Diploma Programme Design technology

Glossary of terms

For use with the DP design technology guide (for first assessment 2016)

Contents

Preface

This glossary of Design technology terms for the Diploma Programme was developed as a **working tool** for teachers, workshop leaders and examiners involved with the IB Diploma programme Design technology course.

It was produced by extracting the terminology used in the Design technology subject guide (published in March 2014 for first examinations in 2016).

We welcome your feedback about this glossary. Please send any suggestions for additional terminology or potential errors to andrew.mayes@ibo.org

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How to use this glossary

This glossary first arranged by topic as per the subject guide. Each term is then arranged alphabetically.

The terms and definitions in this document serve as a tool to ensure that there is consistent understanding of the DP Design technology terminology. **They are not provided to be rote learned for regurgitation in response to questions in examination papers.** Students and teachers should use this glossary as a reference document only.

Where possible and applicable, definitions of terms used in the previous iteration of the DP Design technology guide have been replicated in this glossary.

Topic 1 : Human factors and ergonomics

Term	Definition
Adjustability	The ability of a product to be changed in size, commonly used to increase the range of percentiles that a product is appropriate for.
Alertness	The level of vigilance, readiness or caution of an individual.
Anthropometrics	The aspect of ergonomics that deals with body measurements, particularly those of size, strength and physical capacity.
Biomechanics	The research and analysis of the mechanics of living organisms. Biomechanics in Human factors includes the research and analysis of the mechanics (operation of our muscles, joints, tendons, etc.) of our human body. It also includes Force (impact on user's joints), Repetition, Duration and Posture.
Clearance	The physical space between two objects.
Cognitive ergonomics	How mental processes, (memory, reasoning, motor response and perception), affect the interactions between users and other components of a system.
Comfort	A person's sense of physical or psychological ease.
Dynamic data	Human body measurements taken when the subject is in motion related to range and reach of various body movements. E.g. crawling height, overhead reach and the range of upper body movements.
Environmental factors	A set of psychological factors that can affect the performance of an individual that come from the environment that the individual is situated.
Ergonomics	The application of scientific information concerning the relationship between human beings and the design of products, systems and environments.
Fatigue	A person's sense of physical or psychological tiredness.
Functional data	Functional data includes dynamic data measurements while performing a required task e.g. reaching abilities, manoeuvring and aspects of space and equipment use.
Human error	Mistakes made by users, some of which can result in catastrophic consequences for people, property and the environment, as they are considered key contributors to major accidents.
Human factors	A scientific discipline concerned with understanding how humans interact with elements of a system. It can also be considered the practice of designing products, systems or processes to take account of the interaction between them and their users. It is also known as comfort design, functional design and user-friendly systems.
Human information processing system	An automatic system that a person uses to interpret information and react. It is normally comprised of inputs, processes (which can be sensory, central and motor), and outputs.
Interval data	Interval data are based on numeric scales in which we know the order and the exact difference between the values. Organised into even divisions or intervals, and intervals are of equal size.

Nominal data scale	Nominal means 'by name' and used in classification or division of objects into discrete groups. Each of which is identified with a name e.g. category of cars, and the scale does not provide any measurement within or between categories.
Ordinal data	A statistical data type that exists on an arbitrary numerical scale where the exact numerical value has no significance other than to rank a set of data points. Deals with the order or position of items such as words, letters, symbols or numbers arranged in a hierarchical order. Quantitative assessment cannot be made.
Percentile range	That proportion of a population with a dimension at or less than a given value. For a given demographic (gender, race, age), the 50th percentile is the average.
Perception	The way in which something is regarded, understood or interpreted.
Physiological factor data	Human factor data related to physical characteristics used to optimise the user's safety, health, comfort and performance
Primary data	Data collected by a user for a specific purpose.
Psychological factor data	Human factor data related to psychological interpretations caused by light, smell, sound, taste, temperature and texture.
Qualitative data	Typically descriptive data used to find out in depth the way people think or feel - their perception. Useful for research at the individual or small (focus) group level.
Quantitative data	Data that can be measured and recorded using numbers. Examples include height, shoe size, and fingernail length.
Range of sizes	A selection of sizes a product is made in that caters for the majority of a market.
Ratio data scale	A ratio scale allows you to compare differences between numbers. For example, use a rating scale of 1-10 to evaluate user responses.
Reach	A range that a person can stretch to touch or grasp an object from a specified position.
Secondary data	Data collected by someone other than the user.
Static data	Human body measurements when the subject is still.
Structural data	Refers to measurements taken while the subject is in a fixed or standard position, e.g. height, arm length.
Workplace environmental factors	These factors can be considered to maximise performance of a user in a role and reduce the risk of accidents. They can be categorised as: • Management (policies, safety education) • Physical environment (noise, temperature, pollutants, trip hazards, signage) • Equipment design (controls, visibility, hazards, warnings, safety guards) • The nature of the job (repetitiveness, mental or physical workload, force, pressure) • Social or psychological environment (Social group, morale) • The worker (personal ability, alertness, age, fatigue)

