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Design and Technology: Stage 6 Toolkit

Romalina Rocca Arna Wesley

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Contents

<i>Introduction</i>	v
<i>How to use this toolkit</i>	vi
<i>Tips for the Design and Technology assessment</i>	viii
<i>Acknowledgements</i>	x

 Preliminary	
Chapter tasks 1 Design theory and practice	1
Chapter tasks 2 Design and production processes in domestic, community, industrial and commercial settings	5
Chapter tasks 3 The impact of design and technology activities on the individual, society and the environment	9
Chapter tasks 4 Investigating and experimenting with techniques	14
Chapter tasks 5 Using design processes	18
Chapter tasks 6 Using resources effectively and safely	22
Chapter tasks 7 Evaluating the processes and outcomes of designing and producing	27
Chapter tasks 8 Management techniques and tools	32
Chapter tasks 9 Communicating ideas and solutions	37
Chapter tasks 10 Research methods in the development and modification of design ideas	42
Chapter tasks 11 Investigating manufacturing and production processes	47
Chapter tasks 12 Computer-based technologies in designing and producing	52

 Preliminary practice exam	57
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HSC

Chapter tasks 13	The factors affecting design and the development and success of design projects	62
Chapter tasks 14	Relating the practices and processes of designers and producers to the major design project	66
Chapter tasks 15	The influence of trends in society on design and production	73
Chapter tasks 16	The impact of design and innovation on society and the environment	78
Chapter tasks 17	The factors that influence innovation and the success of innovation	84
Chapter tasks 18	Using creative and innovative approaches in designing and producing	89
Chapter tasks 19	Identifying a need or opportunity and exploring ideas for design development	93
Chapter tasks 20	Selecting and using resources responsibly to realise a quality major design project	99
Chapter tasks 21	Evaluating the processes undertaken and the impact of the major design project	105
Chapter tasks 22	Managing the development of a quality major design project	108
Chapter tasks 23	Selecting and using appropriate research methods and communication techniques	113
Chapter tasks 24	Justifying activities undertaken in the major design project through the study of industrial and commercial practices	117
Chapter tasks 25	The emergence and impact of new technologies, and the factors affecting their development	124



Major design project

129



HSC practice exams 1 and 2

140

Introduction

Welcome to the New South Wales *Design and Technology: Stage 6 Toolkit*. This toolkit has been designed to make sure you are aware of the requirements of the syllabus and are comfortable with the various formats in which assessment takes place. It is your personal assessment resource, written as both a workbook and study companion. Browsing through your toolkit, you will see that it has the following sections:

- Tips for the Design and Technology assessment
- Chapter tasks
- Preliminary and HSC practice exams
- Guide to the major design project.

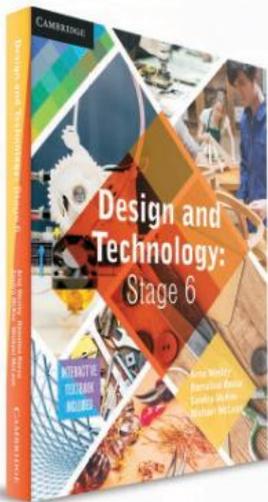


How to use this toolkit

The toolkit can be used as a guide as you prepare your folio, and study for assessment. It provides opportunity for further study in the classroom or at home. You will also find it useful for self-study purposes. Chapter tasks correspond with material covered in the *Design and Technology: Stage 6* textbook, Interactive Textbook and app, or you can use a wealth of other resources. We wish you the best of luck in your studies!

Romalina Rocca and Arna Wesley

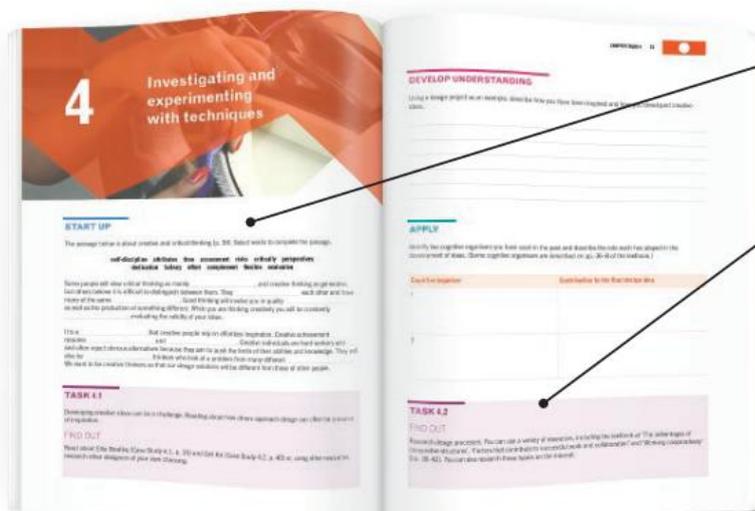
The *Design and Technology: Stage 6* resource bundle consists of two components:



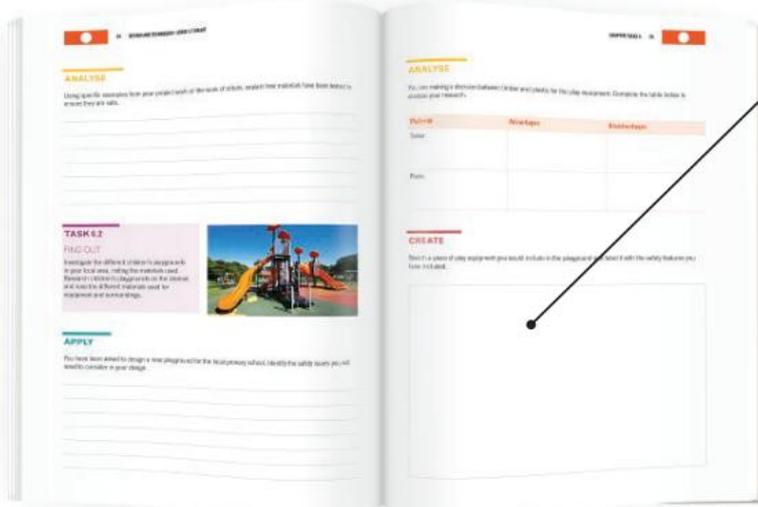
1 Student Book (available also as an Interactive Textbook)

- **Chapter openers** introduce the outcomes addressed in the chapter and prepare students for the activities ahead.
- **Case studies** extend on information, explore innovative designs and their designers and provide detailed accounts of industry practice.
- Learning **activities** explore chapter outcomes, develop skills, build knowledge and understanding, and encourage creativity.
- **End-of-chapter material** includes chapter summaries, chapter summary tasks and extension tasks to test your knowledge through the reinforcement of key outcomes and application of skills.
- **Glossary terms** are bolded in the text, defined in the margins and collated at the end of the textbook for easy reference.

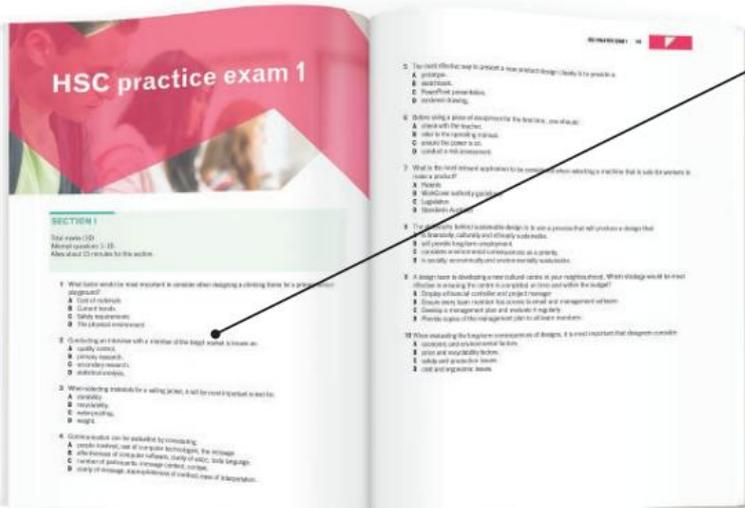
2 Toolkit



Start up tasks open the chapters to test knowledge and introduce the outcomes addressed in the chapter. Apply your skills and develop your understanding of the chapter outcomes through **chapter tasks**. These tasks provide **links to the student book** to enhance learning.



Writing and drawing space for direct answer entry, brainstorming and exploring ideas.



Practice exams to prepare you for your exams and test your knowledge and understanding.



A guide to assist you with the development of your major design project and prepare you for assessment.

Tips for the Design and Technology assessment

- Determining how you learn best will assist in all your studies – and we are all different. Do you learn best by taking notes or highlighting text? Do you prefer to create diagrams or mind maps? Perhaps you like to make rhymes or create acronyms. Do you find preparing study cards useful? Some students place post-it notes of key facts around the bathroom mirror! Some meet with friends and test each other. You may find that you like to use a combination of methods. Once you determine which learning style suits you, your study will be more effective.
- Know your syllabus. Exam questions must relate to syllabus outcomes. So the better you know the content of the syllabus, the easier it is to understand what the question is asking you to do. The New South Wales syllabus outcomes are represented in each chapter of the textbook. The syllabus can also be viewed on the Board of Studies NSW website (see <http://cambridge.edu.au/redirect?id=175>).
- Become familiar with the language of designing and producing. It is important that you clearly understand the questions in the exam paper and that you use appropriate terminology in your responses and throughout your major design project (MDP). The more reading you do about designing and producing, the more familiar you will become with the language.
- Ensure that you understand all the terms provided in the glossary of key words found on the Board of Studies NSW website (see <http://cambridge.edu.au/redirect?id=176>). These are words that will be used in the examination, and it is important that you know what is expected when you are asked to *describe* or *discuss* or *analyse*, for example.
- Keep abreast of current affairs and technological and economic developments through the internet and other media, so you can use current examples in your exam responses. Social and environmental issues are often discussed in the media and can give you an insight into the issues and different perspectives.
- You may be asked to use your major design project as an example when responding to an exam question. Make sure you understand and are able to put into words the processes you applied in your MDP.
- It is also very important to be familiar with the exam format. You can view past papers on the Board of Studies NSW website (see <http://cambridge.edu.au/redirect?id=177>). This toolkit also contains two practice HSC exams.
- Once you have seen the exam format, it is time to practise. This will help you feel more comfortable with the format, style of questions and language used. Complete the practice exams within the set time. Each exam provides a suggested time to allocate to each section of the paper. Take note of the marks allocated for each part. This will give you some indication of the depth required in your response to the questions. Take time to read each question carefully. What does the question ask of you? Some design and technology questions are double-barrelled – they have two or more parts that you need to answer. Ensure that you respond to the question as a whole. Highlight the key words and make sure you have a balanced response. Refer back to the question when writing your answer.

