FLASHES

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

OCTOBER 2016
ISSUE 22

#2016YearOfReading

Accelerating into the future

Dubai is using the accelerator model to boost the UAE's innovation credentials



INTERNET AND MEMORY
Is the World Wide Web throttling our natural thought processes?

THE ELUSIVE SAND CAT
Spotlight on the UAE's conservation efforts

PEAK PERFORMANCE
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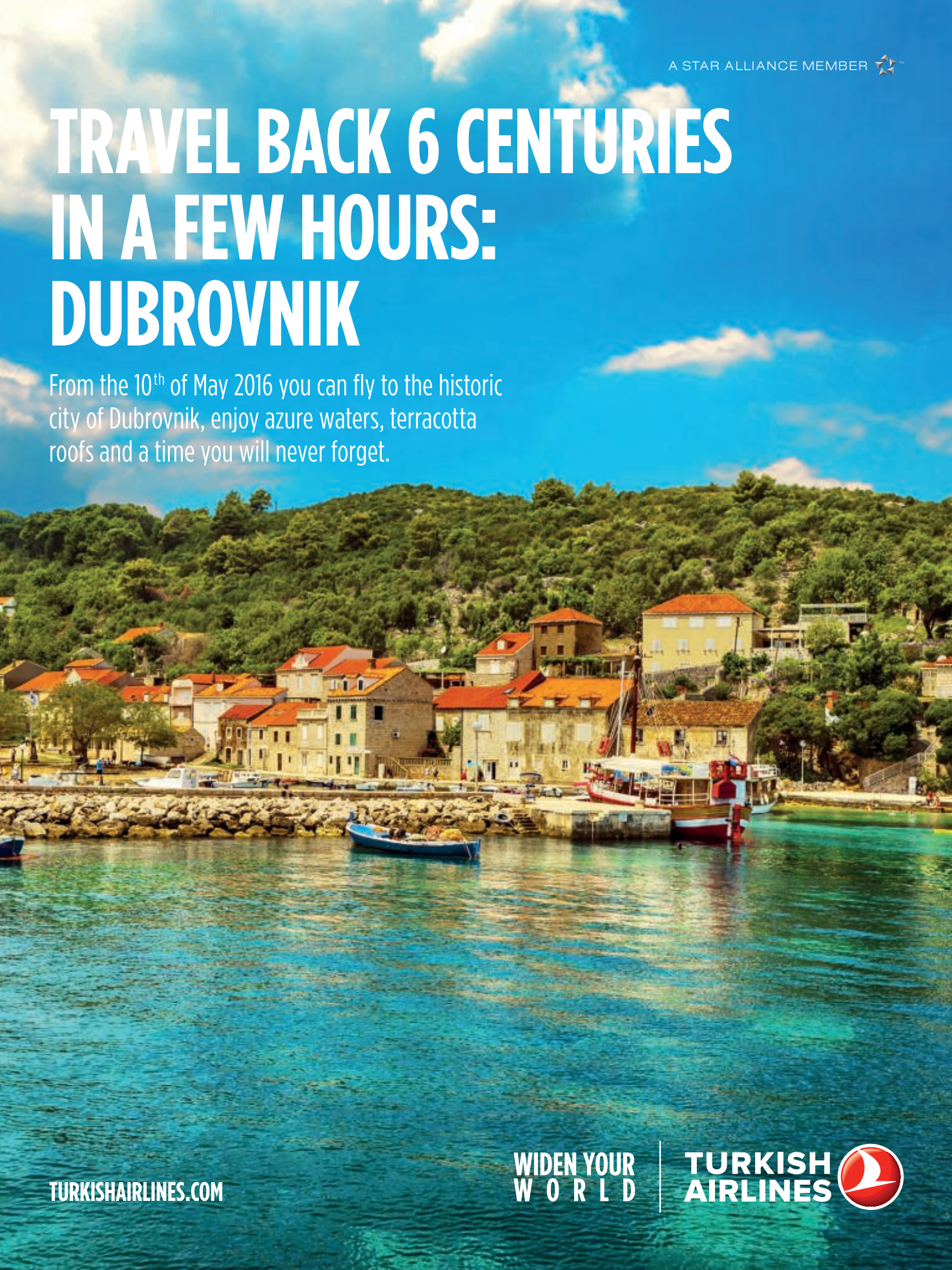
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TRAVEL BACK 6 CENTURIES IN A FEW HOURS: DUBROVNIK

From the 10th of May 2016 you can fly to the historic city of Dubrovnik, enjoy azure waters, terracotta roofs and a time you will never forget.



