Gropius, Marcel Breuer, Johannes Itten, and Marianne Brandt.

The emergence of a Modern Movement in Europe in the early part of the 20th century was not limited to design. While radically new approaches to architecture and design provided icons of modernism, responses to new social, cultural, and technological pressures could be found in music, literature, and cinema. In the United States in the 1920s and 1930s, design came to mean increasing the marketability of products to ensure survival in harsh economic conditions.

A Design and Economic Success

The 20th century saw the emergence of design as a major phenomenon—one which attracted the attention of national bodies, including governments of developed and developing countries. There were two reasons for this. First, design was recognized as a major factor in economic success. Good design was shown to have the potential to reduce costs associated with manufacture and to increase sales by improving the usability or enjoyment of a product. Second, even indisputedly good design needs to be marketed. Promotion of design within industry and to the general public, including the development of design education, was viewed as an important responsibility for governments.

The government of the United Kingdom was among the first to promote the economic importance of design via the Council of Industrial Design, in the years following World War II. Subsequently, Scandinavia, Japan, and Italy established world acclaim for their output of well designed product and environments in the post-1945 era. From 1950 onwards, Japan demonstrated the importance of integrating design with sophisticated industrial manufacturing systems—particularly in high-value consumer goods such as music systems and cameras as well as cars and motorcycles; Denmark, Finland, and Sweden established lasting design standards in textiles, home furnishings and consumer goods; Italian design still commands respect in world markets for its style and flair in clothing and furniture.

B Design in Manufacturing

As manufacturing economies developed, so the systems for manufacturing and marketing products became more complex. For the designer of wooden furniture in the mid-20th century it may have been possible to develop the whole design without the help of others; perhaps handing over a prototype and detail drawings to a manufacturer for mass production. However, the second half of the 20th century saw an increase in complexity in all aspects of production, including design—particularly industrial design. Sophisticated electronic circuitry, mechanical systems, and new materials needed to be integrated; global marketing required specialist knowledge of home and foreign markets; new knowledge about the size and capabilities of users emerged as a result of human factors or ergonomics research; new manufacturing and assembly systems provided innovative possibilities; new tools became available to assist designers to model and develop products including CAD and rapid prototyping techniques. Today manufacturers of complex products such as cars talk of 'mass

customisation', the ability to harness design and sophisticated manufacturing techniques in order to give each customer a personalized variant within a mass manufacturing system. It seems likely that other consumer products will follow suit.

Design for the mass-manufacturing industries is increasingly a team activity requiring designers to develop skills of computer based and international team working. Nevertheless, there are still many designers working outside of mass manufacturing or who offer particular design skills to larger organizations. There is a large craft design community of people designing and making jewellery, clothing, and home furnishings. Other designers offer services such as graphic design, web site design, packaging design, or textile design. There are designers for film, television, and theatre, vehicle or transport interiors; and computer software, including computer games.

DESIGN EDUCATION

VII

[Print Preview of Section](#)

History shows how people have exploited three profoundly human capabilities:

- the ability to identify, create and reconfigure knowledge;
- the dexterity to manipulate materials and use tools to change the environment;
- the motivation to stamp a personal identity on the world in which we live.

These capabilities are still valued today. Design education, and more recently, technology education, emerged during the 20th century to develop and integrate these capabilities through particular practices and curricula. Generally, technology may be seen as the knowledge, skills, and values used when designing. Various countries have recognized that both design and technology are vital aspects of general education. As a result they have become an important part of the school curriculum. For older students who wish to follow a career in design, many countries have established specialist design courses in colleges and universities where education and training can prepare people for professional life as designers. Such higher education is usually specialized and students will focus their education on subjects such as fashion design, furniture design, multimedia design, or industrial design, among others.

At the root of design education is the development of skills to identify and resolve problems. In order to do this, students of all ages need to have a knowledge of, and a competence with, the properties of the physical world that surrounds them. Consequently, design education seeks to develop skills with materials (such as wood, metals, and plastics) and processes (such as forming, joining, and assembling). Design education also seeks to develop skills of investigation, idea generation, communication, and evaluation. The ability to explore situations, define problems, suggest creative ways around problems, and harness technology are all valuable life skills that can form part of the design curricula of schools worldwide.

DESIGN AND SOCIETY

VIII

[Print Preview of Section](#)

Technological advancement has not been the only significant influence on design in the post-1945 era. There has also emerged a new focus on the human and social responsibilities of design. In the immediate post-war period, this is most easily seen in the research and application of human factors knowledge. The professional discipline of ergonomics grew out of military research into improving the fit between people and machines. Increasingly this work moved away from the documentation of measurements of physical size and reach, known as anthropometrics, and established new work involving the investigation of people's ability to perceive, process, and act upon information. Today, the field of ergonomics makes an important contribution to the design process and many manufacturers include ergonomists in the development teams of consumer goods, sports products, and transport systems. Ergonomics research is vital in helping to make products more usable, which is essential in fields as diverse as computer software, town planning, electronic equipment, and the design of user manuals. Design for disability has also emerged as a specialist field.

DESIGN AND THE ENVIRONMENT

IX

[Print Preview of Section](#)

A general and growing concern for the environment has had a dramatic effect on design in the 21st century. This concern has grown out of the critical questioning of a Western economic culture based on consumption. At its best, design for society can mean a greater participation by users in the systems that supply the products people all use. At its worst it can be merely a cynical marketing tool.

One of the key issues for design in the early 21st century concerns the ecological implications of design decisions. Today there is a new emphasis on recycling materials, particularly packaging, and using natural materials only where the resources are managed and sustainable. Design decisions have implications for materials used, energy required, pollution generated, and waste. New consumer awareness and government legislation are increasingly influencing design and there is a growing demand for cleaner fuels, the return and refilling of packaging for toiletries, and home improvements such as double glazing and insulation. Along with greater public awareness of differences between conditions in the wealthy countries and in developing countries, some designers have rejected the consumer culture while others seek to improve lifestyles via their designs. Washing machines that use significantly less water, houses that retain heat, increases in crop yield, and computer-based information systems that reduce the need for travel are all potential improvements.

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