

GLOSSARY OF USEFUL TERMS

Term	Topic	Definition
3D Food Printer	3D Technologies	A 3D printer able to use edible types of filament (e.g. chocolate), used for culinary enrichment, cake decorations etc.
3D Model	3D Technologies	A 3D design typically produced on a CAD program or by a 3D scanning process
3D Scanning	3D Technologies	A process that captures the geometry of a real-world object and uses that data to produce a 3D model.
ABS	3D Technologies	Acrylonitrile Butadiene Styrene (ABS) is a thermoplastic polymer. Although it is more difficult to print than PLA, ABS remains a very popular material for 3D printing professionals due to its resistance to impact and high temperature. ABS has a melting temperature of around 200°C, it is therefore recommended that the extrusion temperature be between 230 and 260°C. The use of a heating plate (between 80 and 130°C) is mandatory.
Action Plan	Social Entrepreneurial	The term Action Plan identifies a set of activities to be carried out as a result of problems and corrective actions arising during the course of a project.
Additive Manufacturing	3D Technologies	The process of fabricating a part by adding material in layers (also known as 3D printing).
ASA	3D Technologies	Acrylonitrile styrene acrylate (ASA) is a thermoplastic that you can 3D print and has many properties that make it good for engineering and outdoor purposes. ASA is basically the new and improved cousin of ABS.
Automatic Bed Leveling	3D Technologies	Automatic bed leveling is a common feature in consumer FDM 3D printers. Many machines use a contactless inductive probe, which work well with a metal build plate. For non-metal beds a BLTouch sensor is commonly used.
Bed leveling	3D Technologies	Bed leveling is one of the most important and necessary activities of the FDM workflow, as many printing problems can be caused from an uneven bed. Bed leveling refers to adjusting a 3D printer's build plate to make it completely level and allow the appropriate distance (gap) between the nozzle and the bed, in order to consistently lay down the first layer of filament. Many 3D printers have automatic or semi-automatic bed leveling using some type of proximity sensor or switch near the tip of the extruder.
Belt printers	3D Technologies	Belt 3D printers are the last type of Cartesian-based FDM printer. They are slightly different mechanically speaking, as they have a large movable belt for the print bed. This belt can also print an infinitely long piece or continuously many small parts.
Blended learning	STEAM	A combination of different modes of learning. Blended learning is often used to refer specifically to combination courses that use both in-classroom and online distance learning techniques.
Bowden extruder	3D Technologies	A Bowden extruder is one of the two types of extruders for FDM printers, and it consists of a separated hot end and extruder motor. This setup incorporates a Bowden tube, which is a long sleeve typically made of PTFE (Teflon) material. A Bowden tube

		encases the filament to transport it from the extruder motor to the hot end.
Bowden tube	3D Technologies	The tube that the filament moves through. When the filament drive mechanism is placed on a non-moving part of the 3D printer, the filament can be pushed into the PTFE (Teflon) tube. This configuration keeps the extruder light, the lighter the extruder, the quicker you can move the toolhead when not extruding.
Bridging	3D Technologies	The bigger the distance a printer needs to bridge, the worse the quality gets, and support needs to be placed under these areas
Brim	3D Technologies	This is the single-layer flat area around the base of the model, sometimes enabled in your slicer to ensure adhesion to the build plate. Unlike a skirt, a brim has a 0.00mm offset from your model. The brim is attached to your part and extends outward, like the brim of a hat. Use brims to stabilize small parts or isolated sections of a model.
Build Plate	3D Technologies	The platform, sometimes referred to as print bed, that the model is printed on.
Build plate temperature or platform temperature	3D Technologies	A heated build plate ensures that the first layer(s) of the print stay warm and don't contract due to cooling. For some materials it is necessary to have a heated bed.
Build Volume	3D Technologies	The X, Y and Z dimensions of the printable area of a 3D printer. These dimensions define how large your 3D model can be. For example 220 × 220 × 250 mm is a common build volume.
Business Ethics	Social Entrepreneurial	Business ethics is the study of appropriate business policies and practices regarding potentially controversial subjects including corporate governance, insider trading, bribery, discrimination, corporate social responsibility, and fiduciary responsibilities.
Business Model	Social Entrepreneurial	The business model refers to how the business will run in terms of generating an income. Examples of this could include B2B (Business to Business) or B2C (Business to Consumer).
Carbon Fiber filaments	3D Technologies	Carbon filament is created by combining shorter carbon fiber with another common material like PetG which is then used to create the carbon filament spool. Despite this, the printed object still benefits from the strength properties while still remaining lightweight. It has improved tensile strength and can create really rigid parts. Special nozzles are needed to use this type of filament. Using standard nozzles will damage them and lead to clogging.
Cartesian printers	3D Technologies	Cartesian 3D printers move components linearly along the X-, Y-, and Z-axes to position the print head and print within three-dimensional space. They are the most common type of 3D printers. They have boxlike frames with linear rails.
Circular Economy (CE)	Social Entrepreneurial	A circular economy (CE) is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products for as long as possible. A CE aims to tackle global challenges like climate change, biodiversity loss, waste, and pollution by emphasizing design based implementation of the three base principles of the model.
CNC machines	3D Technologies	A machine that can cut a block of material in a subtractive process
Collaborative learning	STEAM	A term covering many different approaches to education, all of which use joint effort between groups of students, or students and



