

Aspect 1 Describes appropriate problem, which leads to a design opportunity.	Aspect 2 Explains the key findings from relevant market and user research	Aspect 3 The Design Brief	Aspect 4 Marketing Specifications	Aspect 5 Design Specifications
<p>The design problem should be clearly stated using supporting materials.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Supporting materials can/should include: <ul style="list-style-type: none"> o Photographs of location highlighting issues. o Focus group (about 5 people) discussion to see if there is a potential need. o Extracts from letters, magazines (consumer report magazines could be useful), forums or news. o Statistics (such as injuries, performance, etc) o One or two existing examples (showing how it doesn't fit the needs of the client), etc. SOWT (or something similar) with clients. o Perception graph or initial market research (HL extra content) to find an opportunity. o Lifestyle or image board o Summarised results of a comprehensive interviews or questionnaires with potential clients (primary and secondary). o Ethical considerations (Environment, social, etc) o Establish why it is a problem i.e. prove there is a need. o Establish where it is occurring. <input type="checkbox"/> Describes an appropriate problem that leads to a design opportunity (mention it). Concluding summary of the problem. <input type="checkbox"/> This should be on approximately two A4 (letter) page or equivalent. 	<ul style="list-style-type: none"> <input type="checkbox"/> Research plan including the following: <ul style="list-style-type: none"> o Priority (number it). o Area of research or research topic – this should be comprehensive and specific to the project. o Details such as questions you want answered o Primary and secondary methods of collecting data –use a range of techniques. Appropriate primary and secondary sources are used. Balanced o Identify whether the data to be collected is quantitative or Qualitative <input type="checkbox"/> Follow the research plan – make adjustments to the plan if need be <input type="checkbox"/> Feasibility study for making the prototype – cost, time, facilities, sustainability and scope. <input type="checkbox"/> Carry out market research. This research will/should help you to develop your Marketing specifications <ul style="list-style-type: none"> o An analysis of competing or similar products. SWOT or something similar. o Surveying potential users regarding existing products o Types of shops the product is sold in. o Types of customers (who are potential primary or secondary clients) o Key features such as aesthetics, dimensions, cost, etc <input type="checkbox"/> Carry out and user research. This research will/should help you to develop your design specifications <ul style="list-style-type: none"> o User wants and wishes o Product key features, materials, dimensions etc <input type="checkbox"/> Key findings are summarized <ul style="list-style-type: none"> o Establish why the research data (information) is relevant and useful for the development of the solution <input type="checkbox"/> This should be on approximately two A4 (letter) page or equivalent. 	<ul style="list-style-type: none"> <input type="checkbox"/> A detailed design brief comprises the expected outcome and broad requirements <i>determined from the market and user research</i>. <ul style="list-style-type: none"> o The design brief is the formal starting point for a new design. Occurs when the designer presents the design to the client. It is a statement of the expectations of the design. o The brief does not provide the design solution, but is a statement that sets out: <input type="checkbox"/> The brief should include: <ul style="list-style-type: none"> o the design goal (for example, a working prototype to be evaluated in terms of its feasibility for volume production) o the target Audience for the product. For example for children, disabled adults, etc. o the target market for the product. for example, market sector (a broad way of categorizing the kinds of markets a company is aiming for) or market segment (markets divided up into smaller segments where the consumers have similar characteristics and tastes). o the major constraints/parameters (these have to be in such as legislation or food safety regulations). For example, should comply with new legislation, have fewer working parts, be cheaper to manufacture) within which it must be achieved o the criteria (these are wishes, it would be great if??) by which a good design proposal may be achieved (for example, increased value for money and/or cost-effectiveness for manufacturer). o The feasibility of the project should be considered. o Scale of production. <input type="checkbox"/> This should be on approximately one A4 (letter) page or equivalent. 	<ul style="list-style-type: none"> <input type="checkbox"/> Marketing specifications relate to market and user characteristics of the proposed design. <input type="checkbox"/> Target market <ul style="list-style-type: none"> o Consideration only needs to be given to market sectors and segments. <input type="checkbox"/> Target audience <ul style="list-style-type: none"> o Differentiate between the target market and the target audience. o Characteristics of the users should be established. o Primary and secondary clients are identified and described. o Two personae could be outlined <input type="checkbox"/> Market analysis <ul style="list-style-type: none"> o A summary is required of the important information gathered about: <ul style="list-style-type: none"> o Potential users and the market. o A major trend in the market is identified o An appraisal of economic viability of the proposed design from a market perspective is important taking into account fixed and variable costs and pricing. o Analysed the market in terms of potential users, size and economic viability o Consider the market needs for a detailed discussion of the problem, through use of interviews, questionnaires, newspaper articles, etc o Is there a market gap to fill o Where will it be sold <input type="checkbox"/> User need <ul style="list-style-type: none"> o Specifications should identify the <i>essential requirements</i> that the product must satisfy in relation to market and user need. <input type="checkbox"/> Competition <ul style="list-style-type: none"> o A thorough analysis of competing designs is required to establish the market need. o Identify where the product will sit in the market in relation to the competition o The marketing specification must be developed from the design brief and research. <input type="checkbox"/> This should be on approximately one A4 (letter) page or equivalent. 	<ul style="list-style-type: none"> <input type="checkbox"/> The requirements should include: <ul style="list-style-type: none"> <input type="checkbox"/> aesthetic requirements <input type="checkbox"/> cost constraints <input type="checkbox"/> customer requirements <input type="checkbox"/> environmental requirements <input type="checkbox"/> size constraints <input type="checkbox"/> safety considerations <input type="checkbox"/> performance requirements and constraints <input type="checkbox"/> materials requirements <input type="checkbox"/> manufacturing requirements <input type="checkbox"/> any other you can think off ... <input type="checkbox"/> All of the requirements and constraints need to be: <ul style="list-style-type: none"> o Justified o specific (exactly what it has to be), o feasible o measurable (so think of tests that you may perform). o evidence that the design specification are drawn from the research (your research plan would help outline your specifications). o Perhaps include a column on how you will test it at the end <input type="checkbox"/> The design specification must be developed from the design brief. <input type="checkbox"/> This should be on approximately one A4 (letter) page or equivalent.

