DE2-EDP

Engineering Design Project

DE2 EngDes - Design Challenge

2018 - 2019

Dyson School
of Design
Engineering

Brief:

Design and engineer a battery powered hand-tool for home, garden or educational use, that not only appeals to the mass market, but also meets the needs of a specific (underserved) user group.

Design and develop an inclusive consumer product that *genuinely deserves to exist!*

Your team will deliver a compelling and commercially viable product design solution, based on genuine user insights, realised to fully working prototype, supported by a detailed production data package.

A successful delivery for this module will require the thoughtful synthesis and application of the design and engineering knowledge and skills you have gained to date, alongside the acquisition of new knowledge, skills and working practices.

This end-to-end product design and engineering development will deepen your understanding of how to effectively apply your acquired tools and techniques, and provide greater insight into both what they can deliver, and the challenges that their effective implementation can present.

You will work in professionally structured teams and take ownership of defined roles and responsibilities, for which you will be accountable.

Why? (Background and further reading):

University of Cambridge – Inclusive Design Toolkit:

"Every design decision has the potential to include or exclude customers. Inclusive design emphasizes the contribution that understanding user diversity makes to informing these decisions, and thus to including as many people as possible. User diversity covers variation in capabilities, needs and aspirations ….

…. The British Standards Institute (2005) defines inclusive design as:

'The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible ... without the need for special adaptation or specialised design'… "

http://www.inclusivedesigntoolkit.com/whatis/whatis.html

"OXO began with a few simple questions - Why do ordinary kitchen tools hurt your hands? Why can't there be wonderfully comfortable tools that are easy to use?

In 1990, the first group of 15 OXO Good Grips kitchen tools was introduced to the US market. These ergonomically- designed, transgenerational tools set a new standard for the industry and raised the bar of consumer expectation for comfort and performance.

The annual growth in sales was over 35% per year from 1991 to 2002, and the line now contains more than 500 innovative products covering many areas of the home."

http://www.inclusivedesigntoolkit.com/case_studies/case_studies.html

Ideo.org

"Immersing yourself in another world not only opens you up to new creative possibilities, but it allows you to leave behind preconceived ideas and outmoded ways of thinking. Empathizing with the people you're designing for is the best route to truly grasping the context and complexities of their lives. But most importantly, it keeps the people you're designing for squarely grounded in the center of your work."

'Empathy' - Emi Kolawole, Editor-in-Residence, Stanford University d.school
http://www.designkit.org

The RSA Student Awards 2017/18

"Inclusive design is about understanding people – their needs, their concerns, and what they really want from a space – and engaging the more social aspects of design that others overlook. It's about socially sustainable and affordable design that puts people at the heart of the design process, provides choice and flexibility, acknowledges diversity and difference and does not preclude anyone throughout the cycle of life."

https://www.thersa.org/globalassets/pdfs/sda-briefs/sda17-18-brief-6-eat-share-live-final.pdf

The Design Council:

"Inclusive thinking needs to be built into the design process, whether you're designing for the pixel or the city"

Mat Hunter, Design Council Chief Design Officer

https://www.designcouncil.org.uk/news-opinion/inclusive-design-pixel-city

The Helen Hamlyn Centre for Design

"… people drawn from the Helen Hamlyn Centre for Design's user network …. are not fictional characters – they are real individuals with differing degrees of functional loss across the spectrum of capability. They speak about their lives, their challenges, their relationship with design and the impact that poor design has on them.

Their stories demonstrate that when designers engage directly with real people then there is a richness of information that cannot be obtained through more indirect design research methods alone, valuable though these can be."

http://designingwithpeople.rca.ac.uk/people

"One of the key ways to get started in designing with people is to explore their daily activities – the tasks and rituals that are part of their everyday lives."

http://designingwithpeople.rca.ac.uk/understanding-everyday-activities-in-context

Working as a team:

Professional teams work most effectively when roles and responsibilities are clearly defined. In working together to deliver an outstanding outcome, **each member of the team will adopt a specific role from the list below**. This role will be placed on record with tutors at the outset of the project.

In adopting a role, team members **do not** sign up to creating all of the submission content or assets associated with that role. Rather, the role is to coordinate the team's efforts to ensure delivery of the assets associated with that role's area of responsibility. Role holders will track progress and set targets, delegating, coordinating and collaborating wherever necessary, to ensure appropriate focus and resources are applied to the delivery of outcomes outlined under their key responsibilities. They will identify where suitable progress is not being made, and work with their teammates to resolve resource shortfalls.

