

FLASHES

A MONTHLY MAGAZINE ON KNOWLEDGE AND DEVELOPMENT BY THE
MOHAMMED BIN RASHID AL MAKTOUM KNOWLEDGE FOUNDATION

APRIL 2018
ISSUE 40

#YearOfZayed

EMPOWERING WOMEN

The UAE strives for gender equality



BRIGHT MINDS

FUTURE-SHAPING IDEAS FROM
THE ARAB INNOVATION FORUM

YOUR GOOD HEALTH

COULD AI PREDICT AND
PREVENT ILLNESS?

SAND SHORTAGE

THE WORLD'S INSATIABLE
APPETITE FOR SAND



A RELIABLE INSURANCE THE BASE FOR A MORE ENJOYABLE LIFE



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FOREWORD

Dear readers,

The role of women in UAE society is absolutely central. That was the unwavering belief of the late Sheikh Zayed bin Sultan Al Nahyan, founding father of the UAE, and it's a message that rings out crystal clear today.

As we strive towards gender equality in the UAE, highly talented women are making an impact on the country's political, economic, social and cultural development.

Women also play a key part in innovation, and ideas once inconceivable are changing the world we live in. Right now we're standing at the gateway to an exciting future. The fusion of human imagination and ingenuity with technological advances will soon impact every aspect of our lives – from detecting and preventing illness to the way pizza is delivered to our door.

Insights into tomorrow's world – and how close we are to it – were delivered by a stellar line-up of global, regional and local speakers at the inaugural Arab Innovation Forum, launched by the Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) at Dubai World Trade Centre, as part of the UAE's Innovation Month.

Distinguished international guests and speakers, many of them leaders in their fields, were suitably impressed with the steps the UAE has taken to engineer a society and country powered by innovation and future applications. This

commitment is in line with the National Innovation Strategy, launched in 2014 by His Highness Sheikh Mohammad Bin Rashid Al Maktoum, and the UAE Vision 2021.

Speaking at the forum during a session on innovation in transportation, leading futurist Faith Popcorn, founder and CEO of BrainReserve, described the emirate as having "already created the future in the present".

Attracting 4,000 visitors and over 50 keynote speakers, the Arab Innovation Forum also allowed the brilliant and ambitious minds behind 100 startup companies to showcase their talent and technology. Among them may have been the greatest inventors of tomorrow. I hope you enjoy this issue's extensive coverage on the forum as much as I enjoyed the event itself.

It's also my great pleasure to announce that MBRF's 'Knowledge Week' will touch down in eight countries around the world (see page 9) as we seek to share the results of our knowledge-focused projects. As the famous physicist William Pollard once said: "Learning and innovation go hand in hand. The arrogance of success is to think that what you did yesterday will be sufficient for tomorrow."

Jamal Bin Huwareb

CEO of Mohammed bin Rashid
Al Maktoum Knowledge Foundation



Celebrating International Women's Day

UAE Vice President, Prime Minister and Ruler of Dubai, His Highness Sheikh Mohammed bin Rashid Al Maktoum, has revealed that 70 per cent of his "team" are women. His Highness made the revelation via his Twitter account, as he congratulated women on the occasion of International Women's Day.

Sheikh Mohammed highlighted the importance of celebrating "the nurturers of our future generations, partners in development, and the force of change in societies".

"Seventy per cent of my team are woman," he added. "I thank them on this day and every day for their efforts. Without them we would not be where we are today. With you, the UAE grows in strength and greatness."✍

"I thank them on this day and every day for their efforts. Without them we would not be where we are today. With you, the UAE grows in strength and greatness."

School Libraries to Receive 1 Million Books



Vice President and Prime Minister of the UAE, and Ruler of Dubai, His Highness Sheikh Mohammed bin Rashid Al Maktoum has announced a new initiative to supply school libraries with one million books – to help prepare a generation to make development leaps and ensure the leadership of the UAE.

The initiative, launched on 1 March, coincided with the UAE's Month of Reading. His Highness said the aim of the Month of Reading was to "instill this civilized habit in our society and generations". Sheikh Mohammed added that the initiative also aimed to establish reading as a new habit in the country.

National targets for reading until 2026 include raising reading rates to 80% among students and 50% among adults, and raising the national output of content from 400 books per year to 4,000 books in 2026.

Speaking at the launch, His Highness also said that we couldn't create a tolerant society and stable families without culture or reading or knowledge.

The UAE's Reading Month was launched as part of the UAE Reading Strategy.✍

UAE Ranked First Globally in 50 Development Indices

According to the Global Competitiveness Report 2017 – 2018, the UAE has ranked first in 50 indices related to many vital community, services and development sectors.

The Vice President, Prime Minister and Ruler of Dubai, His Highness Sheikh Mohammed bin Rashid Al Maktoum, announced: “The UAE is in first place in the quality of government decisions, the government’s ability to adapt to change, the effectiveness of government spending, and the partnerships between the public and private sectors, as well as in administrative practices, the digital transformation of companies and adopting technology.

“The UAE also leads globally in terms of tolerance towards foreigners in three international reports, as well as in the lowest number of labour disputes, property rights between genders, the lowest number of violent crimes, information security, road quality and infrastructure,” he added.

“Our goal is to lead globally in all areas, and our development is advancing daily, while competition will only increase our excellence,” Sheikh Mohammed stressed. ↑



Founder of the Nation Memorial Unveiled

A permanent national memorial to the country’s founder Sheikh Zayed bin Sultan Al Nahyan has been unveiled at Abu Dhabi Corniche, under the patronage of President His Highness Sheikh Khalifa bin Zayed Al Nahyan.

UAE Vice President, Prime Minister and Ruler of Dubai, His Highness Sheikh Mohammed bin Rashid Al Maktoum; Crown Prince of Abu Dhabi and Deputy Supreme Commander of UAE Armed Forces, His Highness Sheikh Mohamed bin Zayed Al Nahyan; Supreme Council Member and Ruler of Fujairah, His Highness Sheikh Hamad Bin Mohammed Al Sharqi; Supreme Council Member and Ruler of Umm Al Quwain, His Highness Sheikh Saud bin Rashid Al Mu’alla; and Supreme Council Member and Ruler of Ras Al Khaimah, His Highness Sheikh Saud bin Saqr Al Qasimi, attended the inauguration ceremony, along with other Sheikhs, senior officials and dignitaries.

UAE Vice President and Prime Minister and Dubai Ruler, Sheikh Mohammed bin Rashid Al Maktoum said: “Zayed’s legacy will remain a never-ending source of wisdom from which future generations draw inspiration, as well as lessons of patriotism and dedication.”

“The Founder’s Memorial will continue to testify to the achievements of the founding leader and the sacrifices he made. His legacy is filled with stories of loyalty to the homeland, and it places a responsibility on us and on future generations to safeguard the gains and build on the success stories so that our homeland remains a symbol of dignity and development.”

The Founder’s Memorial includes a monumental artwork at its centre called ‘The Constellation’, which depicts a three-dimensional portrait of Sheikh Zayed. Public artist Ralph Helmick designed the stunning artwork.

The UAE’s royal families, ministers, dignitaries and VIPs witnessed the 30-minute unveiling, which was also broadcast on television.

The 3.3-hectare site on Abu Dhabi’s Corniche will officially open to the public in the spring of 2018. ↑

Nobel Exhibition is Social Media Sensation



Mohammed Bin Rashid Al Maktoum Knowledge Foundation concluded its recent Nobel Exhibition with unprecedented social media interaction. The Nobel Exhibition's official social media channels witnessed remarkable interaction – with the number of views and interactions reaching a whopping half a billion.

MBRF – member of the Mohammed Bin Rashid Al Maktoum Global Initiatives – staged the fourth edition of the Nobel Exhibition, in collaboration with the Nobel Foundation, in Dubai's City Walk, from 4 February until 3 March.

Gathering world-renowned experts from various disciplines, the Nobel Exhibition attracted 20,000 visitors of various nationalities and generated great interest among local and international media outlets.

Bearing the theme 'Nobel Prize in Chemistry – Connecting Elements', the 2018 exhibition focused on chemistry, highlighting the achievements of Arab and Muslim chemists, who played a key role in establishing the foundations of this science. It also underlined the contributions of chemistry to human life, and the role it plays in addressing key challenges and in the development and advancement of the medical field.

On closing day, the Nobel Exhibition 2018 welcomed His Excellency Dr Thani Ahmed Al Zeyoudi, Minister of Climate Change and the Environment, who applauded the Foundation for its efforts to promote knowledge among students and visitors.

MBRF's CEO His Excellency Jamal bin Huwairib said: "The Nobel Exhibition has established itself as a leading knowledge and inspiration platform for talented youth and

Gathering world-renowned experts from various disciplines, the Nobel Exhibition attracted 20,000 visitors of various nationalities and generated great interest among local and international media outlets.

aspiring scientists across the Arab region, helping them perfect their creative ideas, all the while promoting innovation, research and discovery – especially among students."

The Nobel Exhibition allowed students to take part in several expert-led, chemistry-focused workshops organised by the Foundation. At the event's conclusion, the Foundation honoured the event's public- and private-sector sponsors for their contributions to the exhibition's success. These included Qindeel Educational; Abu Dhabi National Insurance Company (ADNIC); Al Nabooda Automobiles; Aramex; Dubai Media Incorporated (DMI); Sky News Arabia; Al Arabiya; CNBC Arabia; CNN Arabic; Al Bayan newspaper; Emarat Al Youm newspaper; Al Dhafra Channel; Entrepreneur Middle East magazine; Al Fujairah TV; Al Watan newspaper; and Arabian Radio Network (ARN).†

Sharing Knowledge Around The World

'Knowledge Week' is expanding – around the globe. The Mohammed Bin Rashid Al Maktoum Knowledge Foundation (MBRF) has announced plans to organise its 'Knowledge Week' event in eight countries around the world to shed light on the initiatives and key takeaways from the Arab Knowledge Project, as well as on the Foundation's projects.

The expansion is part of the Arab Knowledge Project and is organised in collaboration with the United Nations Development Program (UNDP) to benefit universities, academics and research institutes in Egypt, France, Jordan, the UK, Tunisia, Bahrain, Malaysia and the USA. The week's agenda includes workshops and discussion panels to showcase and explore the key takeaways from the Knowledge Summit, and the results of the Global Knowledge Index, among other topics.

MBRF's CEO His Excellency Jamal bin Huwaireb said: "Launching Knowledge Week in countries around the world is a natural extension of the Knowledge Summit, which we organise on an annual basis to act as an integrated platform allowing experts and specialists to present their visions and exchange ideas. The event also seeks to build a constructive knowledge dialogue between the Foundation, prominent academics and university students all around the world, allowing us to share the results of our knowledge-focused projects."

The first leg of the international tour began with Knowledge Week Egypt, which was held at the Zewail City of Science and Technology, Alexandria University (the Division of Trade and Department of Economics), Nile University and Al Ahram Corporation. The event drew in 2,100 participants, including representatives from MBRF and UNDP, as well as professors and students.

Activities included the 'Knowledge Summit Forum', where the Fourth Industrial Revolution, the Literacy in

the Arab World Challenge and the Global Knowledge Index were discussed. The forum brought together prominent experts and speakers, including Former Egyptian Minister of Education Dr Yusri Al Jamal; Former Minister of Higher Education and Scientific Research Professor Motaz Khorshid; and Head of Egypt's National Press Authority Karam Jabr.

Exporting Knowledge Week to countries around the world seeks to promote the use of the Global Knowledge Index as a guide to growth and sustainable development, as well as a tool for change and for political debates. The series of meetings aims to promote effective dialogue, raise awareness and inform stakeholders and the general public about key aspects and expected outcomes from the Index. †





During the centenary year of the UAE's founding father's birth, we reflect on how Sheikh Zayed was an advocate for women's rights and how his legacy has paved the way for the empowerment of women in the country today.

AHEAD OF HIS TIME

"Women are the sisters of men, and there is no difference between them, as they are partners in the nation's advancement and prosperity." Those are the wise words of the late Sheikh Zayed bin Sultan Al Nahyan, who strongly supported and empowered women to take their rightful place in the UAE's economic development and to join men in working to advance the country.

The founding father of the UAE federation, Sheikh Zayed was a strong advocate for women's rights, women's empowerment and gender equality long before such terms became buzzwords. His wise and forward-thinking approach towards women in the workplace and society reverberates just as strongly throughout the UAE today, more than a decade after his passing in 2004.

Just recently – on International Women's Day – UAE Vice President, Prime Minister and Ruler

of Dubai, His Highness Sheikh Mohammed bin Rashid, revealed that 70 per cent of his team are women (see page 6). "Without them we would not be where we are today," he said. In a message directed at women throughout the UAE, Sheikh Mohammed added: "With you, the UAE grows in strength and greatness."

Since its establishment on 2 December, 1971, the country has focused on raising and empowering women to perform their natural role as effective participants in the country's sustainable development. Sheikh Zayed's vision for women's empowerment lives on. Emirati women have benefited through political empowerment programmes, launched by UAE President His Highness Sheikh Khalifa bin Zayed Al Nahyan. In 2015, the UAE's Gender Balance Council was formed to give women equal opportunities in the public sector. Today,



Above: The UAE Cabinet

Emirati women have taken on senior positions in the country, from employee to minister to the Speaker of the Federal National Congress, as well as professional positions, such as judges, doctors, engineers and soldiers.