Conceptual Design		
Criterion B		
Aspect 1	Aspect 2	Aspect 3
Justifies the choice of appropriate	Use concept modelling to guide design development	Justifies the most appropriate idea for detailed development.
<ul style="list-style-type: none"> • generating original ideas <ul style="list-style-type: none"> ○ Start with napkin sketches (number the individual sketches) ○ Select about 5 ideas to incrementally improve so to better meet the appropriate specifications ○ Make low fidelity card/clay etc models of the 5 ○ Evaluate them against the specifications, with the client and peer review (summarise the client and peer feedback) ○ Choose two based on the evaluation • communicating ideas clearly using appropriate techniques <ul style="list-style-type: none"> ○ graphic, CAD, and physical (3d printed and card) modelling. ○ appropriate and meaningful annotations to identify key features that explain how they meet the design specifications ○ annotations should also related back to the theory, e.g. topic 1 ○ annotations should show begin thinking and be linked to previous designs • undertaking additional (and record it) research as required to inform development. • This should be on approximately four A4 (letter) pages or equivalent. 	<ul style="list-style-type: none"> • Concept models in the form of sketches, CAD, 2D and 3D models should be used to establish the validity of ideas against specifications before refining ideas through detailed development. <p>Concept modelling is used to:</p> <ul style="list-style-type: none"> • test design ideas to find out if they will meet requirements against the specifications <ul style="list-style-type: none"> gain target audience (client) feedback peer/expert appraisal • provide feedback, which is used to develop designs further. • You should consider the appropriate use of conceptual, graphical, physical and CAD models to develop, refine and test their ideas. • Develop your two chosen ideas further with extra modelling (Graphic, CAD, etc) • Continue annotations (see above) - Annotations should show begin thinking and be linked to previous designs <ul style="list-style-type: none"> • This should be on approximately 6 A4 (letter) pages or equivalent. 	<ul style="list-style-type: none"> • Evaluate ideas and models against the design specification to identify the most feasible solution. • The most appropriate idea should be validated against specifications before development is refined to enable manufacture. • The most appropriate idea should be validated by the client and peer/expert • Present the most feasible idea. • 3D sketch or CAD model • Justification for chosen solution. • This should be on approximately one A4 (letter) pages or equivalent.