Equally, in adopting a role, team members do not abdicate responsibility for their team's delivery of assets outside of their role. One of the many benefits of knowing who is managing what, is that all team members can direct their support, inputs and concerns toward an identified teammate whose role is clearly defined.

Successful delivery within this module will require a high level of focus on resolution at every stage. The module is structured to ensure that a rigorous delivery against each milestone in turn can build toward a highly resolved outcome. Weak, poorly defined, or delayed outputs at any stage of the process undermine all successive stages of product development. It is therefore essential that the team deliver timely and rigorously validated progress and outputs at every step, in preparation for the next.

At points of assessment, role holders will be expected to report on, and answer for, key decisions and progress made by the team, within their field of responsibility. A total of 35% of your final grade for the module will be subjected to your tutor's and your team's assessment of your performance within your role and within the team overall ….

CCO (Chief Creative Officer)
As CCO you will oversee, track and coordinate your team's: Branding development and graphical communications; Videography; CMF (Colours, Materials and Finishes) research, exploration and specification; Storytelling and narrative structure; Product USP positioning and communication; Digital presentation structure, timing, content and rehearsal; Analysis of market design trends and product positioning; Packaging design and definition; Product design detailing; User interface development and definition; Soft modelling assets; Visual product renders; Product naming and logo development; User guide graphical communication; Marketing materials and assets;

COO (Chief Operations Officer)
As COO you will oversee, track and coordinate your team's: Timetable, plan, logistics and attendance for collaborative working sessions; HCD research strategy, recruitment process, logistics and communications; Project budget management and financial record keeping; Creation and management of a 'Live' Gantt chart tracking progress toward deadlines and milestones; Prototype and test rig production lead-times and logistics; Team meetings - process for agreeing times, pooling of inputs for agendas, notation of attendance, records and dissemination of summaries, key decisions, actions and their owners; Identification and record keeping of a chair for each meeting; Ethics approvals for user research;

CIO (Chief Information Officer)
As CIO you will oversee, track and coordinate your team's: Research data capture, assets (photographs, videos, notes), insights, findings and conclusions; Shared database structure, naming conventions, version control and asset management; Reference database; Test data capture, analysis and presentation; Liaison and dialogue with tutors and dissemination of tutor feedback; Contacts database; Signed participant release form database (consent to the use of image and voice recordings in public communications); Application and adherence to production data conventions, standards and protocols; Reviews of data prior to data issue; Validation evidence; Coordination of hardware, assets and materials for milestones, submissions and digital presentations;

CTO (Chief Technical Officer)
As CTO you will oversee, track and coordinate your team's: Technical research plan, analysis and findings; Product design specification definition; Product compliance research and recommendations; Regulatory product labelling, warnings and user guide requirements; Risk analysis; Engineering development requirements and gateways, CAD data creation and data management; Production data package; Prototyping process research, evaluation and selection; Testing and validation plans; Data analysis and calculation verification; Materials research; Component specification and selection; DFM and DFA considerations and communication;

CCO   _____

COO   _____

CIO   _____

CTO   _____

Teams of 5:
Have an additional step to undertake on day one: as a team, create a list of the responsibilities the 5th team member will own, taken from each of the 4 roles outlined above, reach agreement on the fairness of this division, and assign an appropriate title to the newly defined role. Submit this list of 'owned' responsibilities, and the additional role title, to your tutors along with the list of team members assigned to each of the pre-defined roles above (it's a little extra work, but there are five of you after all).

C _ O   _____

How? (Approach to the project):

Phase 01:

As a team, brainstorm potential user groups and initiate direct contact with members, in order to arrange and undertake human centred design (HCD) research.

Your team will then gather, filter, develop and present a series of well-defined, meaningful and justified insights from this primary research. The aim is to identify design opportunities for a battery powered hand-tool that will better answer genuine, underserved, user needs.

Through analysis of this initial research, your team will identify a number of *product opportunities* and narrow these to **three** for submission to your tutors. Your tutors will select **one** of these for your team to focus on. Once your team's *product opportunity* is agreed, alongside further primary research focussed on your specific *opportunity*, your team will undertake a review of products that already exist in the space you are considering, and place them in their commercial context.

You will receive a donor product that will be your benchmarked product for this phase. To ensure engineering feasibility, the team will create 3D CAD data for all internal (donor) components, and create carefully considered block CAD representations of any additional internal components that must be accommodated and integrated in order to meet the *product opportunity's* function (based on the initial testing), and use these in the development and evaluation of external form proposals.

