Exploring New Trends in 3D Scan-to-Print
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3D printing and 3D scanning have been around for nearly a decade. But it’s only been in the last few years that each, especially 3D printing, has gained wide mainstream awareness and broader professional use. One of the hindrances to the mass adoption of 3D printing has been the absence of an easy way for non-technical users to generate the files needed for the 3D printer; very few of us know how to design in 3D computer aided design (CAD) software. And, adding an additional layer of colour only compounds the level of difficulty.

3D scanning is one way to generate those 3D printable files. Despite the fact that 3D scanners and 3D printers have been used together for selected industrial applications for many years, recent advances in both technologies have resulted in a growing trend toward innovative 3D scan-to-print applications by a broad range of new users.

In this white paper, we’ll explore the trend in 3D scan-to-print applications and users, what’s behind the shift, what it all means and what to look for in 3D scanners and 3D printers for today’s 3D scan-to-print applications.
As recently as three to five years ago, 3D scanners and 3D printers were not part of the average person’s daily vocabulary. These devices were predominantly used together by engineers, product designers and quality control professionals in industrial applications, such as reverse engineering and inspection.

Say a part on an obsolete airplane or vintage car needed to be replaced, the existing part was scanned and a 3D printed prototype precisely replicating that part was produced for aftermarket and custom manufacturing for that vehicle. For bespoke fit items, such as prostheses, the geometry of the area is scanned and can be incorporated into a 3D printed part or prototype which will fit exactly. Custom foot beds (insoles) are an example of this application in the orthopedic industry.

3D scan-to-print technology has also been used for digital archiving in companies with shelves and even warehouses chock full of old moulds and tooling. Rather than simply discard these outdated items in an attempt to recapture much needed space, they are first scanned and the digital scan files stored. If and when they are ever needed again, the scan data can be 3D printed to remanufacture the required items. This process has also been used in dental offices for years to avoid storing physical teeth moulds for every patient.

These industrial applications still very much exist today. However, in the last few years, there has also been a dramatic shift in the number and type of users and applications for which 3D printers and 3D scanners are used together. The complementary use of these two technologies has become prolific in a variety of applications, including:

**Entertainment** – Film and electronic gaming producers scan people and objects of almost any size and send these 3D scan files to a 3D printer in order to create characters for stop motion animation, avatars, props and scenery.
Packaging – Package and container manufacturers scan objects that will be packaged and then use that scan data to 3D print package prototypes that precisely house those objects, no matter how oddly shaped they might be.

Existing packages and bottles can also be scanned and that scan data subsequently modified and 3D printed in the development of new package designs. People’s hands and grips can even be scanned in order to incorporate that grip data into the design of a 3D printed bottle prototype for ergonomic testing. Accurate and realistic prototypes are then used to determine the design for the final manufactured product.

Consumer gifts and keepsakes - 3D printer service bureaus popping up around the world create bespoke consumer products using 3D scanner and 3D printer technologies. For example, pets, children and brides and grooms are scanned and 3D printed figurines are produced from the scans as lasting keepsakes. Common household objects are also scanned, customised and 3D printed as gifts or for personal use.

Cultural heritage and archeology - Museum curators have turned to 3D scanning and 3D printing to overcome the challenge of providing effective, hands-on education about ancient artefacts without damaging those priceless items. Now, they simply scan an object – an ancient mummy hand, priceless African mask or Neanderthal skull, for example – 3D print it and enable students, the public and even other curators to examine and even handle the 3D printed replicas, all while keeping the original object locked safely away in secure, climate-controlled storage.

Medicine - Doctors at healthcare facilities around the world are using 3D scanning and 3D printing together in exciting new ways to benefit their patients. Reconstructive surgeons, for example, can scan an unharmed side of a patient’s face and use the scan data to 3D print an accurate physical model that will be used in the repair of the damaged side of their face. The 3D printed model is used to facilitate communication with the patient and his family, as well as better prepare the surgical team prior to surgery. The result is reduced surgical times.
and improved patient outcomes. The 3D scan-to-print process is also often used in preparation for plastic surgery and in the development of custom prostheses.

