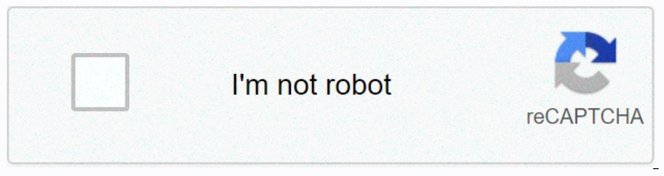


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# Technology is not just a tool

Long before humans became homo sapiens, they used tools. As time passed, the tools they created became more and more advanced. Nowadays, tools to trade, like the ones used to make prototypes of fantastic and innovative new products, are both complex and cool, you and I will probably never own them. We don't have to do this. But people invented cutting-edge products, these tools are black. One of the interesting prototype tools we read on the following pages is a rotating circular glide picture above. Crew members of the Discovery show Prototype It! also tried to create a 6x6 all terrain runner and robots in that box. Team Prototype This! consists of five scientists and engineers with different specialties such as animatronics, mechanical engineering and electronics. Together they will work to create wild futuristic prototypes in a short period of time. Advertising Unlike tools collecting egg nets in the corner of your garage, these high-tech tools are what is needed to push the boundaries of human innovation and create amazing new potential products. In the following pages, we take a look at some of the types of tools used in Prototype It! and explore the interesting functions they perform. Table of Contents Regular 2-D printers have become ubiquitous products in modern times. Three-dimensional printers, on the other hand, are still able to turn some heads. Whether you're an architect or artist, trainer or product designer, a 3-D printer can be exactly what you're looking for. In some ways, the technology is similar to 2-D printing because it uses software to break down 3-D models with 2-D layers - or cross-sections - of the desired prototype. There are several methods to perform 3-D printing, but it is generally made of layers. For example, in one method, layers of fine powder are deposited on a flourishing prototype, followed by a liquid binder layer. Once the object is printed, it can be covered with a sealant to strengthen it. Many of the components of the machine are similar to those of conventional printers, but this is where the technologies diverge. Advertising One thing, compared to 2-D printers, 3-D printers are slow. Of course, some are faster than others - Z Corporation makes one of the fastest on the market - but even it builds only an inch or two hours (depending on the size and shape of what is printed). Their ZPrinter 450 provides layers between 0.0035 and 0.0040 inches thick (.089-0.102 millimeters), and it can build prototypes that are 8 inches by 10 inches x 8 inches in size (20 by 25 by 20 centimeters). Z Corporation has another model, the Spectrum Z510, which can be built with slightly larger prototypes at a higher resolution and about the same speed as the 450. ZPrinter rings for about $45,000 and Z510 about $73,000 [source: Prototype Magazine, Prototype Magazine]. Despite the potential drawbacks - including the hefty price tag - the 3-D ZPrinter's capabilities are interesting. You can print relief maps on the ocean floor, prototype products, pitch meetings, model human hearts for research, or create architectural models to give construction workers a better visual image of design plans. And the best part- it's all colored. Different materials can be used in the printing process to create different characteristics in finished products; they can be changed to rubber for example. Depending on the company, you can use a variety of techniques and materials that affect the characteristics of the finished product. For example, some make stronger prototypes, some offer more colorful results, others with greater accuracy. On the next page, let's take a closer look at cutting-edge software that makes 3-D printing possible. To print a 3-D prototype, the first thing you need is a 3-D model. Using specialized software, it is possible to make virtual designs that can be fed by a 3-D printer and presto – you have a desktop visual of your product. CAD (computer-backed design) software was first pioneered in the early 1960s, and it became popular in the commercial arena in the 1970s. Since then, a huge field of engineers and designers of all kinds has used technology to design everything from airplane engines to kitchen sinks. Advertising SolidWorks is one company that makes top-of-the-line mechanical CAD software, with a variety of tools and features for designing, manipulating, compiling, correlated and evaluating future products. SolidWorks software allows users to convert 2-D to 3-D, use a variety of tools to quickly and efficiently develop their design, simulate the assembly and operation of the prototype, compare and share their finished product, and much more. Using SolidWorks software, it is possible not only to manipulate 2-D images and create professional drawings ready for the production line, but also to make detailed 3-D image maps. These can be sent to 3-D printers, and you could have a prototype of your design in a few minutes (or hours depending on size). One example of the application of SolidWorks 3-D CAD software was created by MAKO Surgical Group. They designed and built a MAKO tactile control system - a robotic arm that helps surgeons perform less invasive, more successful operations. The machine not only controls the surgeon's movements, it can also let them know where it is safe and appropriate to cut. SolidWorks software proved useful not only as part of the design, but also in mapping virtual space surgeons navigate. Guys Prototype It! does not make surgical devices with their tools, but read