Phase 02:

At the outset of Phase 02, teams undertake tests and calculations to establish the performance requirements necessary to deliver their *product opportunity's* function(s). Based on this information, your team's research insights, and assessments of the market, you will then ideate to develop a series of design proposals that effectively address your team's identified *product opportunity*; these will be your design responses to the user needs, insights and the commercial context your team have identified. Although you will be developing designs individually at this stage, your teammates will be an invaluable resource in support of your thinking and ideation.

You will each develop a number of your concept proposals through 2D sketching, 3D soft modelling, iterative refinement and the careful consideration of internal component topology and product assembly requirements. You will design, develop, prototype, test and iterate, using soft models to explore ergonomics (via user observation) and aesthetics (via peer and user feedback). You will visually record your process and the evolution of both the physical design and your thinking.

Each of you will bring your strongest concept to a high level of resolution and refinement, that demonstrates a thorough consideration of engineering viability, so that it can be clearly and visually communicated - your tutors and fellow students (your 'virtual client') will then vote for which of your team's proposals **most deserves to exist!** *

Once through this gateway, the chosen product concept will be developed by your entire team.

* Products that 'most deserve to exist', present the most compelling proposition for both the mass market AND those of your chosen user-group: they have the greatest potential to achieve the aims of inclusive design.

Phase 03:

Across the summer term, the team will engineer: develop, refine, specify, build and test a working product prototype that effectively demonstrates the team's final design solution and intent.

The creation of your fully working prototypes will further develop your understanding of how to effectively integrate a collection of functional parts that have been both harvested from an existing (donor) product, and created through a potentially diverse range of prototyping techniques. You will learn to identify and select prototyping techniques that are best fit for purpose by considering aesthetic, tolerance, strength, surface finish, cost and lead-time factors.

The team will carefully consider, identify and specify materials and manufacturing processes, gather samples, and be supported in the creation of a production-ready CAD data package, detailing the full product assembly and its components including fits, tolerances and CMF specification.

You will create detailed 3D CAD part data for mouldings and adapt this data suite where necessary for effective prototyping.

You will create an ex-works BOM estimate and review the design proposal in relation to cost targets, developing and redefining as necessary.

You will also resolve the aesthetic design elements of the project to a high level in the form of visual renders, marketing assets, packaging design, labelling, user guides and safety warnings.

Who? (Selecting your user group):

You must begin here …. immediately!

Brainstorm and research to identify a user group that you believe may have specific needs not presently well served by existing mass-market products, due to uncommon challenges the group may collectively face, or uncommon requirements the group may collectively share, for whom you will design and develop a mass-market battery powered hand-tool that affords a function, or includes a feature or features, that better meet both the chosen user group's needs, and those of the mass market as whole.

Your team will need to establish direct access to users at the outset of this project in order to undertake ethnographic research, so it will be useful to identify, and simultaneously explore, multiple user group options in case access to any particular group proves challenging.

Your choice of user group is not limited to a predefined list. The type of users you are looking to identify do not need to have a physical impairment or disability (although they may have): they must simply share a need not presently well served by existing products of the type you will be developing.

By way of example, these types of need may be driven by context (e.g. specific requirements driven by the situation of use and user…), age/demographic (e.g. specific needs of younger or older people…), physical impairment (e.g. limited grip, pain, or uncommon hand/limb physiology…), cognitive impairment (e.g. learning disability or cognitive degeneration…), sensory impairment (e.g. sight/hearing/touch…) etc.

The above list is intended only to help kick-start your thinking.

Think about your personal resources and network. You may know a family member or friend, or perhaps a friend with a family member, with a disability, impairment or difficulty. These connections are often the most accessible. Beyond these connections your team will need to be resourceful and creative.

It is essential that you approach each of these avenues with sensitivity and respect that you follow carefully the school's ethics procedures.

Your aim will be to engage with your chosen user group as quickly as possible to explore and identify which are the common tasks or tools that your users find challenging, so that your team can identify a genuine product need i.e. a *product opportunity.* High quality outcomes will be built on common insights drawn from research with multiple users. Insights are effectively new knowledge, and the essence of quality insights is that they provide the basis for new avenues of creative thinking and design responses that seek to address previously unaddressed issues or challenges that your user group experience.

The information your team gathers from this human centred design process will drive ideation, concept development, specification, testing and evaluation throughout.

You will seek to develop and test user insights throughout the first two phases of the module. Ongoing or multiple connection opportunities would therefore be highly beneficial.

