

Desktop 3D Printing: Adding value for **retailers**



Leapfrog
3D Printers



lpfrq.com

Insights from this report

While 3D printing currently attracts much attention from the media, not all groups 3D printing can add value for are aware of the benefits. This report evaluates the current state of the adoption of desktop 3D printing by retailers based on feedback by partners and clients of Leapfrog 3D Printers. It also analyzes the potential added value for retailers by looking at their value chain.

Desktop 3D printers are those relatively small, affordable and easy to use 3D printers that utilize cheap materials such as plastic, which are currently acting as a catalyst behind the rapid adoption of 3D printing. These printers are not to be mistaken for hobby machines, they are used in highly professional settings. For the first time, businesses and schools can now afford to integrate 3D printers in processes all throughout their value chain. For this report, focused on the retail sector, we asked product and interior designers, retailers and retail experts:

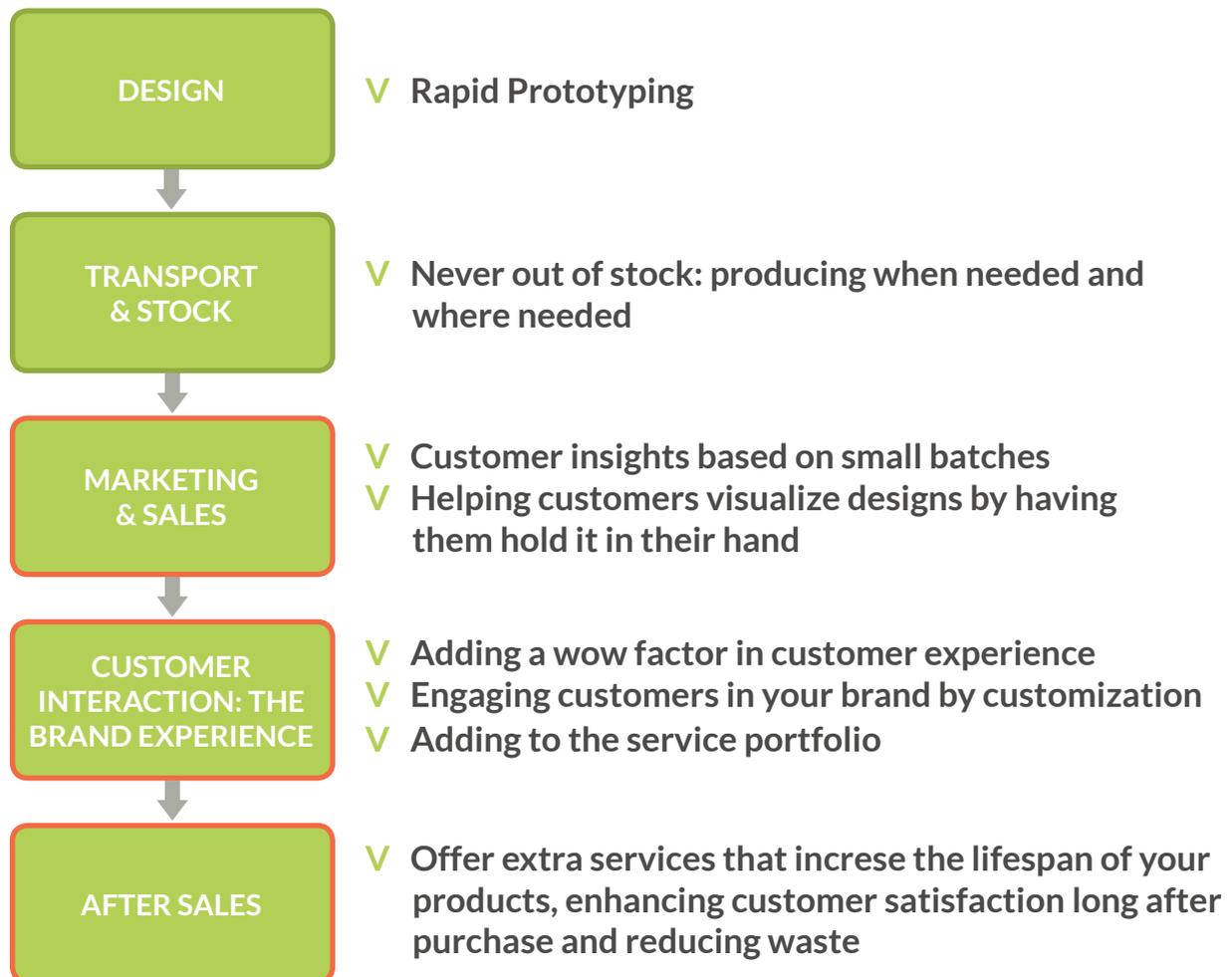
- how retailers use desktop 3D printing now
- how they could use it to add value
- what is currently keeping them from using it on a large scale

