Name:	Date:	Class Set:

FACTORS AFFECTING DESIGN

Outcome for this lesson:

PI.1 - examines design theory and practice, and considers the factors affecting designing and producing in design projects

↳ Factors affecting design:

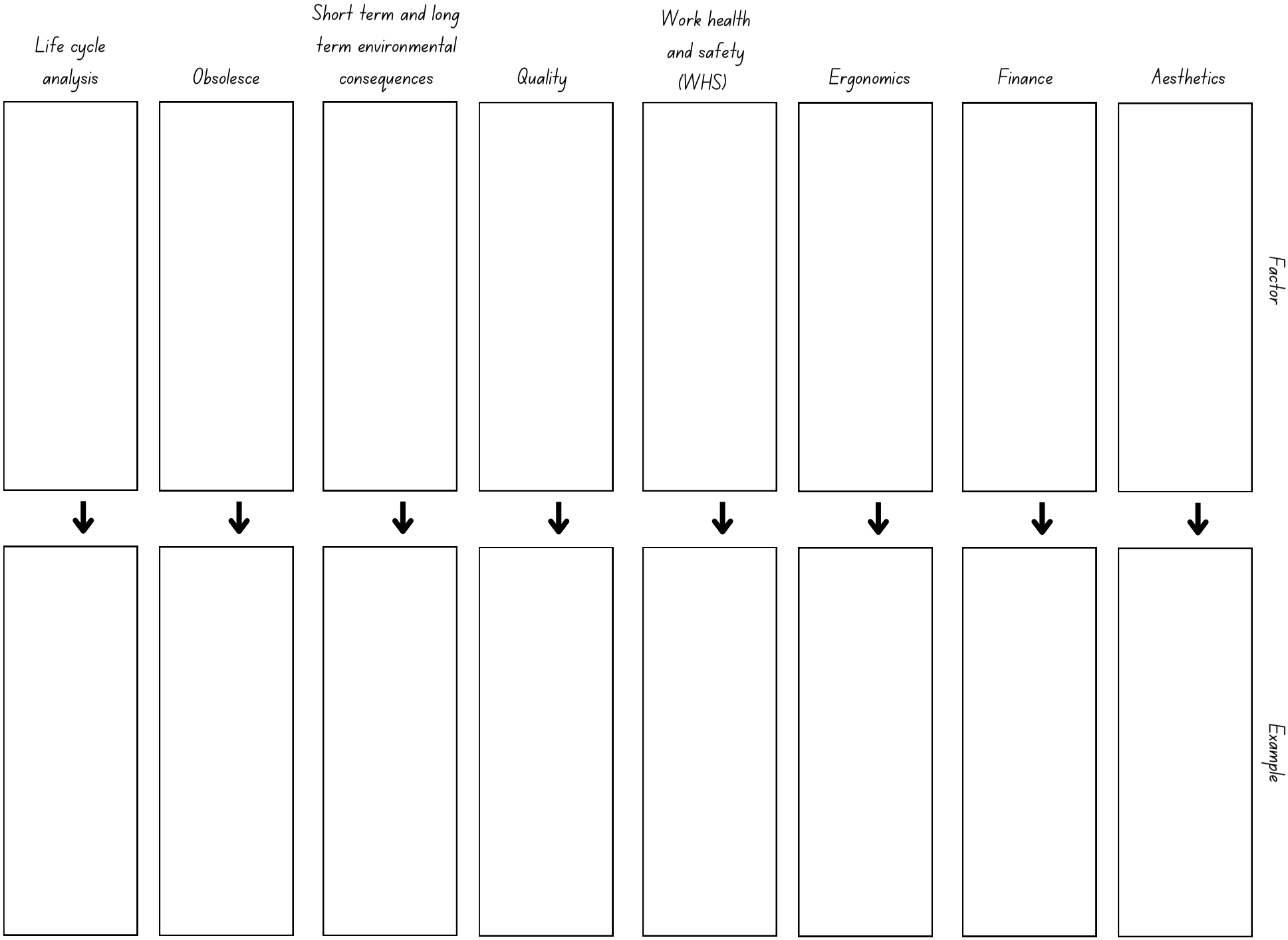
- appropriateness of the design solution
- needs
- function
- aesthetics
- finance
- ergonomics
- work health and safety
- quality
- short-term and long-term environmental consequences
- obsolescence
- life cycle analysis