Topic 2 : Resource management and sustainable production

Term	Definition
Circular economy	An economy model in which resources remain in use for as long as possible, from which maximum value is extracted while in use, and the products and materials are recovered and regenerated at the end of the product life cycle.
Clean technology	Products, services or processes that reduce waste and require the minimum amount of non-renewable resources.
Combined Heat and Power (CHP)	A system that simultaneously generates heat and electricity from either the combustion of fuel, or a solar heat collector.
Converging technologies	The synergistic merging of nanotechnology, biotechnology, information and communication technologies and cognitive science.
Cradle to cradle	A design philosophy that aims to eliminate waste from the production, use and disposal of a product. It centres on products which are made to be made again.
Cradle to grave	A design philosophy that considers the environmental effects of a product all of the way from manufacture to disposal.
Dematerialization	The reduction of total material and energy throughput of any product and service.
Design for the environment software	Software that allows designers to perform Life cycle analysis (LCA) on a product and assess its environmental impact.
Eco-design	A design strategy that focusses on three broad environmental categories - materials, energy, and pollution/waste.
Embodied energy	The total energy required to produce a product.
End-of-pipe technologies	Technology that is used to reduce pollutants and waste at the end of a process.
Energy distribution	The method with which energy is transported from a source to where it is used.
Energy storage	The method with which energy is stored for later use.
Energy utilization	The method with which energy is used.
Green design	Designing in a way that takes account of the environmental impact of the product throughout its life.
Green legislation	Laws and regulations that are based on conservation and sustainability principles, followed by designers and manufacturers when creating green products.
Incremental solutions	Products which are improved and developed over time leading to new versions and generations.
Individual energy generation	The ability of an individual to use devices to create small amounts of energy to run low-energy products.
Legislation	Laws considered collectively to address a certain topic.
Life cycle analysis (LCA)	The assessment of the effect a product has on the environment through five stages of its life: pre-production; production; distribution (including packaging; utilization; and disposal.

Linear economy	An economy based on the make, use, dispose model.
Local combined heat and power (CHP)	CHP plants that generate heat and power for a local community - the plant is close enough to the community so that the heat generated can be dispersed through the community efficiently.
National and international grid systems	An electrical supply distribution network that can be national or international. International grids allow electricity generated in one country to be used in another.
Non-renewable resources	A natural resource that cannot be re-made or re-grown as it does not naturally re-form at a rate that makes its use sustainable, for example, coal, petroleum and natural gas.
Product cycle	Also known as the product life cycle, it is a cycle that every product goes through from introduction to withdrawal or discontinuation.
Product recovery strategies	The processes of separating the component parts of a product to recover the parts and materials.
Quantification of carbon emissions	Defining numerically the carbon emissions generated by a particular product
Radical solutions	Where a completely new product is devised by going back to the roots of a problem and thinking about a solution in a different way.
Recondition	Rebuilding a product so that it is in an "as new" condition, and is generally used in the context of car engines and tyres.
Recovery of raw materials	Strategies for the separation of components of a product in order to recover raw materials.
Recycle	Recycling refers to using the materials from obsolete products to create other products.
Re-engineer	To redesign components or products to improve their characteristics or performance.
Renewability	The level at which a resource is renewable. The rate that a resource can be replenished.
Renewable resources	A natural resource that can replenished with the passage of time, or does not abate at all.
Repair	The reconstruction or renewal of any part of an existing structure or device.
Reserves	Reserves are natural resources that have been identified in terms of quantity and quality.
Resources	Resources are the stock or supply of materials that are available in a given context.
Re-use	Reuse of a product in the same context or in a different context.
System level solutions	Solutions that are implemented to deal with the whole system, rather than just components.
The precautionary principle	The anticipation of potential problems in relation to the environmental impact of the production, use and disposal of a product.
The prevention principle	The avoidance or minimization of producing waste in relation to the production, use and disposal of a product.
Waste mitigation strategies	Strategies used to reduce the waste produced by a product or in the production and disposal of a product.

Topic 3: Modelling

Term	Definition
Aesthetic models	A model developed to look and feel like the final product.
Animation	The ability to link graphic screens together in such a way as to simulate motion or a process.
Assembly drawings	A diagram that shows how components fit together to make a whole. Typically presented in an exploded view.
Bottom-up modelling	A designer creates part geometry independent of the assembly or any other component. Although there are often some design criteria established before modelling the part, this information is not shared between models. Once all parts are completed, they are brought together for the first time in the assembly.
Computer Aided Design (CAD)	The use of computers to aid the design process.
Conceptual modelling	A model that exists in the mind used to help us know and understand ideas.
Data Modelling	A model that determines the structure of data.
Digital human	Computer simulation of a variety of mechanical and biological aspects of the human body.
Fidelity	The degree to which a prototype is exactly like the final product.
Finite element analysis (FEA)	The calculation and simulation of unknown factors in products using CAD systems. For example, simulating the stresses within a welded car part.
Formal drawing techniques	A type of drawing technique that has fixed rules, the most widely used being isometric projection and perspective drawing.
Fused deposition modelling (FDM)	A 3D printing technique that places melted layers of material on a bed to build up a 3D model.
Graphical models	A visualization of an idea, often created on paper or through software, in two or three dimensions.
Haptic technology	Haptic technology is an emerging technology that interfaces the user via the sense of touch.
Instrumented models	Prototypes that are equipped with the ability to take measurements to provide accurate quantitative feedback for analysis.
Laminated object manufacturing (LOM)	A system that virtually slices a 3D CAD model into thin layers, then cuts out each layer from a roll of material using a laser or plotter cutter. The layers can then be glued in the correct order to create a 3D model.
Mock-ups	A scale or full-size representation of a product used to gain feedback from users.
Motion capture	The recording of human and animal movement by any means, for example, by video, magnetic or electro-mechanical devices.
Part drawings	Orthographic drawings of the components of an assembly containing details just about that component.
Perspective	A set of formal drawing techniques that depicts an object as getting smaller and closer together the further away they are. The techniques