- You will have time to plan your response and reflect on your points. This will ensure that the response is well structured and considered. Brainstorming or developing a mind map can be useful. Planning is essential, as you must be succinct in your answers. Dot points may be better than full sentences in some cases. Provide examples to support your responses. Use correct terminology at all times.
- After practising your exam, review your performance. This will help you identify areas you need to target in your studies. Each year the examiners make comments about the students' responses, which can be viewed on the Board of Studies NSW website (see <http://cambridge.edu.au/redirect/?id=178>). These comments indicate the depth or level of detail that the examiners are looking for in student responses.
- Tips for the assessment of the major design project can be found on p. 233 of the textbook.



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1

Design theory and practice

START UP

Complete the table by selecting a term to match the definition.

needs function aesthetics ergonomics finance quality obsolete consequences

Term	Definition
	Characteristics that determine the ability to perform a predetermined function
	Study of relationships between machines and the people who use them
	The work something is designed to do
	No longer useful
	Relating to the principles of beauty, art and taste

TASK 1.1

FIND OUT

It is important to be informed about the work of other designers. Their work can inspire you, set the standards, and show you what has been done before. Some case studies are in your textbook and many others are available on the internet. Research the following designers:

- Dana Lenko (p. 3)
- Tin&Ed (p. 4)
- Alexander Berlage (p. 20)
- Ellie Bradley (p. 35)
- Antoni Gaudi
- Akira Isogawa



APPLY

Complete the table below for each designer.

Designer	Occupation	Training	Achievements
Anton Gerner	Furniture designer	School of Woodcraft	<ul style="list-style-type: none"> Award-winning furniture Own business
Dana Lenko			
Tin&Ed			
Alexander Berlage			
Ellie Bradley			
Antoni Gaudi			
Akira Isogawa			

ANALYSE

1 What elements are common to the work of these designers? Describe the relationship between these elements and how they impact on the work of the designers.

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2

Design and production processes in domestic, community, industrial and commercial settings

START UP

- 1 Robotics technology is commonly used in industrial settings. It is most likely to be used when:
 - A management do not have time to make factory-floor decisions.
 - B machinery needs replacement.
 - C tasks are repetitious, dangerous or precise.
 - D automatically controlled processes are needed.
- 2 When we distinguish between domestic, community, industrial and commercial settings, we are most likely to consider the:
 - A scale of production, manufacturing techniques and plant size.
 - B number of workers, scale of production and mechanisation.
 - C plant size, geographical position and government funding.
 - D management structures, manufacturing techniques and number of workers.
- 3 Which criteria would be most important when you are designing a new school uniform?
 - A Safety, ergonomics and aesthetics
 - B Function, ergonomics and safety
 - C Aesthetics, function and durability
 - D Recyclability, safety and function
- 4 Evaluation is a key stage in the design process and should occur:
 - A at the beginning of the design process.
 - B after experimenting to select resources.
 - C at the end of the design process.
 - D throughout the entire design process.
- 5 Rapid prototyping is:
 - A developing a prototype for the final design in a short amount of time.
 - B developing a prototype using a new material for the final design.
 - C developing a prototype that is a model casting from a CAD drawing.
 - D developing a prototype using rapid technology for the final design.



TASK 2.1

It is important that you know about various technologies and how they are used in different settings.

FIND OUT

Research technologies used in the design process. You can use a variety of resources, including the textbook at 'Technologies used in design and production processes' (p. 17) and the internet. Consider the technologies that are available to assist you in your designing.

APPLY

List eight different technologies that are available to you, state how you might use the technology in your designing and any special considerations concerning the use of the technology (e.g. safety, skills, environmental consequences, availability).

Technology	Use in designing	Considerations
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ANALYSE

Compare and contrast two different technologies from your list, considering their impact on designing.

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TASK 2.2

FIND OUT

Research three different technologies using a variety of resources, which can include ‘Technology used in production processes’ (p. 18) in the textbook or production technology resources on the internet.

DEVELOP UNDERSTANDING

Define production process.

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APPLY

- You have designed a timber storage unit for your bedroom. You are ready to make the unit in the school workshop. Complete the table below to show the steps of production, what technology or equipment you will use, and the things you need to consider (e.g. safety, skills, environmental consequences, availability).

Production process	Technology	Considerations
.....
.....
.....
.....
.....
.....
.....
.....
.....

3

The impact of design and technology activities on the individual, society and the environment

START UP

Draw a line to link each of the factors in the first column to an appropriate example.

Cultural beliefs	The use of wind power to produce electricity	.....
Personal values	Ensuring all Year 9 students have computer access	.....
Equity	Designing a full-body swimsuit for Muslim women	.....
Sustainability	Trialling and testing of all new drugs	.....
Safety and health	Providing virtual schooling to remote communities	.....
	Designing water-saving devices	.....
	Ensuring kosher food is available at a party	.....
	Providing safety instructions in different languages	.....

TASK 3.1

As responsible designers, we learn by analysing the work of other designers and how it impacts on individuals, society and the environment.

FIND OUT

Investigate how the fashion industry is responding to environmental concerns (see Case Study 3.1, p. 30).



TASK 3.2

FIND OUT

Research how design impacts on the individual, society and the environment. You can use a variety of resources, including the textbook at 'Considerations for the individual, society and the environment' (p. 28) and the internet.

DEVELOP UNDERSTANDING

Provide an example of how your personal values have impacted on your purchase of a particular product.

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APPLY

Outline why a designer should conduct a life-cycle analysis during the development of a design.

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ANALYSE

Explain why sustainability is an important factor to be considered by designers. Use examples to justify your comments.

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4

Investigating and experimenting with techniques

START UP

The passage below is about creative and critical thinking (p. 34). Select words to complete the passage.

**self-discipline attributes time assessment risks critically perspectives
dedication fallacy effort complement flexible evaluative**

Some people will view critical thinking as mainly _____, and creative thinking as generative, but others believe it is difficult to distinguish between them. They _____ each other and have many of the same _____. Good thinking will involve you in quality _____ as well as the production of something different. While you are thinking creatively you will be constantly _____ evaluating the validity of your ideas.

It is a _____ that creative people rely on effortless inspiration. Creative achievement requires _____ and _____. Creative individuals are hard workers who devote _____ and _____ to their pursuits. They are prepared to take _____ and often reject obvious alternatives because they aim to push the limits of their abilities and knowledge. They will also be _____ thinkers who look at a problem from many different _____. We want to be creative thinkers so that our design solutions will be different from those of other people.

TASK 4.1

Developing creative ideas can be a challenge. Reading about how others approach design can often be a source of inspiration.

FIND OUT

Read about Ellie Bradley (Case Study 4.1, p. 35) and Dirt Art (Case Study 4.2, p. 40) or, using other resources, research other designers of your own choosing.



DEVELOP UNDERSTANDING

Using a design project as an example, describe how you have been inspired and how you developed creative ideas.

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APPLY

Identify two cognitive organisers you have used in the past and describe the role each has played in the development of ideas. (Some cognitive organisers are described on pp. 36–8 of the textbook.)

Cognitive organiser	Contribution to the final design idea
1	
2	

TASK 4.2

FIND OUT

Research design processes. You can use a variety of resources, including the textbook at ‘The advantages of cooperative structures’, ‘Factors that contribute to successful work and collaboration’ and ‘Working cooperatively’ (pp. 39–42). You can also research these topics on the internet.

5

Using design processes

START UP

- 1 Designers must always consider the parameters of the design brief. Parameters may be described as the:
 - A materials to be used.
 - B limits that define the design.
 - C market research.
 - D ongoing evaluation.
- 2 The most important factors to consider when designing children's play equipment are:
 - A safety standards.
 - B ergonomics.
 - C aesthetics.
 - D cost and availability of resources.
- 3 Designers need a good understanding about materials and tools because they need to:
 - A test designs for reliability and function.
 - B sketch ideas clearly.
 - C work effectively with market groups.
 - D convert ideas into working models.
- 4 Marketing a product to a specific group of consumers is called:
 - A product promotion.
 - B target marketing.
 - C viral marketing.
 - D market segmentation.
- 5 Which of the following best describes aesthetics?
 - A Strength, ergonomics, cost
 - B Proportion, colour, texture
 - C Proportion, cost, strength
 - D Ergonomics, texture, cost



TASK 5.1

As a Design and Technology student, you will learn by looking at how design processes are used in different situations.

FIND OUT

The Parramatta River Urban Design Strategy is a strategy for the regeneration of Sydney's second largest CBD and its waterfront – a site that encompasses 31 hectares in the centre of Parramatta. Research this strategy using the following links: <http://cambridge.edu.au/redirect/?id=184> and <http://cambridge.edu.au/redirect/?id=185>.

APPLY

Identify specific criteria you believe should apply to the development of this site.

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CREATE

On a separate sheet of paper, draw a suggested design for the Parramatta River site, or the Bays Precinct Urban Renewal Program in Sydney's inner west, or a site in need of redevelopment in your local area. Display your work in the classroom for others to comment on.

TASK 5.2

Marketing is an important aspect of design development. The most successful designs are those that meet with the approval of consumers or users.

FIND OUT

Investigate the role of marketing in design. You can use a variety of resources, including the textbook at 'Marketing environments' (p. 51) and the internet.

DEVELOP UNDERSTANDING

Explain the difference between the micro-environment and the macro-environment in terms of marketing.

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ANALYSE

Consider the Smart automobile as a design that has been thoughtfully marketed. Describe how each of the following forces or trends has impacted on the marketing of the Smart car.



Forces	Impact on marketing
Demographic trends
Technological trends
Cultural trends

EVALUATE

The World Wide Web is a gigantic marketing platform and many advertising agencies are producing commercials to be spread via internet users. Define the term 'viral marketing' and comment on its success.

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6

Using resources effectively and safely

START UP

- 1 Selecting the most appropriate material for a design involves research and testing of:
 - A tools and techniques.
 - B properties, characteristics and sustainability.
 - C availability, strength and cost.
 - D safety and support.
- 2 Work health and safety committees are required to:
 - A ensure the workplace is safe.
 - B check all signage is displayed.
 - C ensure injured workers receive compensation.
 - D provide orientation for new employees.
- 3 Selecting an appropriate material for a hiking tent will involve testing for:
 - A technical skills needed for construction.
 - B durability, weight and water resistance.
 - C techniques of cutting and joining the material.
 - D flammability, strength and fading.
- 4 To ensure the most appropriate material is selected, it is most important to consider:
 - A aesthetics and durability.
 - B recyclability.
 - C testing to meet appropriate standards.
 - D training schedules.
- 5 The primary objective of the NSW statutory authority WorkCover is to achieve:
 - A safe work places, effective return to work and security for injured workers.
 - B high-value workers' compensation and job security.
 - C effective training for workers and safe work places.
 - D communication between workers and management on safety issues.