Learning Intentions	Success Criteria
<u>You are learning to:</u> • Identify factors affecting design	<u>You will be successful if you can:</u> • analyse design products • compare and contrast the factors to be considered in the design and production of design projects • appraise the aesthetic and functional qualities of a variety of design products, systems and/or environments

Factors affecting design

Please read chapter 13.1 of the textbook and then in the boxes below write a small definition of the factor with an example (this can be from the textbook). The first one is completed for you.

	<u>Factor</u>	<u>Example</u>
Appropriateness of the design solution	The design solution should be a manageable response to an identified need or problem or opportunity. The outcome of the design process must consider the end-user and the environment in which it is to be used.	An appropriate design solution aimed at preschool-aged children would need to consider durable, non-toxic materials, have minimal weight, use bright colours, and use large, clearly labelled buttons or control mechanisms incorporating symbols rather than words.
Needs		
Function		


Life cycle analysis
Obsolesce
Short term and long term environmental consequences
Quality
Work health and safety (WHS)
Ergonomics
Finance
Aesthetics
Factor
Example

Design detective

With a partner, please choose one of the images below. You will work together to analyse the product and consider what factors could have impacted this design. Write your answers in the space below the pictures.

A. reusable water bottle

B. flat pack furniture

C. smartwatch

D. compostable takeaway container

Chosen product: _____

Consider:

- *What factors influenced this design? (at least 3–5: e.g. aesthetics, function, sustainability, ergonomics, cost)*
- *Give evidence from the product to support each factor.*
- *Which factor do they think was the most important to the designer? Why?*

Once you believe you have thought of all the possible factors, flip over to do the final activity

AI cross check

Go on to ChatGPT and ask AI about the product. Consider prompts such as:

- "What factors may have influenced the design of (your product)?"
- "Why would sustainability be important in designing a (product)?"
- "What ergonomic features would a good (product) include?"

Write down some points the AI program mentioned in the space below

Reflect on what the AI program said, did it...

- confirm your thinking?
- provide additional factors you missed?
- have conflicting viewpoints to consider

Is AI a reliable program for designers to use to help them consider the factors that affect their design? Why or why not?

13.1 Factors affecting design

Figure 13.1 Factors affecting design

There are a range of factors that ... impact, either positively or ne... development of your ma... des... pr... (MDP). The list of factors ... ot e...ust... e and should be applied differenti... n design. Some will have greater influence on your work than others. Make sure that you consider each factor, then be selective and document only those of significance to the development of your project.

Appropriateness of the design solution

The design solution should be a manageable response to an identified need or problem or opportunity. It should answer the need, fix the problem or capitalise on the opportunity. The outcome of the design process must consider the end-user and the environment in which it is to be used. It must effectively perform the task for which it was designed and be acceptable to ... get market. For example, an appropri... design solution aimed at presch... ge... children would need to co... er d... n-toxic materials, have min... l weight, use b... ht colours, and u... arg... labelle... ns or contr... ch... sm... co... rating symbols rathe... than ... ds.

Needs

Successful designs respond to genuine needs, so identifying a need is a good starting point in the design process. The need may present itself as a problem experienced by consumers, which may be solved by developing a new or improved product. A **needs analysis** may be conducted to explore the problem, to evaluate existing solutions, examine the consumers in the target market and determine the potential for future development of a product.

needs analysis in-depth exploration of the needs and wants of the target market; used to establish a genuine need or opportunity and ensure that the design solution is in response to that need

ISBN 978-1-107-50437- 0

Figure 13.2 The key to good design

Function

Function refers to the ability of a product to perform the task for which it was designed. It specifies what the product must be able to do in order to be successful. All products are designed to achieve a primary function; that is, the main purpose for which they are selected by the consumer. All products, however, have **secondary functions** or additional features that differentiate them from other products in the market and encourage consumers to purchase them. These secondary functions are referred to as the point of influence. For example, the primary function of a dishwasher is to wash and hygienically clean dinnerware, cutlery and kitchen utensils. However, many consumers will make their purchase choice based on secondary factors such as water and energy efficiency, quiet operation, capacity, materials and finishes that blend in with kitchen designs.