Main insights

- Currently not much activity among retailers. Retailers have not widely adopted 3D printing yet. Besides selling 3D printers, there are not many known cases of established retailers using 3D printing in their business processes or to delight their customers or offer extra services to them. The main activity we see from the rising number of startups and a few established companies is to open up 3D print service shops, which work much like the traditional copy shops.

- Benefits within the value chain. In fact, looking at the value chain of retailers (page 3), there is a world of opportunity to gain from integrating desktop 3D printing in processes all throughout the business. While 3D printing has gained much attention from the fact that it can cut costs in manufacturing, retailers can strongly benefit from it in customer interaction as well. Since there has not been much 3D printing activity in this industry yet, there is a major advantage for the retailer that dares to move first.

- Main reasons why retailers are not currently integrating desktop 3D printing in their practices. The main reason is unfamiliarity with the phenomenon as well as with the skills needed to produce a 3D design. Most retailers have heard about 3D printing, but how it can really be utilized to add value is in many cases still a mystery. Respondents that have had previous experience in 3D printing, expect that the adoption of the phenomenon by retailers will take a spur in the coming months, especially as desktop 3D printers get faster with a more accurate and detailed result. Much will be gained from the fact that there is increased innovation activity within the material industry that is expected to hit desktop 3D printing soon. The more printing materials available, the more versatile the range of applications.



Mythbusters

Greatest myths heard from retailers:

Reality of desktop 3D printing:

<p>In order to print parts that are actually used in putting together furniture for example, cheaper materials are not suitable: you need metal.</p>	<p>3D printing with metal is possible but expensive and out of reach of desktop 3D printing. There are actually some very common 3D print materials that are highly durable and can stand much pressure, like ABS and nylon, which are perfectly suitable to replace metal parts.</p>
<p>The current state of desktop 3D printing is not suitable for customer interaction.</p>	<p>The fact that the technique is still developing, does not mean it is not ready to add value. Now is the time for retailers to use 3D printing to enlighten customers. The current desktop 3D printers are affordable while offering accuracy, nice finish through different materials. With no activity in this field yet the technique provides a great competitive advantage.</p>
<p>Extensive technical knowledge on the software and controls of 3D printers is required to work with them, as well as much knowledge in CAD design to generate STL files.</p>	<p>The emergence of desktop 3D printing comes with easy to operate plug and play printers. Along with the many different kinds of software available for different levels of knowledge this enables anyone to use a 3D printer. There are also many very simple options to create 3D models available.</p>

About Leapfrog 3D Printers

Leapfrog 3D Printers is a producer of plug and play and affordable 3D printers situated in Alphen aan den Rijn, The Netherlands. We aim to continuously bring the most advanced techniques in 3D printing available and affordable to a broad audience. Our customers are at the heart of our business: we learn from their experiences and help them to uncover the applications of 3D printing suited for their business. We share the knowledge we gain from our experience through publications as well as through our business consulting services in which we analyze the value chain of a business to see where desktop 3D printing can add value for them.