drawings	are one-point perspective, two-point perspective, and three-point perspective.
Physical modelling	The creation of a smaller or larger tangible version of an object that can be physically interacted with.
Projection drawings	Systems of drawings that are accurately drawn, the two main types are isometric projection (formal drawing technique) and orthographic projection (working drawing technique).
Prototypes	A sample or model built to test a concept or process, or to act as an object to be replicated or learned from. Prototypes can be developed at a range of fidelity and for different contexts.
Scale drawings	Drawings that are bigger or smaller than the real product, but exactly in proportion with product.
Scale models	A model that is either a smaller or larger physical copy of an object.
Selective laser sintering (SLS)	An additive manufacturing technique that uses a laser to fuse small particles of material into a mass that has a desired 3D shape.
Sketches	Rough drawings of ideas used to convey or refine the idea.
Solid modelling	Solid models are clear representations of the final part. They provide a complete set of data for the product to be realized.
Stereo-lithography	A modelling technique that creates 3D models layer-by-layer by hardening molecules of a liquid polymer using a laser beam.
Surface modelling	A realistic picture of the final model, offering some machining data. Surface models contain no data about the interior of the part.
Top-down modelling	"Top down" design is a product development process obtained through 3D, parametric and associative CAD systems. The main feature of this new method is that the design originates as a concept and gradually evolves into a complete product consisting of components and sub-assemblies.
Virtual prototyping	Photorealistic CAD-based interactive models that use surface and solid modelling. They can be considered 'digital mock-ups'.
Virtual reality (VR)	The ability to simulate a real situation on the screen and interact with it in a near-natural way.
Working drawings	Drawings that are used to guide the production of a product, most commonly orthographical projection, section drawings, part drawings, assembly drawings and plan drawings.

Topic 4: Raw material to final product

Term	Definition
Absorbed moisture	The moisture within timber that is contained in the cells walls.
Additive techniques	Manufacturing techniques that add material in order to create it.
Aesthetic appeal	Favourable in terms of appearance.
Aesthetic characteristics	Aspects of a product that relate to taste, texture, smell and appearance.
Air-drying	Air- drying places the stacks of sawn timber in the open or in large sheds hence there is little control over the drying process.
Alloy	A mixture that contains at least one metal. This can be a mixture of metals or a mixture of metals and non-metals.
Assembly line production	A volume production process where products and components are moved continuously along a conveyor. As the product goes from one work station to another, components are added until the final product is assembled.
Automated production	A volume production process involving machines controlled by computers
Batch production	Limited volume production (a set number of items to be produced).
Bio-compatibility	The product ensures the continued health of a biological environment.
Bowing	A warp along the length of the face of the wood.
Brittle	Breaks into numerous sharp shards.
Chemically inert	Lack of reactivity with other materials.
Composite	A material comprised of two or more constituent materials that have different properties.
Compressive strength	The ability of a material to withstand being pushed or squashed.
Computer numerical control (CNC)	Refers specifically to the computer control of machines for the purpose of manufacturing complex parts in metals and other materials. Machines are controlled by a program commonly called a "G code". Each code is assigned to a particular operation or process. The codes control X, Y, Z movements and feed speeds.
Continuous flow	A production method used to manufacture, produce or process materials without interruption.
Craft production	A small-scale production process centred on manual skills.
Creep	The slow, permanent deformation of a solid material under the influence of a mechanical stress.
Creosote	A material that penetrates the timber fibres protecting the integrity of the wood from attack from borer, wood lice and fungal attack.
Cupping	A warp across the width of the face of wood, in which the edges are higher or lower than the centre.
Density	The mass per unit volume of a material. Its importance is in portability in terms of a product's weight and size. Design contexts include, pre-packaged food (instant noodles) is sold by weight and

	volume, packaging foams.
Design for assembly	Designing taking account of assembly at various levels, for example, component to component, components into sub-assemblies and subassemblies into complete products.
Design for disassembly	Designing a product so that when it becomes obsolete it can easily and economically be taken apart, the components reused or repaired, and the materials recycled.
Design for manufacture	Designers design specifically for optimum use of existing manufacturing capability.
Design for materials	Designing in relation to materials during processing.
Design for process	Designing to enable the product to be manufactured using a specific manufacturing process, for example, injection moulding.
Dry rot	When timber is subject to decay and attack by fungus.
Ductility	The ability of a material to be drawn or extruded into a wire or other extended shape.
Elasticity	The extent to which a material will return to its original shape after being deformed.
Electrical insulator	Reduces transmission of electric charge.
Electrical resistivity	The measure of a material's ability to conduct electricity. A material with low resistivity will conduct electricity well.
Electro-rheostatic	This smart property relates to a fluid that can undergo a dramatic change in its viscosity when exposed to an electric field.
Equilibrium Moisture Content (EMC)	EMC is at which the moisture content of wood achieves an equilibrium with the environment which can be affected by humidity and temperature.
Felting	A method for converting yarn into fabric by matting the fibres together.
First generation robots	A simple mechanical arm that has the ability to make precise motions at high speed. They need constant supervision by a human operator.
Free moisture	The moisture within timber that is contained within the cell cavities and intercellular spaces.
Glass	A hard, brittle and typically transparent amorphous solid made by rapidly cooling a fusion of sand, soda and lime.
Grain size (metals)	Metals are crystalline structures comprised of individual grains. The grain size can vary and be determined by heat treatment, particularly how quickly a metal is cooled. Quick cooling results in small grains, slow cooling results in large grains. Grain size in metals can affect the density, tensile strength and flexibility.
Hardness	The resistance a material offers to penetration or scratching.
Hardwood	The wood from a deciduous (broadleaved) tree.
Joining techniques	Methods that are used to join two similar or dissimilar materials together.
Kiln drying	Kiln-drying places the stacks of sawn timber in a kiln, to reduce the moisture content in wood, where the heat, air circulation, and