secondary function
additional features that make a product different and preferred to competition products

entrepreneur
a person who sets up and manages new commercial enterprises to make a profit

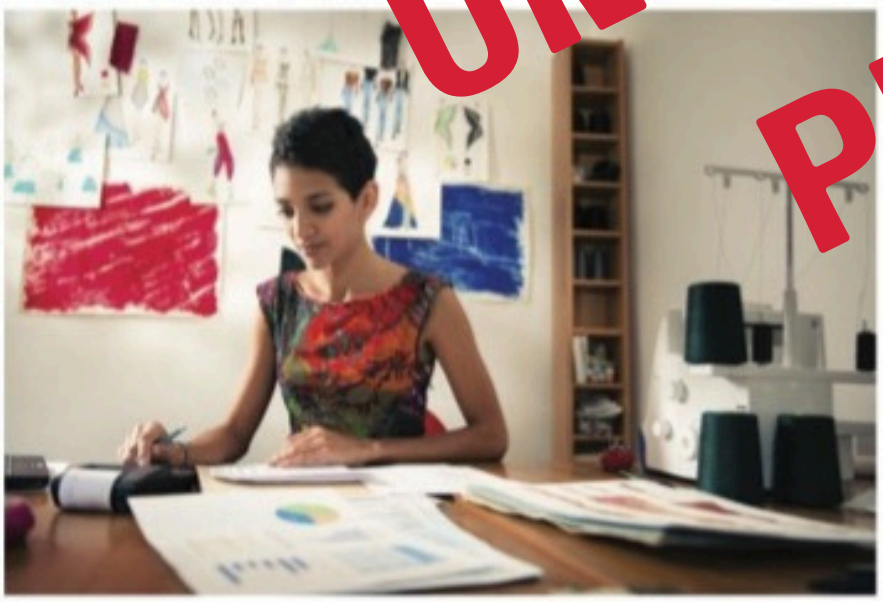


Figure 13.3 Budget is a crucial consideration for any project.

Aesthetics

Aesthetics refers to the physical appearance of a product and its visual appeal to the target market. It appeals to one group of consumers may not appeal to another. Age, gender, socio-economic background and current fashion trends are some factors that determine whether a product appeals to consumers. There needs to be a balance between the consideration of function and aesthetics when designing. If two products perform the same function, it will often be their aesthetic qualities that determine their success. People like products that look good and work well.

Financial

Financial refers to the amount of money required to complete all phases of the development of a product. This may include research and development, establishing and maintaining manufacturing processes, product distribution and operating, advertising and marketing costs. Developing a new product can be a very time consuming business. Designers need to consider how they will fund the initial design period prior to the release of the product, whether government support or funding is available, or whether the assistance of an entrepreneur is advisable. Finally, the designer needs to consider the payback period or how long it will take before the product starts to make a profit. Management of finance is crucial to the success of any project. The budget established in the MDP needs to be reviewed to determine whether it is affordable for the student and to ensure that it is worth proceeding with the project.

Ergonomics

Ergonomics may be defined as the relationship between the human user and their physical or work environment. Ergonomics is an important consideration in products that are designed to be used by people and aims to ensure that workplaces, products and systems are designed to fit the people who use them. Ergonomics uses data obtained from several disciplines, including anthropometry (body sizes and shapes), biomechanics (muscles, levers and forces) and environmental physics

ISBN 978-1-107-50437- 0

(noise, light, heat, cold and radiation). It looks at the different ways in which people interact with the product or system – physically, mentally or otherwise. This is referred to as the product–person interface. The aim of ergonomics is to develop a comfortable, safe (and thus productive) product or work environment. Failure to consider ergonomics could result in a project that causes pain or physical injury to the user.