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FOREWORD

Dear readers,

Nobody can know the future, but through analysis of current trends, innovations and technological developments one can attempt to predict it. The UAE and Dubai's success has been largely due to the efforts of its wise and forward-looking leadership that has implemented plans such as UAE Vision 2021 and Dubai Plan 2021 that are firmly aimed at the future. In the words of His Highness Sheikh Mohammed Bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, "The future does not wait for those who hesitate".

It is therefore fitting that the Mohammed bin Rashid Al Maktoum Foundation's (MBRF) third annual Knowledge Summit is entitled "Knowledge... Present and Future". One of the key focus areas of this event, which will be held in Dubai from December 5-7, is the concept of future foresight. Future foresight is about formulating strategies to not only predict the future, but to also have a hand in shaping it, something that Dubai has been particularly successful at.

This is highlighted by the tremendous response to the Dubai Future Accelerators programme launched by HH Sheikh Hamdan Bin Mohammad Bin Rashid Al Maktoum, Crown Prince of Dubai and Chairman of the Dubai Executive Council. This initiative received 2,274 applications from 73 countries, and the goal as set by HH Sheikh Hamdan "is to transform the city of Dubai into a global test bed for leading ideas and technologies". This focus on the future is central to the UAE's National Innovation Strategy, which is a primary tool to achieve Vision 2021 and a diversified economy based on knowledge and innovation.

The UAE is currently ranked first among Arab countries and 41st worldwide in terms of overall performance on the 2016 Global Innovation Index, a six place improvement on the previous year. Thanks to initiatives such as the above, the UAE is well on its way to becoming one of the world's most innovative countries.

In the words of HH Sheikh Mohammed bin Rashid Al Maktoum, "The future belongs to those who can imagine it, design it, and execute it. While others try to predict the future, we create it".

Jamal Bin Huwaireb
MD of Mohammed Bin Rashid
Al Maktoum Foundation

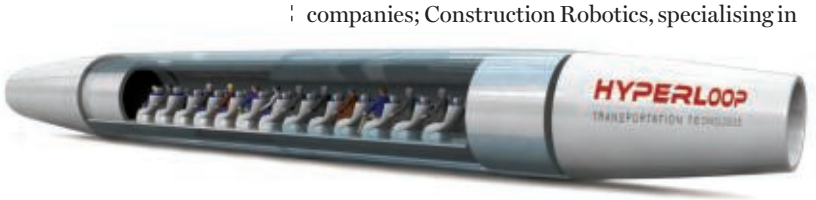


AED1bn for Dubai Future Accelerators' Projects

His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, has directed the relevant authorities to invest one billion dirhams on projects and companies taking part in Dubai Future Accelerators – the ambitious programme launched to advance research and development, as well as entrepreneurship in strategically important sectors in the UAE.

The Dubai Future Accelerators programme recently shortlisted 30 companies among 2,274 applications from 73 countries. The 30 companies will work with seven government authorities over a 12-week period to develop and test their products and solutions.

The list of finalists chosen to take part in the first round of the programme includes Hyperloop One, which is developing a superfast transportation system; Next Future Transportation, specialising in mass-transit solutions and self-driving vehicles; Concensys, the world's largest software provider for app developers and Blockchain companies; Construction Robotics, specialising in construction solutions that increase productivity five-fold; and Honeywell, the Fortune 100 company working on developing advanced digital systems for the healthcare sector.



The Dubai Future Accelerators programme comprises three rounds every year, with each round lasting three months. The initiative provides training programmes for participants to learn about business development and prototyping, as well as to create pilot projects for Dubai. By the end of the programme, participants are given the tools to build a profitable business model, in cooperation with the relevant government entities and global experts.

