THE DESIGN PROCESS

Factors that need to be considered when creating products & machines sustainably 🇬🇧

Three main stages: Planning (1-3); development (4-6); production (6-7).

1 PLANNING: PROJECT DEFINITION

Identifying the need (to replace, or update a product)= new opportunity. Getting to know the problem, why do we have this problem, & how to make it better. Defining target market, user, customer. Identifying constraints, outside forces. Getting to know the *project scope,* time line, budget, & resources available. Defining & setting the teams & goals.

2 PLANNING: CONDUCTING RESEARCH

Conducting market research, *benchmarking*, verifying need, understanding customers and users, SWOT analysis (strengths, weaknesses, threats and opportunity). Gathering *anthropometric data,* info about purchase preferences, etc. through focus groups, surveys, and interviews. Conducting *secondary research*. Defining the *unique selling proposition* (unique benefit exhibit by the company that makes your product stand out from the competition). Goal: Learning from previous success & failures to solution problems, while saving costs & resources. Create *sustainable products: considering social, economic & environmental factors, and their life cycle.*

3 PLANNING: DESIGN BRIEF

Creating preliminary agreement, list of requirements, needs, constraints, *specifications*, & details of how the product should look like.

4 DEVELOPMENT: CONCEPTUALISATION

Idea generation. Drawing 1st sketches,. Exploring aesthetics, ergonomics, functionality while experimenting with different materials & shapes, exploring options, creating *thumbnails*, mood-boards, *rendering* images, creating *mock-ups, building prototypes, testing concept feasibility, & developing concept "feedback loop", consulting clients, managers or shareholders, estimating preliminary costs .*

5 DEVELOPMENT: REFINEMENT

Detailed views of renderings are improved, sending designs to machines to make individual parts with *CAD.* Keep on testing & improving prototypes *iteratively.* Field testing, evaluating prototypes in collaboration with other engineers, designers, & experts, adjusting for user testing, creating the *Alpha prototype* to find flows, failures and getting user testing feedback.

6 DEVELOPMENT & PRODUCTION: FINAL EVALUATION

Designing, procuring & debugging tooling, moulding, *Beta test* to find faults that are likely to appear in actual use.

7 PRODUCTION

Once the product is ready for manufacture, the *ramp-up* begins. Setting up assembly line, producing & shipping 1st products, monitoring quality & evaluating, adjusting to meet demands.

Posible questions:

1. *What are the different steps involved in the 3 stages of the design process?*
2. *What are the main concerns of engineers and designers?*
3. *What does sustainability mean? What is a sustainable product?*
4. *Why is the 1st step: planning, so important?*
5. *Explain the purpose of research, and the difference between primary and secondary research.*
6. *How can research be conducted?*
7. *What is the design process an iterative process?*
8. *What is the design brief? Why is it an important document?*
9. *What is a field test? What is the difference of an Alpha and Beta prototype?*
10. *When should the production ramp-up be started?*

Knowledge Check

- There are three main stages of the design process: planning, developing and production.
- Designers, artisans, engineers and technologists have two main concerns while creating products in collaboration: *solving problems & coming up with sustainable solutions, and safety.*
- *Sustainability should be at the center of the design thinking. Sustainability means considering economic, social and environmental issues. This means also not only considering the design and manufacture of products but they should think about what happens to a product when it is broken or no longer needed.*
- *The planning stage is one of the three main stages of the design process because it makes sure that natural and human resources are not depleted or wasted. In addition, gathering information and learning about requirements will save costs, time, and resources later in further stages.*
- *Research is key in this first stage to learn from users and past experiences (see more about the different types of research next page). How can research be conducted? Asking questions such as: Who is the user of the product? How is the product used? Are there similar products available? How did products use to work, & how could these be improved? How could they be created sustainability?*
- *The design brief contains a detailed description of expected results, materials, construction, and constraints. It will help you to get a fully understanding of what is required, and the appearance that the design must have, and the client will get a full understanding of what will be designed. Designers should check it regularly to avoid deviating from it.*
- *During the entire design process, engineers and designers should consult and report to superiors and team leaders about their decisions and progress. Collaboration is a must.*
- *The design process is an iterative process because products need to be tested and improved again and again based on the feedback from users, from the very beginning till the end, in order to meet the needs of the users successfully and create a final product in a sustainable way. Only after repetitive testing and trials, the production should begin.*

CHECK THE MAIN VOCABULARY ON THE NEXT PAGE FOR MORE!

Vocabulary

- **benchmarking** - studying successful competitors and selecting the best development process methods used to become successful.
- **Beta test -** An external test of products in the preproduction stage to test it to find failures or faults before sale to the general market
- CAD - Computer Aided Design
- **concept development -** the act by which new concepts, or product ideas are generated.
- **constraint -** something that may limit aspects of your design, limitations
- **design brief** - a document that contains the description of how the product should be like, which is written along with your client, and should be checked regularly to ensure compliance with specifications and agreements.
- **ergonomics -** the study of people and products or the process of designing or arranging workplaces, products and systems so that they fit the people who use them, to be best experienced by them
- **feasibility - workability or practicability**
- **field test** - **user trial,** product use testing with users from the target market in natural environment.
- **life cycle -** also called cradle to cradle; all stages of a product's existence, from its design through its use, to the end of its life.
- **market analysis** - target specific groups
- **mock up -** a quick, simple model of a design.
- **rendering -** adding line, colour and texture to a drawing to make it look realistic.
- **scope -** extent and concrete goals, deadlines, and project deliverables
- **specification** - a list of key points describing the construction, materials, and appearance etc. and criteria of evaluation throughout the process.
- **primary research** - new research carried out by yourself, looking for similar products, discussing with your client and user group, observing broadly similar products & materials, etc.
- **ramp-up -** to increase considerably the production
- **secondary research** - research based on other designer's works, design or engineering magazines, data books, anthropometric, websites, etc.
- **sustainably -** in a way that can be maintained avoiding depletion of natural resources
- **sustainability -** using resources without having an impact on the environment and considering social and economic impact!

Bibliography:

- Harris et. al., 2016: Cambridge IGCSE Design and Technology Book for Students. Harper Collins Publishers. London, Great Britain.
- Cuffaro et. al. 2013: The Industrial Design Reference and Specification Book. Rockport. Beverly Massachusetts USA.