Work health and safety

Work health and safety (WHS) refers to both the rights and responsibilities of employers and employees in the workplace. Employees have the right to a safe and healthy work environment (provision of appropriate personal protective equipment, adequate training, well-maintained equipment and machinery, good lighting and ventilation) and the responsibility to adhere to all safety procedures put in place by the employer (wearing personal protective equipment, following evacuation procedures, not using machinery if untrained). Employers must comply with all work health and safety guidelines and legislation applicable to their state.

The *Work Health and Safety Act 2011* was introduced in New South Wales on 1 January 2012, replacing the previous *Occupational Health and Safety Act*. The new work health and safety laws were designed to provide greater consistency and make it easier to understand work health and safety duties. WorkCover is the government regulatory body responsible for workplace safety. For students, the classroom or workshop is your workplace, and rules relating to safe work practices are implemented to ensure your safety. Treat your tools and machines with respect. Learn to use them safely and always use them with patience and consideration.

Designers have a responsibility to ensure safety on several levels. They should consider the safety of those involved in manufacturing of their products and ensure materials and processes used do not harm workers. They must consider the safety of the consumer when using their product. Safety testing should always be carried out on prototypes and modifications made if there is any chance of harm to the user.

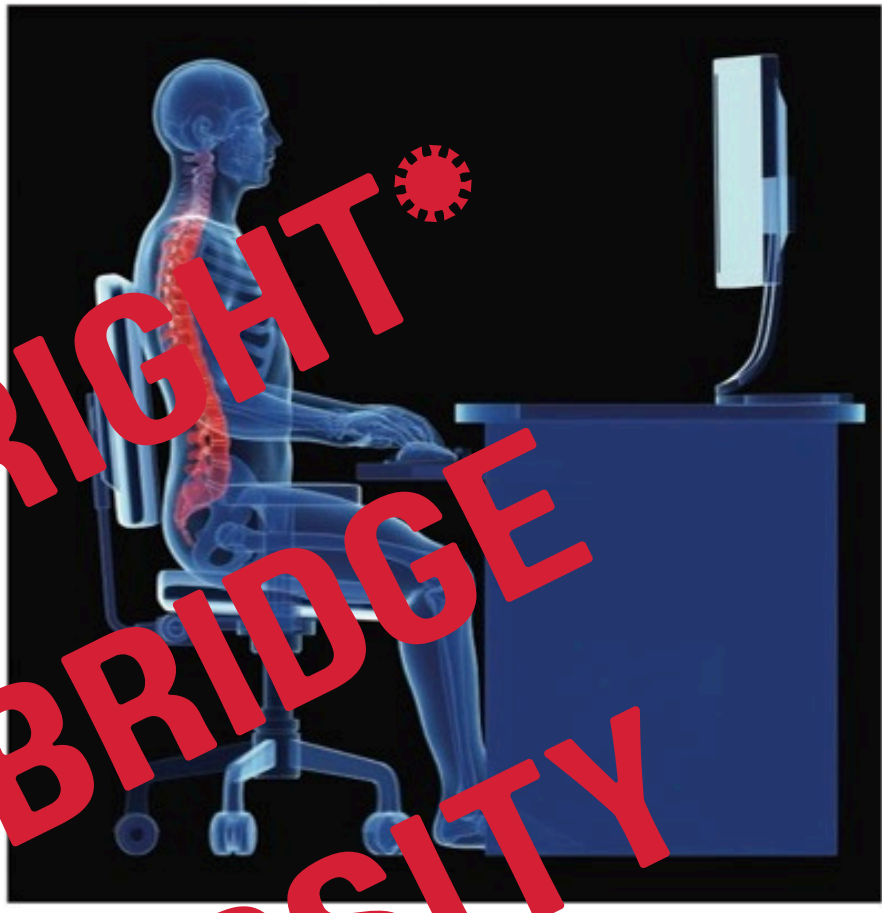


Figure 13.4 Ergonomic design can reduce physical and mental stress to improve performance.