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The current state of desktop 3D printing

Although it has been used by industry and a growing number of hobbyists for decades now, additive manufacturing, better known as 3D printing, has just recently caught the attention of the masses. One reason for this 'hype' is that 3D printing has become highly affordable: both prices of 3D printers as well as the prices of materials that are used by them are falling rapidly. These 'desktop' 3D printers are relatively small and affordable machines which can be used at home or in the office much like a 2D printer. They work with techniques that have been simplified and automated in such a way that minimal technical knowledge is required to operate them. These printers are not to be mistaken for hobby machines, they are used in highly professional settings. With the emergence of these affordable and easy to use 3D printers, many businesses, schools and even consumers are now able to experiment with the use of 3D printing. This is why desktop 3D printers have been adopted widely in the last few years: from about 20.000 printers under \$5000 sold in 2011 to twice as much in 2012 and an estimated 65.000 in 2013¹.

While much hyped, the benefits of desktop 3D printing for different sorts of users are not widely understood yet. A reason for this lack of understanding is the type of news the media focuses on, which are generally the most spectacular and extreme applications, ranging from 3D printed livers to the infamous printed gun. Most of these applications are futuristic and so high end that they are not available and will not be to most businesses or consumers. Leapfrog 3D Printers aims to demystify 3D printing and show the added value that businesses and schools can obtain using desktop 3D printers.

This report focuses on how desktop 3D printing can add value for retailers in both their business processes as well as in their client interaction. Leapfrog 3D Printers views her customers as partners: together we uncover the benefits of 3D printing. This report reflects opinions and examples by a range of our clients and partners in the retail sector: retailers, engineers and product, scenic and interior designers. We used their input to evaluate where desktop 3D printing is right now in terms of adoption by retailers, and which benefits they currently gain from this. We also look at how desktop 3D printing will be likely to add value for retailers throughout the value chain in the near and far future and what will be needed to get just there.

1 Wohlers report 2013

How do retailers currently use desktop 3D printing?

Although many resellers are now increasingly interested in selling 3D printers, there is little activity among established retailers using the technique to optimize their business processes or to wow their customers. The interest to embed 3D printing is mainly coming from startups specialized in 3D printing services and established print and copy shops extending their services by adding a 3D print service. We also see some initiatives where retailers scan and print customers on the spot. The larger players in the retail market seem to be hesitant to jump on the bandwagon. Why are retailers not all over this new technique? Many of our respondents claim that the reason for this is quite simple: the technique is simply not well known nor understood among this group yet, they either have not seen a 3D printer in action yet or the direct benefits for them are not clear.

British and American retailers seem to be one step ahead of the competition. They are planning to use 3D printing in their stores in the near future. For example: McDonald's is planning to place 3D printers in their restaurants. This way they can print the toys that come with a Happy Meal on the spot, so they do not need to keep them on stock and it allows them to offer a bigger variety of toys to choose from¹. The British retailer Tesco is looking to adopt 3D printing to help their customers repair non-food products².

