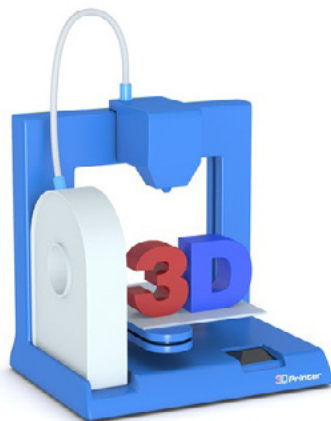




STATE OF THE MARKET: COMMERCIAL 3D PRINTING IN THE MIDDLE EAST

“In theory, anything that we have today can be produced through 3D printing. It may just alter manufacturing as we know it.”

Simon Jones, technology expert at global law firm DLA Piper



In an increasingly interconnected global economy, the ordering, manufacturing and transportation of every imaginable product is becoming more widespread and diverse. However, for businesses all over the world there still remain significant logistical difficulties in securing specific parts and products in a timely and cost-effective manner.

However, a bold and ambitious emerging technology could soon be the answer to this problem. In the last 5 years, 3D printing has rapidly developed from an interesting concept into a viable means of creating an incredibly wide range of products. Now, with the technology's principles and potential impact well-established, businesses from practically every industry are looking at it with renewed interest and a keen focus on solving existing procurement and logistical difficulties.

3D printers are capable of creating solid 3D objects from a digital model designed through a computer aided design (CAD) or through the use of a 3D scanner. Once the model is finalised, the printer essentially creates distinct 'layers' of material before binding them together to create a seamless 3D product.

Understandably, the applications of this technology are extremely wide-ranging due to its versatile design elements and ability to form almost any conceivable shape through bonded material layers. From creating spare parts for military vehicles in operational theatres, to intricate artificial limbs used in leading European medical institutions, 3D printing can be used to fulfil the needs of almost any industry.

3D Printing's Growing Impact on the Middle East

“There are still limits imposed by the technology available today but I'm certain that within 10 or 20 years, we'll have a kind of revolution in terms of the technology being available to everyone.” – Olivier Olmo, operational director of Switzerland's EPFL research institution

The concept of 3D printing is older than most consumers might imagine, as it has its roots in expanding the scope of standard 2D printing to encompass specific designs, in areas like machine tooling, that would be created quickly and inexpensively. The first commercial 3D print technology, known as stereo-lithography, was invented in 1994 and since then its increasing versatility has impressed all manner of companies, universities and even private citizens with its potential to render solid objects from even the most experimental prototypes, all without the expense of traditional manufacturing techniques.¹

However, while 3D printing technology is commercial available to both businesses and individuals (personal 3D printers range from approximately \$2000 to \$10,000) in its current form it is more suited to satisfying the need for custom products rather than mass-production.²

However, the technology's impact is still being felt in terms of satisfying

¹ Arab news, 3D printing could herald new industrial revolution, 29/04/2013

custom product needs in a global supply chain. As print times decrease, outputs increase and unit costs decline, 3D production means that Middle Eastern companies can look forward to enjoying shorter lead times as well as lower development and transportation costs.³

While the following examples will demonstrate specific benefits of utilising 3D printing as experienced by the companies investing in the technology, there a number of general benefits that it could grant any applicable businesses operating in the Middle East:

- **Reduced development costs:** Companies looking to create new prototypes usually incur significant development costs through the trialling of new designs. 3D printing allows for new design concepts to be tested quickly and effectively, leading to better products and fewer expensive dead-ends.
- **Mitigate risks:** Instead of investing in an expensive moulding tool for a product that may or may not live up to expectations, 3D printing allows for a much cheaper test prototype that can be redesigned or altered. This approach saves companies from making risky outlays on manufacturing equipment that may not suit the final design, leaving them freer to experiment at the prototype phase.