	humidity is closely controlled.
Kiln seasoning	Thermally insulated chamber, a type of oven, which produces temperatures sufficient to complete some process, such as hardening, drying, or chemical changes.
Knitting	A method for converting a yarn into fabric by creating consecutive rows of interlocking loops of yarn.
Knots	Imperfections in timber, caused by the growth of branches in the tree that reduces its strength.
Lacemaking	A method for creating a decorative fabric that is woven into symmetrical patterns and figures.
Laminated boards	Sheets of material made from layers of veneers (e.g. plywood).
Laminated object manufacture (LOM)	A rapid prototyping systems that creates a 3D product by converting it into slices, cutting the slices out and joining the slices together.
Lamination	Covering the surface of a material with a thin sheet of another material typically for protection, preservation or aesthetic reasons.
Load capacity (Robots)	The weight a robot can manipulate.
Machine to machine (M2M)	Wired and wireless communication between similar devices.
Magneto-rheostatic	This smart property relates to a fluid that can undergo a dramatic change in its viscosity when exposed to a magnetic field.
Man-made timber	Also known as engineered wood or composite wood, these are wood products that are made by binding or fixing strands, particles of fibres, veneers of boards of wood together with adhesives or other fixing methods to create composite materials. Typical examples include MDF, plywood and chipboard.
Mass	Relates to the amount of matter that is contained with a specific material. It is often confused with weight understandably as we use Kg to measure it. Mass is a constant whereas weight may vary depending upon where it is being measured.
Mass customization	A sophisticated CIM system that manufactures products to individual customer orders. The benefits of economy of scale are gained whether the order is for a single item or for thousands.
Mass production	The production of large amounts of standardized products on production lines, permitting very high rates of production per worker.
Material selection charts	A chart used to identify appropriate materials based on the desired properties.
Mechanical properties	Properties of a material that involve the relationship between stress and strain or a reaction to an applied force.
Mechanized production	A volume production process involving machines controlled by humans.
Multi task robots	A type of robot that can perform more than one task in a manufacturing environment.

Natural fibres	Materials produced by plants or animals that can be spun into a thread, rope or filament.
Non-toxic	Absence of toxic breakdown products/lack of reactivity.
One-off production	An individual (often craft-produced) article or a prototype for larger-scale production.
Oxidization resistance	A property of a metal that means that it does not readily react with oxygen and degrade.
Paper-based rapid prototyping	Often the first step in a rapid prototyping process, paper prototyping is widely used in UCD for designing and testing interfaces.
Particle boards	A material made from different sizes of wood chips and joined with glue.
Photochromicity	A property of a smart material. A photochromic material changes colour in response to an increase in light. When the light source is removed, it returns to its original colour.
Physical properties	Any property that is measurable that describes a state of materials, for example, mass, weight, volume and density. These properties tend to be the characteristic of materials that can be identified through non-destructive testing (although some deformation is required to test hardness).
Piezoelectricity	A property of a smart material. A piezoelectric material gives off a small electrical discharge when deformed.
Plasticity	The ability of a material to be changed in shape permanently.
Pultrusion	A continuous manufacturing process used to create composite materials that have a constant cross-section. Reinforcing fibres are saturated with a liquid polymer resin and then pulled through a heated die to form a part.
Reforestation	Reforestation is the process of restoring tree cover to areas where woodlands or forest once existed. If this area never returns to its original state of vegetative cover the destructive process is called deforestation.
Seasoning	Seasoning is the commercial drying of timber which reduces the moisture content of wood.
Second generation robots	Robots that are equipped with sensors that can provide information about their surroundings. They can synchronize with each other and do not require constant supervision by a human; however, they are controlled by an external control unit.
Shape memory alloys	Shape memory alloys are metals that when deformed, can spring back into its original shape once released.
Shaping techniques	Manufacturing methods for modifying the shape of a material.
Single task robots	Robots that can perform one task only.
Smart material	Materials that have been designed to have one or more properties that can be modified when subject to an external stimuli in a way that the output can be controlled.
Softwood	The wood from a coniferous (evergreen) tree.

Stiffness	The resistance of an elastic body to deflection by an applied force.
Strain	The response of a material due to stress, defined as the change in length divided by the original length.
Stress	A force on a material divided by the cross-sectional area of that material.
Super alloys	An alloy that exhibits excellent mechanical strength, resistance to thermal creep deformation, good surface stability and resistance to corrosion.
Synthetic fibres	Fibres made from a man-made material that are spun into a thread; the joining of monomers into polymers by the process of polymerisation. Examples include polyester, acrylic, nylon, rayon, acetate, spandex, and Kevlar.
Tempering	A heat treating process designed to increase the toughness of an iron-based metal by heating it and allowing it to cool in air. Tempering decreases the hardness of the material, which usually increases the ductility and decreases the brittleness.
Tensile strength	The ability of a material to withstand pulling forces.
Thermal conductivity	The measure of how fast heat is conducted through a slab of material with a given temperature difference across the slab.
Thermal expansion	A measure of the degree of increase in dimensions when an object is heated. This can be measured by an increase in length, area or volume. The expansivity can be measured as the fractional increase in dimension per kelvin increase in temperature.
Thermo-electricity	This refers to a smart material that when heated can produce an electric current. A thermoelectric material is comprised of two dissimilar conductors.
Thermoplastic	A type of plastic that can be heated and formed into a new shape repeatedly.
Thermosetting plastic	A type of plastic that once formed into a shape, cannot be reformed into a different shape.
Third generation robots	Autonomous robots that can operate largely without supervision from a human. They have their own central control unit. Swarms of smaller autonomous robots also fit in this category.
Toughness	The ability of a material to resist the propagation of cracks.
Transparency	Ability to allow light to be transmitted with minimal scattering allowing a clear view through material.
Twisting	A distortion in which the two ends of a material do not lie on the same plane.
Volume	The quantity of three-dimensional space enclosed by a boundary, for example, the space that a substance solid, liquid, gas, or shape occupies or contains.
Warping	A distortion in wood caused by uneven drying, which results in the material bending or twisting.
Wasting/subtractive techniques	Manufacturing techniques that cut away material in order to create a component.