What? (Scope of suitable outcomes):

It's important that your Engineering Design project objectives are achievable to a high standard within the resources and time available. It's also important that they present a suitably challenging learning opportunity. To ensure this is the case, all *product opportunities* must be approved by your tutors as appropriate within the scope of the module's aims, time and resource limits. This will help enable high quality project deliverables and a meaningful learning journey.

Rather than presenting a pre-defined list of acceptable product outcomes, this module has been structured to allow you creative freedom within certain bounds, affording you the opportunity to develop product proposals that are genuine responses to identified user need.

This will allow you to further develop and demonstrate your ability to produce creative and compelling responses within the bounds of defined limitations of scope: offering solutions and opportunities that reflect and acknowledge both user and commercial client / business needs and objectives.

Projects that effectively communicate creative design engineering responses to well-defined and articulated user needs, within real market context, are powerful demonstrations of your abilities and potential as a design engineering practitioner.

Product proposals do not need to be new or unique in their core functionality or purpose. They may be, but they may equally be an augmentation or adaptation to an existing product archetype that broadens the product's inclusiveness.

Your team will be developing a battery powered hand-tool. Your tool will be powered by a rechargeable battery, contain a motor, control electronics, a transmission / gear train, and be hand-held in use.

Suitable categories/contexts of use, and example hand-held battery powered product types would include (by way of example):

- **Cooking and Food Preparation:** Stick Blender / Food Mixer / Grinder / Whisk / Masher / Bread Knife / Can Opener/ Juicer / Reamer / Frother / Smoker
- **DIY:** Screwdriver / Drill / Sander / Angle Grinder / Belt Sander / Circular Saw
- **Gardening:** Cultivator / Pump / Boot Cleaner / Trimmer / Strimmer / Sprayer / Leaf Blower
- **Cleaning and Housework:** Window Cleaner / Floor Cleaner / Grout Cleaner
- **Personal Care:** Massager / Toothbrush / Hair Remover / Facial Washer / Exfoliator
- **Product Repair and Disassembly:** Polisher / Micro-screwdriver / Dust Blower
- **Car Cleaning and Valeting:** Carpet Brush / Upholstery Brush / Wheel Cleaner / Ice Scraper / Bodywork Polisher
- **Craft and Making:** Sharpener / Brush Cleaner / Sprayer / Die Cutter / Air Brush

The above list, when viewed as a whole, should provide a clear definition of products that would be within scope of expected outcomes. *Product opportunity* proposals that fail to acknowledge and respond to the bounds of scope implicit in the above list, will likely be rejected by tutors, and cause the team further work in defining more appropriate *product opportunities*.

Submissions (overview):

For each submission, the date, time and mode of submission are given below. The CIO will submit on behalf of the team. The project is broken down into three phases, across two terms.

Phase 01 (15%):

➢ Email: **Team Roles – Tuesday 15th January by 14:00 hrs** (via email during tutorial)

➢ Email: **Ethics Forms - Tuesday 22nd January by 14:00 hrs** (via email during tutorial)

➢ Email: **Product Opportunities - Friday 25th January by 18:00 hrs** (via email)

➢ **Slide Presentation - Monday 11th February**

➢ **Presentation Boards - Thursday 14th February by 12:00 hrs** (digital submission via box – max. 150 MB)

Phase 02 (25%):

➢ **Slide Presentation and Soft Models - Tuesday 12th March**

➢ **Presentation Boards - Monday 18th March by 16:00 hrs** (digital submission via box – max. 10 MB per digital board)

Phase 03 (60%):

➢ **Slide Presentation and Demo - Tuesday 18th June**

➢ **Physical Submission - Friday 21st June by 12:00 hrs** (location TBC)

➢ **Presentation Boards - Friday 21st June by 12:00 hrs** (digital submission – via box – max. 10 MB per digital board)

Submission Formats:

Email Submissions: the email submissions listed are information exchange / touchpoints: confirmations are given and agreements finalised. Email submissions must be presented on time, and should be concise. Any email submission, including attachments, must not exceed 2MB.

Slide Presentations: team presentations supported by a digital slide deck, formatted specifically for screen / projection to provide a visually impactful and compelling aid to verbal delivery. Considerations of graphical layout, image selection, font, point size, word count, and colour are tailored accordingly. Files may be submit as .pdf or PowerPoint. File size may not exceed 40MB. Any videos should be embedded, or otherwise uploaded to a video streaming location, and launched via a link / URL (bring a backup on a stick!). Presentations may not exceed size, slide count or time limit where stipulated.