- **Expedited product launch times:** Designing, refining and manufacturing with 3D printing technology is becoming faster with each passing model. Now products can be 3D printed on the same day that they were designed, massively reducing development times from months or years to a matter of days.
- **Clear communication of concept:** New product designs often have to be solidly convincing at the conceptual stage before they can be turned into the real thing. Prospective investors/buyers/ audiences often need to rely on their imagination, augmented by supportive concept art, schematics or marketing material. With 3D printing, companies can deliver an extremely close representation of their proposed product right from the beginning, fuelling the imagination of their audience and leaving little to no room for misinterpretation.

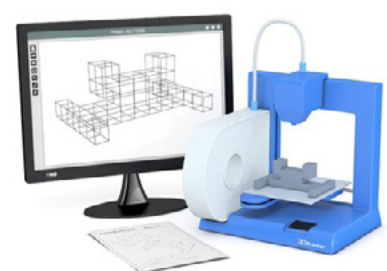
Examples of businesses using 3D printing in the Middle East

3D Printed map of the City of Dubai

²Business.com, *What Are the Technology Trends That Will Change the Business Landscape in 2016?*, 04/12/2015

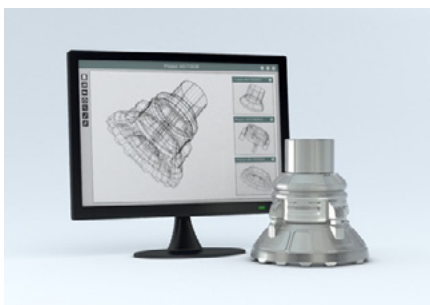
³JLL, *Is 3D printing manufacturing's new tomorrow?* 13/05/2015

“We are immensely proud of the eventual outcome and thankfully, so is the client,” said Generation 3D’s co-founder, Dominic Wright. “Typically, a client would want a model done in 6 to 12 months to prepare for events or projects. With 3D printing we can do it in a month and it is much easier for us to incorporate any last-minute changes that are required.”



“We created a computer-aided design model of Dubai using Google Maps as our reference in just under three weeks. Unlike the more traditional model-making you’ll see and which is often handmade, this is much faster. That is great for developers, architects, engineers and the wider construction industry.”

Max Reynard, Generation 3D’s co-founder and technical director



“We created a computer-aided design model of Dubai using Google Maps as our reference in just under three weeks. Unlike the more traditional model-making you’ll see and which is often handmade, this is much faster. That is great for developers, architects, engineers and the wider construction industry.” – Max Reynard, Generation 3D’s co-founder and technical director

3D Generation, a Dubai-based company has managed to create an almost exact replica of the entire city of Dubai, reproducing world-famous landmarks such as the Burj Khalifa as well as almost every other building in the city.⁴

“We are immensely proud of the eventual outcome and thankfully, so is the client,” said Generation 3D’s co-founder, Dominic Wright. *“Typically, a client would want a model done in 6 to 12 months to prepare for events or projects. With 3D printing we can do it in a month and it is much easier for us to incorporate any last-minute changes that are required.”*

The use of 3D printing for the quick, efficient and accurate production of models on this scale represents significant progress for the Middle East’s architecture, engineering and construction industries. For major projects, this will significantly reduce preparation times as the key concepts can be accurately delivered with much greater speed, while enhancing the clarity of communication between the project’s designers and developers.

Entire office building produced by 3D printing

“The project marks the beginning of an important transformation in the construction and design sector; the shift to 3D printing and digital fabrication. Although long tested in labs, 3D printing technology is rapidly coming of age. This project will be the most advanced 3D printed structure ever built at this scale and the first to be put into actual use.” – Mohamed Al Gergawi, UAE Minister of Cabinet Affairs

The UAE has partnered with Winsun, a Chinese company that has been pioneering the use of 3D printers to build houses, to build the world’s first 3D printed office building. Made with a combination of reinforced concrete, glass-fibre-reinforced gypsum, and fibre-reinforced plastic, the 2,000 square foot office building’s parts will be printed in thin layers by a 20-foot-tall industrial printer and then assembled on-site. The entire structure, including the furniture, will be printed, making it one of the most intricate and advanced 3D printed buildings to date.⁵