TASK 6.1

Safety is important in all aspects of our lives. As designers, we must treat safety as crucial to the development of our designs.

FIND OUT

Research safety issues in design and production processes. You can use a variety of resources, including the textbook at 'Safety and the use of materials, tools and workmanship' (p. 61) and the internet.

DEVELOP UNDERSTANDING

Why is it important for designers and producers to be familiar with legislative requirements? Use examples to support your discussion.

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APPLY

Use specific examples from your project work to explain how you have implemented safe work practices. Justify the need for these practices.

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ANALYSE

Using specific examples from your project work or the work of others, explain how materials have been tested to ensure they are safe.

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TASK 6.2

FIND OUT

Investigate the different children's playgrounds in your local area, noting the materials used. Research children's playgrounds on the internet and note the different materials used for equipment and surroundings.



APPLY

You have been asked to design a new playground for the local primary school. Identify the safety issues you will need to consider in your design.

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TASK 6.3

FIND OUT

Select a piece of machinery in your school workshop. Familiarise yourself with the machinery and read the operational manual. Your teacher may decide which piece of machinery you will use for this task.

ANALYSE

Conduct a risk assessment for the selected machinery.

- 1 Identify the hazards.

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- 2 List the precautions that should be taken when using the machinery.

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CREATE

Develop a safety test to be completed by any student planning to use the selected machinery. Trial your safety test with another student.

TASK 6.4

SYNTHESISE

Explain the health and safety issues that need to be considered when designing and producing. Provide examples to show the cause-and-effect relationship between the issues discussed. (Your explanation should be approximately 500 words, to be submitted to your teacher.)



7

Evaluating the processes and outcomes of designing and producing

START UP

Complete the table by selecting a term to match the definition.

parameter evaluate criteria process produce design appropriate outcome development

Term	Definition
.....	Judge the value of
.....	Suitable for the purpose
.....	Any constant limiting factor
.....	Result of specific actions
.....	Bring into existence

TASK 7.1

DEVELOP UNDERSTANDING

Identify parameters of design that you have used in previous projects and describe how you evaluated these criteria.

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APPLY

You have been asked to design a jacket to be worn by hikers. Complete the table below to show how you will evaluate the design parameters.

Parameter	Method of evaluation
Comfortable
Lightweight
Waterproof
Easily visible
Built-in GPS system

TASK 7.2

FIND OUT

Research the role of evaluation in the design process. You can use a variety of resources, including the textbook at 'Continual evaluation' (p. 67) and the internet.



TASK 7.3

Evaluating the work of other designers and their use of technologies helps us become more proficient in evaluating our own designs.

FIND OUT

Use Case Study 7.1 (p. 70) to research the philosophy behind sustainable living.

DEVELOP UNDERSTANDING

- 1 Many companies have used sustainable plastic for packaging. Predict the parameters of design that would be considered when using environmentally friendly packaging.

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- 2 Outline two tests that may have been conducted to determine the appropriateness of sustainable plastic packaging for biscuits.

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EVALUATE

Assess the impact of sustainable packaging on society and the environment (approximately 400 words, to be submitted to your teacher). Complete two mind maps to assist you in planning your response.



Society



Environment

8

Management techniques and tools

START UP

Define the following terms in your own words.

Term	Definition
Gantt chart	
Finance plan	
Action plan	
Project manager	
Evaluation	

TASK 8.1

We are asked to demonstrate the use of a variety of management techniques in our project work. Studying the techniques used by others will help us to develop the necessary skills.

FIND OUT

Research different management techniques used in the design process. You can use a variety of resources, including the textbook at 'Management techniques and tools' (p. 74) and the internet.



APPLY

1 For each of the tools or techniques listed below, explain how and why you have used it in your project work.

Tool or technique	How and why it was used
Meeting	
Journal	
Gantt chart	
Action plan	
Finance plan	

2 What is meant by 'plan, implement and evaluate'?

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3 Explain how you have utilised this approach in your own project work.

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ANALYSE

Consider the processes involved in domestic and commercial projects and explain how these different contexts impact on management procedures.

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TASK 8.3

FIND OUT

Watch the animated video at <http://cambridge.edu.au/redirect/?id=186>, which uses humour to illustrate some valid points about project management.

DEVELOP UNDERSTANDING

Reflect on the lumberjack video and discuss the issues it presents that relate to your work as a designer.

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9

Communicating ideas and solutions

START UP

The passage below is about visualising and communicating ideas and solutions with a range of techniques (p. 83). Select words to complete the passage.

technology paper computer-aided designer two-dimensional three-dimensional drawings pencil computer accurately visualise process manufacturing

Computers and _____ drawing have become powerful tools and their use is now widespread. Software packages have been developed that allow the _____ to draw complex designs more easily and very accurately. A whole range of shapes can be drawn using the _____ and mistakes are easily corrected.

Designers have had to become very skilled computer operators in order to use this new _____. The computer allows the designer to draw their designs on a flat two-dimensional screen and then convert them into a _____ image. Computers have provided designers with the tools to produce quality drawings, the ability to _____ designs by creating virtual models and also to produce very high quality 2D and 3D printouts that can then be passed on to the _____ team for production. The whole drawing and revising _____ is now speeded up significantly and designers are able to send files around the world to specialist companies for manufacture.

TASK 9.1

FIND OUT

Learn about stereolithography 3D layering at <http://cambridge.edu.au/redirect/?id=187>, or do an internet search for 'stereolithography' or 'rapid prototyping' to find out how the technology works.



DEVELOP UNDERSTANDING

1 What is stereolithography?

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2 What other common names have you heard for the process of stereolithography?

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APPLY

How can the process of stereolithography be used to communicate design ideas?

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EVALUATE

Assess the influence of modern communication technologies such as presentation software, graphics software, computer-aided drawing and videoconferencing on the work of designers. Provide real-life examples to support your arguments.

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CREATE

A plastics manufacturing company has asked you to design a storage device to hold an iPod, an iPad and an iPhone, with chargers, cords and earphones. Use a combination of written and graphical forms of communication to show one design idea.

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EVALUATE

Evaluate each of the following as a method of communicating design ideas.

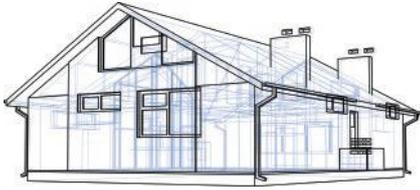
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TASK 9.3

SYNTHESISE

Describe the communication processes that you used in one of your design projects to illustrate the move from initial ideas to concept stage. Justify your choice and explain how these methods are similar to or different from those used in commercial settings (approximately 400 words, to be submitted to your teacher).

10

Research methods in the development and modification of design ideas

START UP

- 1 An example of qualitative research would be:
 - A statistical analysis.
 - B surveys.
 - C experiments.
 - D observations.
- 2 An example of secondary research would be:
 - A statistical analysis.
 - B surveys.
 - C experiments.
 - D observations.
- 3 What type of data is most likely to be collected by quantitative research methods?
 - A Attitudes and opinions
 - B Visual information
 - C Statistical information
 - D Oral interviews
- 4 How can an ethical researcher ensure the privacy of participants?
 - A Publish details about the participant
 - B Seek guarantees from the publisher
 - C Seek appropriate permission to conduct the research
 - D Hold a meeting for all participants
- 5 A code of conduct for research is likely to include:
 - A rules about timing of research.
 - B respect for intellectual property.
 - C statistical analysis.
 - D details about the researcher.



TASK 10.1

We can learn much from analysing the research techniques and methodologies used by others.

FIND OUT

Study the research methods used in Case Study 10.1 (p. 95).

APPLY

Describe the primary and secondary research that Jack conducted to understand the concept of obesity (Case Study 10.1, p. 95).

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FIND OUT

Read about the invention of the Safety Propeller (see <http://cambridge.edu.au/redirect/?id=188>) and the Easy Girth (see <http://cambridge.edu.au/redirect/?id=189>). You could also complete this task with two inventions of your own choosing.

APPLY

Outline one aspect of research you believe the inventors of the Safety Propeller and the Easy Girth may have conducted before development.

1 Safety Propeller

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11

Investigating manufacturing and production processes

START UP

Define the following terms in your own words.

Term	Definition
Manufacture	
Mass production	
Custom production	
Batch production	
Machining process	
Casting process	
Plastic extrusion	
Injection moulding	
Blow moulding	
Vacuum forming	

TASK 11.1

FIND OUT

Research the use of materials and production techniques in design processes in the textbook or on the internet.



DEVELOP UNDERSTANDING

Consider a project you have completed and detail the manufacturing processes used to produce the product, system or environment. Complete the table below for that project.

What materials were used?	.....
What was the shape?	.....
What finishing processes were used?	.....
What quantities were involved?	.....

ANALYSE

Compare the production process used in the project described above with the processes used to make a similar product, system or environment in a commercial or industrial setting.

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TASK 11.2

FIND OUT

Read Case Study 11.1 (p. 108) about how HSV builds a car.



EVALUATE

Assess the use of automation over manual operations in the manufacture of an HSV car.

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TASK 11.3

FIND OUT

Read about mass production at <http://cambridge.edu.au/redirect/?id=191>. Read all six pages.

DEVELOP UNDERSTANDING

'The process used to manufacture a product as a result of a design process must be appropriate to the needs of the designer, producer, consumer and society.' Describe how this statement relates to the manufacture of a product that you have studied.

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12

Computer-based technologies in designing and producing

START UP

For each of the steps of a design process listed below, identify at least two computer-based technologies you might use.

Step in the design process	Computer-based technologies
Research	
Idea development	
Testing	
Production	
Evaluation	

TASK 12.1

FIND OUT

Research the work of designer Vince Aloï. You can use a variety of resources, including the case study on Aloï in the textbook (Case Study 12.1, p. 121). Alternatively, visit the Powerhouse Museum website (see <http://cambridge.edu.au/redirect?id=192>) and view one of the case studies there. You may also like to look at one of the case studies available on the Logo Factory website (see <http://cambridge.edu.au/redirect?id=193>).



DEVELOP UNDERSTANDING

Describe how Vince Aloï uses computer technologies in his design work, or describe how computer technologies are used by a different designer.

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APPLY

Refer to a project you have completed and describe how you have used computer technologies in designing and producing.

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EVALUATE

Assess the use of computer technologies in the project described above, or assess the role of computer technologies in the work of Vince Aloï.