		their instructors. Related to cooperative learning, collaborative learning can include group projects and collaborative writing, among other tasks.
Control Panel	3D Technologies	Most 3D Printers have a control panel for loading 3D CAD files and adjusting various parameters
Cooling fan	3D Technologies	Fans are installed to help keep its electrical components cool or to cool down the filament which has just been extruded through the nozzle.
CoreXY printers	3D Technologies	CoreXY printers are classified as Cartesian with regards to the printer's operational coordinate system but use a clever motion system. CoreXY printers are often mixed up with H-bot. Though the two are very similar, the belt system in a CoreXY is different, allowing for less torque and even fewer vibrations.
Creativity	Social Entrepreneurial	Disruptive learning techniques, playful learning, flipped learning, digital games and Xtended Reality technologies to enhance understanding and engagement in entertainment, education and heritage
CSR (Corporate social responsibility)	Social Entrepreneurial	Corporate Social Responsibility is something that larger commercial businesses undertake to contribute to social, economic or environmental good. This could mean that they allocate a proportion of profits to invest in social projects or give their staff time to volunteer. It can be useful for social businesses to understand what is available and companies CSR strategies so to see if this could benefit their organisation.
Cura	3D Technologies	A popular brand of open-source 3D printer slicing software developed and maintained by Ultimaker
Curing	3D Technologies	Curing, in 3D printing, is the process of UV light turning liquid resin into a solid state of matter. When directed at the photosensitive resin, the UV light causes chemical bonds to form, which hardens the resin. This process mainly takes place during printing in SLA, DLP, and LCD printers, which use UV lasers to cure a part.
Delta printers	3D Technologies	Delta 3D printers are a different type of FDM printers that also use Cartesian coordinates. They work with three (or sometimes even more) arms attached to vertical rails. The printhead is connected to the end of each arm with hinges, and the arms work together to adjust the printhead's position.
Direct drive extruder	3D Technologies	Direct drive is the opposite mechanism to a Bowden extruder, where an extruder motor sits directly on top of the hot end. This setup typically results in fewer mechanical issues, but, due to the added weight and vibrations experienced by the carriage, it can lead to minor inaccuracies or artifacts in prints. Such an arrangement minimizes the travel distance of the filament to the hot end and can allow for more reliable 3D printing of flexible filaments.
Divide and Conquer	3D Technologies	This principle states that in order to model a complicated 3D object you need to Divide that object into simple geometric pieces and then design those pieces individually. At the final step we should combine these individual pieces together in order to create the more complicated object.