After a reshuffle in October 2017, nine women currently sit on the UAE Cabinet – three more than previously. Among other key achievements towards gender equality, government statistics state that women handle half of UAE businesses in the small-to-medium enterprise sector; four women have been appointed as judges, two as public prosecutors and 17 as assistant public prosecutors. Women also make up 20 per cent of the UAE's diplomatic corp.

A main cornerstone behind the overall advancement of Emirati women is Her Highness Sheikha Fatima bint Mubarak, Chairwoman of the General Women's Union, President of the Supreme Council for Motherhood and Childhood and Supreme Chairwoman of the Family Development Foundation. The "Mother of the nation" has become a symbol of giving and resolve, and she is now one of the key female leaders in the world, who performs a leading role in empowering women and defending their causes, not only in the UAE but also across the region and around the world.

Sheikha Fatima also recently announced that the theme of this year's Emirati Women's Day, on 28 August, will be 'Women on the Course of Zayed'.

In her speech marking International Women's Day, which was given on her behalf by Reem Abdullah Al Falasi, Secretary-General of the Supreme Council for Motherhood and Childhood, during a seminar at the headquarters of the GWU in Abu Dhabi, Sheikha Fatima said that the goal of Emirati Women's Day is to highlight the accomplishments of women and honour them for their efforts and perseverance in achieving their goals, which will empower them in all professional and technical sectors and enable them to continue their success with confidence.

Sheikha Fatima added that the achievements of Emirati women are due to the efforts of the late Sheikh, to support and empower women – foresight driven forward by today's leadership.

"Emirati women have been supported and assisted by the wise leadership and have attained complete equality with men," stated Sheikha Fatima. "Gender balance has therefore been achieved in the UAE, and women are present in all technical and professional jobs and in all government and private sectors, and they have proved their merit in advancing the country's development."

Speaking on International Women's Day, His Highness Sheikh Khalifa said: "We consider women as a key part of the Emirati community, and they are men's partners in all areas of work. The privileged stature of Emirati women is not a surprise, but it is the crowning of a long journey, which

was established by the founding leader, the late Sheikh Zayed bin Sultan Al Nahyan, who encouraged women and empowered them to practice their rights, alongside men.”

Echoing those sentiments, Sheikh Mohammed added: “We have surpassed the stage of women’s empowerment, as we empower the community

through women, and empower our economy by strengthening their role, and develop our government services when they take on leadership positions. The presence of women in these sectors is the logical result of the education received by our university graduates, 70 percent of whom are female.” ↑



WORDS OF WISDOM

TO QUOTE SHEIKH ZAYED BIN
SULTAN AL NAHYAN:

“The endeavours undertaken by women in the Emirates are important and honourable endeavors that are worthy of esteem”

“I encourage women to work in positions that maintain respect and dignity as mothers and makers of generations”

“The woman is half of the society: any country which pursues development should not leave her in poverty or illiteracy”

“Islam affords women their rightful status and encourages them to work in all sectors”

(Source: Father of Our Nation: Collected Quotes of Sheikh Zayed Bin Sultan Al Nahyan, published by Books Arabia)



COUNTRY PROFILE: SINGAPORE

GDP US\$296.97 BN

POPULATION 5,535,262

HDI 0.925

SECTORIAL INDICES



PRE-UNIVERSITY EDUCATION (PUE)

RANK **1**
VALUE **85.4**



TECHNICAL VOCATIONAL EDUCATION & TRAINING (TVET)

RANK **55**
VALUE **53.6**



HIGHER EDUCATION (HE)

RANK **3**
VALUE **60.8**



RESEARCH, DEVELOPMENT & INNOVATION (RDI)

RANK **13**
VALUE **55.7**



INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT)

RANK **7**
VALUE **78**



ECONOMY

RANK **1**
VALUE **76**

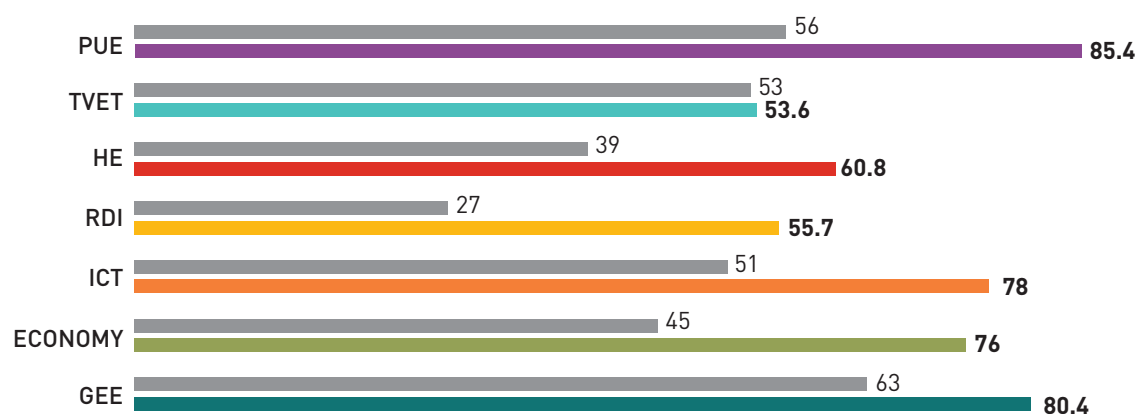


GENERAL ENABLING ENVIRONMENT (GEE)

RANK **8**
VALUE **80.4**

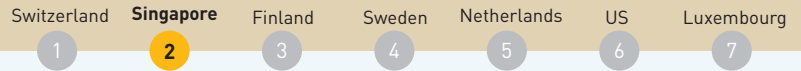
SECTORIAL INDICES IN COMPARISON WITH WORLD AVERAGE

● World Average ● Sectorial Indices





WORLD RANK 2/131



GENERAL ENABLING ENVIRONMENT

8 RANK 80 VALUE

POLITICAL AND INSTITUTIONAL

11 RANK 87 VALUE

SOCIO-ECONOMIC

10 RANK 73 VALUE

HEALTH AND ENVIRONMENT

15 RANK 84 VALUE

PRE-UNIVERSITY EDUCATION

1 RANK 85.4 VALUE

KNOWLEDGE CAPITAL

1 RANK 99.9 VALUE

EDUCATIONAL ENABLING ENVIRONMENT

51 RANK 63.7 VALUE

TECHNICAL VOCATIONAL EDUCATION AND TRAINING

55 RANK 53.6 VALUE

FORMATION AND PROFESSIONAL TRAINING

36 RANK 56.7 VALUE

FEATURES OF THE LABOUR MARKET

103 RANK 49.0 VALUE

HIGHER EDUCATION

3 RANK 60.8 VALUE

HIGHER EDUCATION INPUTS

39 RANK 48.0 VALUE

HIGHER EDUCATION OUTPUTS AND QUALITY

2 RANK 70.1 VALUE

RESEARCH, DEVELOPMENT AND INNOVATION

13 RANK 55.7 VALUE

RESEARCH AND DEVELOPMENT

11 RANK 60.3 VALUE

INNOVATION IN PRODUCTION

20 RANK 50.4 VALUE

SOCIAL INNOVATION

16 RANK 47.3 VALUE

INFORMATION AND COMMUNICATIONS TECHNOLOGY

7 RANK 78.0 VALUE

ICT INPUTS

10 RANK 81.6 VALUE

ICT OUTPUTS

7 RANK 76.4 VALUE

ECONOMY

1 RANK 76.0 VALUE

KNOWLEDGE COMPETITIVENESS

1 RANK 77.3 VALUE

ECONOMIC OPENNESS

2 RANK 77.1 VALUE

FINANCING AND VALUE ADDED

2 RANK 72.5 VALUE

SHAPING A BRIGHT FUTURE

The inaugural Arab Innovation Forum welcomed forward-thinking innovators and entrepreneurs from around the world.

In November 2014, His Highness Sheikh Mohammad Bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai, chaired a rather unprecedented cabinet meeting. Soon after, the year 2015 was declared as 'The Year of Innovation' for the UAE.

"The announcement of 2015 as the Year of Innovation comes in support of the Federal Government's efforts, and the distinctive intensive research efforts to find national cadres that lead our future in this sector towards further progress, prosperity and innovation," said President His Highness Sheikh Khalifa Bin Zayed Al Nahyan, at the time. "Today we live in a rapidly changing world, with speedy developments, great opportunities, discoveries and inventions. Hence we must prepare our generations

in a manner commensurate with the world in which we live, and ensure us a place among other nations, thus guaranteeing us a bright future such as our present day."

That last bit is particularly interesting. 2015 was a difficult time for the UAE and the world as a whole. With markets all around the world feeling the heat, the UAE decided it was time to look beyond oil. The meeting was to ensure that the Arab nation would diversify and not be overly reliant on oil GDP. While the rest of the world was solely concentrated on surviving, the UAE was drawing up plans on what would make it thrive in the future. The location of the meeting was interesting too. Held at the 500-year Fujairah Fort, the



UAE's leaders went to the past to look towards the future. Nothing was by accident.

The inaugural Arab Innovation Forum, held at Dubai World Trade Centre, on 26 and 27 February – followed by an award ceremony on 28 February – was a by-product of that particular meeting about four years ago. Organised by the Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) and held under the patronage of MBRF Chairman His Highness Sheikh Ahmed bin Mohammed bin Rashid Al Maktoum, the forum was launched as part of the foundation's mission to build knowledge-centred societies, embrace projects and initiatives that support ideas and innovation, and provide opportunities for young generations to learn and to create sustainable solutions for their communities.

Divided into several sessions, the forum started with the opening ceremony followed by sessions from entrepreneurs, creative thinkers and international experts from all around the world, who discussed innovation within the various sectors covered in the forum.

However, that wasn't all that the Arab Innovation forum was about. The second part of the event was a 10,000-square-metre exhibition, where more than 100 international, Arab and local start-ups showcased their innovations to visitors, alongside innovations from Dubai Customs, the Dubai Corporation for Ambulance Services, the Dubai Chamber of Commerce and Industry, the Higher Colleges of Technology and Emirates NBD. The forum also included a series of workshops on innovation, as well as topics of interest for start-ups, such as attracting investment, growth and global expansion.

"The Arab Innovation Forum 2018 is launched as part of UAE Innovation Month, and in line with the directives of the UAE's wise leaders, who have called on all stakeholders across the country to work together towards sustainable development and the objectives of the UAE Centennial 2071 Plan," said His Excellency Jamal bin Huwairb, MBRF's CEO, in his keynote speech at the inauguration ceremony. "The forum seeks to instil the culture of innovation by offering specialised

Above: Saif Al Mansoori, director-general of MBRF (front right), with Lieutenant General Dhahi Khalfan Tamim, Deputy Chairman of Dubai Police and Public Security and other dignitaries at the forum





Above: Jamal Bin Huwaireb, CEO of MBRF

Above right: Dr Ahmed Al Nuseirat, Coordinator General of the Dubai Government Excellence Programme

platforms to highlight models of innovation and discuss the various aspects and implications of innovation at all levels, as well as underline its requirements by a group of professionals and innovators from around the world.”

Also at the opening ceremony were distinguished guests such as Lieutenant General Dhahi Khal-fan Tamim, Deputy Chairman of Dubai Police and Public Security; Abdulla Mohammed Al Basti, Secretary General of the Executive Council of Dubai; Ahmed Mahboob Musabih, Director of Dubai Customs; Khalifa bin Dray, Executive Director of Dubai Ambulance Services Corporation; Dr Ahmed Al Nuseirat, Coordinator General of the Dubai Government Excellence Programme; and Ahmed Thani Al Matrooshi, Managing Director of Emaar Properties.

Director of Dubai Customs, Ahmed Mahboob Musabih said: “The forum represents a golden opportunity for both the public and private sectors to propose creative and innovative ideas and interact with one another. Ever since we introduced systems to receive proposals and ideas in Dubai Customs back in 2004



and up until 2017, we were sent a total of 26,000 ideas, and have accumulated nearly AED1.7 billion in residual revenue and guided expenditure.”

Of course, the Director of Dubai Customs knew what he was talking about. After all, Dubai Customs has received more than 120 innovation awards, including 35 institutional excellence awards, such as the Mid-Sized Government Agency Award and the Government Agency for International Acclaim. In fact, Dubai Customs has propelled the UAE onto the world-class Efficiency of Customs Procedures Index, according to the Global Competitiveness Yearbook of the International Institute for Administrative Development in Switzerland.

GOVERNMENT EXCELLENCE

In the opening session, Dr Ahmed Al Nuseirat looked back at government innovation in Dubai. He claimed that the term government excellence was coined in 1997 by H.H. Sheikh Mohammed bin Rashid Al Maktoum after he launched the first programme for government excellence, which set the tone for the continuous development of government operations and raised competitiveness among government agencies. Before that, government excellence was unheard of.