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APPLY

Describe how computer-based technologies could be used to communicate and present the benefits of the new apartment building to potential purchasers.

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TASK 12.3

FIND OUT

Research the technologies behind VideoTrace (see <http://cambridge.edu.au/redirect/?id=194> and <http://cambridge.edu.au/redirect/?id=195>).

DEVELOP UNDERSTANDING

1 What is VideoTrace modelling?

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2 Predict how this technique may be used as a design tool.

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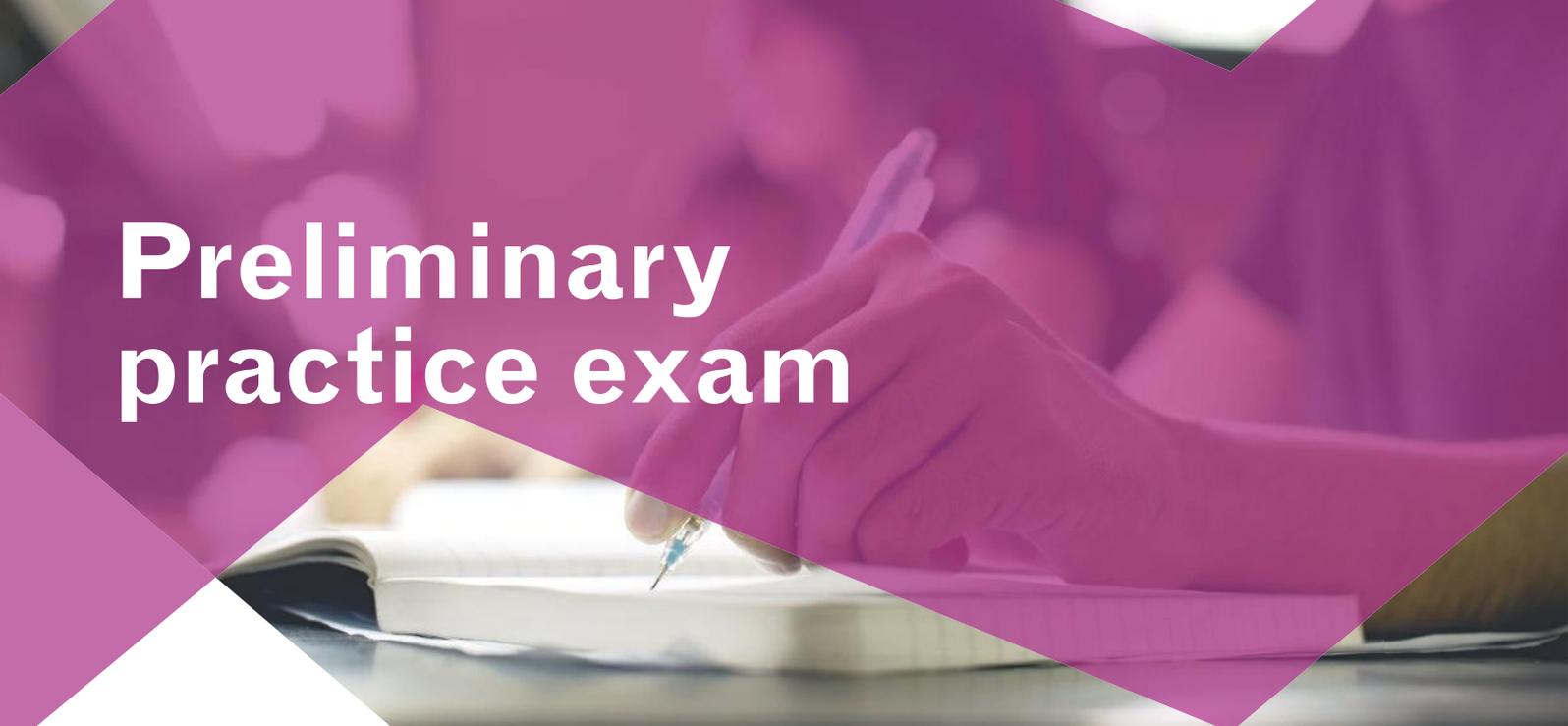
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Preliminary practice exam



SECTION I

Total marks (10)

Attempt questions 1–10.

Allow about 15 minutes for this section.

- 1 The process of analysing a product from its conception through to its disposal is:
 - A quality control.
 - B life-cycle analysis.
 - C environmental analysis.
 - D ongoing evaluation.
- 2 Work health and safety committees are required to ensure:
 - A the workplace is safe.
 - B signs are in different languages.
 - C injured workers receive compensation.
 - D new employees receive union documentation.
- 3 You have been commissioned to design a device to assist elderly or disabled people to open bottles. Which of the following factors is most important?
 - A Technical skills
 - B Durability
 - C Ergonomics
 - D Cost
- 4 To ensure the most appropriate material is selected, it is most important to consider:
 - A aesthetics and durability.
 - B recyclability.
 - C testing to meet appropriate standards.
 - D work health and safety.



- 5 The reason for built-in obsolescence is best described as:
- A increasing employment.
 - B considering current trends.
 - C ensuring the product adheres to safety regulations.
 - D restricting the product's useful working life.
- 6 Robotics is mainly used in industry to:
- A ensure employment.
 - B complete precise, dangerous or repetitive tasks.
 - C monitor quality control.
 - D manage the whole production process.
- 7 Computer-aided manufacture:
- A uses data from CAD drawings to automate the production of a product.
 - B displays the graphical information from the CAD program.
 - C is software to control the machining process.
 - D is the computer control of machine tools.
- 8 Australian Standards aim to ensure:
- A work health and safety.
 - B the protection of intellectual property.
 - C processes are monitored.
 - D quality and common understanding.
- 9 Examples of some cognitive organisers are:
- A management, communication and evaluation.
 - B problem solving, prioritising and explaining.
 - C brainstorming, mind maps and concept boards.
 - D safety tests, computer software and emailing.
- 10 Project management is best described as:
- A developing skills with computer-based technologies.
 - B communicating effectively with all team members.
 - C getting people and resources together to meet designated goals.
 - D ensuring the best technicians are available.



SECTION II

Total marks (15)
Attempt questions 11–14.
Allow about 40 minutes for this section.

Question 11

Sally Dominguez designed the Nest Highchair after the birth of her first child. Rotation moulding technology was used in the construction and the chair has a scooped-out plastic seat and detachable tray. The column and tray can be removed to allow the chair height to be adjusted, forming a low chair for older children.



- a Identify the need, problem or opportunity Sally Dominguez may have been responding to when she designed the Nest Highchair. (1 mark)

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- b Identify two criteria that could be used to evaluate the success of the Nest Highchair. (1 mark)

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Question 12

Outline how ergonomics would impact on the design of the Nest Highchair. (3 marks)

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13

The factors affecting design and the development and success of design projects

START UP

Explain the following terms as they relate to the study of design and technology.

Term	Explanation
Work health and safety	
Quality control	
Built-in obsolescence	
Needs analysis	
Environmental consequences	

TASK 13.1

FIND OUT

Regina Wright and Bernie Ausburn are the inventors of the Fold Out Bus Rail (shown here), a device that assists the elderly and disabled to enter and exit a patient transport bus. Wright, an occupational therapist, had been treating a patient who had fallen when alighting from a bus and she combined her expertise with Ausburn, who has a mechanical background, to design the new device. You can read more about this design at <http://cambridge.edu.au/redirect/?id=196>.





DEVELOP UNDERSTANDING

Describe the problem that these designers responded to.

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ANALYSE

Explain how each of the following factors impact on the design of the Fold Out Bus Rail.

Factor	Impact
Appropriateness of the design
Function
Aesthetics
Ergonomics
Durability

SYNTHESISE

Discuss how these factors impact on each other. Draw out the implications between the factors in relation to the development of the Fold Out Bus Rail or other designs.

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TASK 13.2

FIND OUT

Research environmental issues in design processes. You can use a variety of resources, including the case studies in the textbook on the Active Reactor (Case Study 13.2, p. 135) and the work of Andrew Simpson (Case Study 14.2, p. 143).

APPLY

Water is precious. Space is too. HOG tanks have an unrivaled slim fit, sleek design, and a unique form that works in modules, horizontally or vertically. Robust wall strength and Food Grade plastic means efficient potable water storage, as an emergency water container, or for rainwater reuse.

Source: <http://rainwaterhog.com>

Complete a life-cycle analysis on the Rainwater HOG. Using the table below, show the type of actions that would allow the Rainwater HOG to be environmentally friendly.

Stage of life-cycle analysis	Actions taken to ensure Rainwater HOG is environmentally friendly
Choice of material	
Manufacturing	
Transport	
Product use	
Product disposal	

ANALYSE

Why is it important for designers to consider disposal of the product when choosing materials? Use examples to support your ideas.

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14

Relating the practices and processes of designers and producers to the major design project

START UP

You are a clothing designer developing a new range for the teenage market. Define each step and list the possible activities you may complete at each stage of the design process.

Step in the design process	Definition	Example of activity
Analysis		
Investigation		
Ideas/clothing solutions		
Research and testing		
Modification/refinement		

TASK 14.1

FIND OUT

Design processes are fluid and involve a number of stages and people. Read about Cinnamon Lee (Case Study 14.1, p. 142) and Andrew Simpson (Case Study 14.2, p. 143).



DEVELOP UNDERSTANDING

- 1 Describe the design processes used by each of these designers.

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- 2 Explain the similarities and differences in the two design processes.

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ANALYSE

Discuss the importance of following a design process in developing a successful design project. Use examples from your own work and the work of known designers to support your comments.

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ANALYSE

Discuss how each step influences the next stage in the design process.

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APPLY

Identify five good practices that you can emulate in your design projects.

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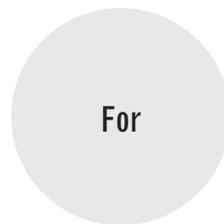
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TASK 14.4

ANALYSE

Debate the topic 'Design is organic: there is no need to plan.' Complete two mind maps to assist you in preparing your arguments.



15

The influence of trends in society on design and production



START UP

In your own words, describe the following:

1 Social issues

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.. .. .

2 Globalisation

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3 Political issues

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4 Economic issues

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5 Environmental issues

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TASK 15.1

ANALYSE

Technologies are developed to keep up with societal changes. Describe how two of the technologies shown below have influenced our lives and changed the nature of everyday tasks.



Wearable technology



E-commerce



Coffee machine

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CREATE

You have developed a new wearable technology for use by elite athletes. Create a pamphlet to describe the technology and its benefits to the individual, the athletic community (local and global) and the environment.