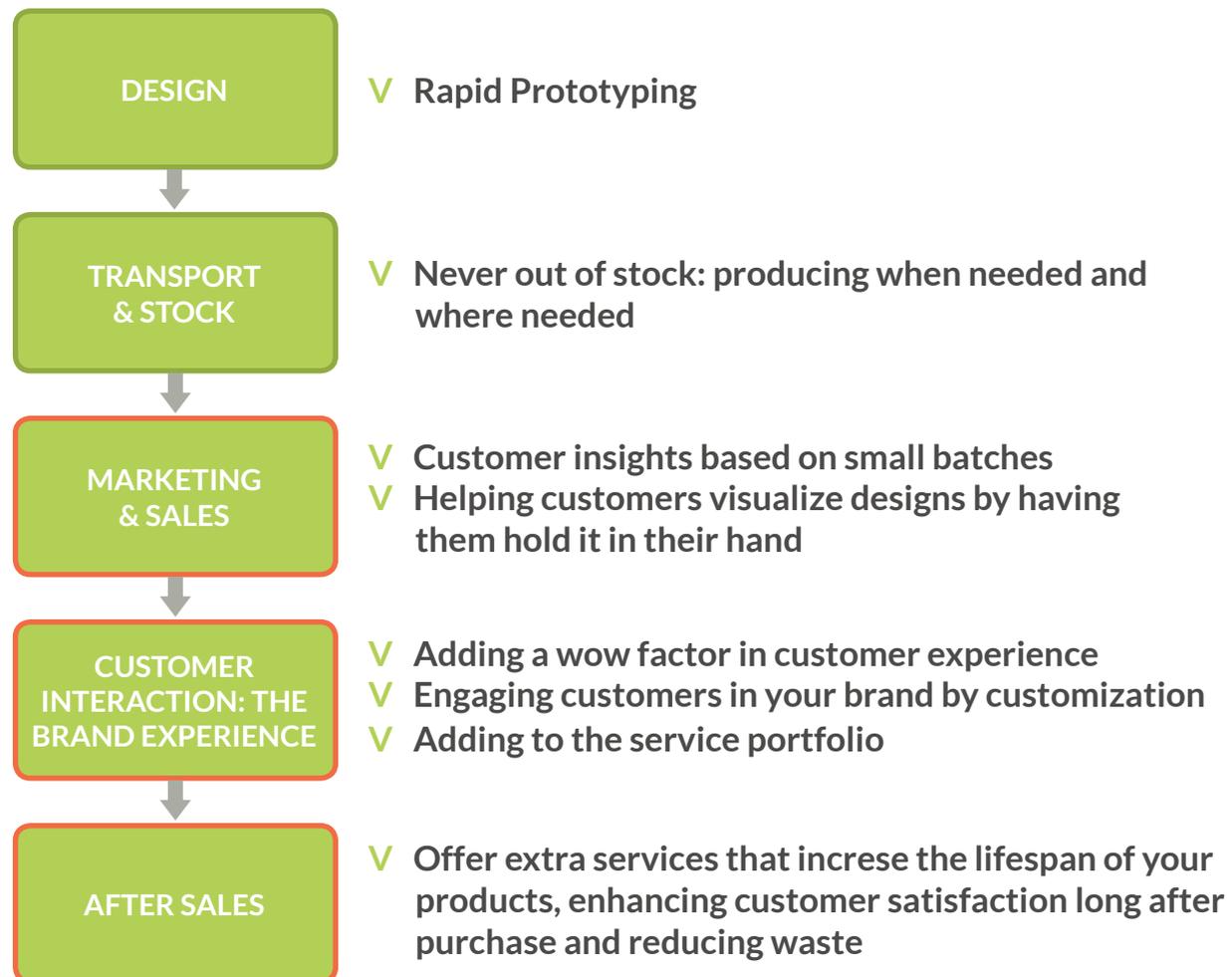


Fig. 1 Demonstration of 3D printing at Q&A retail event

1 <http://www.businessinsider.com/mcdonalds-wants-3d-printers-2013-11>
2 <https://www.tescopl.com/talkingshop/index.asp?blogid=124>

The benefits of desktop 3D printing for retailers

Based on the feedback we received from clients, partners and other respondents, we analyzed how desktop 3D printing can be used throughout the retailer value chain.



Adding efficiency to the design process

3D printing is typically very suitable for rapid prototyping. In designing new products, being able to 3D print your design to make sure it works in practice, can save considerable amounts of money since no outsourcing is needed. In addition, the feedback loop within the design iteration process, during which you design a new product or part, have it prototyped, tested and then approved or altered to your liking, is considerably shortened. Rapid prototyping can thus be utilized to save money and time for retailers that sell their own designed products. It also makes it much easier to give decision makers within a company or even test panels a range of options to choose from when deciding on a new product.