Dr Al Nuseirat explained that the programme set the standards of innovation and excellence in government for the first time, which reframed the entire thought process in government departments. It created



Left: Jamal Bin Huwaireb, CEO of MBRF (second right), with Lieutenant General Dhahi Khalfan Tamim, Deputy Chairman of Dubai Police and Public Security (centre) and other dignitaries listen intently to the opening speeches

Dubai ranked 14th out of 30 global cities on the Dubai Innovation Index 2017, climbing up one position since last year and marking three years of consistent advancement, surpassing major cities including Madrid, Milan, Shanghai, Moscow, Johannesburg, Sao Paulo, Kuala Lumpur and Beijing.

a stimulating environment for innovation, Dr Al Nuseirat said, stressing that innovation in government has become a work ethic, resulting in innovative initiatives and projects across the government eco-system.


DUBAI INNOVATION INDEX

At the opening session, the Dubai Chamber of Commerce and Industry showcased the Dubai Innovation Index – another by-product of the ‘Year of Innovation’.

“The purpose of the index is to support Dubai’s economic growth and to transform the economy from services to a knowledge economy,” said Amira Alhaddad, Senior Analyst for Business Strategy at the Dubai Chamber. “We sought to create a tool to measure innovation, its results and its impact on the economy of Dubai, as well as its potential to support the emirate’s transformation into a regional and global hub for innovation.”

Alhaddad went on to reveal that Dubai ranked 14th out of 30 global cities on the Dubai Innovation Index 2017, climbing up one position since last year and marking three years of consistent advancement, surpassing major cities including Madrid, Milan, Shanghai, Moscow, Johannesburg, Sao Paulo, Kuala Lumpur and Beijing.

The Dubai Chamber of Commerce and Industry also launched the Dubai Innovation Index Platform, which allows users to choose a particular industry, compare it to other industries in the sector, as well as with other sectors, and evaluate innovation and growth in the said industry over the years. Users can also monitor innovation in one particular city, or several cities around the world, and compare them to visualise the progress of innovation in the city over the years.

Over the coming pages, *Flashes* covers each of the sessions – namely innovation in smart government, innovation in healthcare, innovation in energy and utilities, transportation, financial services and technology – from the inaugural Arab Innovation Forum. 

A large, white, abstract graphic on the left side of the page, resembling a circuit board or a stylized tree. It has several vertical lines with circular nodes at the top and bottom, and horizontal lines connecting them. The graphic is set against a light blue background.

FORGING AHEAD

The first nation with a government minister dedicated to AI, the UAE is driving its Smart Government Initiative forward.



In 2015, a call to action was issued to UAE government departments to be more proactive with innovation. At the time, His Highness Sheikh Mohammed bin Rashid, Vice President of the UAE and Ruler of Dubai, said: "Governments that set an example for innovation have the power to implant a nationwide culture of creativity." It was an accurate prediction.

By 2017, Dubai ranked as the 29th most energetic startup city in the world, amongst a list of 85 cities, in a survey conducted by international property finder Nestpick. Its Best Startup Cities Index placed Dubai ahead of New York, London and Tokyo.

Last year, Sheikh Mohammed also announced a UAE cabinet reshuffle wherein he appointed Omar bin Sultan Al Olama as the UAE's Minister of Artificial Intelligence, creating what is thought to be the world's first such cabinet position. Al Olama's responsibilities include "enhancing the government's performance by investing the latest technologies and tools of artificial intelligence and applying them in various sectors".

Such bold moves are contributing to the success of the Smart Government Initiative. For the uninitiated, the Smart Government Initiative – launched in 2013 with a AED200 million injection – was introduced to



Sheikh Mohammed called for 1,000 government services in Dubai to 'go-smart' through mobile and electronic mediums by 2017

ensure the happiness of UAE citizens. At the time of its launch, Sheikh Mohammed described a smart government as one that works 24 hours, 365 days a year to serve its citizens.

Sheikh Mohammed called for 1,000 government services in Dubai to 'go-smart' through mobile and electronic mediums by 2017, while a dedicated department was established to supervise and facilitate the Dubai Government into a smart government.





Above: A captive audience

Many initiatives were launched as part of the programme, including MyID, which “enables customers to have one single sign-on to all the eServices provided by Dubai Government entities and interact with them using one account only”.

As part of the Smart Dubai strategy, Sheikh Mohammad also launched the Happiness Meter – to measure the public’s happiness and satisfaction across government and private sector services, with responses fed into a central data centre.

“In this age of rapid change, those who lag behind become irrelevant – in a heartbeat,” Sheik Mohammad wrote in a column in *The National* newspaper. “Countries whose governments grow old face the same fate as outdated companies. Their choice is simple: innovate or become irrelevant.”

“The secret to the renewal of life for corporations, to the evolution of civilizations and to the development of humanity is simple: innovation. I am always amazed when governments think they are the exception to the rule; that they are above the need for innovation,” he wrote.

“Innovation in government is not an intellectual luxury, a topic to be confined to seminars and panel discussions, or a matter only of administrative reforms. It is

the recipe for human survival and development, the fuel for constant progress and the blueprint for a nation’s rise.”

Sheik Mohammad continued that innovative governments “empower citizens to cultivate their collective energy and develop their potential, and thus become drivers for their countries’ growth and advancement in the world arena. Above all, they value human minds and help people become better guardians and builders of our planet.”

“For governments, innovation is an existential question. Only those that sustain innovation can drive change in the world, because these are the governments that never grow old.”

Dubai Silicon Oasis Authority is one of the fore-runners to Dubai’s smart government aspirations. For those who may not know, Silicon Oasis is a free zone that fosters innovation. Ghanim Al Falasi, SVP People Happiness and Innovation at Dubai Silicon Oasis Authority, calls it a city within a city that propels happiness and innovation. “You need to be happy to innovate and when you’re happy, you innovate,” Al Falasi said at the Arab Innovation Forum.

One of the DSOA’s focuses is bridging the gap between academia and business through its Innovation Technology Transfer Programme.



Left: Ghanim Al Falasi, SVP People Happiness and Innovation at Dubai Silicon Oasis Authority



“The programme, sponsored by DSOA, helps graduating students – right from the start of their final year – bring their brilliant visions to life. We select these outstanding students and instruct them to create a startup team – a mix of engineers, marketing and business people”

GHANIM AL FALASI

SVP People Happiness and Innovation at
Dubai Silicon Oasis Authority

“The programme, sponsored by DSOA, helps graduating students – right from the start of their final year – bring their brilliant visions to life. We select these outstanding students and instruct them to create a startup team – a mix of engineers, marketing and

business people,” Al Falasi said. “We let them work on their concepts until they’re ready to pitch the idea in front of our partners. Winning candidates get to work with our partners and are even helped with funding their project. Those who fail to secure a place are given a certificate for their endeavours to prove that they have gained this kind of valuable experience, which will help their job prospects.”

Hussam Juma Mohammed, Director of Service Innovation & Enterprise Architecture at Dubai Customs, claimed that his team at Dubai Customs, too, innovate for happiness. “We at Dubai Customs innovate for the happiness of the community and society,” he told the forum. That motto has made Dubai Customs the first government department in Dubai to receive more than 120 innovation awards, including 35 institutional excellence awards. †

A large white graphic on a blue background. It consists of a lightbulb shape on the left, which transitions into a heartbeat line (ECG) that extends across the bottom of the page. The lightbulb has a spiral base, and the ECG line has several peaks and valleys, with the tallest peak occurring just below the word 'GOOD'.

TO YOUR **GOOD**

With artificial intelligence transforming healthcare, could it also be used to predict and prevent illness?



HEALTH

Discuss artificial intelligence with the man on the street and it's likely he'll have a grasp on its impact and prospects for the technology and production industries. Replacing human toil with machines that can do the same job is not a new concept. However, would we trust artificial intelligence when someone's life is at stake? That's where the future is headed.

Medical practitioners the world over believe in a future where robots will conduct complicated surgery with an experienced doctor or surgeon overlooking the process to make sure everything goes off without a glitch.

The idea for cyborg surgeons is born out of necessity. According to a World Health Organization (WHO) report, the world will face a shortage of almost 13 million healthcare professionals by 2035.

Joel Robertson, CEO of Robertson Health, a network of companies in the field of predictive and precision-based medicine, claims that's where AI can help. A leader in the area of brain chemistry, the clinician, author, lecturer and consultant told the Arab Innovation Forum how artificial intelligence would revolutionise healthcare.

Robertson believes that while doctors tell people what they should do, they can never successfully address what their patients will do. "Knowledge does not make people change," he said. He's not wrong. For example, we all know we should eat healthily and exercise regularly, but all too often even those two simple steps for a healthier life slip down our priority list.

The answer with healthcare, according to Robertson, is getting data that the patient will use. "The sheer volume of data coming in, from rings that keep tabs on your blood pressure to smartwatches that monitor your steps and heart rate, will be overwhelming," he said. "But that will also help doctors to recognise patterns and syndromes, which they would otherwise miss."

Strides towards android medical treatment have already been made. In 2015, San Francisco-based Catalia Health unveiled its robo-nurses, called the Mabu personal healthcare companion. It uses artificial intelligence and data records to remind patients to take medicines, assist with chronic disease management and help doctors track patient progress.



Above: Joel Robertson, CEO of Robertson Health, believes AI will predict medical procedures

Right: A cyborg surgeon of the future?

In fact, technology has already made headway towards the aforementioned cyborg surgeons. In September 2016, University of Oxford surgeons at Oxford's John Radcliffe Hospital performed the world's first operation inside the eye using a robot. The remote controlled Retinal Dissection Device (R2D2) was used to remove a membrane 100th of a millimetre thick from the retina of the right eye of Revd Dr William Beaver. The experimental procedure not only corrected the patient's vision, it also made medical history as the first time a robot had been used to conduct an operation of the eye. At the time, the surgeon, Professor of Ophthalmology Robert MacLaren, said: "We have just witnessed a vision of eye surgery in the future."

Robertson dares to dream big. "What if we could use artificial intelligence to not just help with medical procedures but predict them?" he asked. Robertson told the forum that the World Health Organisation predicted a 17 per cent increase in chronic heart disease over the next ten years. "One of the most fascinating things coming out of healthcare right now is that instead of doing clinical studies where you would put a drug into your body, you could put a chip [into your body]," Robertson said. "This chip will be able to tell what's wrong with the body, from kidney failure to heart disease."



What Robertson is referring to is a form of bioelectronic medicine – where tiny electronic implants target medical conditions by controlling the neural signals going to a specific organ. He calls it a form of active diagnosis. "In terms of active diagnosis, Google now has a [contact] lens that can monitor your blood sugar," Robertson said. "In about five years, your cholesterol and electrolytes will be monitored in real-time."

Robertson, who calls the US home, claimed that the US has an average of about 20 per cent misdiagnosis.



“This chip will be able to tell what’s wrong with the body, from kidney failure to heart disease”

JOEL ROBERTSON,
CEO of Robertson Health

Active diagnosis in those cases could make the difference between life and death.

Artificial intelligence has even found a place within psychology. According to the World Health Organisation, depression is a common illness worldwide, with more than 300 million people affected.

While it is known to make a person suffer greatly and function poorly, at its worst, depression can lead to suicide. Close to 800,000 people die due to suicide every year, reports the WHO, with suicide the second leading cause of death in 15 - 29-year-olds.

Talking helps, particularly with a mental health professional. But a report by the United States National Institute of Mental Health recently concluded that out of the one in five Americans who have a mental illness, close to two-thirds have gone at least a year without treatment.

For its part, technology is stepping into the arena through apps and chat rooms. The most recent tech-based ‘treatment’ is an artificially intelligent chatbot (and app) called Woebot. Created by Alison Darcy, a clinical psychologist at Stanford University, it’s based on cognitive behavioural therapy. The chatbot conducts daily chat conversations and plays curated videos and word games to track your mood with the help of its algorithms. It then offers tips to help reduce depression, anxiety and other problems.

Mohit Sagar, Managing Director and Editor-in-Chief of OpenGov, a digital publishing platform and event production company focused on digital transformation in the public sector, who spoke on the future democratization of healthcare at the forum, agreed with Robertson’s vision for the future.

Sagar compared the world’s healthcare system to Formula One. “Consider the F1 crew to be the hospital staff and the patient to be the driver,” he said. “If you rewind

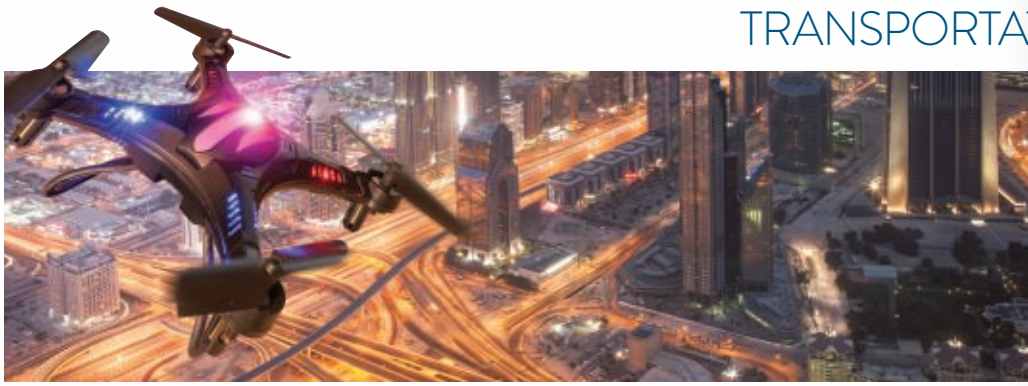


and go back to the old days of Formula One, the driver wore a helmet, got into his car and flew down. After he was done with the race, he would tell the crew what was wrong with the car. So if this person weren’t educated in mechanics, he’d be giving his team incorrect and inaccurate information. The entire healthcare system is like that.”