Weaving	The act of forming a sheet like material by interlacing long threads passing in one direction with others at a right angle to them.
Weight	Relies on mass and gravitational forces to provide measurable value. Weight is technically measure as a force, which is the Newton, i.e. a mass of 1 Kg is equivalent to 9.8 Newton [on earth].
Wood recycling	Wood recycling is the process of turning waste timber into usable products. Recycling timber is a practice that was popularized in the early 1990s as issues such as deforestation and climate change prompted both timber suppliers and consumers to turn to a more sustainable timber source.
Wood treatment	Treatment of wood can involve using solutions, which make the wood poisonous to insects, fungus, and marine borers as well as protecting it from the weather.
Work envelope	A fixed 3D space where work activities take place, considering clearance and reach.
Work hardening	Also known as strain hardening or cold working, this is the process of toughening a metal through plastic deformation.
Yarn	A long continuous length of interlocked synthetic or natural fibres.
Young's Modulus	A measure of the stiffness of an elastic material and defined by stress/strain.

Topic 5: Innovation and design

Term	Definition
Act of insight (innovation strategies)	Often referred to as the "eureka moment", a sudden image of a potential solution is formed in the mind, usually after a period of thinking about a problem.
Adaptation (innovation strategies)	A solution to a problem in one field is used to provide a new idea for a design problem in another.
Analogy (innovation strategies)	An idea from one context is used to stimulate ideas for solving a problem in another context.
Architectural innovation	The technology of the components stays the same, but the configuration of the components is changed to produce a new design.
Chance (innovation strategies)	An unexpected discovery leads to a new idea.
Competition	Any company or product that can fulfil similar functions for a similar market.
Configurational innovation	A change is made in both technology and organization.
Copyright ©	A legal right that grants the creator of an original work exclusive ownership for its use and distribution. Usually for a limited time and within geographical boundaries, copyright allows the creator to receive compensation for their intellectual effort.
Design protection	A simple and cost-effective way to protect an innovative shape, appearance or ornamentation.
Design specification	A list of requirements, constraints and considerations that a yet-to-be-designed product must fulfil.
Diffusion (Markets)	The wide acceptance (and sale) of a product.
Disruptive innovation	A product or type of technology that challenges existing companies to ignore or embrace technical change
Drivers for invention	These include personal motivation to express creativity/for personal interest, scientific or technical curiosity, constructive discontent, desire to make money, desire to help others.
Early adopters	The second fastest category to adopt an innovation.
Early majority	The third fastest group to adopt an innovation, tends to take more time to consider adopting new innovations and is inclined to draw from feedback from early adopters before taking the risk of purchasing new products/systems.
Entrepreneur	An influential individual who can take an invention to market, often by financing the development, production and diffusion of a product into the marketplace.
First to market	The first product of its type to be released on the market.
Functional	Over time, products wear out and break down. If parts are no longer

obsolescence	available, the product can no longer work in the way it originally did. Also, if a service vital to its functioning is no longer available, it can become obsolete.
Innovation	The business of putting an invention in the marketplace and making it a success.
Innovators	The first individuals to adopt an innovation. They are willing to take risks.
Intellectual Property (IP)	A legal term for intangible property such as "creations of the mind" such as inventions and designs that are used in a commercial setting. Intellectual property is protected by law.
Invention	The process of discovering a principle. A technical advance in a particular field often resulting in a novel product.
Laggards	The last to adopt an innovation. They tend to prefer traditions and are unwilling to take risks.
Late majority	The fourth fastest group to adopt an innovation. They do so after it has been established in the marketplace and are seldom willing to take risks with new innovation.
Lone inventor	An individual working outside or inside an organization who is committed to the invention of a novel product and often becomes isolated because he or she is engrossed with ideas that imply change and are resisted by others.
Market analysis	An appraisal of economic viability of the proposed design from a market perspective, taking into account fixed and variable costs and pricing. It is typically a summary about potential users and the market.
Market pull (innovation strategies)	A new idea is needed as a result of demand from the marketplace.
Modular innovation	The basic configuration stays the same, but one or more key components are changed.
Multi-disciplinary approach	On occasion, the inventor is also the product champion and/or entrepreneur. This requires specific skill sets and actions to fulfil these roles and the reason inventors often take on multiple roles. Effective design draws from multiple areas of expertise, and this can be utilised at different stages of product development.
Patent	An agreement from a government office to give someone the right to make or sell a new invention for a certain number of years.
Patent pending	An indication that an application for a patent has been applied for but has not yet been processed. The marking serves to notify those copying the invention that they may be liable for damages (including back-dated royalties), once a patent is issued.
Planned obsolescence	A product becomes outdated as a conscious act either to ensure a continuing market or to ensure that safety factors and new technologies can be incorporated into later versions of the product.
Process innovation	An improvement in the organization and/or method of manufacture