another tool they make your own unique prototypes. If you work with electronics and electrical systems, the opportunities are very good, which you have heard of - and probably your own - multi-metre. But to give the rest of us a bit of a background, the multimeter is a convenient device that can measure the various parameters of the world with all things electric. For example, they can usually measure connectivity, frequency, flow, resistance, volte, ampre, sigh, temperature, and more. This can be useful in many situations: testing the presence of an electrical current, detecting the value of the resistor, or checking the battery charge. Such measures can help identify breakdowns, solve a number of problems and be very important as precautionary measures. Advertising Let's look a little closer to one popular brand multimeter - Fluke. Fluke makes several multi-metric options suitable for different users. Advanced features large, well-lit digital monitors that can be used to view data trends through graphs and charts. This can be especially useful if you are having trouble finding an intermittent electrical problem. Other models are simpler for simpler apps. Newer Fluke multimeters often have high memory capacity and no longer run battery time, making them a good choice in situations that require constant monitoring. Many are tightened to be safe in difficult industrial conditions, and they can be important for troubleshooting and problem solving in dangerous environments such as plants, factories and other engineering facilities. Whether fixing a conveyor system, building a robot or testing a fuse, a multimeter can be just what you need to get the job done safely and efficiently. On the next page, we will examine a similar tool with other important features. Oscilloscopes are much like multimeters, but in most cases, they are much more powerful and take measurements and analysis to the next level. One important difference is also that oscilloscopes focus only on electrical signals, and when we say we are focused, we mean it. They actually let the user look at the signals they're monitoring. An important tool is the hand in designing and testing something related to electronics and electrical systems, oscilloscopes are used by people across the high cross-sectional industry. You can find one space-defense testing facility, another car factory or another one of any number of science labs. An oscilloscope can display a wave pattern with an electric signal, and it allows someone to analyze whether it has a suitable pattern and strength. Advertising Agilent Technologies is one company that makes oscilloscopes. Their top-of-the-line models cost upwards of $100,000, but many are cheaper [source: Agilent Technologies]. Let's take a closer look at which one affordable oscilloscopes can achieve. At a base price of nearly $18,000, InfiniiVision MSO7104A Oscilloscope measures several aspects of electric waves in the 1 gigahertz bandwidth range [source: Agilent Technologies]. It is capable of providing measurements with high accuracy and performing a number of mathematical functions in the results in order to manipulate and examine them. It has four analog and 16 digital channels that can be used to view and compare all separate signals on your 12.1-inch screen. You can watch your waves come in a maximum of 4 giga-sample per second with a refresh rate of up to 100,000 waves per second, providing great detail and accuracy. InfiniiVision also has a fair amount of memory, so you can record sample signals and play them back for comparison and learning. Now that we've looked at some cool tools for designing and testing, we're moving to the factory floor. Laser engraching machines (also known as laser corrosive machines, laser cutters and a variety of other similar names that describe their different functions) are gaining popularity, both with the accuracy of the results and the speed at which they work. In the process, the laser beam is programmed to create a design for a variety of possible materials. These materials can be organic, such as paper, stone, wood, rubber and leather, or they can be plastic or metal. Lasers create a nicely polished edge when they vapors or cut controlled parts of the material into their assigned pattern. Laser engravings can be called cutting, engraving, scribbling, drilling, marking and other related modeling techniques. They can be used pretty much for something you can think of being etched or imprinted, whether it's a picture frame, a trophy, a printed circuit board, jewelry, then a name. Laser cutters can also be convenient industrial settings, whether for mass production, prototype production or something in between. Advertising One laser cutter, VersaLASER VLS3.50, can be designed, etched, writer and cut objects in a workspace 24 by 12 inches in size (about 61 by 31 centimeters). This diverse and incredibly accurate machine weighs 110-123 pounds (50-56 kg) and needs a computer all by itself to run, operating on either Windows XP or Windows Vista. It requires an exhaust system, and while the laser engraver is not as expensive to run, it is expensive to acquire. VersaLASER also has a cylindrical axis to create an all-around effect. The main way to understand laser engravers is to look at how similar they are to printers. Only instead of working by adding material to the surface, they create details by taking it away. Let's look at a machine with a somewhat similar function on the next page. The CNC machine - which stands for Computer Numerical Control - is a type of computerized workshop device that replaces more workshop machinery. CNC