Sagar envisions a future where doctors have access to their patients’ Internet of Things (IoT) devices – wearables like smartwatches and chatbots like Woebot, etc – to help them keep tabs on their patients’ health. “This new technology with wearables isn’t simply meant to pull information, it can also push information. That means it’ll provide doctors with information you would never consider giving them, which turns into data that can help predict patient habits. AI is the future,” he said.†

Above: Mohit Sagar, Managing Director and Editor-in-Chief of OpenGov, described the current healthcare system to the old days of Formula One

From self-flying taxis and flying police motorbikes to Hyperloop One, the UAE is accelerating ahead in transport innovation.



ROAD TRAVELLED

The first serious attempt at building a flying car took place just over 100 years ago. In 1917, Glenn Curtiss invented the autplane. While the vehicle managed a few short hops, it never took flight. In 1950 Robert Fulton's FA-2 Airphibian became the first roadable aircraft approved by the Civil Aviation Administration. It could fly and then be transformed into a car by removing its wings, tail and propeller. It's reported the Airphibian could fly at almost 200 km/h, drive at 80km/h and took five minutes to convert from plane to car.

We've come a long way since then and though the commercial flying car still eludes us, we're within touching distance.

In 2016, His Highness Sheikh Mohammad Bin Rashid Al Maktoum launched the Dubai Autonomous Transportation Strategy, claiming that "25 per cent of all trips in Dubai will be smart and driverless" by 2030. The strategy is projected to generate economic revenues and savings of up to AED22 billion a year.

Plans for a self-flying taxi service were unveiled at the World Government Summit in Dubai, in 2017. Just seven months later the two-seater self-flying taxi built by German company Volocopter was aerial tested in the emirate. A statement at the time said the autonomous air vehicle "will be used for the world's first self-flying taxi service to be introduced by Dubai's Road and Transport Authority".

While Dubai Police already has an enviable fleet of supercars, the force is also planning to introduce driverless mini security patrol cars after signing

an agreement with Singapore-based firm OTSAW Digital last June. The O-R3 vehicles, which will be used for police duties like surveillance, will be kitted out with 360-degree cameras and biometric scanning devices. The O-R3 will also be able to launch a drone to track suspects and relay information back to Dubai Police command room.

Late last year Dubai Police started using 4G technology drones to monitor traffic and emergency incidents, and tests have been carried out on a flying motorbike, a drone/motorcycle hybrid, that can carry a passenger at a top speed of 70km/h. And finally, in February this year, Dubai's RTA offered a glimpse into the prototype design of Hyperloop One, the levitating capsule that will shoot passengers between Dubai and Abu Dhabi in 12 minutes, at a speed of 1,200km/h.

Below: Dubai Police drone/motorcycle hybrid



"Hyperloop is only going to become faster and fast until we can time travel"

FAITH POPCORN,
Founder and CEO,
BrainReserve



Above: Virgin Hyperloop One will connect Dubai and Abu Dhabi

With all transport inventions finding a place in Dubai, it's no wonder that BrainReserve founder and CEO Faith Popcorn described the emirate as having "already created the future in the present". The leading futurist and trends expert said that the environment and atmosphere of the emirate was beyond her imagination.

"I had to re-write my whole speech because I was supposed to talk about the future and what's coming, but when I did my research and found out what is here, I realized that you are in the future," said Popcorn. "So many of the things that I was going to say are coming, are already here."

Keep in mind that impressing a futurist like Popcorn, tagged 'the Nostradamus of Marketing' by *Fortune* magazine, is no mean feat. Recognized as America's foremost trend expert, Popcorn describes her company's work as applied futurism. Clients include brands like Nike and the United States Post

Service. "We repositioned the United States Post Service to explain to them that they represent connecting people and not simply mail," Popcorn said. "We created something called future mail, where you can write a letter or send a cheque to your great, great, great, great grandchild to be delivered on his or her thirteenth birthday."

Faith claimed her team has consistently predicted the future thanks to the two interesting properties they coined: TrendBank and TalentBank. "Our predicted trends have been holding up for about four-and-a-half-decades," she said. "I predict that with the Hyperloop coming here and one in New York, soon Hyperloop will be a way to travel between New York and Dubai. Hyperloop is only going to become faster and faster until we can time travel."

If you're laughing that prediction off, remember that flying cars were once confined to cartoons like *The Jetsons* and movies like *Back To The Future 2*.



Hyperloop will take passengers from Dubai to Abu Dhabi in 12 minutes at a speed of

1,200km/h

New modes of transport will also be used in delivery services, said Popcorn. "Amazon is now testing drones, which they load, and the drone comes to you," she told the forum. "In Germany, Pizza Hut is beta testing driverless droids that come to your front door. Pizza Hut employees just put the pizza in the droid and it cooks while it's on its way to you."

Crystal Worthem, Marketing Director, Ford Middle East and Africa, was also vocal on the subject of innovation in transportation during the forum. During her Reimagining the Auto Industry session, Worthem agreed with most of Popcorn's hypotheses, pointing out that inventions like the flying car are only properly coming to fruition now because of huge technological advances.

Worthem also claimed that a startup could put a 100-year-old company out of business just because it's investing in the future, which is why she claims Ford is investing billions of dollars in the future of mobility. She also revealed that Ford is working with Domino's on pizza delivery via autonomous vehicles. "To continue to participate in areas that we haven't historically is going to take a lot of work and working very closely with lots of different partners," Worthem said. "What we're learning from our partnerships with partners like Lyft and Dominos is how people want to interact with driverless cars."

For those wondering why Ford would bother with trivial things like ridesharing and deliveries, it's because that is the space automobile companies will be branching into in the very near future. "To this day,

Henry Ford is seen as one of the most innovative people of our time. One of the things we don't want to do with that legacy is stall it," Worthem said. "We've had to continue to evolve and take all the incoming disruptors like carpooling, car sharing, the evolution of different companies getting into the autonomous vehicle space, as a result of it."

Worthem revealed that a global survey conducted by Ford discovered that 71 per cent of people in the Middle East were hopeful about the future of autonomous cars and the benefits they bring. She further added that a major factor in this wholehearted acceptance of technology is the youth.

"Young people today people are already letting technology take over their lives. Considering the UAE has one of the largest youth populations in the world, we see a lot of things go faster here in the Middle East," said Worthem. †

"To this day, Henry Ford is seen as one of the most innovative people of our time. One of the things we don't want to do with that legacy is stall it"

CRYSTAL WORTHEM

Marketing Director,
Ford Middle East and Africa



Above: A self-flying taxi service is coming to Dubai

Below: The O-R3 autonomous car

TIDE OF CHANGE

How
innovation
is shaking
up financial
services
around the
world.

Launched in 2009, cryptocurrency Bitcoin burst onto the mainstream last year. Over the course of 2017, its price went from \$950 at the start of the year to nearly \$20,000 towards the end of the year. That's a dramatic shift.

The virtual currency basically only exists as computer code with no bank or government creating or controlling it, which is why many experts still continue to disregard it, waiting for the bubble to burst. It really shouldn't have value, but the fundamental reason Bitcoin has value is because people believe that it does. Think of it as more of a speculative investment than a currency. Whether Bitcoin or other cryptocurrencies catch on or not – Australia's Brisbane Airport announced in January that travellers would soon be able to pay for goods with cryptocurrency at several terminal outlets – many experts are far more excited about the technology behind it: blockchain.

At the Arab Innovation Forum, Bradley Hall, Chairman and CEO of Icon Capital Reserve AG, described the open source, ledger book protocol called blockchain as the future. Icon is a financial software company led by a management team with international finance, risk management, digital cryptography, governance and gold trading experience. In 2013, the company launched Aureals as a decentralized, digital method of exchanging value.



Each Aureals is denominated as one-gram weight and measure of physical gold. Aureals can be held as a store of value or exchanged for any other asset of value, including currencies or allocated physical gold, stored in non-bank vaults in free zones around the world including, but not limited to, Hong Kong, Shanghai, Singapore and Switzerland.

During his session, Hall spoke about gold and its value as an asset, as well as it being a symbol of trust. "Gold medals are always awarded to the highest achievers," he said. "If you're the best of the best at the Olympics, you get a gold medal. When you look at the central banks that currently operate our financial system, when they store their reserves, it's stored in gold. Things like that have made gold become a symbol of trust and value."

According to Hall, there's another reason gold is valued so much. That bit is based on math. The total stock of above ground gold in the world is estimated to be around 200,000 metric tons. The flow of gold – the estimated amount of gold mined each year – is about 2,700 metric tons. The stock and flow ratio stands at about 1.35 per cent. That ratio shows us the stock of new gold that keeps coming in incrementally.

Conducting a study, Hall and his team went back in time and found that our current financial system is Babylon's brainchild. According to their findings, Babylon came up with a semiotic three-tier system – physical assets stored in a safe place, dematerialised into financial assets that could be registered and stored in a ledger, and then financial liabilities created against those financial assets. Those liabilities could

Right: Bradley Hall, Chairman and CEO, Icon Capital Reserve



“Blockchain not only works, but thrives... We’re already seeing that technology being embraced in the UAE”

BRADLEY HALL

Chairman and CEO, Icon Capital Reserve AG

be traded. The central banks that run our financial system today adopted this system. This essentially proves that the system is ancient.

“When you move away from the financial asset and liability construct, you’ll realise that as soon as you shift your focus asset, the money loses value,” Hall said. “This happens to all currencies. Confidence in central banks’ healing powers have been faltering for a while now, which is why people have more confidence in gold.”

While there has been a lot of noise about Bitcoin, Hal is not a fan. “Those tokens remain a claim cheque with nothing to claim. However, they stand as proof that the technology powering them – blockchain – not only works, but thrives,” he said. Hall explained why he was such a fan of the network.

Within the blockchain, there is no single point of technology failure. It exists on a distributed network of computers around the world. Effectively, it runs like a supercomputer 24/7. One that hasn’t crashed since 2009. Secondly, its records cannot be manipulated because it’s based on open source protocols. There’s no single company that owns the blockchain. “We’re already seeing that technology being embraced in the UAE, with the central bank of the UAE already engaged in a blockchain project,” Hall said.

Walmart, IBM and JP Morgan have all been experimenting with blockchain technology. There is currently so much excitement around blockchain that it’s a magnet for investment. In fact, Reuters found that existing companies that merely added the word blockchain to their name saw their stock prices increase. An example of that is Long Island Iced Tea Corp. Its shares rose by 289 per cent after it changed its name to Long Blockchain Corp. late last year.

Thierry Sanders, CEO of Mekar (PT Sampoerna Wirausaha) decided to take his forum session in another direction. While illustrating the new promise that fintech brings, he also talked about failure. Specifically within his business venture. “The ability to identify failure and recognise mistakes is the most



important part of the innovation process,” Sanders said. “When you come up with a new company, it’s not going to be perfect. You’re going to make mistakes, reach dead ends and even lose money. You’ll have to fix all of that.”

Mekar is an Indonesian financing company that helps fund small and medium sized enterprises driving economic growth. It was born out of necessity. Only 27 per cent of all businesses in Indonesia are able to go to a bank, or a non-bank financial institution, and get a loan. Mekar sought to change that.

The company used social media to find people who understood finance – whom they call mobile agents – in certain areas of the country. Once recruited, Mekar gave them a mobile application to download so they could get to work. The mobile agents went to businesses in their respective areas, found out their financial needs, and collected collaterals and identification to help them get off the ground.

It wasn’t all smooth sailing. In 2016 Mekar became a victim of fraud, at the hand of some agents who were outsmarting the mobile app. Picking themselves up, Sanders and his team worked on solving the other problem that plagued the company

– collecting commissions from the small companies. The solution they went with was to remove collection and lending altogether.

Today, Mekar works with credit co-operatives to find investors and bring them on to its peer-to-peer crowdfunding site, via the Cloud based Genero core banking system developed by Jakarta based Silvia Banking Solutions BV. The credit co-operatives then publish their borrowers on Mekar’s crowdfunding platform. That way, the investors and borrowers get in touch without Mekar falling for old traps.

That’s not to say Mekar has made its agent programme redundant, with 2,000 agents still using Mekar’s mobile app. The agents look for businesses that need finance. Mekar takes the best loan requests and publishes them on the crowdfunding marketplace for financial institutions. Banks that do not have branches across the country are able to pick up those loans and finance those businesses. This helps Mekar categorize which businesses can be trusted, which neighbourhoods are apt for business and which agents are performing well. The big data implications of this marketplace that Mekar created has not only enabled the company to learn from their mistakes, but improve its business model. ↗



Left: Thierry Sanders, CEO, Mekar



LIGHT THE WAY

Could disruptive energy solutions bring electricity to the one billion people currently living without it?

With technology improving day-by-day we've begun consuming energy at an alarming rate. If current trends continue, we'll run short of electricity to power our computers alone by 2040, according to the US-based Semiconductor Industry Association and the Semiconductor Research Corporation.

While the most obvious answer may be to expand power generation to meet growing demand, unfortunately, things aren't as easy. Investment in electric power generation and distribution is a slow, long-term proposition. No one has the appetite to build enough power plants and expand the grid to meet the rising demand for electricity.