DLP (Digital Light Processing)	3D Technologies	DLP technology is almost the same as SLA. The key difference is that DLP uses a digital light projector to flash a single image of each layer all at once. DLP can achieve faster print times compared to SLA.
Eisenhower Decision Matrix	Social Entrepreneurial	A list of the business tasks that must be completed, organized in a quadrant map depending on significance and urgency.
Elephant's Foot	3D Technologies	"Elephant's Foot" is a common FDM 3D printing issue that causes the first layer (or sometimes the first few layers) to be wider than desired. By this, we mean the region of the part touching the print bed extends past the intended boundaries.
Enclosure	3D Technologies	An enclosure refers to some sort of container that provides a controlled environment in and around a 3D printer. Enclosures offer several benefits, but the main one is to stabilize the ambient temperature. Accurately printing with materials like ABS or ASA, requires the use of an enclosure.
Endstop	3D Technologies	The switches that help protect the machine from moving past its intended range and damaging itself.
EntreComp (European Entrepreneurship Competence Framework)	Social Entrepreneurial	The European Commission has developed EntreComp: the European Entrepreneurship Competence Framework as a reference framework to explain what is meant by an entrepreneurial mindset. EntreComp offers a comprehensive description of the knowledge, skills and attitudes that people need to be entrepreneurial and create financial, cultural or social value for others. EntreComp is a common reference framework that identifies 15 competences in three key areas.
Ethical and sustainable thinking	Social Entrepreneurial	One of the competences that are included in the EntreComp framework and a (social) entrepreneur should have. It is about the assessment of the consequences of your own ideas and actions and the evaluation of their impact on society and the environment.
Extruder	3D Technologies	The group of parts of the 3D printer which handles feeding and extruding of the build material.
FDM (Fused Deposition Modeling)	3D Technologies	Fused Deposition Modeling (FDM) uses a string of solid material (filament), pushing it through a heated nozzle and melting it in the process. The printer continuously moves this nozzle around, laying down the melted material at a precise location, where it instantly cools down and solidifies. This builds up the model layer by layer. The most common 3D printing technology.
FFF (Fused Filament Fabrication)	3D Technologies	Fused Deposition Modeling (FDM) is also sometimes referred to as Fused Filament Fabrication (FFF).
Filament	3D Technologies	The material used in Fused Deposition Method (FDM) or Fused Filament Fabrication (FFF) 3D printing.
Fill density	3D Technologies	The density of the infill structure that will be printed inside a semi-hollow outer shell.
Financial literacy	Social Entrepreneurial	One of the competences that are included in the EntreComp framework and a (social) entrepreneur should have. It is the ability to understand and use various financial skills (such as budgeting, investment, etc.) effectively. In other words, it is your relationship with money.
Flexible Build Plate	3D Technologies	A flexible build plate (usually metallic and magnetic, made from PEI or PEX or powder-coated etc.) makes it a lot easier to remove

		3D prints from it. With just a gentle twist/flex finished 3D printed part pop right off.
Funding	Social Entrepreneurial	Funding is the money given by an organization on the government for a particular activity (event, research, start-ups etc.)
Funding plans	Social Entrepreneurial	A funding plan is a description of the sources of funding to be utilized in the implementation of a project, the resources from which the funding will be provided and the estimation of when the funds will be needed.
Gamification	STEAM	Gamification is the process of using game mechanics, elements, and principles and applying them to non-game contexts to engage users better.
G-code	3D Technologies	G-code is the language through which a 3D printer (and most CNC machines) are controlled. G-code can be described as commands for a machine that instructs it to perform actions like moving components, extruding filament etc.
Hairspray	3D Technologies	A common option for adhesive aid on 3D printer print beds. The advantage of hairspray is that it applies a nice thin coating and remains stable even at high temperatures.
H-bot printers	3D Technologies	H-bot 3D printers represent a different approach to boxlike printer design and they belong in the Cartesian category because they operationally use a Cartesian coordinate system. They use belts to move the printhead within the XY plane.
HIPS	3D Technologies	HIPS (High Impact Polystyrene) is a filament that can both be used as a support material and also to create 3D prototypes. In terms of mechanical properties, it is very similar to ABS where it is often used as a support material due to the similar temperature properties that allow both materials to stick to each other. This material dissolves quickly in D-Limonene, a lemon-based solvent.
Hot end	3D Technologies	The bottom part of the extruder that heats up and melts the filament.
Inclusive Entrepreneurship	Social Entrepreneurial	Inclusive entrepreneurship is about supporting entrepreneurs from all backgrounds by creating a genuinely level playing field. This involves understanding and then overcoming the barriers faced by different people in different places. It is about unleashing the creative potential that people have within them and using this to create a more sustainable future for all of us.
Industrial Ecology (IE)	Social Entrepreneurial	Industrial ecology (IE) is the study of material and energy flows through industrial systems. The global industrial economy can be modelled as a network of industrial processes that extract resources from the Earth and transform those resources into commodities that can be bought and sold to meet the needs of humanity. Industrial ecology seeks to quantify the material flows and document the industrial processes that make modern society function. Industrial ecologists are often concerned with the impacts that industrial activities have on the environment, with the use of the planet's supply of natural resources, and with problems of waste disposal.
Infill	3D Technologies	The mesh pattern inside the 3D print that provides structure.
Interest rates	Social Entrepreneurial	The interest rate is the amount (a percentage) a lender (most probably a bank) charges a borrower (in our case social entrepreneurs) in addition to the amount of money loaned. The