The complete 3D printing of entire buildings is an extremely exciting prospect for the Middle Eastern construction industry. Firstly, the methodology represents the potential to deliver construction projects much faster – Winsun claims that it will take only a matter of weeks to print the completed building, between 50-70% quicker than traditional construction methods.⁶

⁴The National, Dubai comes alive with massive 3-D printed map of city, 26/10/2015

⁵Architectural Digest, The World’s First 3-D-Printed Office Building Will Open in Dubai, 30/06/2015

There's also reduced labour costs to consider (50-80% less, according to Winsun). If these savings rates are accurate, it could spell much higher productivity, better returns and increased sustainability for the industry. For ME countries like Oman whose construction sector continually suffers from labour shortages, the introduction of 3D printable construction projects could offer an extremely elegant solution.⁷

"This building will be a testimony to the efficiency and creativity of 3D printing technology, which we believe will play a major role in reshaping construction and design sectors. We aim to take advantage of this growth by becoming a global hub for innovation and 3D printing. This is the first step of many more to come." – Mohamed Al Gergawi, UAE Minister of Cabinet Affairs

World's fastest 3D-printed Drone

"This is the final piece in the puzzle for aerospace and we're here to show manufacturers what can be done when you take this technology and build your design around it... Companies are already using 3D printing technology, making huge savings and producing aircraft that are faster than ever before for customers like the Middle East carriers. 3D printing is helping them to meet deadlines, bring schedules forward and the technology has now gone from a piece of kit you'd have on the manufacturing floor to a technology you can actually build your manufacturing around." – Jay Shelby, Vertical Solutions Applications

Engineer for Stratasys

The Dubai Airshow represents the cutting edge of the aerospace industry. 2015 saw the world's fastest, largest and most complex 3D printed drone unveiled by the show's sponsor Stratasys in combination with the aviation company Aurora Flight Sciences, as the centrepiece of its exhibition on the future of 3D printing. The lightweight aircraft, which took just two months to create and can break speeds of 150 miles per hour, was used to highlight the flexibility of the technology to aircraft and technology manufacturers.⁸

By making use of several different printing techniques —filament extrusion, laser sintering, and laser melting tech— Aurora was able to deliver on its intent of creating a revolutionary jet-powered drone:

"This is a perfect demonstration of the unique capabilities that additive manufacturing can bring to aerospace," says Stratasys Senior Business Development Manager Scott Sevcik. "This meant using different 3D printing materials and technologies together on one aircraft to maximize the benefits of additive manufacturing and 3D print both lightweight and capable structural components."

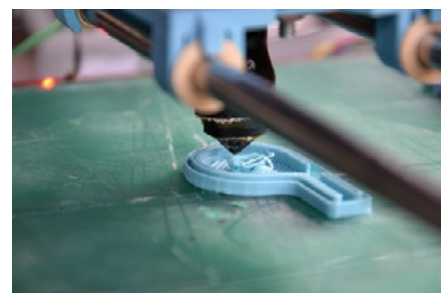
⁶ Reuters, Dubai says plans world's first 3D printed office building, 30/06/2015

⁷ Zawya, Getting priorities right: Oman's construction industry is going through a steep learning curve with new challenges, 17/08/2015

⁸ Digital Trends, The world's largest 3D-printed drone is also its fastest, clocking in at 150 MPH, 09/11/2015

"This is the final piece in the puzzle for aerospace and we're here to show manufacturers what can be done when you take this technology and build your design around it... Companies are already using 3D printing technology, making huge savings and producing aircraft that are faster than ever before for customers like the Middle East carriers. 3D printing is helping them to meet deadlines, bring schedules forward and the technology has now gone from a piece of kit you'd have on the manufacturing floor to a technology you can actually build your manufacturing around."