We could look to renewable sources of energy such as solar, waves and wind. The UAE is already working towards its Energy Strategy 2050. It aims to achieve an energy mix that combines renewable, nuclear and clean energy sources – 44 per cent clean energy, 38 per cent gas, 12 per cent clean coal and 6 per cent nuclear.

At the Arab Innovation Forum, Jamie Anderson, one of the world's top 25 management thinkers, highlighted the energy problem tormenting African nations at this very moment.

"You may have noticed that the symbol representing the Arab Innovation Forum is that of a lightbulb. Try not to take that for granted," Anderson said. He revealed that in sub-Saharan Africa more than 650 million people live in darkness. Indeed, a report by PBL Netherlands Environmental Assessment Agency published last year claimed that two in every three people in sub-Saharan Africa do not have access to electricity, while the International Energy Agency



estimates that around one billion people on the planet still do not have access to electricity.

Anderson told the forum that off-grid energy is one of the world's biggest business opportunities in the energy field. He explained how Kenyan solar energy company M-Kopa had identified this market. The company sells home solar systems for between \$150 and \$200. While that price may seem more than affordable to most, it's still an expensive outlay for people in that part of the world. So how did the company fix that conundrum?

"Every one of M-Kopa's home solar systems has a SIM card embedded in it. So, instead of having to pay the full price for the system, be it \$150 or \$200, all the purchaser needs to pay to avail the system is about \$25," said Anderson. "Following that, every single day, the buyer is asked to transfer the equivalent of

50 cents for a whole year to pay off their debt for the system. Should they default on payment, the system shuts down. The best part is, after paying it off for a whole year, the family owns the system."

For M-Kopa, the benefit is two-fold. While the company is successfully moving its product line, they're simultaneously collecting data on creditworthiness. When the time comes, and it will, financial institutions will pay top dollar for that kind of information. Making money while helping the continent's economy grow, that's the kind of math every smart entrepreneur cherishes.

Larry Siebert is the President and Founder of Kilowatt Labs, a company that develops disruptive and impactful technologies to solve big, energy related problems and deliver better energy. "We really need to start pushing towards renewable sources," Siebert told the forum. "Our mission is to solve the world's energy problems."

Siebert and his team are currently commercialising their Sirius battery product, which scales from cell phone size right up to grid level storage. The Sirius battery delivers the first supercapacitor-based energy storage system that is modular and can be discharged rapidly or slowly, depending upon the requirements of the load. With an energy density of more than 115Wh/Kg, charging time of fewer than 30 seconds and cheaper pricing, the Sirius energy storage solution is a serious alternative to all chemical batteries.

Siebert and his team are continuing to work on it. Over the last year, they've managed to drop its price by half. With a little more work, they expect it to have an impact on the Earth's energy problems. †

Left: Jamie Anderson, one of the world's top 25 management thinkers

Below: Larry Siebert, President and Founder of Kilowatt Labs



A cluster of several glowing, translucent light bulbs, some of which are encased in clear, protective domes. The bulbs are arranged in a dense, overlapping group, with some showing internal filaments and others appearing as solid, glowing spheres. The overall effect is one of bright, futuristic illumination.

THE AGE OF

Manufacturing is going through rapid change as the physical and digital worlds blend together.

“Will networked, automated, artificial intelligence applications and robotic devices have displaced more jobs than they have created by 2025?” That was the question put to industry experts by the US-based PEW Research Center back in 2014. The experts were split, with 48 per cent saying ‘yes’ and 52 per cent saying ‘no’.

Ever since the Luddites objected to the use of mass-production machinery in the Industrial Revolution in England, in the early 1800s, advancement of technology has created more jobs than it has displaced. Back then Luddites were fearful of the sewing machine.

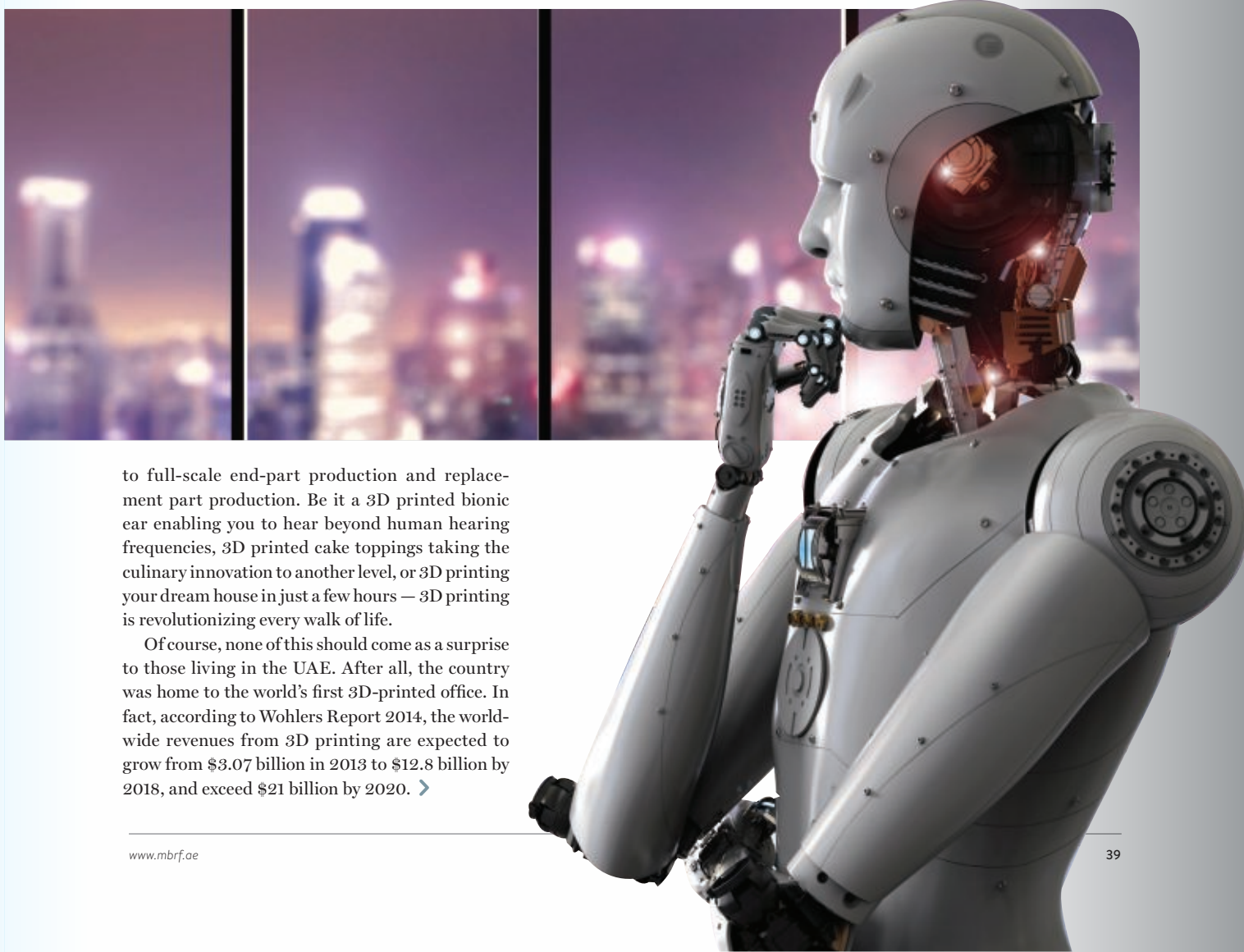
The main difference between then and now is the sheer speed of technological development. A good indicator of exactly how fast computers are growing is Moore's Law, which is named after Gordon E. Moore, the co-founder of Intel, and states that computer power approximately doubles every two years. Since the term was coined in 1965, the exponential growth has followed this pattern almost exactly, and current calculations estimate that, if anything, the rate is only going to speed up.

For example, in years gone by, a CPU as powerful as the one in your iPhone would cost many millions of dollars and take up the size of an entire building. Now you can buy it for a few hundred and hold it in the palm of your hand. If the current rate of development is maintained, we're on course to achieve an affordable computer that rivals the power of the human brain by 2025.

In the manufacturing world, 3D printing has stirred up quite the storm. Moving from prototyping to tooling, additive manufacturing – commonly known as 3D printing – has expanded



DISRUPTION



to full-scale end-part production and replacement part production. Be it a 3D printed bionic ear enabling you to hear beyond human hearing frequencies, 3D printed cake toppings taking the culinary innovation to another level, or 3D printing your dream house in just a few hours — 3D printing is revolutionizing every walk of life.

Of course, none of this should come as a surprise to those living in the UAE. After all, the country was home to the world's first 3D-printed office. In fact, according to Wohlers Report 2014, the worldwide revenues from 3D printing are expected to grow from \$3.07 billion in 2013 to \$12.8 billion by 2018, and exceed \$21 billion by 2020. >



Above:
Design and
manufacturing
is changing,
said General
Electric's Rania
Rostom

MEET THE MICRO-FACTORY

Rania Rostom, Chief Innovation and Communication Officer at General Electric, told the Arab Innovation Summit that the physical and digital worlds are blending. "The reality is, the way we design and manufacture things is changing. We have personally seen that in the jet industry. We learnt that with manufacturing, when designs become more complex costs rise. However, with additive, costs go down. That's because complex parts that were once seemingly impossible to produce are now just a click away."

Rostom wasn't simply theorising. General Electric's aviation business journey started with the jet engine nozzle. Back in 2012, they wanted to make the jet engine efficient. They did it by first understanding how the nozzle was being manufactured and realised that what they wanted to do could not be accomplished by traditional manufacturing methods. So they approached a company called Mars Technologies – a company General Electric later acquired. "What we were able to do with additive is take 20 different parts within the fuel nozzle and make them one. We reduced the cycle time, made the product four times more durable and reduced its weight by 25 per cent."

Once the team realised how much they accomplished with just that one part, they decided to stretch the team further and create a complete engine. "What we wanted to do there was completely change the way we're designing these things. That's the kind of opportunity additive manufacturing brings," said Rostom. "You don't take an existing product and put it through an additive machine; instead, you think additive first. With the turboprop engine in question, we used additive manufacturing to turn 855 parts into 12. It's set to take flight this year."

For those whose entrepreneurial senses aren't tingling yet, additive manufacturing is a \$76 billion market. But here's the biggest advantage of this new-age manufacturing process: since Industry 4.0 and its subsets are a whole different animal to anything we've ever dealt with, the usual economies of scale barely apply to it. Easy-to-change software means manufacturers can turn out one-off items with the same equipment and materials needed to make thousands. That alters the nature of manufacturing.

For customised products, customers have shown their willingness to pay more — sometimes much more — for products they've shaped themselves. This allows marketers to add more product variety with niche demand, fattening the so-called "long tail" of product demand and provides them with the opportunity to reap additional profits from niche products.

ACROSS ALL INDUSTRIES

Don't for a second believe that the advancement in technology is only coming for the manufacturing sector. It's coming across all sectors, even the ones that have remained relatively untouched until now.

In the US, more than two million people were employed as accountants, bookkeepers and auditors in 2015. Until now, these types of information-oriented professions have resisted automation because they require managing unstructured data emanating from the real world, making judgments and dealing with actual people. What's different now, however, is that artificial intelligence's perceptive capabilities have improved. Machines can now handle images, sounds and text in a way that enables them to ingest and analyse data at high volume, without making costly mistakes. Between accounting professionals and truck drivers alone, about 4.5 million human jobs could be ceded to robots over the next few years.

"Organisations are changing," said Steve Cox, Group Vice President, Oracle ERP and EPM Product Marketing. "Forty eight per cent of the CFOs we've surveyed



Left: Oracle's Steve Cox said CFOs need to be change agents

WORLDWIDE REVENUE
FROM 3D PRINTING IS
EXPECTED TO GROW FROM

\$3.07

BILLION IN 2013 TO

\$21

BILLION BY 2020

are going to take action in the next year to automate low skilled jobs. With all the digital transformations we're seeing, it's no longer enough to simply respond to opportunities and threats, we've got to start anticipating them."

Cox added: "Talking from a people perspective, people joining us today come in almost equipped with digital skills from the get-go. They were brought up on Facebook, WhatsApp and Snap. They realise that intelligent process automation is eliminating routine work."

Cox doesn't even believe email is the best form of communication – the red circle over your email app is a testament to his beliefs. He envisions a future where business and financial transactions are treated like a Facebook picture, where if two or more parties even wanted to have a confirmation about said transaction they could retrieve it instantly as opposed to searching for the subject line in the email app.

"The CFO has always been the co-pilot of an organisation but now they're also the change agent. The focus of the CFO now is that of insight," said Cox. "The average organisation's data volume is currently growing two times per year. For anyone looking to dabble in IoT [Internet of Things], their data growth will be by 50 times. The CFO has to be on top of all those numbers at any given time."

So how are they going to manage that? Per Oracle's research: technology. Oracle found that organisations consistently achieving high productivity were spending five times more on software. The automated process is so optimised that those large companies achieve period closures in five days. To give you some perspective, period closures are essentially an eight-step process that takes the better part of a fortnight to complete. With autonomous software running things that process takes three to five days. Cox predicts it'll take just minutes as technology advances further. The age of disruption is upon us. ^f

ARE SAND CASTLES ENDANGERED?