		interest rate on a loan is typically based on an annual basis known as the annual percentage rate (APR).
Layer height or layer thickness	3D Technologies	Also known as layer resolution, this is the thickness of one printed layer measured in millimeters. With a thinner layer height, you will usually increase the quality of the print, leading to a smoother surface and more detail visible in the Z-direction of the model. The default layer height is usually 0.2mm.
Layer resolution	3D Technologies	It is normally used to refer to the layer height, also known as print resolution or Z height.
Not-for-Profit	Social Entrepreneurial	An organization that is set up for a 'purpose' other than making a profit. Some or all of the profits are used for good (either to do more of the good stuff that the organization does or maybe offer cheaper prices to those who would not be able to afford full price) rather than being paid to shareholders or bonuses to directors. Being a not-for-profit organization does not mean that you can't pay yourself. It defines an organization by what they intend to do with their profits.
Nozzle	3D Technologies	The nozzle is the tip of the printing head that extrudes the plastic.
Nozzle diameter	3D Technologies	The diameter of the material that is extruded out of the nozzle. This plays an important role in FDM where shells and walls should be a multiple of nozzle diameter.
Nozzle temperature	3D Technologies	The temperature needed at the nozzle so that the solid filament melts and turns into a liquid. This temperature varies depending on the type of filament.
Nylon	3D Technologies	Nylon filament is a material that offers high durable and strong printed parts. Although similar to PETG, it offers far greater durability for engineering functional parts with the slight advantage of offering very low coefficient of friction parts.
Octoprint	3D Technologies	OctoPrint is a Raspberry Pi-based 3D printer application (Free and Open Source Software) that lets you control your 3D printer remotely.
Overhang	3D Technologies	Overhangs occur when a newly printed layer of material is only partially (or not at all) supported by the layer below. Angled walls are considered overhangs and depending on the print technology and angle often requires support to print successfully. You can enable supports in any slicing software, or design supports in your modeling program, or sometimes reorient your model to eliminate this issue. A rule of thumb is that you can successfully print an overhang of less than 45° unsupported.
PC	3D Technologies	Polycarbonate (PC) is a powerful material used across many industries. It stands out for three main features: optical clarity, resistance to heat, and incredible toughness. Printing PC can be quite a challenge and requires high nozzle and bed temperatures.
PETG	3D Technologies	PETG (POLYETHYLENE TEREPHTHALATE + GLYCOL) is a very durable and a great material for a wide range of engineering requirements.
PLA	3D Technologies	PLA, also known as polylactic acid or polylactide, is a thermoplastic made from renewable resources such as corn starch, tapioca roots or sugar cane, unlike other industrial materials made primarily from petroleum. Due to its more ecological origins this material has become popular within the 3D printing industry. It has a