Never out of stock

Another place where 3D printing can add value is within the logistics department. Major retailers move around huge amounts of products and parts between production facilities and sales outlets. The main benefit of 3D printing is that production can take place at the exact same time and location as the sales part, so the need for transportation and stocking up is greatly reduced. When using a 3D printer, products will never be out of stock. As long as there is material to print with and the digital file of the product is available, it can be printed infinitely. Although 3D printing is not an alternative for mass producing, making the produce-where-and-when-you-need-it benefit not a real option for generic products, it is a great option for other purposes. These are testing the market with small batches or providing spare parts for sold products.

Marketing and sales

Respondents said they often find it a challenge to find out just what customers' needs are. 3D printing can help retailers gather market data: 3D printing allows them to produce a small batch of a product and test these products in different shapes in different regions. For example, a retailer selling drinking cups might produce one tall blue version locally in a store in France, while testing a small batch of wider pink versions in the UK. The result is instant market data on (local) consumer preferences.

3D printing is also a great way of visualizing ideas and designs and showing customers how something will work in real life, whether it is a home interior or a furniture design. The ability to show a design is a valuable communication tool for selling and engaging customers in a design. A few respondents we spoke to plan to use the visualization benefits of desktop 3D printing to wow their customers showing how their kitchen, stage or interior will look like in real life and have them move things around by themselves.

Guido Petzold designing the backdrop of the theatre production on Frida Kahlo staged in Switzerland this winter. In Guido's case small scale models are used to show the placement of the decor on a map of the theater and larger models for the workshop to judge the feasibility of the design.