TASK 15.2

APPLY

Designers must consider everyone in the community. Describe how these designs can be modified to accommodate all. Use a number of communication techniques to demonstrate your designs.

Product, system or environment	Description of modification	Communication technique (e.g. sketch/mind map/brainstorm)
Car		
Bed		
Playground		

EVALUATE

Analyse how multiculturalism has influenced designers to introduce many new products and innovations to Australian society. In a separate workbook, plan your answer and then complete a written response using a number of examples (approximately 600 words).



SYNTHESISE

Designers must consider their impact on the environment. They achieve this by completing a life-cycle analysis. You will need to complete a life-cycle analysis for your major design project (MDP). Select the main material used in your MDP and complete the following table.

Identify the main material:

Steps in production (complete each step below)	Describe and analyse the energies used and their environmental impact
Raw materials	Energy/energies used: Environmental impact:
Transportation	Energy/energies used: Environmental impact:
Manufacture	Energy/energies used: Environmental impact:
Packaging	Energy/energies used: Environmental impact:
Use	Energy/energies used: Environmental impact:
Disposal	Energy/energies used: Environmental impact:



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TASK 16.2

APPLY

Label all the elements on the camera below where intellectual property can be protected.



TASK 16.3

FIND OUT

Research the use of sustainable technologies in the design process.

- 1 Explain the environmental issues that have led to the introduction of emerging energy methods.

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- 2 Describe how designers can modify their design and production methods to become more environmentally friendly.

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TASK 16.4

ANALYSE

1 Discuss the ethical issues raised by the use of the internet.

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2 Explain how environmental issues have influenced new innovations. Use examples to support your answer.

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3 Analyse the impact that your major design project (MDP) has on society and the environment.

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EVALUATE

'There is no difference between inspiration and imitation.' Hold a debate on this statement. Prepare both sides of the argument below.

For

Against

17

The factors that influence innovation and the success of innovation

START UP

1 Identify at least four Ps of marketing.

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2 Entrepreneurs are:

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3 Define the following factors and outline how they influence the success of innovations.

a Timing

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b Available and emerging technologies

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c Historical

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d Cultural

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e Political

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f Economic

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g Legal

.. .. .

h Marketing strategies

.. .. .

TASK 17.1

FIND OUT

The success of a product is determined by a number of factors, not just whether it functions correctly. Research a number of successful products. You can use a variety of resources, including the case study in the textbook on the Dyson Airblade™ Tap (Case Study 17.1, p. 165) and the Dyson Airblade™ website (see <http://cambridge.edu.au/redirect/?id=197>).

- 1 Discuss the terms ‘market pull’ and ‘technology push’.

.. .. .



2 Describe why the factor of timing was significant in the success of this innovation.

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3 Identify three factors that affect the success of this innovation.

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4 Clarify the ways in which governments may influence the success or failure of this innovation.

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DEVELOP UNDERSTANDING

Watch any two of the interviews with designers on the Powerhouse Museum website (see <http://cambridge.edu.au/redirect/?id=198>) or search the internet to find interviews with two other designers of your choice.

1 List the two designers and their designs below.

Designer	Product, system or environment
.....
.....



TASK 17.2

SYNTHESISE

You are ready to launch your major design project (MDP) onto the market. Identify how each agency can assist you. Provide specific examples.

Agency	How it can assist
Standards Australia	
IP Australia	
Small Business Council	
Australian Competition and Consumer Commission	
Australian Securities and Investments Commission	
Australian Centre for Innovation and International Competitiveness	

CREATE

Investigate one of the following entrepreneurs:

- Craig Winkler
- Nabi Saleh and Peter Irvine
- Brian Dolling
- Bruno Schiavi
- Gary Gale

Prepare a 7–10-minute speech. Include the following:

- a brief biography of the entrepreneur
- a description of the innovation
- an analysis of the factors that influenced the innovation and its success; for example, timing, cultural, political, economic and legal factors, and marketing strategies
- a discussion of agencies and entrepreneurial activities and the role they played in the success of the innovation.

18

Using creative and innovative approaches in designing and producing

START UP

- 1 The main purpose of developing a need for your major design project (MDP) is to:
 - A identify a clear goal from which to develop a solution.
 - B help develop a prototype.
 - C provide guidance in assisting with the project.
 - D outline what needs to be outsourced.
- 2 Designers demonstrate their creativity through different communication methods. This is important because it:
 - A makes it much more marketable.
 - B gives clear direction for the designer, client and producer to prevent errors.
 - C demonstrates clearly what has influenced the designer.
 - D allows the client to see what they are getting.
- 3 Which of the following outlines systematic design?
 - A A designer's personal perception
 - B A design that has constraints, limitations and opportunities
 - C Collaboration between client, designer and producer to develop a solution
 - D Clear, deliberate, methodical steps
- 4 When communicating a design idea, what is the most important factor?
 - A Knowing a target market.
 - B Having a number of props to communicate the idea.
 - C Demonstrating clear understanding of the need and how the solution meets the need.
 - D Being prepared, and speaking in a loud, clear voice
- 5 A designer has been commissioned to develop a new highchair. In order to evaluate the most appropriate material for this, they must:
 - A investigate the properties of possible materials and complete trial tests.
 - B complete a survey and see what the target market wants.
 - C produce a working model and do product testing on the durability and strength.
 - D speak to the experts in the field.



TASK 18.1

FIND OUT

Designers approach their design processes differently. Using primary or secondary resources, investigate the design processes of two different designers. You may use any resources of your own choosing.

ANALYSE

After choosing your designers, briefly describe the design processes, identifying any similarities and differences.

Designer: **Designer:**

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DEVELOP UNDERSTANDING

With reference to one of the designers you investigated above:

- 1 Describe the product, system or environment he/she designed using a combination of written and graphical communication.

Designer:	Product, system or environment:
Description	Sketch
.....
.....
.....
.....



Factor	CSIRO/Biolytix	My MDP
Search for inspiration		
Documentation of all design ideas		
Consideration of functional and aesthetic factors		
Investigation of competing products		
Model and testing of designs		
Detailed requirement for production		
Consideration of resources (availability and environmental impact)		
Quality assurance system		

TASK 18.3

EVALUATE

'If designers consider quality, innovation and creativity, their product, system or environment will be successful.'
Critically analyse this statement with reference to successful innovations you have studied. In a separate workbook, plan your answer and then complete a written response of approximately 600 words.

19

Identifying a need or opportunity and exploring ideas for design development

START UP

Decide whether each of the following statements is true or false.

- 1 It is important to complete a needs analysis.
- 2 Initial research will help shape my design proposal for my major design project.
- 3 Having an idea of what your final product should look like while developing your need is critical.
- 4 Market research is not required for every project.
- 5 The criteria to evaluate success and areas of investigation must be completed before production begins.

Discuss your answers with a friend or family member. Do you agree or disagree with any of their answers? Justify your answers.

TASK 19.1

APPLY

You have been commissioned to develop a new accessory that can be attached to the interior of a car.

- 1 Complete a needs analysis for this product.

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- 2 Write up a design brief for your product.

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3 Use the table below to identify appropriate areas of investigation for the accessory.

	Areas of investigation	How I will conduct this investigation (primary, secondary, experimentation)	Justification or reason for this investigation and direction for further action
Tools (Research on tools ensures that you are able to use them safely and correctly.)			
Techniques			
Materials			

4 Developing the criteria to evaluate success will help you identify what your product needs to achieve for it to be successful. Complete the table for function and aesthetics only. (For your major design project, you will consider all the appropriate factors affecting design.)

What my product needs to be successful	How I will test this	Justification	Analysis
Function			
1			
2			
Aesthetics			
1			
2			

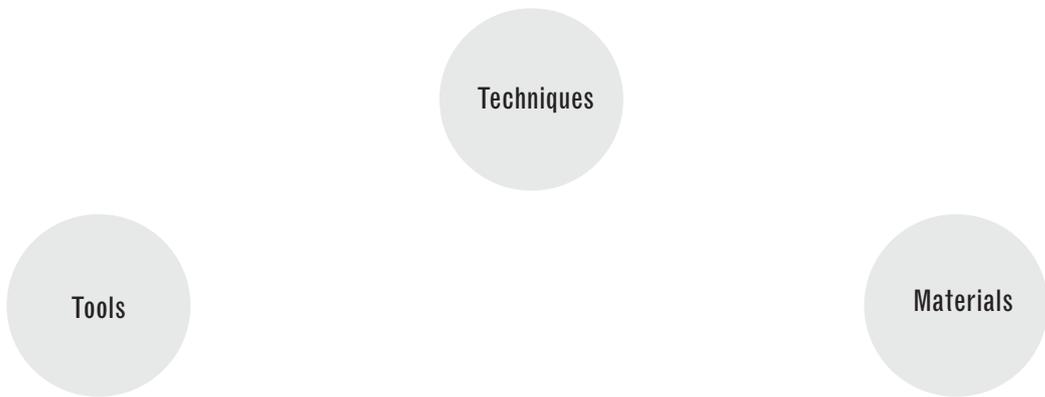


- 2 Identify three possible areas of research and experiments that were undertaken when developing Newson’s designs for the Ford O21C.

Primary research	Secondary research	Experimentation (tools, techniques, materials)

DEVELOP UNDERSTANDING

- 1 Complete the following sentence:
Market research is integral to the successful development of a design project, as it identifies ...
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.....
- 2 Brainstorm the possible tools, techniques and materials you may investigate and experiment with to use with your major design project (MDP).



20

Selecting and using resources responsibly to realise a quality major design project

START UP

Define the following terms in your own words.

1 Standard operating procedures (SOPs)

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2 Safety regulations

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3 Material safety data sheet (MSDS)

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4 Personal protective equipment (PPE)

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5 Ethics

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TASK 20.1

APPLY

PlaySam is a company that creates wooden toys using simple, timeless and elegant designs.



1 Describe why safety is one of the most important factors when designing toys for children.

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2 Discuss what PlaySam must consider to ensure safety guidelines are met.

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Scaffold your answer here.

Safety concern	How it was addressed
Safety of consumers or the end-users	
Safety of the producer/designer	
Personal protective equipment worn when producing the MDP	
Research and experimentation of resources undertaken in the design development stage	

TASK 20.3

FIND OUT

Jewellery designer April Doubleday is committed to socially and environmentally responsible business practices.

April only uses ethical and Fairtrade gold in her jewelry. This gold is mined in accordance with the standards set by Fairtrade Labelling Organisation (FLO). By choosing to source her materials in this way April can be sure that they have been traded in an ethical manner.

Source: <http://www.aprildoubleday.com/policy.htm>

ANALYSE

Describe how ethical considerations influenced the work of April Doubleday.