Digital Presentation Boards: submitted as .pdf files formatted for A3 print. The maximum number of boards per heading is given in parenthesis after each item listed (). Boards are visually rich, standalone presentation assets (i.e. they do not rely on a presenter). They may contain more information and text than slides, as key points must be conveyed without the support of additional verbal presentation – text should be used strategically and sparingly to communicate important project decisions, outcomes, reflections and conclusions. Each presentation board may not exceed 10 MB in size.

Video: several components of the submissions either require documentary video evidence, or may be supported by video components. Video assets should convey the key messages and information in a clear and well finished outcome with sufficient caption or narration as needed. Any person featured in a video asset must have given written consent or otherwise be appropriately anonymised. Video that features images of people must not be used without the person's knowledge or consent, including consent on the condition of anonymity (this equally applies to all photography assets that feature people or private spaces). Videos should be uploaded to streaming sites and linked from presentations via a URL if embedding them proves problematic in relation to file size. Any music used within video must either be free from copyright restrictions or permission must be evidenced in writing. Teams should bring backup video assets along to presentations on portable storage as a backup. Video duration my not exceed any stipulated limit.

Submissions (Phase 01 – dates, content and expectations):

- **Email: Team Roles - Tuesday 15th January by 14:00 hrs** (via email during tutorial)
    - Submission of team roles and responsibilities

Subject: 'EDP – Team Roles – Team [number]' To: Shayan Sharifi and Jim Reeves (CC: team members)

- **Email: Ethics Forms - Tuesday 22nd January by 14:00 hrs** (via email during tutorial)
    - Submission of ethics forms for user research

Subject: 'EDP – Ethics Forms – Team [number]' To: Shayan Sharifi and Jim Reeves (CC: team members)

- **Email: Product Opportunities - Friday 25th January by 18:00 hrs** (via email)
    - Submission of 3 *product opportunities* - max. 3 images for each and/or 50 words each

Subject: 'EDP – 3 Product Opportunities – Team [number]' To: Shayan Sharifi and Jim Reeves (CC: team members)

- **Slide Presentation - Monday 11th February**

    - Slide Presentation - Phase 01: Team mugshots, names, roles and responsibilities; Summary of research process, methodology and decisions; initial findings and user insights; 2 x 'runner up' *product opportunities;* 1 x selected *product opportunity*; Commercial context (re: selected opportunity); Summary of next steps and aims.

NOTE: Your team will present to the entire cohort. There is no slide limit. There is a strict time limit of **10 minutes**.

- **Upload: Digital Presentation Boards - Thursday 14th February by 12:00 hrs** (digital submission – via box – max. 150 MB) Maximum number of boards shown in parentheses for each item (#).
    - The Team: mug shots, names, roles and responsibilities (1)
    - Human Factors Research: background, approach and rationale; user-group selection process; research plan and methodology (3)
    - Human Factors Research: user profiles; key findings and insights (5)
    - *Missed Opportunities?* identification, definition and justification of the 2 'runner up' *Product Opportunities* (2)
    - Product Opportunity Statement: 'hero board' – visual board comprised of image or images that convey the chosen design opportunity / challenge (not a visual depiction of a product design at this stage) including a maximum of 150 words defining the opportunity to be addressed, and key aims (1)
    - Market and Commercial Context: initial research and assessments of competitor landscape and market opportunity (2)
    - Product Teardowns: the product that your team have reviewed (exploded sketches, photographs, notes on materials, processes, component features and their function, product specification, B.O.M.) – your team will be given these products for teardown (6)
    - Component tech drawing suite (A3) – from 3D CAD data – internal functional (donor) components and adaptation components required (no specific page limit)

o Project Plan V1: (e.g. Gantt Chart) breakdown of project plan to date and projections through to the end of Phase 02 (future submissions will track the evolution of this plan, indicating updates and revisions made) (1)

Marking Criteria (Phase 01):