The global hunger for building sand, much of which is being mined illegally, is causing huge problems in many countries.



Any right-minded person who has seen the vast expanse of the UAE's Empty Quarter or Namibia's Namib Desert would conclude that there is no shortage of sand in the world. That person would be wrong.

Sand – just like gold, oil and uranium – is a finite natural resource. This is compounded by the fact that not all sand is equal. During the First Gulf War, Coalition forces had to import sand, as the local variety was so fine it trickled out of sandbags. In Dubai, the sand filling the sand traps of the two famous golf courses, Fire and Earth, was imported from the United States and Canada. Why? The local wind-blown desert sand grains are so rounded that golf balls sink into them. Furthermore, the sand of the Arabian Peninsula also contains a surfeit of chalk, clay and iron oxide, which makes it chemically unsuitable for building.

Size and shape are the two important factors that determine the usefulness of sand as a key ingredient in the production of glass, electronics, oil and – most importantly – concrete. According to geologists sand is between 0.0625 and two millimetres across. If it is smaller it is considered silt, any larger and it is reaching gravel status. The composition is unimportant. Sand mainly consists of silica, while beach sand has a high proportion of shell pieces. For microchips, lenses and glass, pure quartz sand is required. Sand is almost always formed through the gradual disintegration of bigger rocks through the action of ice, water, wind and time.

Sand also comes in many shapes ranging from oblong and sharply angular to nearly spherical and smooth. Desert sand is almost always highly rounded, as strong winds knock the grains together so forcefully that protrusions and sharp edges break off. River sand is more angular. When it comes to construction and manufacturing the latter is required, as it offers a sufficient number

of multidirectional chemical linkages. This characteristic increases density, stability and overall engineering behaviour. Smooth, rounded particles offer less resistance to rearrangement than angular or elongated particles with rough surfaces.

In construction, ISO 14688 grades sands as fine, medium and coarse with ranges of 0.06mm to 0.2mm. Sharp sand, also known as concrete sand, is coarse sand with larger particles. Builder's sand, also known as plasterer's, mason or bricklayer's sand, is a finer grade with smaller particles. It's often mixed with water and cement to make mortar for laying bricks/blocks. Jointing sand, also known as beach sand, is fine with very small particles. This type of sand is used for grouting joints in paving or patio slabs.

SO WHY IS THERE A SHORTAGE?

The simple answer is demand. In the industrial world, the need for "aggregate" is voracious – a category that includes gravel, crushed stone, sand and various recycled materials. Aggregate is the main constituent of concrete (80 per cent) and asphalt (94 per cent), and it's also the primary base material that concrete and asphalt are placed on during the building of roads, buildings, parking lots, runways and many other structures.

As a result, natural aggregate is the world's second most heavily exploited natural resource after water, and for many uses the right kind is scarce or inaccessible. Sand and gravel are now the most extracted materials in the world by weight, and since these products take thousands of years to form by erosion, demand is beginning to outstrip supply. The United Nations Environment Programme estimated that in 2012 the world used nearly 30 billion tons of these materials just to make concrete – enough to construct a wall 27m high by 27m wide around the equator.



Above: Sand mining in India

In 2010, nations mined about 11 billion tons of sand just for construction and the industry generated \$70 billion a year. Extraction rates were highest in the Asia-Pacific region, followed by Europe and North America. In the United States alone, production and use of construction sand and gravel was valued at \$8.9 billion in 2016, and production has increased by 24 per cent in the past five years.

Sand traditionally has been a local product. However, regional shortages and sand mining bans in some countries are turning it into a globalized commodity. Its international trade value has skyrocketed, increasing almost six-fold in the past 25 years.

Singapore is by far the world's largest importer of sand, adding 130 square kilometres to its land area over a 40-year period. The island nation has achieved this by dumping millions of tons of sand into the ocean.

China also has an insatiable appetite. Between 2011 and 2013 it used more concrete than the US got through in the entire 20th century. It takes 30,000 tons of sand to construct one kilometre of highway and 200 tons to build the average concrete house, reports Coastal Care, a non-profit foundation dedicated to beach conservation. Chinese officials have said that by 2030 they hope to have completed 165,000 miles of roads – a national network nearly three and a half times as long as the American interstate system. Globally, China accounts for a fifth of the world's sand imports, according to the trade statistics branch of the United Nations.

This means that, at national and local levels at least, these regions are facing a genuine sand shortage. For example, in Vietnam domestic demand for sand exceeds the country's total reserves. If this mismatch continues, the country may run out of construction sand by 2020, according to recent statements from the country's Ministry of Construction.

In Indonesia, some two dozen small islands are believed to have disappeared since 2005 due to sand mining. In Jamaica, thieves stole a whole beach in 2008 when they carted away 500 truckloads of sand

Across Asia, rampant sand mining over the decades has led to eroding coastlines and degraded waterways in much of the continent.

In India, building sand has become so scarce that organised 'sand mafias' oversee illegal riverbed mining. Fuelled by a real estate boom estimated to generate \$180 billion annually by 2020, India is digging 500 million metric tons of sand every year, feeding an industry worth more than \$50 billion. And India's hunger is bound to increase, as the government plans to build about 60 million new affordable homes between 2018 and 2024. According to a report by the Geological Survey of India (GSI), riverbed mining causes several alterations to the physical characteristics of both a river and riverbed. These can severely impact the ecological equilibrium of a river and damage plants, animals and riparian habitats.

In Indonesia, some two dozen small islands are believed to have disappeared since 2005 due to sand mining. In Jamaica, thieves stole a whole beach in





2008 when they carted away 500 truckloads of sand. Environmental officials estimate that half of Morocco's construction sector is built with stolen sand, while in the United States a sand mine in California's Monterey Bay is blamed by environmentalists for rapid coastal erosion.

As land quarries and riverbeds become exhausted, sand miners are turning to the seas. The UK, for instance, gets about one fifth of the nation's sand from the ocean floor. In Germany, dredgers the size of aircraft carriers trawl the North and Baltic seas with gigantic suction heads vacuuming the grains from the sea floor. Worldwide, thousands of ships gobble up millions of tons from the seabed each year, tearing up habitats and muddying waters with sand plumes that can affect aquatic life far from the original site.

ALTERNATIVES TO SAND

As outcry about the effects of sand mining increases in countries such as India, pressure is mounting to find alternatives for use in construction.

The first and most logical solution is to speed up natural erosion by crushing rocks to create manufactured sand. Depending on the machine setting, it can produce particle size and grading at par with river sand that can be used to partially or fully replace river sand from a concrete mix depending on economics.

Crusher dust (quarry waste) is by-product of stone crushers while producing coarse aggregate. Instead of filling up landfills, it can be utilized to replace up to 25 per cent of sand in a concrete mix.

Granulated blast furnace slag is waste from the steel industry; its use can be best exploited as part



replacement of sand in concrete. It can replace sand to the amount of 70 per cent in concrete mixes.

Construction demolition wastes (crushed and sieved) are basically dead mortar and concrete separated from steel, which when crushed and sieved can replace sand to the amount of 25 per cent in concrete mixes. However, this solution does not work for rapidly developing countries that lack the old infrastructure to tear up.

One of the most promising approaches is to use a substance of which there is literally an overabundance in every country: plastic. Numerous research facilities, especially in Asia, have studied using granulated, post consumer waste plastics as the aggregate in concrete. In this application, different plastics can be universally mixed with no adverse affects, heat driven re-amalgamation is not required, and early test results show the resulting product is as strong as conventional concrete mixes. India has also built a test road where plastic waste-coated aggregate is mixed with hot tar.

Besides plastic, wood and various other concrete alternatives have all been suggested but none have yet caught on in any significant way due to economic constraints. Ultimately, as sand stocks diminish and prices soar, developers will be forced to find alternatives. ↑

Above and above left: The sand mining trade in Indonesia, where small islands are believed to have disappeared as a result:

IN MACHINES WE TRUST?

Humanity is standing before a precipitously sharp upsurge in technological progress. Will AI help tackle our greatest challenges or lead to humans ceding control of the planet to computers and machines? Google's DeepMind is at the frontier of development and change.

Artificial Intelligence is absolutely everywhere. If it were more apparent in physical form, like a shiny gold C3PO clanking around behind us and making withering remarks about our decisions and actions, we'd be more aware of it. But as it stands, AI is hiding in plain sight. Or rather it's not that it's concealed, more that it's taken for granted. We use it without realising it.

Uploaded a photo to Facebook recently? Zuckerberg's giant uses AI to recognise your friends' faces. Facebook also uses AI to tailor specific content to your newsfeed, including adverts for products relevant to your interests. If you've been on Spotify or Netflix lately and followed a music or movie recommendation, it was AI that monitored your previous choices and placed them into a learning algorithm.

The last time you took a commercial flight the pilot will have used an AI assisted autopilot. Been on Pinterest, Snapchat or Instagram recently? All deploy basic forms of AI.

It is impacting our lives on a daily basis without us being overtly aware of it. It is behind the bank notice about fraud detection or an online advert predicting your next purchase. You may have chatted with an AI support bot as part of a website's customer support instant messaging service. If you use Siri, Google Now or Cortana on iOS, Android and Windows Mobile respectively, you're using AI. According to Microsoft, Cortana "continually learns about its user" and will soon anticipate users' needs.

The global legion of video game players has been using AI since they were first invented, with modern games such as 2014's *Middle Earth: Shadow of Mordor* featuring video game characters that learn behaviours and react in unpredictable ways.

Games, both on computers and board games like chess, are a core feature in the evolution of AI. Playing a leading

role in the industry is Dr. Demis Hassabis. A child chess prodigy who coded the multi-million selling simulation game *Theme Park* while still in his teens, Hassabis graduated from Cambridge University with a Double First in Computer Science before founding Elixir Studios and creating award-winning games for global publishers. He is also a five-times World Games Champion.

After gaining ten years' experience heading up successful technology start-ups, Hassabis completed a PhD in cognitive neuroscience at University College London, followed by postdocs at MIT and Harvard. His research into the neural mechanisms underlying imagination and planning was listed in the top ten scientific breakthroughs of 2007 by the journal, *Science*.

Alongside Shane Legg and Mustafa Suleyman, Hassabis then founded the British artificial intelligence company DeepMind Technologies, in September 2010. By 2014 DeepMind was swallowed up by the ever-expanding Google, which fended off rival global tech giant Facebook to win their largest European acquisition to date.

A mission statement from DeepMind reads: "By implementing our research in the field of games, a useful training ground, we were able to create a single program that taught itself how to play and win at 49 completely different Atari titles, with just raw pixels as input. And in a global first, our AlphaGo program took on the world's best player at Go – one of the most complex and intuitive games ever devised, with more positions than there are atoms in the universe – and won." Simply put, AI is vastly more advanced than we realise.

The term 'artificial intelligence' was coined by the American computer scientist pioneer and inventor John McCarthy in 1956 and was defined by him as "the science





Above:
South Korean professional Go player Lee Se-Dol (right) versus Google's artificial intelligence program AlphaGo at the game



Google DeepMind

and engineering of making intelligent machines”, but the roots of AI trace back to the classical philosophers who attempted to describe the process of human thinking as the mechanical manipulation of symbols.

This field of study eventually culminated in the invention of the programmable digital computer in the 1940s, a machine based on the abstract essence of mathematical reasoning. In 1950, the English computer scientist, cryptanalyst, philosopher and theoretical biologist Alan Turing wrote the paper *Computing Machinery and Intelligence*, exploring the notion of machines being able to simulate human beings and do intelligent things, like play chess. In the paper, Turing asked: “Can machines think?”

The world-renowned figure and subject of 2014 movie *The Imitation Game* devised a test to establish a machine's ability to exhibit intelligent behaviour equivalent to, or indistinguishable from, that of a human. The Turing test remains the benchmark

that AI research strives to pass. AI scientists aim to prove that not only can AI master and utterly surpass humans at complex games such as chess and Go, but also that AI can learn, display understanding and develop common sense.

If, or as many experts in the field would say, *when*, that happens, the implication is that if a computer can imitate the sentient behaviour of a human, then is the computer itself sentient? Beyond that a whole world of ethical debate opens up. And beyond that the almost inconceivable ramifications of when AI soars way beyond human intelligence.

Ray Kurzweil, the American author, computer scientist, inventor and futurist, and since 2012 Google's Director of Engineering, predicts just 11 more years before we see dramatic change. “2029 is the consistent date I have predicted for when an AI will pass a valid Turing test and therefore achieve human levels of intelligence,” he says, adding: “I have set the date 2045

for the 'singularity,' which is when we will multiply our effective intelligence a billion-fold by merging with the intelligence we have created."

The technological singularity is the hypothesis that the invention of artificial superintelligence will spark astronomical technological advances and subsequent incomprehensible changes to civilization as we know it. For those who think that sounds like science fiction, be aware that Kurzweil has a solid track record for accurate predictions. Of his 147 predictions since the 1990s, he claims an 86 per cent strike rate. In line with what Kurzweil refers to as human history's Law of Accelerating Returns – where more advanced societies progress at a faster rate than others because they're more advanced – he believes that the 21st century will achieve 1,000 times the progress of the 20th century.