	that often leads to reduced costs or benefits to consumers.
Product champion	An influential individual, usually working within an organization, who develops an enthusiasm for a particular idea or invention and "champions" it within that organization.
Product generations	A business practice in which a company releases a new group of products that have advanced features compared to an earlier group.
Product life cycle	A tool for mapping out the four stages of a product's commercial life: Launch; Growth; Maturity; Decline.
Product versioning	A business practice in which a company produces different models of the same product, and then charges different prices for each model.
Radical innovation	A high risk innovation strategy that introduces a new idea, system or product that is very different from the existing paradigm.
research methods	A thorough analysis of competing designs is required to establish the market need. Methods include user research, user trial, literature search, expert appraisal, performance test.
Rogers' characteristics of innovation and consumers	Five characteristics identified by Rogers that impact on consumer adoption of an innovation: Relative advantage; Compatibility; Complexity; Observability; Trial-ability.
Service Mark (SM)	A trademark used to identify a service rather than a product.
Shelved technology	Technology that is shelved for various reasons. Sometimes shelved technologies will be rediscovered or taken off the shelf.
Social roots of consumerism	Consumerism is concerned with protecting customers from all organisations where there is an exchange relationship. The roots of consumerism can be traces through: disillusionment with the system; the performance gap; the consumer information gap; antagonism toward advertising; impersonal and unresponsive marketing institutions; intrusions of privacy; declining living standards; special problems of the disadvantaged; different views of the marketplace.
Style (fashion) obsolescence	Fashions and trends change over time, which can result in a product no longer being desirable. However, as evidenced by the concept of retro styling and the cyclic nature of fashion, products can become desirable again.
Suppression (Markets)	A process where a new idea or adoption of a product by the market is actively slowed.
Sustaining innovation	A new or improved product that meets the needs of consumers and sustains manufacturers
Target audience	A specific group of people within the target market at which a product or the marketing message of a product is aimed at.
Target market	When determining the target market, market sectors and segments need to be identified.
Technological obsolescence	When a new technology supersedes an existing technology, the existing technology quickly falls out of use and is no longer

	incorporated into new products. Consumers instead opt for the newer, more efficient technology in their products.
Technology push (innovation strategies)	Scientific research leads to advances in technology that underpin new ideas.
Technology transfer (innovation strategies)	Technological advances that form the basis of new designs may be applied to the development of different types of products/systems, for example, laser technology.
Trademark ® or ™	A trademark is a symbol, word, or words legally registered or established by use as representing a company or product.
User need	The essential requirements that a product must satisfy in relation to the user.

Topic 6: Classic design

Term	Definition
Conflict and compromise	The development of new products often require a multidisciplinary team including designers, engineers, and manufacturers. These different actors often have different priorities when developing a product and this can often lead to conflict. In order to achieve the goals of creating the new product, the different team members must often compromise.
Culture	In the context of classic design, culture plays an important part. They often reflect cultural influences and mark transition points within a particular culture. The culture of concern may be national, religious or a sub-culture, such as a particular youth culture or movement.
Design classic	A product that serves as a standard of its time, that has been manufactured industrially and has timeless appeal.
Dominant design	The design contains those implicit features of a product that are recognized as essential by a majority of manufacturers and purchasers.
Form	Also considered as the three-dimensional space that a product takes up, in the context of classic design, form relates to the shape of a product and the aesthetic qualities that the shape gives.
Function	Products can be considered classic designs based on how well they fulfil the task that they have been designed for.
Image	Within the context of classic design, image relates to the instantly recognizable aesthetics of a particular product. For example, the shape of a Coca-Cola bottle, or the shape of a Volkswagen Beetle motor car.
Obsolescence	This is the stage in a product life cycle where the product is no longer needed even though it functions as well as it did when first manufactured. Classic designs tend to transcend obsolescence and become desired objects long after they have ceased to be manufactured.
Omnipresence	In the context of classic design, a product that is omnipresent has existed and been in circulation for a long time.
Retro-styling	A design that uses the form and decoration from a particular period of time and/or style.
Status	Products considered as classic designs often increase in value and can project a certain status as they become more desirable. The ownership of a classic design can increase the perceived status of an individual.
Ubiquitous	In the context of classic design, a product that is ubiquitous is one that can be found almost everywhere. For example, a mobile phone.

Topic 7: User-centred design (UCD)

Term	Definition
Affinity diagramming	A tool used to organise ideas and information.
Affordance	Property of an object that indicates how it can be used. Buttons afford pushing, knobs afford turning.
Anti-personae	A profile of those for whom a product is not designed.
Attitude	The perceptions, feelings and opinions about a product by a user.
Behavioural design	Focussed on use and understanding, this considers how people will use a product, focussing on functionality.
Characteristics of a good user-product interface	These include: simplicity and ease of use; intuitive logic, organization and low memory burden; visibility; feedback; affordance; mapping; and constraints.
Constraints	Limitations on how the product can be used.
Design for emotion	A design strategy that focusses on increasing user engagement, loyalty and satisfaction with a product by incorporating emotion and personality into product design.
Dominant design	The design contains those implicit features of a product that are recognized as essential by a majority of manufacturers and purchasers.
Effectiveness	A measure of the speed of performance or error rate and its relation to the capabilities of a product.
Empathetic	When the designer takes the place of the user to see who potentially could use the product and the object could be better suited for the consumer.
Enhanced usability	Enhanced usability increases product acceptance, user experience, and productivity while decreasing user error and required training and support.
Environment	The place where a product is likely to be used.
Feedback	The provision of information as a result of an action. This can be a audio, visual or aesthetic response.
Field research	A first hand observation of customer's user experience. It is essential for the research to be conducted in the user's environment.
Ideo-pleasure	Pleasures linked to our ideal, aesthetically, culturally and otherwise.
Inclusive design	The design of mainstream products and/or services so that they are accessible and usable by as many people as possible without the need for adaptation or specialised design.
Iterative	Act of repeating a process with the aim of approaching a desired goal, target or result. Each repetition of the process is also called an iteration, and the results of one iteration are used as the starting point for the next iteration.
Iterative design	Developed through user centred evaluation and based upon the six principles of iterative design.
Learnability	The extent to which a user can operate a product or system at a defined level of competence after a pre-determined period of