is capable of filling many common store jobs, such as drilling, milling and turning - and they do it all by themselves, changing the shape you define. CNC machines are computer-programmed to perform all the tasks that a person should have done on a manual machine, as well as many tasks that people simply can't do. Whether it's cutting a sinuous curve into a heavy steel plate, or engraving a miniature image on the back of a gold watch, CNCs can do it faster and with greater accuracy than any other type of machine. By moving a number of linear and rotating axes, most CNCs can perform a variety of complex tasks – more axes, more different tasks and more complex shapes that can be cut. Advertising One CNC in particular Tormach PCNC 1100 Mill (this is personal computer numerical control), stands as the leader of the field and may be just the thing you need, whether you are an engineer, entrepreneur or hobbyist. The machine can cut through everything from wood and plastic to steel, iron, titanium and chromium alloys - and shape them into any final 3-D product you're looking for. PCNCs with 1.5 horsepower spindle rotates at speeds between 100 and 5000 RPMs. Want a full package? THE PCNC and all the accompanying gadgets will set you back about $16,000 [source: Tormach]. But this price does not include a long list of accessories; The PCNC 1100 Mill itself costs $7,480, and you can mix and match your extras. And it is not as expensive as it could be; During the design process, people at Tormach worked to keep this personal CNC affordable, as well as easy to use. Learn about another type of tool that can be found in the Prototype See! toolbox on the next page. If two metal surfaces need to be connected and cannot be melted, you will reach your faithful soldering iron. Watering uses the fact that different metals have different melting points - using a metal alloy with a lower melting point than the two you join does the trick. Watering can be difficult, though. Getting just the right amount of heat and watering onto your project can be tricky, especially if you use solder, which requires a lot of heat like some lead-free ones. Then there's the wetting and the flows and the risk that you haven't formed a strong enough bond between what you're trying to connect. There's a lot to consider with good watering. Advertising Due to all this, many companies develop technologies to make the process smoother. One example is OK International, a company that develops and sells electronics assembly equipment tools such as their PS-900 soldering plant. The PS-900 uses SmartHeat Technology to provide a very stable level of heat throughout the soldering process – it's up to you to set it in handy auto-sleep Unleaded alloys work perfectly with the PS-900. Depending on what you use for watering and what you drink, the company offers a variety of tips for getting the best match. This soldering flask can also be used with other OK International products, such as their smoke extraction systems, liquid dispensers and other related tools. We have seen what happens when things warm up; Let's cool them down a little bit on the next page. A cold saw is a special circular saw that uses a coolant system during cutting. This helps reduce the amount of sparks, dust and dirt cooling saw, which helps produce a smoother cut and increase grain life. Powerful rigid vises of different types are common, and these hold materials are cut with vibration-free grip, another big factor that contributes to precision cutting and long-lasting blades. Cold steths are particularly suitable for cutting narrow pipes and small rods and producing precise miters (cuts in corners - such as cuts at a 45-degree angle on pieces of the door frame). They use special saw blades called high-speed steel or HSS blades, which are less heat resistant and can cut faster. Advertising Let's take a closer look at one of the machines manufactured by kalamazoo machine tool. Cast Iron Kalamazoo FHC350D cold saw is a hand machine that can make a large cut that has free burrs. The saw uses circular fast steel blades up to 14 inches (about 35 centimeters) in diameter, which can be set to spin at either 26 or 52 revolutions per minute - something you'd like to adjust depending on what you're cutting. Now that we've cut everything to pieces, let's look at the cool tool on the next page to help you put everything back together. And this next tool is not like a little soldering system that we read about on the last page, which is perfect for a complicated job - this hot air machine is for big jobs. MIG welding (which stands for metal inert gas) is achieved by feeding the wire through the contact tip of the welding gun. The gas shield, which is also supplied through the tip, surrounds the contact surface - protects the electrode wire and keeps any contamination out of the weld, so it looks nicer. The power cord melts when it is electrically energized and forms a weld. MIG welding is also known as GMAW (gas metal arc welding -- nowadays it may actually be some semi-inned gases like carbon dioxide in it too - although the term MIG remains popular). The advantages of MIG-style welding are that it saves time, there's not much clean-up, there's less waste and, probably most importantly, you can get a really good weld. Advertising millermatic 252 MIG Welders is a good example of this technology and sells at a base price of about $2,500 [source: Miller]. With wheels for easier movement, this Millermatic can be used for light production, metal and many other seminar applications. Millermatic can weld steel, stainless steel and aluminum wire at a speed of between 50-700 inches per minute (about 1.3-17.8 meters per minute). Different aspects of welding work can be preset to save time and allow welder control of each stage of the process. For example, you can specify how long the shield gas will flow before the welding arc is energized. Millermatic also has certain memory features, such as storage parameters and settings for different types of welding weapons you can add to it. We have quite a lot of heavy equipment and materials in hand now, which takes up space. Find out about the cool tool you can use to haul all this stuff around the workshop on the next page. Most forklifts, and vehicles in