Experts in the field of AI envision both dystopian and utopian outcomes. One of the founders of DeepMind, Shane Legg, once stated: "I think human extinction will probably occur and technology will likely play a part in this." Hassabis is aware of the potential peril that accompanies the promise but ultimately believes AI will help to alleviate poverty, cure disease and save the environment.

DeepMind states: "We're on a scientific mission to push the boundaries of AI, developing programs that can learn to solve any complex problem without needing to be taught how. If we're successful, we believe this will be one of the most important and widely beneficial scientific advances ever made, increasing our capacity to understand the mysteries of the universe and to tackle some of our most pressing real-world challenges. From climate change to the need for radically improved healthcare, too many problems suffer from painfully slow progress, their complexity overwhelming our ability to find solutions. With AI as a multiplier for human ingenuity, those solutions will come into reach."

With every new technology, there is the chance that our lives will be greatly improved or thrown into jeopardy. The technology in itself is amoral; it is those in control of the technology that we need to focus on. A scalpel in the hands of a desperate criminal can be a deadly object. In the hands of a surgeon it's a life-saving tool.

British-born BAFTA-winning producer/director Sheila Hayman, who is also a Director's fellow at MIT, does not pull any punches when it comes to DeepMind. Writing in *The Guardian*, she says: "Having met the DeepMind people in my role with the MIT Media Lab, I know that their definition of 'intelligence' is so impoverished that it doesn't extend beyond the abstract calculations that an algorithm can achieve, and completely fails

to understand that human intelligence is embodied and distributed throughout our physical selves – and indeed between them, in the mirror neurons that fire in sympathy when we watch a dancer or help an injured friend. In short, it's not just depressing, it's bad science."

Hayman continues unflinchingly, adding: "Artificial intelligence of the kind Google promotes can play Go and even – at a pinch – recognise Bach or Picasso. It can never produce Bach or Picasso, still less understand the complexity of social forms and culture that made their lives possible. If we entrust the education of those who will determine the future relationship of people and machines to a company whose core belief is that all human experience can be replicated by algorithms, all we can hope is that global warming wipes us out before the machines do."

When the topic being considered is no less serious than the future of humanity, it is unsurprisingly highly contentious and divisive. In conclusion, Hassabis says: "Recognising that there are strong opinions on the safe and ethical use of AI, and that no one team has all the answers, we're deeply involved in working through issues with wider academic and research communities. Our motivation in all we do is to maximise the positive and transformative impact of AI. We believe that AI should ultimately belong to the world, in order to benefit the many and not the few, and we'll continue to research, publish and implement our work to that end." †

Left: DeepMind founder Dr Demis Hassabis





READY FOR THE FUTURE?

With over 20 years experience in the aerospace industry, Dr Omar Hatamleh shares his thoughts on colonizing Mars and how humans will evolve

In 1969, Neil Armstrong and Edwin Aldrin became the first humans to set foot on the moon. Their mission isn't just significant for what was accomplished; it's momentous for how mankind even managed to pull it off.

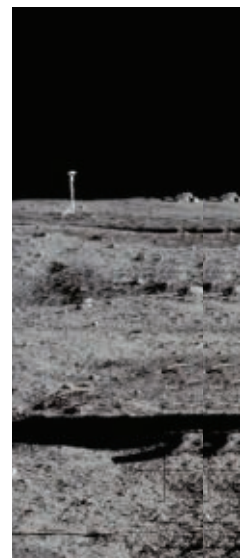
The most staggering part about the mission that put mankind on the moon? "When NASA launched the Apollo project, the whole system's computing power was less than the calculators we have right now," NASA's Chief Innovation Officer Omar Hatamleh told the recent Arab Innovation Forum. "That alone should give you an idea of the advancements we've made in such a short time."

Dr Hatamleh, who shared his considerable insights during his Innovation Through Rocket Science session at the forum, is currently on loan from NASA to the International Space University in France, where he is Director of the Space Studies Programme. He's also held the position of Associate Chief Scientist at NASA ARC and served as a member of the AI Advisory Board at Base10 Partners. He holds four engineering degrees, speaks four languages and has been a keynote speaker at several national and international events. During his 20-plus years in the aerospace industry, he has published over 33 international journal articles. Dr Hatamleh has also received several prestigious awards and recognitions from NASA.

"The real question is, how close will humans be to real cyborgs in the future?"

"If we continue this trend of reaching new heights in a short time, in about 15 years from now computation power will be equal to the human brain," he told the forum rather casually. "While something like that is big, in the larger scheme of things, it doesn't matter. Computation power is already big enough to have an impact on just about everything we're doing."

"At the same time, robotics is advancing," he added. "By 2025, we expect the robotics market to be worth \$70 billion. Because of that, in the US alone, we're anticipating about 50 million job losses by the year 2050. This isn't a new discussion. People thought the industrial revolution would be the end of a lot of jobs. Obviously, that wasn't the case. People adjusted and started getting other jobs. Losing jobs never really became an issue."



Above:
Dr Omar Hatamleh
envisioning that
humans will have
electromechanical
organs

Of course, the first industrial revolution was a long time ago and in the span of 200 years we've gone from less than a billion to 7.6 billion people populating the planet. Obviously, medicine has played a big part here but when you consider the fact that scientists and researchers are now working on rejuvenation therapies, a form of technology that can detect ageing cells and rejuvenate them to increase the average human life by about 30 years, it's safe to say that Earth is going to stay crowded for a long time. According to Hatamleh, that's not really a problem.

"We'll soon have about 10 million people, but we also have tremendous computational power and when you marry this with artificial intelligence, that's when the magic happens. In a sense, you're creating a new species here," Hatamleh said. Read that line once more if you want.

"Humans have already started adopting technology into their lives in the form of wearables. At NASA, we've developed a glove that enables you to be much stronger and do repetitive work without getting tired. We also make use of exoskeletons in space to exercise and build muscle because we don't have gravity there, but the same technology is being used to help people walk on Earth. Eventually, we're going to have electromechanical organs. The real question is, how close will humans be to real cyborgs in the future?"

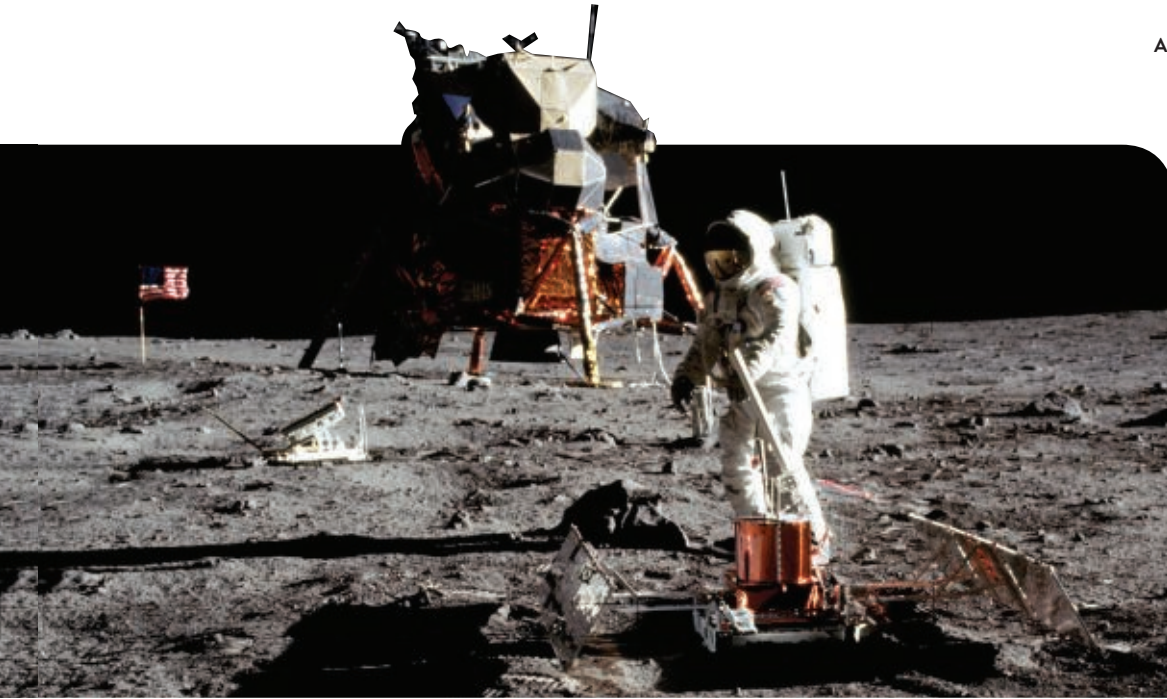
Coming back to the jobs debate, Hatamleh said: "The top 10 jobs of the future do not even exist today. We're currently preparing students for jobs that don't exist using technologies that haven't been

"I'd like to be able to encourage more and more people to take up science, technology engineering and math and groom them into future scientists and physicists"

invented yet, in order to serve products we don't know about yet."

Hatamleh believes that in the quest to be future-ready, we need to build bridges between academia, government and industry, and be able to work together so that we can produce the best skill force possible. "There is a big disconnect between companies, government and academia in terms of intellectual property but at the end, there is no use for it. Most of those things are just shelved. So before you spend all that time, effort and resources, make sure there is an alignment of sorts with the industry so that you can create new jobs out of that."

The passion in Hatamleh's voice rings clearly when he talks about getting the next generation



Left: The 1969 moon landing was astonishing accomplishment at the time

Below: An exoskeleton

ready for the future. "My biggest passion is encouraging youth to think beyond their limits," he told the forum. "I'd like to be able to encourage more and more people to take up science, technology engineering and math and groom them into future scientists and physicists."

According to Hatamleh, the main technologies – and by extension job opportunities – that will become a part of our lives over the next decade or so is robotics, 3D manufacturing, drones and the like. "The interesting thing about all these technologies is that they are not restricted to a single industry. They are synergistic across all industry lines. Nowadays, the technology you develop for one industry will most probably have implications to many others. The end usage might be different, but the technology is the same," he said. "The benefit is that instead of spending your time, effort and resources developing something, you could just partner with people from different industries and create solutions. You'll be able to do it in less time and for less money."

Thinking innovatively is key if you want to be future-proof, according to Hatamleh, who explained why NASA was so interested in innovation. "We have a lot of challenges. One of them is going to the moon again and another is establishing a permanent base on Mars. These are very challenging endeavours. To do that we have to constantly think innovatively to cope with

the limited funding that we have and the challenging technologies we need to develop."

The Mars mention there was no accident. Asked what he thought about the UAE's own Mars mission, Hatamleh replied: "I understand that the UAE is making a lot of progress and sending a probe to Mars in the near future. Sending people to Mars is going to be the biggest challenge here. You have a lot of risk and issues you have to deal with while sending a person to Mars. It'll start with the atmosphere. Mars' atmosphere is very light. You can't deploy a parachute so the landing is going to be challenging. Once you land, there are problems like radiation, food supply, communication, medical emergencies and the dilemma of producing enough fuel should you want to come back."

Yes, there are obstacles but that's not to say Hatamleh is pessimistic about the UAE's chances of pulling off the feat. If anything it's the contrary. Hatamleh recognises the UAE as a catalyst for innovation. "Innovation is a very difficult thing to do because there are always so many constraints and so many roadblocks. One of the things that has made this nation successful and one of the most innovative is the leadership. The leadership enables people to be successful at what they do. Once you create an environment where you encourage things to take place, magic will follow. And so far it has." ↑



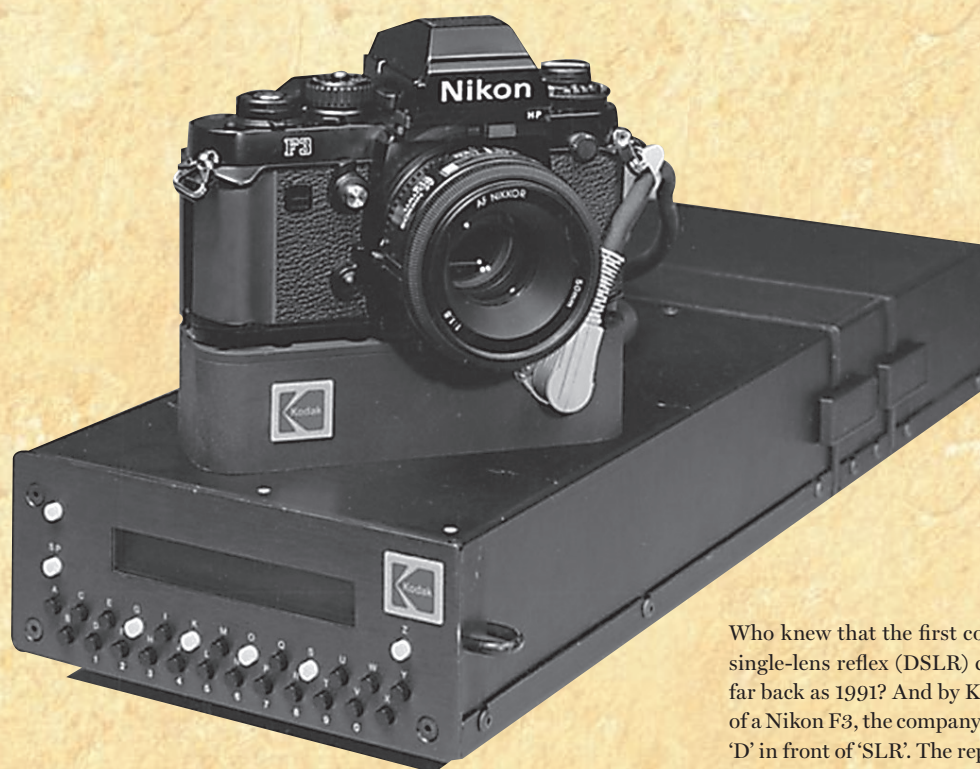


EXPLORE

BACK TO THE FUTURE



It's hard to predict what will change the world and in what ways. Many innovations that promise much lead only to dead ends, while others that at first seem futile or unnecessary go on to help in the furtherance of humanity. We look at five major innovations that, over the course of the past 25 years, have changed the world we live in and our understanding of it.