	training.
Mapping	Relates to the correspondence between the layout of the controls and their required action
Method of extremes	A common sampling method where users are selected to represent the extremes of a user population, typically the 2.5th and 97.5th percentile. Products are then designed and/or tested to ensure that they function efficiently for those users.
Natural environment	The monitoring of the user interacting with the product in their homes, place of work or other natural product usage environments.
Observation	A collection of responses from users, a trail of observation of users interacting with the product
Participatory design	When users representing the target market for a product perform realistic tasks by interacting with a paper version of the user-product interface manipulated by a person acting as a computer who does not explain how the interface works.
Personae	A profile of the primary target audience for a product.
Physio-pleasure	A sensual pleasure that comes from touching, smelling, hearing or tasting something. It can also be derived from a feeling of satisfaction that comes from the effectiveness of an object in enabling an action to be performed
Population stereotype	Responses that are found to be widespread in a user population.
Product acceptance	The knowledge that a product or service paid for will meet up to its defined expectations
Productivity	Developing products and services with the user in mind so that they can reduce time wasting and simplify complex aspects of the product
Prototype testing session	A session where a test product is made and tested - all experiments are conducted before making the final product, making all changes necessary that can be seen when the prototypes are used.
Psycho-pleasure	Types of pleasure that comes from cognition, discovery, knowledge and other things that satisfy the intellect.
Reflective design	Design that evokes personal memory focussing on the message, culture and the meaning of a product or its use.
Scenario	An imagined sequence of events in the daily life of a persona based on assumptions.
Secondary personae	A profile of those who are not the primary target audience for a product, but whose needs the product should meet.
Socio-pleasure	Pleasures that come from a feeling of belonging to a social group, social-enablers, and other ways that one can identify oneself with social groups.
Sympathetic	The decisions required for the product to be the most helpful for the user given certain conditions.
Task	The thing that the product is supposed to do, however the user may have several sub uses for the product

Testing house	Typically a company that will test products on their site.
The attract/ converse/ transact (ACT) model	A framework for creating designs that improve the relations of users with a product and intentionally trigger emotional responses.
The four-pleasure framework	A framework devised by Professor Lionel Tiger that encourages design for pleasure and emotion. It comprises of four areas: Socio-pleasure; Physio-pleasure; Psycho-pleasure; and Ideo-pleasure.
Training and support	Help and guidance such as tutorials or instructions on how to use the product
Usability	The extent to which a product can be used by specified users to achieve specified goals effectively and efficiently, while functioning in a predictable and consistent manner.
Usability laboratory	A lab in which usability testing is carried out, and test users are monitored by another group of observers in a different room.
Usability objectives	Usability objective include usefulness, effectiveness, learnability and likeability.
Usability testing session	The testing of a product with potential users to find out how usable the product is.
Use case	A set of possible sequences of interactions or event steps between a user and a product to achieve a particular action.
Usefulness	The extent to which a product enables the user to achieve their goals.
User	Person utilising the product, person who is being affected by the product or who is reaping benefits/drawbacks
User error	Mistakes and slips when using the product due aspects such as complexity or inefficiency
User experience	A person's perceptions and responses that result from the use or anticipated use of a product, system or service, this can modify over time due to changing usage circumstances
User population	The range of users for a particular product or system.
User-centred design	A design process that pays particular attention to the needs of potential users of a product by involving them in all stages of the design process.
Visceral design	Design that speaks to people's nature in terms of how they expect products and systems to function and how they expect to interact with them.
Visibility	Controls should be easily accessible to the human eye

Topic 8: Sustainability

Term	Definition
Bottom-up strategies	At its most basic, this is the piecing together of components or systems in order to give rise to a more complex system or product. From a corporate strategy perspective, a bottom up strategy methodology means that the leadership level will determine the overall goals, but the workforce will assist in developing the mechanisms and ideas to meet that goal.
Datschefski's five principles of sustainable design	Five principles that facilitate a holistic approach to sustainable design: Cyclic; Solar; Safe; Efficient; Social.
Decoupling	Disconnecting two trends so that one no longer depends on the other. Through the act of decoupling (using resources more productively and redesigning production systems), it is technically possible to deliver the same or equivalent goods and services with lower environmental impact while maintaining social and equity benefits.
Eco-champion	Individuals or groups that champion environmental issues within organizations.
Eco-fan	Individuals or groups that enthusiastically adopt environmentally friendly practices as consumers.
Eco-labelling	The labelling of products to demonstrate that they are better for the environment than other products.
Eco-phobe	Individuals or groups that actively resent talk of environmental protection.
Eco-warrior	Individuals or groups that actively demonstrate on environmental issues.
Energy labelling	The labelling of products to show how energy efficient they are. The label displays information in four categories: the product's details; Energy classification that shows the product's electrical consumption; Measurements relating to consumption, efficiency and capacity etc.; Noise emitted from the product when in use.
Energy security	The uninterrupted availability of energy sources at an affordable price.
Ethical consumerism	The practice of consciously purchasing products and services produced in a way that minimises social and environmental damage, while avoiding those that have a negative impact on society and the environment.
Lifestyle consumerism	A social and economic order and ideology that encourages the acquisition of goods and services in ever greater amounts.
Macro energy sustainability	Macro energy sustainability involves large scale energy generation from non-exhaustive sources for international, national or large community use. Examples include hydroelectric power, wind, wave and geothermal energy generation.
Micro energy	Micro energy sustainability involves small scale energy generation