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21

Evaluating the processes undertaken and the impact of the major design project

START UP

- 1 Evaluation occurs:
 - A at every stage of the design process.
 - B only when something significant happens in the design process.
 - C at the beginning of the design process and at the end of production.
 - D at the market research stage.
- 2 The main purpose of the criteria to evaluate success is to:
 - A identify that a project has achieved its intended outcome.
 - B determine the costing of the product when it is marketed.
 - C ensure the consumer's needs and wants are met.
 - D analyse what research will need to be undertaken.
- 3 Why is it important for designers to evaluate the design processes?
 - A To save the designer money
 - B To ensure products are completed on time, to budget and use the most suitable materials
 - C To ensure that the client's needs are met
 - D To maintain a record for future projects
- 4 Product designers create working prototypes. This assists the design process by:
 - A allowing focus groups to test the prototype.
 - B showing the manufacturers how it should be made.
 - C creating a working solution, which means research can be limited.
 - D testing all the materials, tools and techniques quickly and efficiently, saving the company money.
- 5 Why should function and aesthetics be considered in developing innovations?
 - A To encourage new products
 - B To ensure the product achieves its intended purpose
 - C To increase consumer demand for products
 - D So all new products look good



TASK 21.1

FIND OUT

Evaluation is critical to a successful design, so it is important that designers continually evaluate their designs and processes. The KeepCup was developed to meet an environmental need. It reduces the need for disposable cups. Consumers are encouraged to purchase and use the KeepCup when visiting coffee shops. The KeepCup was especially designed for coffee and is available in a number of colours to attract most consumers.



DEVELOP UNDERSTANDING

- 1 Designers evaluate their designs according to function and aesthetics. Identify the functional and aesthetic characteristics of the KeepCup.

Functional characteristics	Aesthetic characteristics
.....

- 2 Describe three methods of evaluation the designer would have used during the design process.

- i
- ii
- iii

TASK 21.2

ANALYSE

- 1 Explain the role that prototypes and working models played in developing the KeepCup.

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-
-
-



2 Analyse the impact of the KeepCup on society and the environment.

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SYNTHESIS

Every new product, system or environment has an impact. As the designer of your major design project (MDP), you must be aware of the impact your project has:

- on the individual
- on society
- on the environment (local and global)
- in relation to potential social or environmental costs or benefits.

Brainstorm how your MDP impacts these areas. Provide specific examples. Complete a report and place this in the evaluation section of your folio. Use the following table to plan your report.

Individual	Society	Environment (local or global)	Potential cost or benefit (social/environmental)
.....
.....
.....
.....
.....

TASK 21.3

EVALUATE

Analyse the impact that the life-cycle analysis may have on a designer’s design processes and the final product.

22

Managing the development of a quality major design project

START UP

Define the following terms in your own words.

Term	Definition
Project management	
SWOT analysis	
Time plan	
Action plan	
Finance plan	

TASK 22.1

DEVELOP UNDERSTANDING

- 1 Identify and outline three factors you must consider before embarking on the major design project (MDP).
 - i
 - ii
 - iii

23

Selecting and using appropriate research methods and communication techniques

START UP

Investigate the terms below. Provide a definition and example for each.

Term	Definition	Example
Descriptive research		
Historical research		
Experimental research		
Operational research		

TASK 23.1

DEVELOP UNDERSTANDING

You are the designer of a new study desk for teenagers. Complete two mind maps on the next page with possible examples of qualitative and quantitative research.



APPLY

From the mind maps above, choose two research methods that you have used in developing your major design project (MDP), then identify how they aided in the development of your project.

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ANALYSE

Describe research methods that you can use to evaluate the response of your target market. Analyse the relationship between these methodologies and show how they interact. Provide specific examples.

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TASK 23.2

DEVELOP UNDERSTANDING

Explain the importance of ethical research and how it impacts on designs and designers alike.

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ANALYSE

Analyse how research, experimentation, testing and evaluation aided in determining the design ideas, tools, techniques and materials used in your MDP. Provide specific examples.

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TASK 23.3

SYNTHESISE

Catherine Martin is an award-winning Australian production and costume designer. Her work in the films *Moulin Rouge*, *Romeo + Juliet*, *Australia* and *The Great Gatsby* has been highly acclaimed. You can conduct a search online to watch interviews with Martin about her work on set.

- 1 Name and describe the type or types of research Martin would have undertaken before producing the costumes for *The Great Gatsby*.

.....

.....

.....

24

Justifying activities undertaken in the major design project through the study of industrial and commercial practices

START UP

List 10 safe work principles that you should abide by when developing your major design project (MDP).

- i
- ii
- iii
- iv
- v
- vi
- vii
- viii
- ix
- x



TASK 24.1

DEVELOP UNDERSTANDING

Identify and describe the benefits of collaborative design.

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APPLY

Describe the collaborative approaches that may be undertaken in designing and developing a school bus route.

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ANALYSE

Case Study 24.1 (p. 237) describes the process used by an HSC student's MDP. Compare this process with your own MDP, noting similarities and differences.

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TASK 24.2

DEVELOP UNDERSTANDING

Describe how you implemented safe work practices when selecting materials and techniques in the design and production of your MDP.

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SYNTHESISE

Describe and compare how your production process may differ from those used in an industrial situation.

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25

The emergence and impact of new technologies, and the factors affecting their development

START UP

Identify the emerging technology or technologies that underpin these innovations.

Innovation	Emerging technology or technologies
3D films	
Smart car	
Blu-ray player	
E-book reader	
Wireless printer	

TASK 25.1

FIND OUT

Skype has transformed the way we communicate. With the introduction of new and emerging technologies, Skype continues to be innovative. Conduct a search enquiry to find out more about Skype.

- 1 Identify the emerging technology that has made it possible for Skype to be developed.

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2 Explain the ways in which Skype continues to be innovative.

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3 Describe how market research assists in developing new innovations. Use specific examples to support your thoughts.

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SYNTHESISE

Appraise the ecological, economic, social, ethical and legal implications of these new and emerging technologies. Use the table below to plan your response.

Skype or another new communication method

Ecological implications

Economic implications

Social implications

Ethical implications

Legal implications



ANALYSE

Communication has changed significantly over the last 50 years, most particularly with the introduction of smartphones. Discuss the societal impact this technology has had on the way we communicate. Provide specific examples to support your answer in approximately 600 words. Scaffold your answer below:

•	•	•	•
•	•	•	•

TASK 25.3

DEVELOP UNDERSTANDING

Research emerging technologies.

- 1 Identify three different emerging technologies in the area of medical research.

..
..
..

- 2 Describe the positive and negative impacts of these technologies on society.

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..

ANALYSE

Analyse the economic and legal implications of these technologies.

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..
..



Major design project

The major design project (MDP) demonstrates your practical understanding of the Design and Technology course. It will provide you with 60 per cent of your external marks. The MDP allows you to demonstrate your creative skills; however, documentation of this process is critical to your success. As it is a practical subject, the markers will be looking for a quality finished product, system or environment that meets its intended purpose. To be successful in this project, you need to demonstrate that you have a number of qualities. It is important that you are prepared to be flexible and creative in your design decisions. You also need to be able to work in a consistent, concise and methodical manner. As HSC students, you should keep well informed of the requirements of the course. The Board of Studies, Teaching and Educational Standards (BOSTES) publishes information regarding your MDP on its website. Before you begin, you can visit the website to view the marking guidelines (see <http://cambridge.edu.au/redirect/?id=207>). Study these guidelines very carefully. You can even use these marking guidelines as a checklist while completing your project. The notes from the marking centre also provide a good reference. These notes were written by the practical markers of the MDP, and will steer you in the right direction (see <http://cambridge.edu.au/redirect/?id=177>).

This section of the toolkit is a guideline that will assist you in organising your folio. By studying Design and Technology, you will develop a greater understanding and appreciation of the design process. Designers may be employed in different fields and use different technologies, but at a fundamental level they all work with a similar design process. The design folio is a record of how you worked through the design process. It will assist the marker in understanding the design decisions you have made. Each design step must be thoroughly documented and evaluated. Remember, this is a guide only. There are many different ways of presenting your information. You may choose a different format for your folio. Students often explore different mediums to present their work, including:

- concept boards of inspirational images
- sketches that aid in idea development
- slide shows that outline all the experimentations undertaken
- videos or photographs that demonstrate the production process.

All these mediums supplement your folio while demonstrating your creativity. Be aware that there is a six-minute limit to the viewing time of multimedia or media-based attachments. Another stipulation, at the time of writing, is that your folio must not exceed 80 written A4 pages or 40 written A3 pages, printed on one side only. Note that the page limit includes the title page, index, bibliography, design ideas, concept sketches and detailed drawings, as well as information presented on displays or noticeboards. A clear and easily read font equivalent in size to 12-point Times New Roman should be used for text, and folio pages should be numbered.

It is important to regularly visit the BOSTES website to ensure that you are up to date with any changes.

The final product, system or environment needs to be of high quality, reflecting all the research and experimentation you have completed.



Introduction

Imagine your folio to be like a book with three chapters:

- Project proposal and project management
- Project development and realisation
- Evaluation.

You are the author of this book and you must ensure each chapter has the right contents. If you miss one of the elements within these chapters, the book will be incomplete or hard to follow. The same applies to the design process. It is your role to ensure all of the design steps are clearly and methodically documented. The marker will be able to clearly see how you managed your project through your project management section, how your design was developed, and what research and experimentation you completed through the project realisation and development section. Through the evaluation section, your reflections and evaluations give the marker insight into what you or your target market thought of your MDP, and whether it was successful or not. The impact of the design on the environment and society is also documented in this section.

Let's begin your design story!

Project proposal

Identification and exploration of the need

The exploration and development of your 'need' is one of the most important steps in the design process. This will set the scene and tone of your folio and project. This 'need' will provide direction for what research and experimentation you may undertake. You are asked to identify a 'genuine' need or opportunity (project proposal). This need can be written and set up as a design situation, which will provide the audience with an overview and an understanding of why you are completing this project. The design situation will give you an opportunity to document any preliminary research you have undertaken and demonstrate that there is a real need for your design solution. At this point, you shouldn't know what your final product will be; rather, that there is a need for a solution. Your project proposal should include:

- **Design proposal:** Your MDP must reflect a 'genuine' need. Write this up as a design situation. Set the scene for the markers.
- **Preliminary research:** Provide a detailed exploration of this need. Provide evidence using preliminary research of both primary and secondary sources. This may include researching existing products on the market in magazines, journals or newspaper articles, then documenting how these products don't meet your need; data from government agencies or support groups that can provide invaluable statistics to further emphasise the importance of your project; or interviews or focus groups with your target market that could provide great direction and voice for support of your project.
- **Analysis of research:** Discuss how the preliminary research supports the need for your MDP. What did you find? How will people benefit from your design? Ensure that you record the source of any statistics, images or quotes that you may use.
- **Justification of need:** After you have established that there is a market for your MDP, ask: 'Why am I doing this project?'
- **MDP parameters:** Describe your constraints, limitations and opportunities. These may include time, skills, finance and resources.
- **Write up your design brief:** Finally, state the brief – do not be specific with what you will be making but make a clear statement of where your project will be going.