Kodak Digital Camera System [1991]

The system could cost up to \$25,000 and the camera's newly invented KAF-1300 CCD sensor provided 1.3 megapixels of resolution

Who knew that the first commercially available digital single-lens reflex (DSLR) camera had been released as far back as 1991? And by Kodak? Built around the body of a Nikon F3, the company's DCS was the first to put the 'D' in front of 'SLR'. The repercussions, both for photography and for the New York-headquartered Kodak itself, would be enormous.

The DCS's predecessor had initially been prototyped at the Kodak Research Labs in the spring of 1987, with numerous problems having to be ironed out before launch. When it was eventually released to the market, Kodak gave the DCS a retail price tag of between \$20,000 and \$25,000. A total of 987 units were sold.

"The Kodak Digital Camera System was a family of all-digital SLR cameras," explains Dag Spicer, Senior Curator at the Computer History Museum in California. "The first model in the family, the DCS-100, coupled a high-resolution sensor array to a stock Nikon F3 SLR camera body and was introduced in 1991. A separate shoulder-carried computer and storage unit were connected to the camera and had to be carried around with it. The system could cost up to \$25,000 and the camera's newly invented KAF-1300 CCD sensor provided 1.3 megapixels of resolution, enough for decent five-inch by seven-inch prints – a first.

"While professional photographers and photojournalists were not entirely convinced by the DCS-100's capabilities, most preferring to keep using traditional film cameras, this was the first salvo in a coming sea change in how the world kept its memories. While Kodak is but a shadow of its former self, there are still plenty of 'Kodak moments' to be had. Like it did with its Brownie camera in the 1900s, Kodak once again revolutionised the photo industry with the DCS-100."



Mosaic XS Web Browser [1993]

The first web browser that was properly tested, supported and easy for non-geeks to install

Internet browsers are ubiquitous in the modern age but prior to 1993 these software applications, which enable the Internet's kaleidoscope of images and text to be presented to the world in a coherent form, were still in the early stages of development. The first was created in 1990 by Sir Tim Berners-Lee, the father of the worldwide web, but Berners-Lee's browser and those that followed were largely limited to the field of research.

That all changed with Mosaic. It was the first browser to be supported by a major institution and was modelled on earlier Viola and Midas browsers. It also used the European Organisation for Nuclear Research's (CERN) code library, was reliable, could be installed by amateurs and added colourful graphics within web pages instead of in separate windows.

"It was written in early 1993 by brilliant student Marc Andreessen and unix expert Eric Bina at the National Center for Supercomputing Applications (NCSA)," wrote Marc Weber, Curatorial Director of the Computer History Museum's Internet History Program, on the 25th anniversary of the worldwide web back in 2014. "At first it sounded like little more than a me-too browser in the model of Viola and Midas. But NCSA had been a major site in the 1980s' expansion of the Internet, and had created and distributed the most popular program to run over the Internet so far, NCSA Telnet.

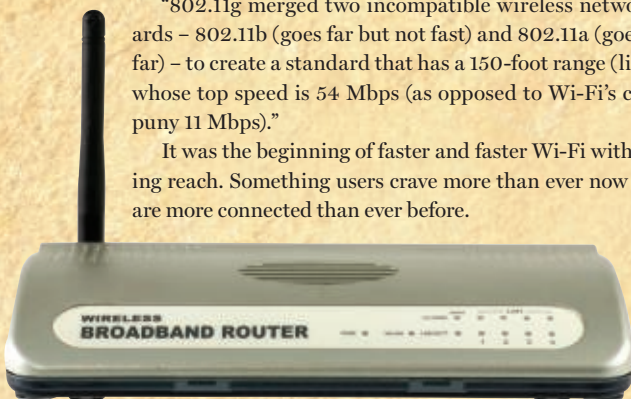
"Recognising the web's potential, NCSA software manager Joseph Hardin quickly assembled formal teams for unix, Mac and PC browsers, as well as a server, and he and NCSA director Larry Smarr turned the ignition key on the institution's formidable support and PR machines. The result? The first web browser that was properly tested, supported and easy for non-geeks to install. Like the Viola and Midas browsers it was modelled on, Mosaic left out editing; you could browse web pages but not change them. But Berners-Lee was confident that could soon be added back."

We all take Wi-Fi for granted now but prior to 2003 no single wireless transmission standard had either the range or the speed to handle our growing appetite for connectivity. Up stepped the numerically named but highly praised 802.11g. It was widely adopted, even before ratification, thanks largely to the public's demand for higher data rates and lower costs.

As John Hersey wrote in a 2003 end-of-year review for *Popular Science*: "Wi-Fi (aka 802.11b) was everywhere you turned, with hot spots spreading like kudzu in cities and towns across the nation. As if this mass proliferation weren't enough of a boon to wireless bandwidth hounds, the Institute of Electrical and Electronics Engineers (IEEE) certified a new standard – 802.11g – that dramatically improves performance yet is backward-compatible with existing Wi-Fi equipment (though you need 'g' equipment on both ends to realise the speed gains).

"802.11g merged two incompatible wireless networking standards – 802.11b (goes far but not fast) and 802.11a (goes fast but not far) – to create a standard that has a 150-foot range (like Wi-Fi) but whose top speed is 54 Mbps (as opposed to Wi-Fi's comparatively puny 11 Mbps)."

It was the beginning of faster and faster Wi-Fi with ever expanding reach. Something users crave more than ever now that our lives are more connected than ever before.



IEEE 802.11g Wi-Fi [2003]

The beginning of faster and faster Wi-Fi with ever expanding reach



»» SpaceShipOne [2004]

The beginning of privately-funded space flight and what many people believed would be a new space age

On October 4, 2004, test pilot Brian Binnie flew to an altitude of 367,442 feet above the Earth's surface, reaching the boundary of space. It was, along with Mike Melvill's flights in the same space plane earlier in the same week, the beginning of privately-funded space-flight and heralded what many people believed would be a new space age.

Binnie flew in SpaceShipOne, a space plane designed and built by Scaled Composites, a company owned by aerospace designer Burt Rutan and financed by Microsoft co-founder Paul Allen.

The flight itself was the end result of a race to win the Ansari X Prize, in which the X Prize Foundation – a non-profit organisation that designs and creates competitions that encourage technological development – had offered \$10 million to the first non-government organisation to launch a re-usable manned spacecraft into space twice within two weeks.

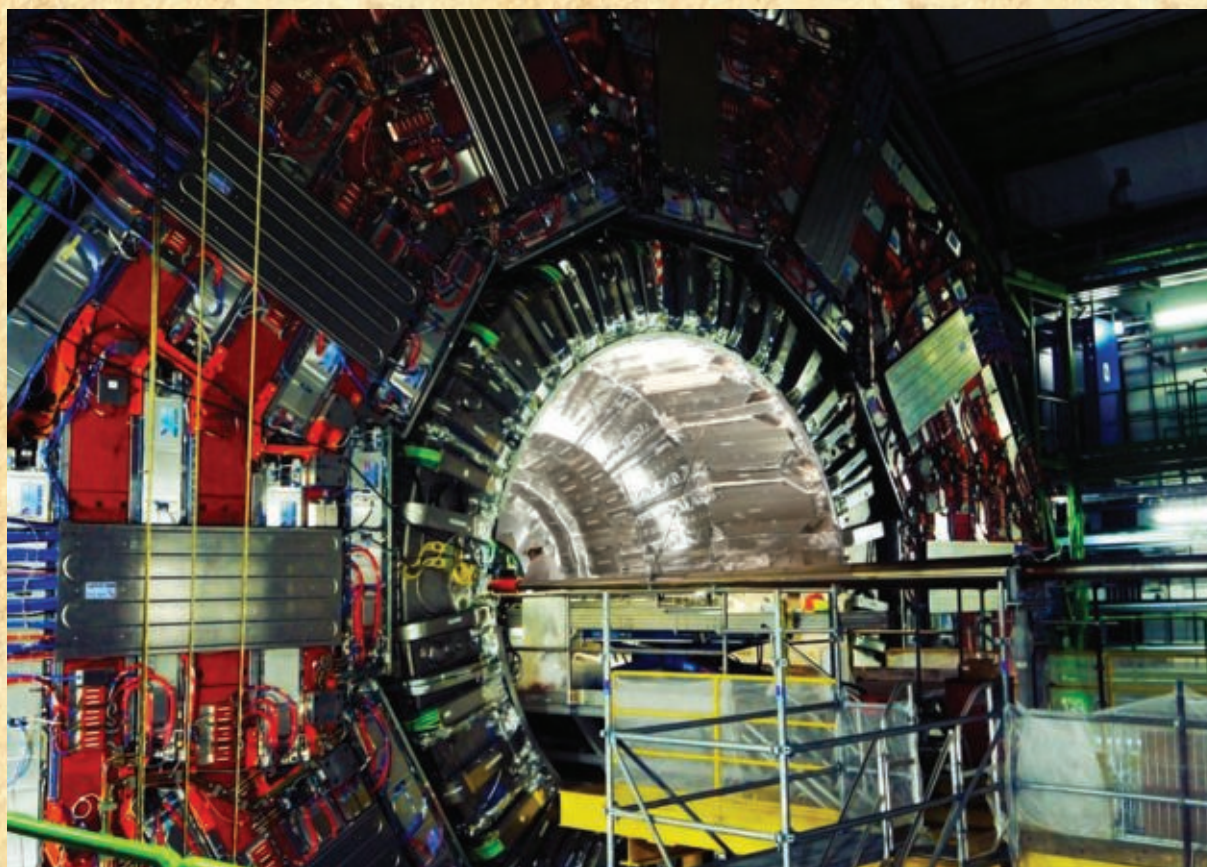
SpaceShipOne's success was a feat that drew worldwide attention and revealed that private enterprise could indeed cross the threshold into human spaceflight. It was, however, a feat that is yet to be repeated.

"I think everybody's a little shell-shocked that ten years later, the achievement has not been repeated by Virgin Galactic or Blue Origin – or by any of the other teams vying for the Ansari X Prize in the first place," said Binnie on the 10th anniversary of SpaceShipOne's flight. "That being said, it just goes to show you how persnickety some of the technology is in this arena. No one can afford an accident, so if there are any doubts, the schedule takes a hit.

"But I believe we are getting closer and closer. It's easy to be a pessimist, to say, 'It will never happen, private industry doesn't have the money to pull it off'. I take the other view. I believe that in five years, Virgin Galactic, XCOR and Blue Origin will have competing operations that serve wealthy customers. In ten years, your children or grandchildren will know that they will be able to go into orbit in their lifetime. And in 25 years, there will be destinations to travel to other than the International Space Station."

"The technology is already in place – it just needs a bit more testing. There needs to be confidence in the reliability, the robustness and ultimately the reusability of the systems. If you are going to make commercial space travel affordable, you can't keep throwing away half your vehicle every time you fly it."

SpaceShipOne now hangs in the Smithsonian National Air and Space Museum in Washington.



Large Hadron Collider [2008]

Launched in 2008, the LHC discovered the elusive Higgs boson, which was first suspected to exist in the 1960s

Trying to explain what the Large Hadron Collider (LHC) does and why it is important in simple English is not an easy task. Even scientists have problems.

The world's largest and most powerful particle accelerator, the LHC is situated in the CERN laboratory, in Switzerland, and fires particles around a 17-mile underground tunnel, smashing them together at nearly the speed of light. Why? To try and decipher the mysteries of the universe.

By colliding protons at ultra-high energies and allowing scientists to observe the outcome, the LHC hopes to open new frontiers in understanding the structure of space and time, the microstructure of matter and the laws of nature.

Launched in 2008, the LHC has already discovered the elusive Higgs boson, which was first suspected to exist in the 1960s. The Higgs boson's confirmed position in the Standard Model of physics proved the existence of an invisible process that performs the fundamentally important role of giving all other particles their mass or substance.

Now, having re-launched in 2015 after a two-year programme of maintenance and upgrading, it is hoped that the LHC's increased capability will reveal the identity of 'dark matter'. It is estimated that dark matter makes up 80 per cent of the universe and yet none of it has been directly observed. Its existence is inferred only via its gravitational pull on visible matter.

"The most exciting thing is we really don't know what we are going to find," admits Rolf Landua, a research physicist and head of CERN's Education Group. "The most important thing that we would like to find is a new type of particle that could help to explain what this mysterious dark matter is."

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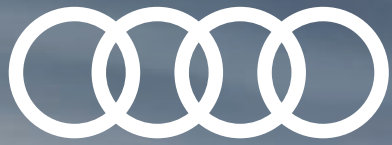
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