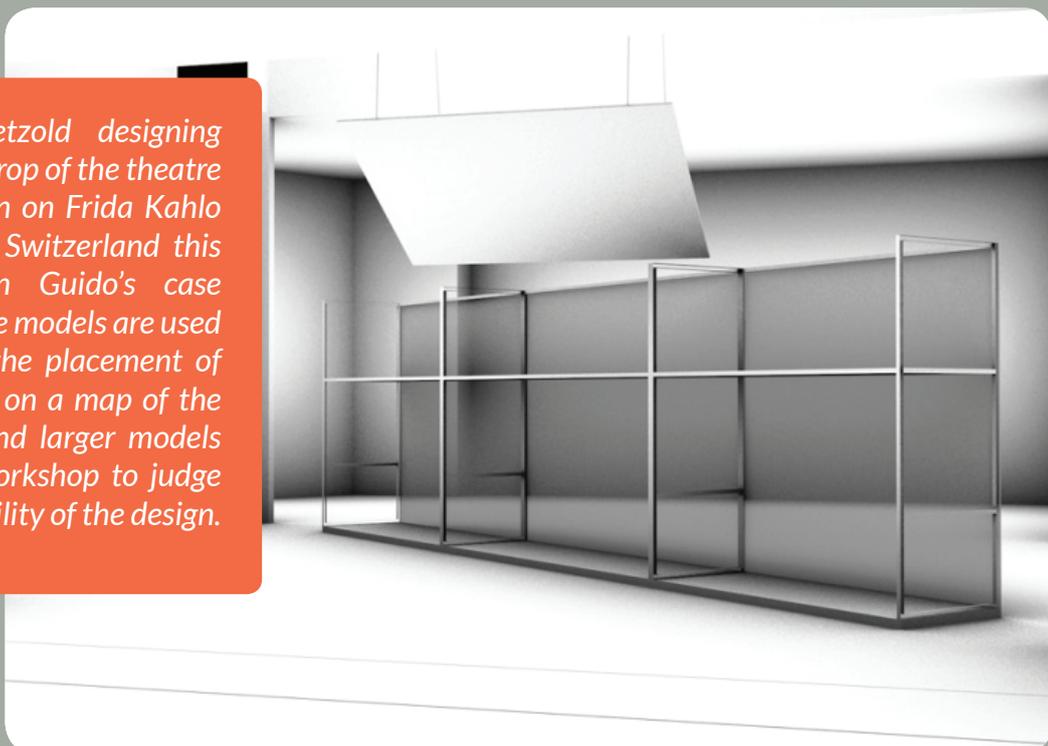


Fig. 2 3D render of scenery by Guido Petzold

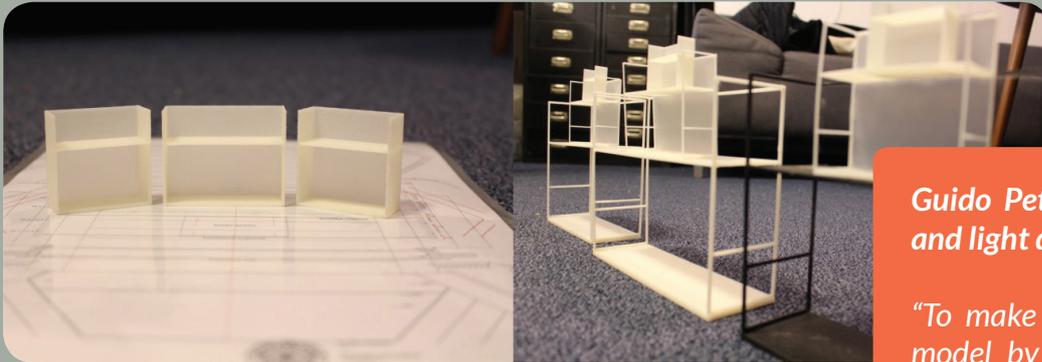


Fig. 3 Left: small scale models placed on a map of the theater. Right: Models of various scales stacked on top of each other. Petzold

Guido Petzold, scenic and light designer:

“To make a showcase model by hand takes too much time and is very old fashioned, I wanted something modern and quick. All my work is done in 3D on the computer so it is very easy to 3D print the models.”

Customer interaction: the brand experience

Due to major improvements in the technique, materials and software, the accuracy and quality of desktop 3D printing now allows the shift from just prototyping to prototyping and the fabrication of medium sized end-products. Currently there is a huge and untapped market of businesses and consumers out there that want to find out if 3D printing is for them, but are not willing to make the investment in a technique they hardly know the capabilities of. By offering a 3D printing service, retailers can make the technique accessible to anyone. Especially now while 3D printing is still a ‘hype’, many people will be attracted by such services. Having a 3D print service will draw attention and promotes engagement of customers in brick ‘n mortar stores. The more people are exposed to 3D printing services, the more the general adoption of 3D printing will be stimulated.

Frank Quix, Director of Q&A Research and Consultancy:

“The way I see it, any store that is currently offering a 2D printing service could eventually offer 3D printing services to add more value for the customer.”

The 3D print service can be taken one step further. There is a customization trend going on as people want to distinguish themselves. They want to put their own identity on products and the brand that allows them to do this will win their hearts. For example, a major Dutch retailer is now contemplating to have customers design their own buttons for clothing. By offering these customization options, retailers are able to let their audience engage with their brand. Customers can do this at the store, or even at home, on the retailer’s website, making the expo-

sure to and the engagement with the retailer brand even longer and more worthwhile. Even when we look at large products like furniture, when the customer can have the small parts fully customized, the details of the furniture are unique. And in the end, these details will define the character of a product.

Again, the customization option serves as a way of gaining instant market insight. When customers are offered freedom to design or adjust products it will be easy to find out what the popular shapes, colors and product types of the audience are. And when designing a new product line it will be easy to try a few products and see how well they do before deciding on the final collection. So 3D printing makes for an easy way to use crowdsourcing for your design process.