		melting temperature of 180°C and an extrusion temperature between 200°C and 220°C. This means that when printing with PLA, the use of a heated printing bed is not necessary, and a closed chamber is not a necessity either.
Planning and Management	Social Entrepreneurial	One of the competences that are included in the EntreComp framework and a (social) entrepreneur should have. It is about the process of developing a strategy to achieve desired objectives and the way of handling it and making it a reality.
Polar printers	3D Technologies	Polar 3D printers use a different operational coordinate system. They plot points on a circular grid rather than a rectangular one. Polar printers use angle and distance to locate points in two dimensions (on the XY plane). This type of printer extrudes filament like other FDM printers, but the printhead usually connects to a curved arm that can swing outward.
Polyjet	3D Technologies	Similar to inkjet printing, but instead of jetting drops of ink onto paper, jets droplets of liquid photopolymer (in layers) onto a build tray and cures them instantly using UV light. The results are fully cured objects that can be handled and used immediately.
Positioning precision	3D Technologies	The accuracy with which the print head moves in the X and Y direction. Instead of moving around in a perfect circle, the print head moves in steps of 12.5 micron.
Post Processing	3D Technologies	Any act of improving the appearance or material properties of a 3d print after it has been printed. This covers a large range of processes in 3D printing that vary by technology (support removal, UV curing, heat treating, sanding, tumbling, polishing, painting etc.).
Print head	3D Technologies	The part of a 3D printer where material is extruded/jetted from. Is an assembly of multiple components including the nozzle in the case of FDM.
Print speed	3D Technologies	The speed at which the print head moves while it is printing. Based on the print speed the amount of plastic that needs to be extruded will be calculated.
Problem-Based Learning (PBL)	STEAM	A concept of active learning, currently being adopted for primary through secondary education. Defining characteristics of PBL include being driven by open-ended problems, collaborative working in small groups, and the use of facilitators rather than teachers.
Prosthetics	Social Entrepreneurial	3D printers can produce low-cost prosthetic upper and lower limb devices for children and adults
Prototype	3D Technologies	An early part or model of a design built before production to test form, function, aesthetics and interaction usually at a low cost. Prototypes are typically items to learn from to improve a design.
PVA	3D Technologies	PVA is used as a water-soluble support material during printing complex parts. It works as a bridge material between open areas of the print which would otherwise deform.
Raft	3D Technologies	This is the printing technique for adding removable support material at the bottom of a print in order to prevent warping. The raft itself is the horizontal latticework of filament located between the model and the build plate. Rafts can be useful when the bottom surface of a model is not completely flat or when the print

		has difficulty adhering to the build plate. Rafts are also used to help stabilize models with small footprints.
Resin	3D Technologies	Resin 3D printers use liquid photopolymers (resins) that are sensitive to UV light. Resins have a higher cost, are toxic, and must be handled with great care and safety. Resin 3D prints require mandatory post-processing steps (washing/curing). There is a variety of different types of resins and can produce very high detail 3D prints.
Retraction	3D Technologies	In FDM 3D printing, retraction is the extruder reversing the direction of the filament (i.e., pulling it away from the hot end). Typically, this is done in short bursts between consecutive instances of extrusion. Among other things, it's a great way to prevent stringing. Retraction can be managed in your slicer by changing the retraction distance and speed. Retraction differs between printers, if you use a direct-drive extruder, your retraction length and speed should be shorter and slower than what you would use for a Bowden setup.
Risk Assessment Matrix	Social Entrepreneurial	A risk assessment matrix, also known as a Probability and Severity risk matrix, is a visual tool that depicts the potential risks affecting a business. The risk matrix is based on two intersecting factors: the likelihood that the risk event will occur, and the potential impact that the risk event will have on the business. In other words, it's a tool that helps you visualize the probability vs. the severity of a potential risk.
SCARA printers	3D Technologies	SCARA 3D printers are a more complicated type of FDM printer that uses Selective Compliance Assembly Robot Arm (SCARA) technology to function. SCARA printers also use a Cartesian coordinate system, but they form their own category due to their unique mechanical setup.
Shell	3D Technologies	The exterior layer of a 3D printed model.
Skirt	3D Technologies	This is a line printed around the object on the first layer, but not connected to the object. This helps prime the extrusion and also gives you a moment to check and correct any bed leveling issues before printing starts.
SLA (Stereo Lithography Apparatus)	3D Technologies	SLA is the world's first 3D printing technology (1986). An SLA printer uses mirrors to rapidly aim a laser beam across a vat of resin, selectively curing and solidifying a cross-section of the object inside this building area, building it up layer by layer.
Slice	3D Technologies	The single layer of a 3D printed model.
Slicer	3D Technologies	The software required to convert an STL or OBJ file into G-code, the machine-readable file needed by a 3D printer to reproduce the model. Slicers cut the model into horizontal layers (slices) and generates the toolpaths needed to fill them. The most commonly used free/open source slicer for FDM printers is Cura and for SLA printers is Chitobox.
SLM (Selective Laser Melting)	3D Technologies	Selective Laser Melting (SLM) produces objects in a similar fashion to SLS. The main difference is that these types of 3D printing technology are applied to the production of metal parts. SLM uses the laser to achieve a full melt of the metal powder forming a homogeneous part.