Project management

Effective project management is critical to the success of your MDP. Your teacher can only do so much for you. It is up to you to ensure that you have the best management strategies in place, so that your project is completed on time and within the budget. Developing your areas of investigation, your criteria to evaluate success, and your time, action and finance plans will help you to manage a successful design process. Each of these is a working document, so you must constantly update and refer back to them.

Areas of investigation

Once you have established the need, you can start planning the research that you will undertake to help develop and realise your designs. This document will help you establish a direction for your research and help identify areas that you may experiment with too. This document will be used as a checklist for your research. You must identify, then analyse and justify whether each area of investigation is crucial to the success of the project. Remember that research can be either primary or secondary.

There are four categories:

- 1 Descriptive research (e.g. focus groups, interviews)
- 2 Historical research (e.g. investigation of historical events to support your need)
- 3 Experimental research (e.g. developing prototypes or sample testing)
- 4 Operational research (e.g. assessing products already in the marketplace or testing of products, including site visits, product testing).

Possible areas of research for your MDP may include:

- **Design ideas:** This research will assist you in developing your designs. It may include surveying your target market, inspiration images or shapes, current trends, technological developments, and the analysis of other products on the market.
- **Materials:** This research will assist you in making an effective choice of the best possible materials that can be used in the development of your project. Research a number of materials, then analyse each material's properties, features, availability and cost.
- **Tools:** This research will assist in ensuring the best tools are used to produce your MDP. It will ensure safe and effective use of equipment and tools. All possible tools must be researched, including the features and characteristics of each tool, and the operational and safety instructions.
- **Techniques:** This research includes the decorative techniques (e.g. decoupage, varnishing, staining) and functional techniques (e.g. butt joint, finger joint, mitre joint) that you may use in the development of your MDP. You may then conduct experimentation (through sample pieces and prototypes) to assist your final decision.



	Areas of investigation	How I will conduct this investigation (primary, secondary, experimentation)	Justification or reason for this investigation and direction for further action
Design ideas (This research will assist in the development of my design and the aesthetics of my MDP.)			
Tools (This research will ensure that I am able to use tools safely and correctly.)			
Techniques (This research will teach me the theories of each technique. I can experiment later with these techniques.)			
Material (This research will identify specific properties of materials.)			

Criteria to evaluate success

Next, consider the question: ‘What must my MDP achieve for it to be successful?’ To answer this question, and to develop the criteria to evaluate success, it may help to pretend that you are the client wanting to buy your design solution. What do you want it to do? How much are you willing to pay for it? What must it achieve to be aesthetically pleasing? Don’t just list the criteria. Careful analysis is needed to achieve high marks.

You must identify how you will determine whether your solution successfully meets the need. The criteria to evaluate success also identify what your finished project must achieve for it to be successful. You must identify how you will test these criteria and judge the level of achievement in relation to the set criteria. Each test needs to be specific and easily measurable.

- 1 Criteria for success:** Using the factors affecting design, develop a very specific outline of how your MDP will meet expectations. Remember that function and aesthetics are essential factors.
- 2 Identify the tests:** You must identify how you will test success against each of the criteria. These tests could include interviews, focus groups, observation or product testing.
- 3 Justification:** Analyse why each of the criteria is important to the success of your MDP.
- 4 Analysis:** Further analysis is needed to judge the level of achievement in relation to the set criteria.



For example:

For my product to be successful, it must ...	I will test this by ...	Justification: Why is it essential to achieve this criterion?	Further analysis: What would be the impact on the MDP if the criterion was not achieved?

Action plan

The action plan allows you to plan your design process. You will outline and evaluate each step in the design process – from the initial idea through to the evaluation. It is not appropriate to use a generic template – the action plan must be specific to your MDP. You will outline detailed steps, tools and techniques that you will be using, and any safety issues that you need to be aware of with your chosen MDP. You must constantly refer back to this document.

For example:

Step	Processes	Tools and techniques	Safety issues
1			
2			
3			
4			

Time plan

A time plan will help you manage your time more effectively and complete the project on time. It works hand-in-hand with the action plan, except you will now place time frames on each task. You will identify each step of the design process with actual and proposed times for each step. You must ensure the following:

- Each step must be specific, with a brief description and a start and finish date.
- Show discrepancies. You can use two colours to show the difference between your proposed time and your actual time. Gantt charts and calendars can also be used. This can be completed by term, but you must set up the time plan for all three terms before you start designing and producing.
- Evaluate discrepancies in your time plan. Be specific. What happened? How did it impact your time plan?



For example:

Term 1											
	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Hol. 1
Write up design situation											
Explanation of time discrepancies:											

You may consider combining the action and time plans.

Finance plan

A finance plan is critical to a successful design project. Successful projects do not need to be expensive projects, but careful planning will ensure you use the funds available to you effectively. You must:

- **Establish your budget:** Begin by outlining your budget. How did you arrive at this amount? You may need to complete some preliminary research to find approximate costs of materials. You should analyse your research, produce a guesstimate and then evaluate if production is financially viable. You should compare the cost to similar products on the market.
- **Provide actual costs:** These costs must be documented as you complete the project. Keep all your receipts. A spreadsheet can help you present this, and can complete the necessary additions for you.
- **Evaluate discrepancies:** The finance plan must be evaluated and discrepancies need to be explained. It is important to justify the cost of your MDP.

A table may help:

Item	Proposed cost	Actual cost	Ongoing total	Justification of difference
Total				Explanation of overall budget

See Chapter 22 of the textbook for extended examples of management plans.



Project development and realisation

Evidence of creativity

Evidence of creativity does not need to appear as a separate section in the portfolio. The marker will look at your overall project and assess it through the following areas:

- ideas generation
- degree of difference
- exploration of existing ideas.

Have you used a number of communication techniques? Have you shown individuality in your design solution? Have you explored other products on the market that are possibly similar to yours and ensured yours has a unique feature?

Ideas generation provides an opportunity for you to explain how your ideas were formed, developed and modified.

Most designers begin by mind-mapping key words or by completing basic sketches. This will vary depending on the technologies you are using. Some methods of ideas generation are:

- brainstorming and mind-mapping of possible ideas
- sketches
- diagrams (side view, top view)
- 2D and 3D drawings
- storyboards
- prototypes.

All ideas should be annotated with explanations of how each supports your need or how it may meet your criteria to evaluate success. Annotations may also include possible materials to be used, possible finishes on a product, possible measurements of the product or opportunities for further research. This section should demonstrate the progression of your ideas, showing how your research and experimentation has influenced this development.

To show a degree of difference, describe how your product is different from others, outlining unique features. This could be completed through an annotated sketch of your product. Some questions you may ask are: How does it meet your need or opportunity? How does it satisfy this need better than any other product on the market? Is it more environmentally friendly? Does it have a less expensive production process? Does it better cater for our multicultural society? Does it target a different audience?

The exploration of existing ideas may involve looking at other products to determine which features you will include.

You might annotate images of these products collected from books, magazines, articles, advertisements or brochures. Ask yourself the following questions:

- How have these designs inspired your project?
- What do you like or dislike?
- What materials are suitable?

You can also set up a PMI (plus, minus, interesting) table on each product. Identify how your design need is not met in these existing ideas. This further demonstrates that there still is a need for your project. Identify what you may include in your design to meet the design brief and the criteria to evaluate. An example PMI table is shown on the next page.



Plus	Minus	Interesting
Impact on MDP	Conclusions	

Consideration of design factors relevant to the major design project

Designers must consider how relevant factors affect decisions in the design and production stage. Identify these issues or concerns before production begins on your project. Considering these factors will help you make key decisions on how to modify your design so that it meets the design proposal. When you complete an analysis of the factors affecting design, you must show the marker how each factor affects the design and/or production of the project. Be as specific as possible and only refer to relevant factors. Show the relationships between each factor. How do the factors you have listed impact on each other? Does finance impact on quality or long-term consequences? Is there a relationship between obsolescence and life-cycle analysis?

Ensure that you actually apply and consider these factors in the development of your MDP rather than just providing a simple description of each. **Function** and **aesthetics** are important factors to consider, and others may include:

- appropriateness of design solution
- work health and safety (WHS)
- obsolescence
- needs
- finance
- quality
- life-cycle analysis
- ergonomics
- short-term and long-term environmental consequences.

Appropriate research and experimentation of materials, tools, techniques and testing of design solutions

It is important that you conduct research into, and experiment with, all potential materials, tools and techniques. This research will help you choose the most appropriate materials, tools and techniques. Ensure that your research is concise and relevant.

You will need to document research described in the areas of investigation. Because of the page limitation for your folio, a summary with a bibliography and indication of how the research will impact on the MDP is appropriate. The possible areas of research for your MDP that you had outlined in the areas of investigation include:

- **Design ideas:** Ensure that you now annotate and show how the ideas influenced your design and its aesthetics (if relevant).
- **Materials:** Research a number of materials, then compare their properties, features, availability and costs. Justify the best possible material solution. Complete experimentation and testing with these materials.
- **Tools:** Research the features and characteristics of each tool, including operational and safety instructions. Justify the best possible tools to be used in the development of your project. Complete any relevant experimentation.
- **Techniques:** Research how each technique is to be completed and what tools you will need. Conduct experimentation (through sample pieces and prototypes) to help your final decision.



Use a wide range of primary and secondary sources. Do not just print information off the internet! Make sure you acknowledge all sources of information. Refer to the HSC: All My Own Work website for more information (see <http://cambridge.edu.au/redirect/?id=208>). After completing each of these sections (design ideas, tools, techniques and materials), summarise your research. There are a number of possible layouts to present your research findings. After completing all your research on tools, for example, you could present your summary in a table like this:

Tool	Description	Positives	Negatives	Does it meet the criteria?

Do not just fill this table in. Make sure you complete the research first. This table can assist you in evaluating the best tools to use for your project. You can then write your conclusion on which tools you will use for your MDP. Your research will also include testing through experimentation. These experiments may test your design solutions through prototypes or sample testing. All experimentation must be relevant, and assist your decision making. Photographic and physical evidence for testing can be included in the folio, or displayed for the marker. You may adapt the following template for your own tests.