Lucas Janssen, co-founder and engineer at Leapfrog 3D Printers:

“At the moment desktop 3D printing is ready to shift from just prototyping of new designs to also fabricating small to medium sized end-products”

After sales

Last but not least is the ability for retailers to offer extra service to the customer, which will increase the life span of your products. Offering a spare part service for designs and products the retailer owns the rights to will make your products last longer and will enhance customer satisfaction. It also increases the loyalty of your customers to your brand by increasing the points and times of contact a retailer has with their customer. A retailer like IKEA could benefit greatly from offering this service as they have many small parts in their assortment. Imagine you have lost one of IKEA’s specialty parts to your bed when moving. Instead of throwing out the bed, IKEA could easily provide you with a 3D file of the spare part, to be printed at home or at the IKEA store. In fact, the IKEAshop on Shapeways, an initiative not connected to IKEA, already offers 3D printed spare parts for some IKEA products.

The use of 3D printing allows any spare part to be readily available: As long as there is material to print with, spare parts can be printed as needed. This will again not only greatly decrease the costs of keeping stock, but can also be seen as a greener production method reducing waste and transportation emissions.

One drawback retailers offered when discussing the possibility of offering the spare part catalogue, is that most spare parts are made out of some sort of metal, while most affordable 3D printers use plastic filament at the moment. Is 3D printing capable of offering a solution when spare parts are originally made of metal? In many cases the answer will be yes. When replacing parts that are originally made out of metal, materials like ABS or nylon can be used. By using a higher infill setting when printing (setting which determines the density of the object) the part will be stronger, this way it will be suitable to endure quite some force and can be used as a replacement of metal parts in many situations.

Just imagine stepping on the floor of your favorite department store, the first thing you notice is a row of machines with different lights busy creating something. Mesmerized, you walk up to them and see one of them creating a beautiful iPhone case, the other one is making a bracelet. Next to the printers is a friendly lady telling you that you can create your own design as well: You customize the drawing of a well designed vase and continue shopping. At the end of your shopping day you go home with your own created vase.



Fig. 4 IKEA furniture often includes various small metal parts.

Big retailers offering products of which they own the design rights will have the biggest advantage when using desktop 3D printers to provide spare parts.

The current quality of 3D prints is also great for the production of spare parts because the looks do not really matter for this type of product and the strength and durability is already there.

What do retailers need to uncover even more benefits from 3D printing?

Our research showed that there is a lot of potential for desktop 3D printing to add value for retailers, but, judging by the lack of activity in this industry, the message has not yet come across for many of them. The biggest draw back for adoption is the lack of awareness and the need for more knowledge about 3D printing. What will help retailers to uncover even more benefits from 3D printing besides the ones mentioned in the value chain analysis?

3D printing speed

Printing speed will be an important property retailers will look at when entering the field. Printing speed has already improved a lot over the past years. Evidence that the speed of current desktop printers is workable is found in the emergence of 3D print services. 3D printing does take some time, just like photo services needed time to develop photos before everything went digital. Printing speeds will definitely continue to increase in the near future, which will be an advantage. But even at the current speed offered, retailers will be able to produce products and spare parts on the spot which will be a huge advantage.

Qualities and finishing of 3D printed objects

New 3D printing techniques will become affordable and they will bring about different benefits and limitations. There are many kinds of 3D printing techniques currently in development, some excel in strength and durability, others are particularly detailed and can print with many different colors at the same time while giving in on strength. It will be exciting to see which new techniques



Fig. 5 Example of 3D printed scale model of furniture

will be added to the repertoire of desktop 3D printing. With these developments, not only the possibilities for end-products will be greater, but the prototyping will also be more realistic and will have a closer resemblance of the actual product. It will be possible to get the same flexibility, durability, surface texture and color all in the prototype. This means that the prototyping phase will be even shorter and the number of steps needed before the final prototype will be less. However, the current state of desktop 3D printing already offers a high level of detail and respondents who have a great

deal of experience in 3D printing expect that the adoption of 3D printing by retailers will take a spur in the coming months because the technique is now ready to be implemented company wide.