Development of a detailed design

Criterion C

Aspect 1	Aspect 2	Aspect 3	Aspect 3
Justifies the appropriate materials and components for a prototype.	Justifies the appropriate manufacturing techniques for the prototype.	Develops an accurate and detailed design proposal.	Produces a detailed plan for the manufacture of the prototype.
<p>Materials are identified and selected considering the requirements of the prototype.</p> <ul style="list-style-type: none"> Did the user suggest a preferred material such as wood? Then you need only look at types of wood can be justified through cost, availability (supply) <u>properties</u> (aesthetic, mechanical and physical), environmental concerns, etc use material selection charts a variety of materials (if client states wood then various types of wood) should be considered finishing of materials should be considered (veneers, lacquer, oil, wax, etc) valid reasons (justification) for your choice need to be presented. Provide rationale for why the materials were chosen compared with other options i.e. appropriateness. with specific reference back to the specifications Material examples: MDF, fiber board, acrylic, glass, canvas, synthetic leather, laminated veneer, composites, textiles etc. <p>Components are identified and selected according to the requirements of the prototype.</p> <ul style="list-style-type: none"> can be justified by considering cost, availability (supply), etc Provide rationale for why the components were chosen compared with other options i.e. appropriateness. mechanical components, assemblies, or sub-assemblies, etc joining of components valid justification of choice needs to be presented. with specific reference back to the specifications Components example: frames, channels, hinges, nut, bolts, screws, belts, tubes, gears, ball bearings etc... <p>Testing: Some tests may be carried out to see what finish is suitable, can those components be joined in that way, some more modeling may be needed, etc</p> <p>This should be on approximately two A4 (letter) pages or equivalent.</p>	<p>Manufacturing techniques are identified and selected according to the requirements of the prototype</p> <ul style="list-style-type: none"> including joining, cutting, laser cutting, and so on. valid reasons (justification) for your choice need to be presented. Provide rationale for why the manufacturing techniques were chosen compared with other options i.e. appropriateness. Accuracy, works only with that type of material choosing manufacturing - needs to justify why it is best suit for the intended part can be justified by considering cost, availability (supply) and/or the working properties of the materials, etc evidence of testing of manufacturing techniques <p>This should be on approximately two A4 (letter) pages or equivalent.</p> <p style="text-align: center;">If you collected new research, cite it!</p>	<p>Develop the design to take into account the choice of materials, components and manufacturing techniques.</p> <ul style="list-style-type: none"> Use CAD, hand drawn, paper/card models and other techniques and methods to finalise the details of the design 3D drawings Orthogonal (with dimension and appropriate standards/conventions), including part, assembly and <u>exploded isometric</u> (if needed). Design proposal should be in enough detail so that a third party (manufacturer, craftsman) to be able to understand them correctly and be able to manufacture it without help. Include details such as sizes, materials, components, assembly, production methods, tools, resources, cutting list, etc. Cutting (materials) list or <u>Bill of Materials</u> (BoM) <p>This should be on approximately three A4 (letter) pages or equivalent.</p>	<p>Plan should contain</p> <ul style="list-style-type: none"> Component name Step number description of the process estimated time of completion of each stage and overall prototype manufacture manufacturing techniques (equipment requirements) risk assessment (health and safety considerations) quality control (jigs, etc) resources it should be in enough detail for a third party to be able to manufacture the prototype. Should be presented in the following formats. <ul style="list-style-type: none"> Gantt charts Flow diagrams Tables <p>This should be on approximately two A4 (letter) pages or equivalent.</p>

Testing and Evaluation		
Criterion D		
Aspect 1	Aspect 2	Aspect 3
<p>Evaluates the success of the solution against the marketing specification</p> <p>Identify strengths and weaknesses by testing the prototype(s) against the marketing specification in criterion A.</p> <ul style="list-style-type: none"> • Test would include interview and product trial • Aspects (areas) to include in your tests: Target market, Target audience, Market analysis, User need and Competition. • Evaluate against all the marketing specifications. • Really look for weaknesses otherwise it will be difficult to complete improvements <p>This should on approximately two A4 pages or equivalent.</p>	<p>Evaluates the success of the solution against the design specification</p> <p>Identify strengths and weaknesses by testing the prototype(s) against the design specification in criterion A.</p> <ul style="list-style-type: none"> • These include: <ul style="list-style-type: none"> ○ Cost constraints ○ Environmental requirements ○ Size constraints ○ Safety considerations ○ Performance requirements and constraints ○ Materials requirements ○ Manufacturing requirements ○ Any extras that pertain explicitly for you design. • Design tests that can test against more than one specification point at a time. • Test would include: user trial, user research , user observations, , field trial, expert appraisal, performance test, etc • Evaluate against all design specifications. • Where possible strengths and weaknesses should be measureable. • Really look for weaknesses otherwise it will be difficult to complete improvements <p>This should on approximately two A4 pages or equivalent.</p>	<p>Explains how the solution could be improved.</p> <ul style="list-style-type: none"> • Suggest improvements to address weaknesses identified through evaluation against marketing and design specifications. • If the final product does not meet any of the marketing or design specifications then suggestions need to be made. • Suggested modification should be valid and feasible. • Improvements should be in the form of revised specifications, annotated (meaningful) photographs, annotated (meaningful) drawings, revised CAD model, revised orthographic drawings. • The improvements should attempt to bring the product up to specification <p>This should on approximately three A4 pages or equivalent.</p>