15%	Fails to meet expectations	Fully meets expectations
Initial HCD Research Approach	poorly chosen, narrow, disorganised, unjustified, one-dimensional, poorly managed	dynamic, creative, responsive, well considered, well communicated, good use of team resources
Initial HCD Research Assets	gathered very few assets of limited worth, data poorly captured and presented	compelling multi-media research assets, well communicated
Initial HCD Research Insights	data is poorly analysed, no significant insights identified, reasoning unclear	potential launch points for ideation well identified, explored and developed
Product Opportunities	none of the 3 proposed 'Product Opportunities' are well matched to user needs or market context	three compelling, innovative, well justified and well communicated 'Product Opportunities'
Market Assessment	poorly presented, superficial, basic, based on questionable data, of limited practical use, without references	insightful, clear and well summarised initial analysis and presentation of market context and opportunity
Project Plan	minimal detail, lacking depth of consideration, poor estimates of time and resource requirements, of limited practical use	thorough and detailed breakdown of project timeline, shared inputs, collaborations, internal milestones and review points
Visual Presentation Materials	disparate and poorly executed visual presentation materials offering no clarity in support of key messages	coherent, consistent and well executed, augmenting key messages throughout and bringing content to life
Presentation Craft	poorly timed, poorly curated, unrehearsed, jumbled, rushed, incoherent	engaging, well-structured narrative, good pace, covers all key points, well-rehearsed, compelling and polished
Teardowns	lacking detail, many features unidentified, important functional details overlooked, visual assets unclear	thorough and informative documentation highlighting all key features, component performance specifications correctly identified, well-presented
Donor Component CAD and Part Drawings	significant errors in measurement, insufficient detail, conventions poorly applied, poor layout	accurately measured and appropriately detailed, all key dimensions and features drawn and annotated to conventions

Submissions (Phase 02 – dates, content and expectations):

➢ **Slide Presentation and Soft Models - Tuesday 12th March**

- o Slide Presentation - Phase 02:
  - – Restatement of team's final *Product Opportunity* (max. 2 slides);
  - – Further HCD research findings and insights (max. 5 slides)

  Each team member then delivers in turn, a max. of 2 slides for each of:
  - – Key Insights *(that drove their concept)*
  - – Concept Development *(2D sketches / visualisations)*
  - – 3D Modelling *(Iterative foam model development)*
  - – Viability and Build *(Detailed exploded sketches)*
  - – Final 3D Model (Images of final soft model)
  - – Final Concept [number or name] *(compelling single visual, or montage of views, with bullets in support if needed)*

  - – **Final montage slide** with all the team's concepts (helpfully numbered), so that your peers and tutors can vote on which concept *genuinely deserves to exist!*

NOTE: Your team will present to the entire cohort. Slide requirements are given above. There is a strict time limit of **12 minutes**.

➢ **Upload: Presentation Boards - Monday 18th March by 16:00 hrs** (digital submission – via box – max. 10 MB per digital board) <u>Maximum</u> number of boards shown in parentheses for each item (#).

- o Restatement of team's final Product Opportunity (2);
- o Further HCD research findings and insights (3);

  EACH TEAM MEMBER TO CREATE (as part of the larger package – identify team member on each of the following boards):
  - – Human Factors Research: Insights (that drove my design) (1)
  - – Concepts Development: Sketches / 2D visualisations (2)
  - – Concepts Development: 3D iterative soft modelling (2)
  - – Exploded sketch of final concept (detailed exploded sketch – internal topology, fixings, features) (1)
  - – Final Model (images of final soft model) (1)
  - – Final concept visualisation (with bullets as needed) (1)
- o Selected Product Concept (identifying the design that won the non-binding vote) (1)
- o Project Plan V2: (e.g. Gantt Chart) breakdown of project progress to date tracking evolution of the plan (indicating updates and revisions made) (1)

Marking Criteria (Phase 02):

25%	Fails to meet expectations	Fully meets expectations
HCD Research Approach	poorly developed, narrow, disorganised, unjustified, one-dimensional, poorly managed	dynamic, creative, responsive, multi-faceted, rigorous, comprehensive, well justified and developed
HCD Research Assets	gathered very few assets of limited worth, very narrow, data poorly captured and presented	rich and extensive curation of illuminating multi-media research assets, well presented
HCD Insights	poorly developed, unjustified, one-dimensional, lacking creativity, poorly related to research outcomes	evolved and developed, closely tied to research outcomes, clearly communicated, well justified, creative, sensitive, subtle
Concept Development (2D)	lacking breadth and iteration, without depth, not clearly connected to insights, poorly visualised	multiple creative directions explored and developed, firmly connected to key insights, strong visualisation
Concept Development (3D)	poorly executed (craft and finish), lacking iteration, 3D does not develop or inform 2D	well executed (craft and finish), multiple iterations, 3D closely tied to 2D, informing further 2D refinement
Performance Requirements (Testing)	inappropriate, poorly planned and executed tests delivering questionable or unusable data	appropriate, well planned and well executed tests delivering valuable and reliable early data
Performance Specification	lacking detail, poorly researched, unrelated to test data, lacking calculation, not appropriate for target function	rigorous, well-reasoned, based on sound test data and calculation, clearly appropriate for target function, sets measurable performance targets that can be tested against, applies appropriate framework
Viability and Build	Engineering viability questionable and poorly communicated, unrealistic, internal features and parts lacking detail, significant build considerations overlooked	Engineering viability convincing and well communicated, internal features and parts comprehensively represented, rational and appropriately detailed, build considerations well integrated to thinking
Project Plan	minimal detail, poorly used, poor estimates of time and resource requirements, without evidence of tracking	thorough and up-to-date breakdown of project progress, milestones achieved and interim review outcomes
Visual Presentation Materials	disparate and poorly executed visual presentation materials offering no clarity in support of key messages	Coherent, consistent and well executed, augmenting key messages throughout and bringing content to life
Presentation Craft	poorly timed, poorly curated, unrehearsed, jumbled, rushed, incoherent	engaging, well-structured narrative, good pace, covers all key points, well-rehearsed, compelling and polished