SLS (Selective Laser Sintering)	3D Technologies	Creating an object with Powder Bed Fusion technology and polymer powder is generally known as Selective Laser Sintering (SLS). First, a bin of polymer powder is heated to a temperature just below the polymer's melting point. Next, a recoating blade or wiper deposits a very thin layer of the powdered material onto a build platform. A CO2 laser beam then begins to scan the surface. The laser will selectively sinter the powder and solidify a cross-section of the object.
Social enterprise	Social Entrepreneurial	A business that is driven by making a difference to communities or the environment. The communities could be a community of interest or geographical community. As with all businesses, they will compete to deliver goods and services. The difference is that social purpose is at the very heart of what they do and profits they make are reinvested towards achieving that purpose.
Social entrepreneur	Social Entrepreneurial	A person who is the founder of a social business. Their main driver and reason for starting the business is to make a difference to a community and/or the environment, rather than 'just' making money.
Social innovation	Social Entrepreneurial	A novel solution to a social problem that is more effective, efficient, sustainable, or just than current solutions. The value created accrues primarily to society rather than to private individuals.
Social Return of Investment (SROI)	Social Entrepreneurial	A form of stakeholder-driven evaluation blended with cost-benefit analysis tailored to social purposes. It tells the story of how change is being created and places a monetary value on that change and compares it with the costs of inputs required to achieve it.
Stringing	3D Technologies	As an FDM printer nozzle travels across an open space to get to the next point, it may sometimes ooze melted plastic, which then solidifies and sticks to the printed parts. This is 3D printer stringing, and it leaves your 3D printed parts with thin strands of plastic that resemble cobwebs or strands of hair. In 3D printing, stringing is a common problem, especially with flexible materials.
Support	3D Technologies	Additional material which can be generated by your slicer to support the structure of the model which wouldn't have any stability otherwise (see overhang). Support is required to successfully print overhangs and bridges and is removed and discarded in the post processing stage.
Supported materials by a 3D printer	3D Technologies	"Supported material" refers to the type of filaments a 3D printer can extrude. It is highly related to the maximum hot end temperature that can be achieved, the existence of a heated build plate and/or the type of the extruder mechanism.
Sustainable Business	Social Entrepreneurial	Sustainable business means doing things thoughtfully by thinking ahead and looking at how your actions, products and services used in your business impact the environment and surroundings.
SWOT Analysis	Social Entrepreneurial	A SWOT Analysis is a strategy that may be used by a group or by an individual to self-assess an idea, business, or project. It is the mapping of a company's Strengths, Weaknesses, Opportunities, and Threats. This mapping will assist in preparing to fix vulnerabilities and tackle threats in order to reduce overall risk.

Temperature differential	3D Technologies	The difference in temperature between 2 points. In 3D printing reducing the temperature differential between 2 nearby points reduces the likelihood of warping or deformation.
Thermal Stress	3D Technologies	The internal stress generated in a material as it changes in dimension as a reaction to changes in temperature. The accumulation of thermal stress in 3D prints as they cool down is what causes warping.
TPU	3D Technologies	Thermoplastic polyurethane (TPU) is created by combining a standard polymer with rubber. This creates a filament that is very similar to what is used in standard manufacturing for parts in automobiles and many household items. The printed objects that can be created are not only flexible, but have higher elasticity than most of the other slightly flexible filaments available.
Travel speed	3D Technologies	The speed at which the print head moves while it is not extruding any plastic.
Triangle mesh	3D Technologies	A triangle mesh is a type of polygon mesh that comprises of a set of triangles (typically in three dimensions) that are connected by their common edges or corners. Many advanced 3D design software can work with triangle meshes for editing STL files and 3D meshes.
Vat Polymerization	3D Technologies	Vat Polymerization is a 3D printing process where a light source selectively cures a photopolymer resin in a vat. The two most common forms of Vat Polymerization are SLA (Stereolithography) and DLP (Digital Light Processing).
Warping	3D Technologies	Warping is a common FDM issue, where part of a print's base lifts off the print bed. In other words, warping occurs due to differences in temperatures between layers