Commercial Production Criterion E		
Aspect 1	Aspect 2	Aspect 3
Justifies the choice of materials and components appropriate for commercial production	Justifies the choice of manufacturing techniques appropriate for commercial production	Explains design modifications to the solution required for commercial manufacture.
<p>Materials and components are identified and selected according to the requirements of making the product commercially viable.</p> <ul style="list-style-type: none"> • Explain your choice and why the material is most appropriate. • Valid reasons for your choice is needed. • These need to be justified with regards to properties (physical, mechanical and aesthetic), cost, supply, ease of (in combination with chosen) manufacture, and so on. • Components considering assemblies and sub-assemblies. <p>This should be on approximately two A4 pages or the equivalent.</p>	<p>Manufacturing techniques are identified and selected according to the requirements of making the product commercially viable.</p> <ul style="list-style-type: none"> • Justified and valid reasons for your choice is needed. • Why did you choose one manufacturing technique over another., <ul style="list-style-type: none"> ○ ie Injection moulding for ABS (match the technique with the material and its properties), also, it is cost effective for volume production • These need to be justified with regards to properties (physical, mechanical and aesthetic), cost, supply, ease of manufacture, assembly, quality control and so on. • Scale of production and productions runs need to be considered and paired with appropriate manufacturing techniques. <p>This should be on approximately two A4 pages or the equivalent.</p>	<p>The detailed design should be modified in order to be compatible with the manufacturing techniques for commercial production and the design specification.</p> <ul style="list-style-type: none"> • Improvements should be presented in the form of revised specifications, annotated drawings/ photographs, or CAD. • Explain how the solution would be modified for commercial production. • This could include drawing angles for a mould, modifying assembly, some redesign to accommodate components, interior of a product to accommodate electronics and so on <p>This should be on approximately two A4 pages or the equivalent.</p>

Marketing Strategies

Criterion F

Aspect 1	Aspect 2
<p>Justifies an appropriate target sales price.</p> <p>Evidence is required to justify the sales price based on:</p> <ul style="list-style-type: none"> • Competing or similar products • Market need • Break-even point - identify fixed costs and variable costs. Things like moulds, components, manufacturing etc. • Use of possible manufacturing calculators to help justify price. • Compare the cost of existing products against the cost of making a prototype • Target sales are justified using the invention calculator • And adjust costs to suit proposed scale of manufacture. • Select pricing strategy(ies) • Set a price point (or range), allowing for profit <p>The evidence for achievement against this strand should be presented in approximately two A4 pages or the equivalent.</p>	<p>Discuss appropriate promotional strategies for the solution</p> <p>Appropriate promotional strategies should be discussed in relation to the suggested initial production run and the nature of the target market. These could include:</p> <ul style="list-style-type: none"> • Advertising (online, magazines, sides of trucks, billboards, etc), sales promotion, personal selling, multi-level marketing, internet marketing, sponsorship. • Consider the demographics of your market segment • Consider the The 4p's <ul style="list-style-type: none"> ◦ Mindtools questions on the 4p's ◦ 4P's and Marketing Mix ◦ Where will it be sold (geographically, bricks n mortar, internet, hybrid of the two) • Develop and justify a brand identity <ul style="list-style-type: none"> ◦ Name(title), logo, colour scheme, trademark ◦ Packaging Design (possibly) • Consider product family and/or mass customization to widen market opportunities. <ul style="list-style-type: none"> ◦ Include images • Consider what your competitors do. • Discussed the reasons for the choice of marketing and promotional strategies. • A timeline for a promotional strategy <p>The evidence for achievement against this strand should be presented in approximately two A4 pages or the equivalent.</p>