Jay Shelby, Vertical Solutions Applications Engineer for Stratasys



Printing Products of the Future

The introduction of 3D printing to various ME industries has been gradual because of a number of challenges involved in adopting the technology, mostly revolving around achieving the required scale of operations while implementing the use of 3D printers.

In the construction industry, for example, the existing infrastructure of materials and labour provision means that a hurried switch over to 3D printing from traditional manufacturing processes would have drawbacks as well as benefits. For instance, current 3D printers are limited in the range of building materials that they can use, some of which may not be suitable for certain construction projects. Additionally, in the long term there are a number of conventional product manufacturing companies that could suffer as their products will no longer be required.

However, even if the adoption of 3D printing in some industries is more gradual than in others, its increasing impact on the business spheres of design and manufacturing cannot be denied. Its wide-ranging, far-reaching applications have already fired the

imaginations of innovative designers, manufacturers and engineers across the Middle East's various business sectors, prompting an ever-growing list of success stories. As the technology becomes more widespread, its implementation costs and challenges decrease while its benefits become easier to understand and appreciate.

Although a manufacturing revolution via 3D printing may be some way off – in the Middle East and globally – the technology is already sparking something of a revolution in bringing new ideas and design concepts to myriad ME industries.



Sources:

<http://www.thenational.ae/uae/technology/dubai-comes-alive-with-massive-3d-printed-map-of-city>

<http://www.architecturaldigest.com/story/worlds-first-3d-printed-office-dubai>

<http://www.treehugger.com/modular-design/3d-printed-office-building-being-built-dubai.html>

<http://www.reuters.com/article/us-emirates-dubai-construction-idUSKCN0PA1M520150630>

https://projects.zawya.com/Opportunities_and_challenges_in_Omans_construction/story/ZAWYA20150817055042/?utm_source=zawya&utm_medium=web&utm_term=term&utm_campaign=story/

<http://ifpinfo.com/Construction-NewsArticle-6689#.VmWmrLgrKM9>

<http://www.business.com/technology/3-new-business-opportunities-in-changing-technology-trends/>

<http://www.constructionweekonline.com/article-34762-all-you-need-to-know-about-3d-printed-construction/>

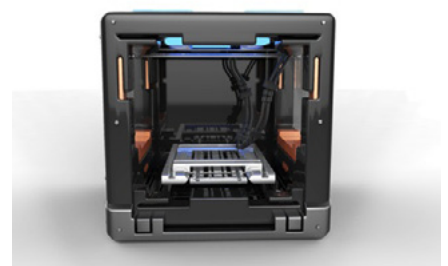
<http://7days.ae/business-news-901/22222>

<http://3dprintingindustry.com/2015/10/30/uae-revives-historical-sites-with-3d-imaging-technology/>

<http://www.thenational.ae/video-3d-printing-technology-for-medical-use>

<http://www.thenational.ae/blogs/plugged-in/3d-printing-furniture-food-human-organs-and-prosthetic-limbs>

<http://www.thenational.ae/business/technology/gartner-warns-breakthrough-technologies-like-3d-printing-and-wearables-could-be-some-way-off>



3D PRINTING MIDDLE EAST

To find out more about the latest in the Middle East's commercial 3D printing sector, don't miss the **3D Printing Middle East Summit (27-28 March 2016, Dubai, UAE)** developed with input from innovative professionals in leading organizations including Tata Technologies, Wipro, Airbus, Prototype Asia and many more.

Visit www.3dprintingsummitmiddleeast.com for more information.



Copyright © 2015 IQPC Middle East. All rights reserved.

This document may not be copied, published, or distributed, in whole or in part, or modified in any way, including by removing the copyright notice or references to IQPC Middle East, without the written permission of the copyright owners. This document and the information contained herein is provided on an "AS IS" basis and IQPC Middle East disclaims all warranties, expressed or implied, including but not limited to any warranty that the use of the information herein will not infringe any ownership rights or any implied warranties of merchantability or fitness for a particular purpose.

Publisher contact details: Rinoy Varghese | IQPC Middle East | enquiry@iqpc.ae