sustainability	from non-exhaustive sources for individual, household or small community use. Examples include roof mounted solar power or water heating panels, combined solar and wind turbine generated power for illuminated traffic signs, and wearable thermoelectric materials.
Pressure groups	Collections of individuals who hold a similar viewpoint on a particular topic, for example the environment, who take action to promote positive change to meet their goals.
Product stewardship	Everyone involved in making, selling, buying or handling electronic equipment takes responsibility for minimizing environmental impact of the equipment at all stages in the life cycle.
Smart grids	A modernised electrical grid that uses analogue or digital information and communications technology to gather and act on information (such as behaviours of suppliers and consumers) in an automated fashion to improve the efficiency, reliability, economics and sustainability of the production and distribution of electricity. They can be national or international. International grids allow electricity generated in one country to be used in another.
Sustainability reporting	A company report that focusses on four aspects of performance: Economic; Environmental; Social; and Governance.
Sustainable consumption	The consumption of goods and services that have minimal environmental impact, promote social equity and economically viable, whilst meeting basic human needs worldwide.
Sustainable design	Designing physical objects and services in accordance with the principles of social, economic, and environmental sustainability
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Take-back legislation	Laws that require manufacturers to 'take-back' packaging and products at the end of use, requiring manufacturers to take responsibility for their disposal. Reasons for this legislation include to encourage the design of products and packaging that are easily and efficiently recycled, and to reduce waste.
Top-down strategies	At its most basic, this is the breaking down of a system into component parts. From a corporate strategy perspective, a top-down strategy means that the leadership level will determine the goals and how each department and/or individual employees will contribute to meet those goals.
Triple bottom line sustainability	An expanded spectrum of values and criteria for measuring organizational success: economic, environmental and social.

Topic 9: Innovation and markets

Term	Definition
Brand	A product from a known source (organization). The name of the organization can also serve as a brand.
Brand loyalty	Where a person has a favourite supplier and prefers to buy products from them rather than from other suppliers.
Competition-based pricing	A pricing strategy where a product is positioned in the market based on the price of similar products. The company will position the product by pricing it lower, similar or higher than similar products.
Corporate social responsibility	A form of self-regulation for a company that centres on the development of goals related to three areas: economic; social; and environmental.
Cost-plus pricing	A pricing strategy where a company will add a percentage to the total costs incurred for a product (production, design, distribution etc.)
Demand pricing	A pricing strategy where a company will set the price based on the demand for the product.
Environmental scanning	The study and interpretation of the political, economic, social and technological events and trends that influence a business, industry or market.
Expert appraisal	The reliance on the knowledge and skills of an expert in the operation of the product.
Imitative strategy	Developing products that are similar to an existing new product.
Literature search	The use of consumer reports, newspaper, magazines, encyclopaedias, manufacturers information, etc. To conduct research.
Market development	Finding new applications for existing products, thereby opening up new markets.
Market penetration	Increasing sales to existing customers or finding new customers for an existing product.
Market research	The systematic gathering of data about individuals or organisations using statistical analysis and techniques to support decision making.
Market sector	A broad way of categorizing the kinds of market the company is aiming for.
Market segment	Markets divide into smaller segments where the purchasers have similar characteristics and tastes.
Marketing mix	Four factors identified through market research that provide the designer with an accurate brief of market requirements. The 4 Ps: Product; Place; Price; and Promotion.
Perceptual mapping	A tool to quickly compare a product to others in the market in a graphical representation
Pioneering strategy	Being first to market with a new innovation
Product development	The creation of new, modified or updated products aimed mainly at a company's existing customers.
Product	Increasing sales from new products or markets.

diversification	
Product family	A group of products having common classification criteria. Members normally have many common parts and assemblies.
Product line pricing	Where the different products from the same product range are positioned at different price points.
Product standardisation	The process of setting uniform characteristics for a particular product, system or service.
Promotion	The ways that can be used to communicate information about a product or system to consumers and other interested parties.
Psychological pricing	Where a product is priced to give the impression that it is paying less. For example, pricing at €1.99 instead of €2
Registered design	An intellectual property mark that protects a product's appearance. This refers to the features of the product's shape, configuration, pattern or ornamentation which is new and distinctive.
User research	Obtaining users' responses through questionnaires/surveys and interviews.
User trial	The observation of people using a product and collection of comments from people who have used a product.

Topic 10: Commercial production

Term	Definition
Computer integrated manufacturing (CIM)	A system of manufacturing that uses computers to integrate the processing of production, business and manufacturing in order to create more efficient production lines.
Cost-effectiveness	The most efficient way of designing and producing a product from the manufacturer's point of view.
Environmental impact assessment matrix	A tool designed to identify and predict the impact of a product on the environment.
Just in case (JIC)	A situation where a company keeps a small stock of components (or complete items) or ones that take a long time to make, just in case of a rush order.
Just in time (JIT)	A situation where a firm does not allocate space to the storage of components or completed items, but instead orders them (or manufactures them) when required. Large storage areas are not needed and items that are not ordered are not made.
Kaizen	A culture of continuous improvement originating in Japan and considered an important aspect of an organization's long-term strategy.
Lead time	The time between the initiation and the execution of a process.
Lean production	A long-term production strategy that considers product and process design as an ongoing activity. It focusses on continual feedback and incremental improvement.
Quality assurance (QA)	This covers all activities from design to documentation. It also includes the regulation of quality of raw materials, assemblies, products and components, services related to production, and management and inspection processes.
Quality control (QC)	Involved in development systems to ensure that products or services are designed and produced to meet or exceed customer requirements and expectations.
Statistical process control (SPC)	A quality control tool that uses statistical methods to ensure a process is operating at its most efficient.
Value for money	The relationship between what something, for example, a product, is worth and the cash amount spent on it.
Value stream mapping	A lean production management tool used to analyse current and future processes for the production of a product through to delivery to the customer.
Workflow analysis	The review of processes in a workflow in order to identify potential improvements.