Submissions (Phase 03 – dates, content and expectations):

➢ **Slide Presentation and Demo - Tuesday 18ᵗʰ June**

- o Slide Presentation - Phase 03:
  - – Restatement of team's *Product Opportunity* – aims, objectives and rationale
  - – Video (max. 90 seconds – launched via video streaming link) documenting project journey from initial research through design and engineering development and build, key moments and findings (including captions / recorded narration as necessary)
  - – Summary of engineering development process, testing, test data and product specification, approach to prototyping, key decisions, learnings and rationale
  - – Product costing estimates (including assembly time) and commercial positioning
  - – Final product proposition slides, including product name, branding and price (high quality visual renders, and images of final working prototype as well as any supporting visual models)
  - – Compliance, labelling and safety requirements
  - – Packaging, labelling and user guide designs
  - – Prototype demonstration

NOTE: Your team will present to the assessment team (time TBC). There is a strict time limit of **15 minutes**, (including product demo) followed by 5 mins Q&A.

➢ **Physical Submission - Friday 21ˢᵗ June by 12:00 hrs** (location TBC)

- o 1 x box / crate, clearly labelled, containing the working prototype (fully charged) packaged in final prototype of full retail packaging, with instructions, material samples, any supporting visual models, a selection of the best 3D development models

➢ **Presentation Boards - Friday 21ˢᵗ June by 12:00 hrs** (digital submission – via box – max. 10 MB per digital board) <u>Maximum</u> number of boards shown in parentheses for each item (#).

- o Approach to prototyping: methods research and selection rationale, integration considerations, issues arising and their resolution (3)
- o Product Performance Requirements: Testing (tests undertaken to establish performance requirements and results) (2)
- o Power and component load calculations and testing (2)
- o Detail design: visual summary of key part and assembly features (4)
- o Production data package: full A3 drawing suite, with BOM, full product assembly and part drawings including fits, tolerances and CMF specification (no specific page limit)
- o Product assembly process: timings and cost estimate (storyboard of stills or photos with link to online video of assembly process) (2)
- o Product compliance research and requirements (1)
- o Product labelling and user guide designs (2)
- o Product packaging design: specification of materials, production processes, graphics, branding and compliance markings (2)
- o Product packaging (visual render) (1)
- o Final Design: product renders and branding with images of working prototype and link to video of working prototype performing target functions (3)

o Project Plan Report: (e.g. Gantt Chart) breakdown of project milestones and when they were achieved (indicating updates and revisions made) (1)

Marking Criteria (Phase 03):

Team Submissions: Slide Presentation and Digital Boards

40%	Fails to meet expectations	Fully meets expectations
Development Testing	Poorly designed tests did not yield adequate data and this issue was not well recognised	Implemented an efficient and well-reasoned series of tests that yielded solid data where needed throughout
Detailed Part Design	Part design does not sufficiently account for process factors and requirements, lacking significant detail	Rigorously detailed part design with appropriate tolerance control that reflects requirements and limitations of selected production process
Production Data Package	Data package does not align with conventions and standards, lacks detail, contains errors and significant oversites	Thorough and efficient communication of full assembly and part requirements in line with standards, clearly defining all details required to implement final product costing and manufacture
Product Compliance	Inadequately researched, poorly implemented and reported compliance requirements	Thoroughly researched requirements for target market, requirements well identified and reflected in the product design, part specification, packaging, user guide and warnings, well reported
DFA/DFDA	Considerations were not accounted for early enough in development process, lacked rigour, targets for time and cost were poorly defined, unclear if final design achieves aims, poorly documented and communicated	Process and considerations fully detailed to ISO 8887, developed for optimal assembly and disassembly with rigour, targets for time and cost well defined and final outcomes well communicated and measured against targets
Business Case	Little consideration given to the development of a compelling business case, rationale is highly questionable and lacking supporting evidence	Business case is well demonstrated and reasoned, based on solid evidence, well referenced and sufficiently detailed to inspire confidence in viability of proposal
UI and Ergonomics	Interactions with product are not clearly communicated through product semantics, inadequate consideration of human factors and ergonomics	Product functions and interactions are clearly communicated through design language and detailing, ergonomic factors for mass marked and chosen user group are thoroughly researched, considered, explored and resolved
Packaging and Labelling Design	Packaging design is unresolved and lacking detail, design fails to acknowledge and consider some significant packaging functions	Packaging is appropriate for target market and users, production processes and materials are well selected, production data is thorough and detailed, graphical communications and branding well implemented and compelling