general, are not the easiest things in the world to manoeuvre. This is because the wheels only roll back and forth - there is no lateral movement. So if your goal is to move somewhere out right or left - say that a better parking space a few slots down that just opened - and you want to end up pointing in the same direction when you get there, you have to turn, either forward or back, and turn again. In the car, it's not such a big deal, but when it comes to vehicles like forklifts, it can be a different story. Forklifts often carry large, bulky and very heavy items, which can be difficult to load and difficult to manoeuvre (especially through doorways and other cramped places). All this rotation and manoeuvring at a safe, but very slow speed can also suck up a lot of time. And that's what makes this last tool so cool - its wheels are designed to let it travel in all directions. Special wheel design was invented by Bengt Ilon Sweden in the 1970s. It works because its wheels consist of a circular set of rollers arranged at an angle along the wheel. It actually gives the wheels something similar to the functional shape of the sphere (like ball bearings in rolling chairs) and significantly increases the range of motion available. You want to go sideways? How about a diagonal back-to-back with a twist at the end? Whatever you want, every direction of movement is now possible. These fancy wheels have begun appearing in various commercial products, including the Airtrax Sidewinder ATX-3000. This forklift works with two joysticks and can rotate in full circle while remaining in one place - no doughnuts here. It can also travel over anything up to 3 inches high. The big advantage of Sidewinder is that the warehouse could fill more points because less space is needed to devote to driving maneuvers, all of which are possible even faster. For more information about the world of high-tech tools and other interesting facts, see the links on the following page. Jackhammers offer incredible power when it degradation of substances. Find out how these demolition miracles work. 7.1.1 Watering basics. Circuit Technology Center. 7/7/200. (8/7/2008). MSO7104A Oscilloscope datasheet. Agilent Technologies. 2008-02-12 (9/22/2008) Technologies InfiniiVision 7000 Series Oscilloscopes Datasheet. (9/22/2008) The Technologies Corporate website. (08/4/2008) Corporate website. (08/4/2008) Cold Saws. Baileigh Industries Inc (8/8/2008) - the history of CAD CAM. Cadazz, can't you do that? 7/2004. (07/5/2008) Saw. South Australia Department of Education and Children's Services. (8/8/2008) Al. ZCorporation Spectrum Z510. Prototype Magazine. 1/5/2005. (06/06/2008) Corporate website. (08/4/2008) High Production Cold Saws. Clausing Industrial, Inc. (09/23/2008) Speed Steel Cutting Tools. Super Tool Inc. (08/8/2008) it works. Cached VersaLASER User Manual. (8/6/2008) Bengt Erland. Wheels of course stable selfpropelling Vehicle Moving in any desired direction on the ground or any other base. Free Patents Online. 11/13/1972. (8/4/2008) DSA91304A High Performance Oscilloscope Agilent Technologies. (08/08/2008 Machine Tool Corporate website. (8.4.2008) Http://www.kmtsaw.com/Kalamazoo. Clausing Industrial, Inc. (09/22/2008) and analyzing events in FlukeView Forms Software. Coincidence. 2004. (8/5/2008) Mike. What is CNC? CNC Concepts, Inc. (8/7/2008) 20is%20cnc.htmMAKO SolidWorks software to design robotics and implants as a minimally invasive surgical alternative. Solidworks. 7/14/2008. (8/5/2008) Company website. (08/4/2008) Corporate website. (2008/08/4) 252 . Miller. 9/2008. (09/22/2008) 252. Miller. 2008. (2008-09/22) GMAW, Wire Welding, MAG. WeldGuru.com. Multimetric tutorial and video. Electronics and radio today. (08/5/2008) fundamentals. Agilent Technologies. 7/21/2008. (8/6/2008) Rudiger. Laser marking. (08/06/2008) W. D. Using oscilloscope. Design Electronics. (8/6/2008) Products week on October 15, 2007. test&measurementZONE en-genius. 10/2007. (8/6/2008) Marty. MIG welding-- basics and then some. TheFabricator.com. 7.3.2004. (8/7/2008) Marty. More MIG welding. TheFabricator.com. 1.11.2005. (8/7/2008) Lilli Manolis. Close-up technology - fast prototypical. Plastic technology. (08/5/2008) Corporate website. (08/4/2008) Technology. ProductionTechnologyNews.com. (8/7/2008) 111/url= . Encyclopedia Britannica. (8/6/2008) metal cutting equipment. A modern machine shop. 8/2006. (20080/8/7) and Pricings. VersaLASERS.net( 8/4/2008) on the Company' s website. (04/4/2008) laser systems corporate website. (08/08/2008) of Glasgow buys 200 licenses for SolidWorks software. About the New York Times. 7/7/2008. (8/5/2008) VersaLaser, what can't you do here? Do. (08/6/2008) watering and watering. Encyclopaedia Britannica Student Edition. (8/7/8) is a DMM Digital Multimeter. Electronics and radio today. (08/5/2008) Corporate website. (8/4/2008) 450 3-D printer. Prototype Magazine. 3/16/2007. (8/6/2008)

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