Aim	To experiment with the technique of ...
Method	
Result	
Conclusion	

The marker will look at your research, experimentation samples, prototypes and your project or design solution to ensure that critical decision making has occurred. You can show this through your ongoing evaluation. The testing of your design solutions must be clearly evident to the markers.

Application of conclusions

A report on research findings is a summary of how the research and experimentation impacts on the design and production of your project. Ensure that you follow what your research has suggested. The marker will look at the link between your research and your project (or design solution). Your report on the research findings should work closely with your design proposal. This is where you tell the marker exactly what you are making, what materials, tools, techniques you are using, and so on, based on your conclusions.

Identification and justification of ideas and resources

You need to acknowledge all your resources, and the impact they have had on the development of your ideas. You are required to provide a detailed list of all people, resources, tools and techniques used in the development of the MDP. If you outsourced any part of the project, you should acknowledge that here too. All your references should be correct. Provide justifications of how they were used and why. Photographs can also assist.



A summary of your MDP

Another way to make a summary of your MDP is by completing a product specification sheet.

Product name	
Relationship to need (How did you ensure you met this need?)	
Tools used	
Techniques used	
Materials used	
Photograph	

Evidence and application of practical skills to produce a quality project

- Aim to produce a quality product, system or environment with a range of high-quality practical skills.
- Try to limit your outsourcing. If you do outsource, ensure you document all the details.
- Keep a camera handy and document the production process.
- A table may be useful to record your production process through photos and comments or evaluations at each step.

Evaluation

Recording and application of evaluation procedures throughout the design project

It is important that you are continually evaluating the design process. This can be done through regular reflections. Demonstrate critical evaluation through ongoing:

- reflections on time, action, finance and production
- evaluation throughout the portfolio.

You might like to highlight this in your folio by placing stickers or stamps where you have made an evaluation. You should evaluate against the identified need or opportunity and your criteria for success.

Analysis and evaluation of functional and aesthetic aspects of design

Your critical analysis should relate to functional and aesthetic aspects. You are required to evaluate the factors of function and aesthetics. Look back at your criteria to evaluate success and review what you wanted to achieve. Has your product, system or environment met these factors?

- **Functional aspects:** Does the design meet its intended purpose? Does it work as expected? Does it perform the task for which it was designed? Is it efficient and effective? Does it satisfy the client's or your needs?
- **Aesthetic aspects:** Is the design appealing to the target market? Does it relate well to its intended environment?

Detailed analysis of these two design factors, as well as any other relevant factors, should be completed here. Ensure that you are honest and critical. What worked? What didn't? What changes would you have made to your design?



Final evaluation with respect to the project's impact on the individual, society and the environment

Your MDP will have an impact on the individual, society and the environment. There is no definitive list of factors you may consider here. Some are personal values, individual needs, cultural beliefs, equity, safety and health, economic factors, community needs, employment, ethical impacts, the consumer, advertisements, intellectual property, privacy, testing, life-cycle analysis, pollution, waste management, landfill, noise pollution, sustainability, energy, global warming.

Relationship of the final product, system or environment to the project proposal

Finally, you are to complete evaluations of how your MDP has fulfilled the project proposal. This ensures that you go back to your design proposal. You need to ask: 'Does it satisfactorily meet the design proposal?' Begin by restating the purpose of your project. Does the finished product fulfil the purpose? Why or why not? Could it be improved? What skills and techniques could you have improved on? What changes, if any, would you make to the overall design? You can ask an expert, or a member of the target market, to evaluate the product. For expert evaluations, ensure that they are completed on a letterhead. What comments were made? Perhaps provide your evaluators with a simple survey. The questions should relate to the criteria to evaluate success.

A photo or video of the final product in its intended environment will provide evidence that your design actually works. As the markers are visiting your school, they may not see your project in its intended environment. You can demonstrate this with a short video showing your project in use. Alternatively, you can photograph the work in its intended space. You can now also test your design against the criteria to evaluate success. At the start of the design process, you established what your project must achieve to be a success. You will now complete this process by completing the tests you outlined and report on the results. Was your product successful? Why or why not?



HSC practice exam 1

SECTION I

Total marks (10)

Attempt questions 1–10.

Allow about 15 minutes for this section.

- 1 What factor would be most important to consider when designing a climbing frame for a primary school playground?
 - A Cost of materials
 - B Current trends
 - C Safety requirements
 - D The physical environment
- 2 Conducting an interview with a member of the target market is known as:
 - A quality control.
 - B primary research.
 - C secondary research.
 - D statistical analysis.
- 3 When selecting materials for a sailing jacket, it will be most important to test for:
 - A durability.
 - B recyclability.
 - C waterproofing.
 - D weight.
- 4 Communication can be evaluated by considering:
 - A people involved, use of computer technologies, the message.
 - B effectiveness of computer software, clarity of voice, body language.
 - C number of participants, message content, context.
 - D clarity of message, appropriateness of method, ease of interpretation.



- 5 The most effective way to present a new product design clearly is to provide a:
- A prototype.
 - B sketchbook.
 - C PowerPoint presentation.
 - D rendered drawing.
- 6 Before using a piece of equipment for the first time, one should:
- A check with the teacher.
 - B refer to the operating manual.
 - C ensure the power is on.
 - D conduct a risk assessment.
- 7 What is the most relevant application to be considered when selecting a machine that is safe for workers to make a product?
- A Patents
 - B WorkCover authority guidelines
 - C Legislation
 - D Standards Australia
- 8 The philosophy behind sustainable design is to use a process that will produce a design that:
- A is financially, culturally and ethically sustainable.
 - B will provide long-term employment.
 - C considers environmental consequences as a priority.
 - D is socially, economically and environmentally sustainable.
- 9 A design team is developing a new cultural centre in your neighbourhood. Which strategy would be most effective in ensuring the centre is completed on time and within the budget?
- A Employ a financial controller and project manager
 - B Ensure every team member has access to email and management software
 - C Develop a management plan and evaluate it regularly
 - D Provide copies of the management plan to all team members
- 10 When evaluating the long-term consequences of designs, it is most important that designers consider:
- A economic and environmental factors.
 - B price and recyclability factors.
 - C safety and production issues.
 - D cost and ergonomic issues.



SECTION II

Total marks (15)

Attempt questions 11–14.

Allow about 40 minutes for this section.

Question 11

At the Consumer Electronics Show in Las Vegas in January 2010, Microsoft Corporation Chief Executive Steve Ballmer demonstrated a Hewlett-Packard slate computer, a type of device designed to supplant e-readers. The machine could display both printed content and video, and carry a continuous internet connection. Other electronic companies have also developed tablets, such as the iPad, which allow users to download their books or videos or music to enjoy at a time suitable to them.

Use examples to explain the term 'innovation'. (1 mark)

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Question 12

In the table below, describe how the factors listed impact on the success of the innovation described above. (4 marks)

Factor	Contribution to the success of the slate computer
Timing
Culture
Economy
Emerging technologies

HSC practice exam 2



SECTION I

Total marks (10)

Attempt questions 1–10.

Allow about 15 minutes for this section.

- 1 A design process may be described as:
 - A cyclical and ongoing.
 - B a framework for product development.
 - C the steps of design production.
 - D the first stage of production.
- 2 Trends in design and production are influenced by:
 - A market research and cultural issues.
 - B primary and secondary research.
 - C advertising, media ownership and social websites.
 - D social, global, political, economic and environmental issues.
- 3 When selecting materials for an environmentally friendly lunch box, it will be most important to test for:
 - A durability.
 - B recyclability.
 - C waterproofing.
 - D weight.
- 4 Social conscience refers to:
 - A racist attitudes.
 - B effectiveness of social education.
 - C individual and societal values.
 - D religion and equality.



- 5 The ongoing process of integrating world economies, societies and cultures is known as:
- A the World Wide Web.
 - B global warming.
 - C communication.
 - D globalisation.
- 6 Legislation that prohibits commercial behaviour or conduct that is unfair, misleading or deceptive is the:
- A Trade Practices Act.
 - B Work Health and Safety Act.
 - C Goods and Services Tax.
 - D free trade agreement.
- 7 The best examples of finite resources are:
- A oil, natural gas, coal.
 - B plastic, wool, solar power.
 - C water, polyester, cotton.
 - D metal, diesel, biomass.
- 8 Protecting the shape, configuration, pattern and decoration of a design occurs through:
- A registered designs.
 - B trademark.
 - C patent.
 - D copyright.
- 9 An innovative product is one that:
- A fulfils a need.
 - B is different to existing products.
 - C builds on an existing market.
 - D involves complex electronics.
- 10 When selecting the most appropriate material for outdoor furniture, one should test for:
- A flammability, fading, strength.
 - B colour, recyclability, hardness.
 - C durability, ultraviolet ray resistance, water resistance.
 - D cost, machinability, draping.



SECTION II

Total marks (15)
 Attempt questions 11–14.
 Allow about 40 minutes for this section.

Question 11

You have been commissioned by a young mother to design a pull-along toy for her son, who is nearly two years old. The design brief reads:

The toy should be different and more interesting than those available in the shops. I prefer it to be made from natural materials that are environmentally sustainable. It should be handmade and brightly coloured as well as safe and durable.

Use the table below to identify a constraint or consideration related to each of the design factors. (2 marks)



Design factor	Constraint or consideration
Function
Aesthetics
Materials
Ergonomics

Question 12

Identify a material you may consider suitable for this product. Describe a test you would conduct on the material to assess its suitability for your toy. (3 marks)

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Question 13

It is important that this toy is environmentally friendly. You have decided to conduct a life-cycle analysis on this product. Explain the process you will use to conduct this analysis. (4 marks)

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Question 14

This toy is a one-off production. Compare and contrast the processes involved in this one-off production with those employed in mass production. (6 marks)

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SECTION III

Total marks (15)

Attempt question 15.

Allow about 40 minutes for this section.

Answer the question in a separate workbook.

Question 15

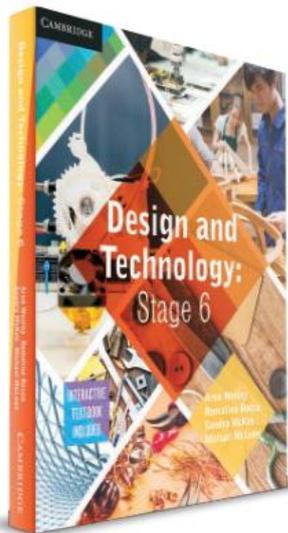
'Social and cultural change is necessary for the successful implementation of environmental solutions.' Discuss this statement in relation to ethical and environmental issues for designers who wish to respond to the eco-friendly movement in design.

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