Product Branding	The team have not developed a branding proposition that adequately considers their users and target market	Good evolution of product branding culminating in a highly resolved and consistent brand identity, developed in context of market and needs / aspirations of target users, implemented across all aspects of product, packaging, marketing assets, final slide presentation and digital submission
Product Design Language	Design language is not rigorously explored or developed, chosen design language aligns poorly with target user group and use-case, design details are inconsistent	Product design language has been rigorously refined and developed through iteration resulting in a coherent implementation and a considered proposition in response to target user-group / market / use case
Reflects Needs of Mass Market	Mass market needs are poorly researched and not sufficiently represented in thinking	Mass market needs are well researched and considerations are built into development thinking and appraisal at every step, market appeal is well argued and compelling
Reflects Inclusive Design Objectives	Final design does not adequately demonstrate attainment of stated inclusive design objectives, design does not actively / evidently offer an inclusive solution	Final implementation effectively delivers target inclusive affordances and is a creative, well executed and sensitive response to identified user needs and research insights
Project Plan	Project plan has not been well used to structure and guide activities, lacking detail, tracking and milestone delivery	Thorough and detailed report of project progression highlighting necessary changes and amendments and the reasons and factors that drove them
Visual Presentation Materials	disparate and poorly executed visual presentation materials offering no clarity in support of key messages	Coherent, consistent and well executed, augmenting key messages throughout and bringing content to life
Video Assets	Video assets are not compelling or well-structured and do not convey sufficient detail	Video assets bring the content to life, have a well-structured narrative, capture and convey compelling content
Presentation Craft	poorly timed, poorly curated, unrehearsed, jumbled, rushed, incoherent	engaging, well-structured narrative, good pace, covers all key points, well-rehearsed, compelling and polished

Team Submissions: Working Prototype and Demonstration

20%	Fails to meet expectations	Fully meets expectations
Approach to Prototyping	Processes poorly researched, reasoned and implemented, many significant factors overlooked	Well researched and selected processes executed to a high standard to ensure quality outcomes that meet the requirement
Prototype Function	Prototype fails to perform intended function at demonstration and function at final submission remains less than adequate	Prototype delivers all functions as defined in Product Performance Specification and can be demonstrated with ease, presents a compelling demonstration of product attributes
Prototype Performance vs Targets	Prototype has not been appropriately tested and performance targets are lacking definition	Prototype has been tested to establish alignment with well-defined performance targets, data well recorded, cause of any misalignment with targets is well identified and remedies/next steps are detailed in response to findings
Prototype Build	Clumsy execution has resulted in a prototype that does not inspire confidence, fit and function of parts is poor, lacking sufficient robustness, details detract from aesthetic intent	Build is rational, fit and function of parts is well achieved, sufficiently robust for reliable function without detracting from design intent and aesthetics
Prototype Finish	Poorly finished final build, evidence of significant hacks and repairs	Fully finished, refined and fettled to allow easy assembly and disassembly and reliable functional demonstration

Appraisal of Individual Performance, Team Roles and Responsibilities:

Peer Assessment: WebPA + Tutor Assessment (35%)

35%	Fails to meet expectations	Fully meets expectations
Fulfilment of Individual Role	Team member did not adequately engage with the management of deliverables within their area of responsibility	Team member actively and constructively worked with the team to ensure high quality deliverables within their area of responsibility, identifying key issues, negotiating collaborations, contributing to meeting agendas and tracking progress throughout
Contribution to Team Delivery	Team member did not adequately support deliverables outside of their individual area of responsibility, neglected to attend team meetings regularly, did not make significant contributions to team discussions and did not sufficiently engage in driving the project forward	Team member actively engaged with all areas of the project, offering collaborations, constructive thoughts and suggestions throughout, identified and raised areas of concern in a constructive and productive manner, respected team member's views and encouraged contributions from all members