Quality

Quality is a measure of excellence. It is difficult to describe exactly what we mean by quality or what properties a quality product must possess. Quality is closely linked to reliability. We expect a high-quality product to perform well for a long period of time. We associate quality with higher cost for product and consumers may be prepared to pay more if they feel the product will work more effectively and last longer. We associate brand names with quality products and often choose products based on a manufacturer who has a reputation for producing products that work well. Superior materials and finishes are another indication of quality, both of which may contribute to the final cost of the product. Finally, quality may be the result of the selected manufacturing processes and workmanship, such as short production runs, high-quality control mechanisms and custom production, which again make a product more expensive to the consumer.

ISBN 978-1-107-50437- 0

Figure 13.5 The Earth's future is our responsibility.

Short- and long-term environmental consequences

As designers, we need to consider the environmental impact of our work. Short-term environmental impacts can be minimised by making informed choices about the selection of resources and the reduction of waste and pollution. Designers have a responsibility to actively seek sustainable alternatives to non-renewable resources to preserve our natural resources for future generations. The selection of processes that are less harmful to the environment should also be considered. Environmentally friendly choices are not always the cheapest option and incorporating sustainable materials and processes may increase the overall cost of a product for both the designer and the consumer.

Long-term environmental consequences, such as **global warming** resulting from the **greenhouse effect**, rising sea levels, loss of biodiversity and the depletion of the ozone layer, may have catastrophic global impacts if we, as both designers and consumers, do not actively change our behaviour. Sustainability means using only what we really need and no more, to ensure that future generations have access to natural resources.

global warming increases in the average land and sea temperatures on Earth

greenhouse effect the gradual warming of the Earth's surface caused by an increase in gases in the atmosphere (caused by human activity)

Obsolescence

Products are considered obsolete when they are replaced by a new or more attractive product that performs the same function. Products may become obsolete when an entire technology is replaced by a new or more effective one. Some industries, such as the computer industry and fashion, rely heavily on obsolescence to maintain high sales levels, encouraging consumers to buy the latest version or style.

Built-in obsolescence refers to when a product has been designed to fail within a given period of time. Built-in obsolescence is incorporated into the product at the time of design. It may involve creating products that cannot be repaired or have components replaced, using poor-quality finishes that will deteriorate over time or using materials with lower durability that will fail after a period of repeated use. Built-in obsolescence ensures new technologies are adopted and, of course, leads to repeat sales for businesses.

ISBN 978-1-107-50437- 0

Life-cycle analysis

Life-cycle analysis is an evaluation of all the resources used when designing, making, using and disposing of a product. It examines all inputs (materials/resources and energy) and all outputs (pollution and wastage) from initial concept through design, manufacture, distribution, usage and disposal. It is a complete analysis of the environmental impact of the product. It considers where the original materials came from, what energy was required for production, what by-products were produced, how the product was transported (energy for transport, pollution from vehicles), how it was consumed and used, finally, how it was disposed of when it reached the end of its useful life (landfill, recycled).

Life-cycle analysis is sometimes referred to as **cradle-to-cradle analysis**. This implies that designers are using sustainable design practice and ensuring that once a product is no longer functional, it can be recycled or reused in some way. **Design for disassembly** is sustainable design practice that ensures that components are easily dismantled for recycling purposes once the product has reached the end of its useful life.

ACTIVITY 13.1

From the factors affecting design that you have read about in this section, select four that you consider relevant to your MDP.

1. Describe each factor.
2. Identify and describe the impact on your MDP during the following stages:
   a. design
   b. production
   c. advertising/marketing
   d. consumer acceptance of the finished product?
3. Prioritise your list of relevant factors in order of importance to the success of your MDP. Justify your choices.
4. Discuss how the factors you have considered interact with each other. Draw illustrations to show relationships between factors such as function and aesthetics, WHS and ergonomics, finance and quality.
5. Analyse the impact on your MDP if these factors had not been considered. Would it still be a success? Could it cause harm to consumers? What impact might it have on the environment?

cradle-to-cradle analysis design of products that do not generate waste or landfill at the end of their useful life, but that can be reused and recycled into new products

design for disassembly design for products that can easily be disassembled, separated and sorted for reuse or recycling at the end of their useable life

Figure 13.6 Cardboard packaged for recycling

ISBN 978-1-107-50437- 0