Different materials available for 3D printing

One thing which is for certain is that many more materials will become available to print with and this will have a huge impact on the appearance and qualities of 3D printed objects. These materials will be available on the current machines, so retailers that step into 3D printing now, will be high on the 3D printing learning curve when more and more materials come out. The emergence of new materials which we currently witness, is particularly interesting for designers and retailers since they will provide more opportunities to create unique and versatile items. One material our respondents are exciting about is graphene.

Ways to produce digital 3D models

To be able to 3D print a prototype or product a digital 3D model is needed. Although a minority of product designers has already worked with 3D printing for some time, many other in the retailing business have no prior experience with 3D modeling and therefore need to either learn to understand and use CAD (Computer-Aided Design) software or find a different way of creating 3D models. Luckily, many good alternatives to hard to use CAD software programs are already available, for example simpler versions like Google sketchup. In addition, prices of high resolution scanners that provide input for 3D printers are expected to fall tremendously in the coming months, as their quality will increase. The internet also offers a whole range of (free) 3D file libraries users can print or alter to their liking. These developments will help to make 3D printing more accessible to people who do not have the skills to fully design their own 3D models from scratch.

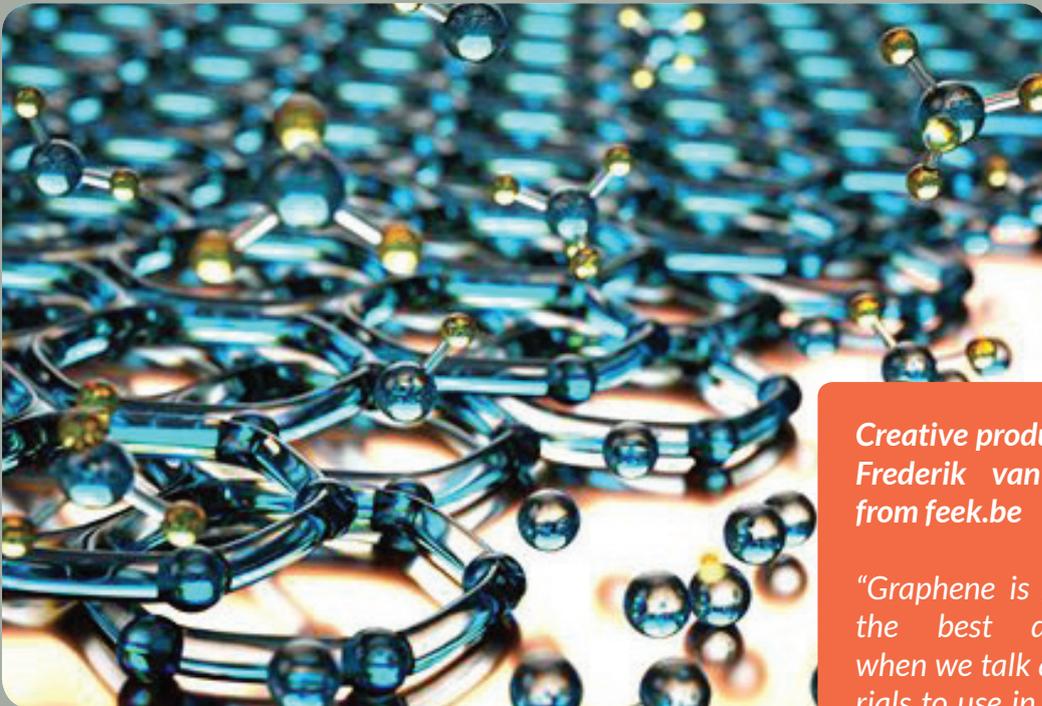


Fig. 6 Graphene is an one-atom thick honeycomb lattice

*Creative product designer
Frederik van Heereveld
from feek.be*

“Graphene is going to be the best development when we talk about materials to use in 3d printing; it is feather light and flexible yet very strong and durable, making it the ideal material for a wide array of applications.”