What is Behind the Shift?

What’s behind the rapid shift in 3D scan-to-print applications? Certainly the explosive increase in awareness and use of 3D printing has contributed to, if not driven, this trend. Additionally, both 3D scanners and 3D printers have independently become far more affordable while their technical capabilities have expanded.

The inspection and reverse engineering applications of a few years ago required expensive 3D scanners from companies like Z Corporation, Creaform, GOM, Aicon, Faro and Konica Minolta. Despite ranging in price from $40,000 USD to $200,000 USD, most of these scanners did not offer the capability to capture colour. Many were attached to fixed mechanical arms or were very complicated to set up, thereby greatly limiting their use. On the 3D printer side of the equation, there were very few colour-capable 3D printers at that time, and those that existed, were expensive to operate and the colour quality inadequate for many of today’s applications.

The introduction of sub-$1,000 USD, highly portable 3D scanners, such as StructureIO, Kinect, Fuel3D and David Scanner - not to mention smartphone 3D scanning apps - most of which can capture colour, combined with affordable, photorealistic colour-capable 3D printers, have transformed the industry. Entrepreneurs and other professionals have much greater access to the technology and are continually finding innovative ways to use the highly complementary technologies together to develop new businesses, revenue streams and customers.
What to Look for in 3D Scanners and 3D Printers for Today’s 3D Scan-to-Print Applications

There are a staggering number of 3D scanners and 3D printers from which to choose, and selecting the right ones for your 3D scan-to-print application can feel overwhelming.

Here are the most important items to keep in mind and capabilities to look for in a 3D scanner and 3D printer for many of today’s scan-to-print applications:

3D Scanner

A suitable, professional-class 3D printer will print what the 3D scanner captures, so the quality of the scan significantly impacts the quality of the final 3D printed model. Factors that govern the quality of scan data are mainly:

- **Global accuracy** - the overall accuracy of the model — it is somewhat hard to quantify, unless compatible with, and utilising, photogrammetry “targets” as part of the process
- **High resolution** for capturing detail and remaining accurate on small radii, providing point spacing less than or equal to that of the printer
- **High-quality colour (or texture)** data capture greater than 1 megapixel and reproduction with constant and bright lighting conditions, ideally incorporated into the scanner
- **Colour export capability**, with texture maps, i.e.; .WRL or .OBJ file formats
- **Photogrammetry capability** if the global accuracy of the prints is important
- **Portable** and easy to set up and use

3D Printer

- **Full, photorealistic 5760 x 1440 x 508 dpi bitmap colour**. The ability to apply any colour, anywhere. Inclusion of ICC (International Colour Consortium) Colour Map.
- **Professional accuracy**: x, y & z axis: 12µ, 12µ, 100µ (0.0004in, 0.0004in, 0.004in)
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- **Low running costs**, under $1.00 USD inch\(^3\)
- **Safe, Green and eco-friendly** process and materials
- **Office friendly and easy to use**, without chemicals, fumes, toxic particle emissions, manual cutting tools, mess and special facility requirements
- **Durable and stable** 3D printed models

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**Conclusion**

As 3D scanner and 3D printer costs continue to decline and low-cost 3D scanners keep pace with the extraordinary output quality of affordable, safe and photorealistic colour professional 3D printers, like the Mcor IRIS, we can expect to see expanded use of the 3D scan-to-print process for creating businesses around 3D photos and ‘selfies,’ personalised statues and ornaments, customised wearables, interior design, real estate staging, and a host of other applications, such as school projects and homework.

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**About Mcor Technologies Ltd**

Mcor Technologies Ltd is an innovative manufacturer of the world’s most affordable, full-colour and eco-friendly 3D printers. They are the only 3D printers to use ordinary business A4 and letter paper as the build material, a choice that renders durable, stable and tactile models. Established in 2004 with a talented team of specialists in the area of 3D printing hardware and software, Mcor’s vision is to make 3D printing more accessible to everyone. The company operates internationally from offices in Ireland, the UK, America and APAC. [www.mcortechnologies.com](http://www.mcortechnologies.com).