The Dubai Future Accelerators initiative has been gaining international attention since its launch, as highlighted by the huge number of entrants. The Dubai Future Accelerators initiative works first and foremost to create an integrated programme to enhance the performance of local, regional, and global emerging companies operating in the field of future technology within key innovation-led sectors. It will also help expand and facilitate the framework of global cooperation in the field of innovation by creating an outstanding platform for start-ups, in collaboration with relevant government institutions, and providing solutions to the biggest challenges of each sector.



Comprehensive Plan to Overhaul Public School Education

His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, has approved a comprehensive new plan to overhaul public school education in the UAE.

The plan, which was developed by the Ministry of Education, will revise the curriculum, enhance skills, introduce new subjects and streams, further enrich learning and enhance the evaluation systems both for schools and students.

The new curriculum will cover technology, innovative design, health sciences, career guidance, general skills and business management. Furthermore, a special 'Elite' stream designed to nurture gifted students will be introduced.

As part of the new plan, the curriculum will gradually be made bilingual and has a specific focus on deepening the students' national identity and building their critical thinking and innovation skills, as well as developing teamwork and problem solving capabilities using innovative information and communication technology.

The new comprehensive development plan also includes the development of a training centre focused on developing teachers' skills in line with current international standards.

HH Sheikh Mohammed said: "We are counting on the teachers and the Ministry of Education to help school education make a great leap forward. We look forward to developing a new generation of students that is equipped to use the tools of the future." م



The curriculum for public schools is being changed to include new subjects to increase critical thinking, innovation skills and teamwork



PLANNING FOR THE FUTURE

The third annual Knowledge Summit will convene under the title of "Knowledge... Present and Future"

HE Jamal bin Huwaireb, Managing Director of MBRF, announced that future foresight would be a key area of the Knowledge Summit 2016

Under the patronage of His Highness Sheikh Mohammed bin Rashid Al Maktoum, UAE Vice President and Prime Minister and Ruler of Dubai, and under the directives of His Highness Sheikh Ahmed bin Mohammed bin Rashid Al Maktoum, Chairman of the Mohammed bin Rashid Al Maktoum Foundation (MBRF), the Foundation announced the details surrounding its third annual Knowledge Summit, which will take place on December 5–7 at the Grand Hyatt Dubai hotel.

One key area that the Knowledge Summit 2016 will focus on is the concept of future insight. Most developed nations are currently focused on the future by formulating strategies to predict that future and, if possible, have a hand in shaping it. The UAE has been very active in that regard as evidenced by it continuous growth and success.

His Excellency Jamal bin Huwaireb, Managing Director of MBRF, explained: "Shaping the future is no small undertaking. To achieve it, we must first understand it and then dedicate all present and future resources to it. We must embrace innovation as a path towards success, and invest in the development of creative minds. We must also learn from other nations' experiences and achievements in this regard and develop a clear, concise, and forward-looking vision."

This will be facilitated by a body of high-ranking international decision makers, ministers, senior officials, academics, and specialists who will share their insights, expertise, and success stories in this regard. The Summit will also highlight Dubai's unique experience in the process of shaping the future, as well as the future of sectors that are vital to the development of countries – most notably reading – which forms the cornerstone for knowledge and is a field MBRF is particularly active in.

HE Bin Huwaireb commented: "Knowledge is a true cornerstone when it comes to building societies. It is the main pillar that supports a

nation's progress, its sustainable development, and the welfare of its people. It is the only true wealth that we need to invest in if we want to establish the UAE's stature among the advanced nations of the world. It is the sector we need to pay the most attention to if we want to develop our societies, and eventually turn them into productive, intelligent, and creative communities that are able to achieve comprehensive development."

He added, "The Mohammed bin Rashid Al Maktoum Foundation carries on with its tradition of launching creative initiatives and projects; initiatives that serve as platforms, gathering experts and pioneers in the field of sharing knowledge to not only discuss pressing issues in this area, but to also propose solutions to face the challenges. The foundation brings yet another edition of the Knowledge Summit to shed light on the latest developments and methodologies in knowledge production and dissemination in the Arab region."

The Knowledge Summit 2016 will also unveil the results of a new 'Reading Index' in collaboration with the United Nations Development Program (UNDP). This effective tool tracks knowledge-related initiatives and measures their impact on communities in the Arab region in the "biggest and most scientific" survey of its kind. The results will be based on field work, as well as an online survey that aims to reach at least 20,000 people. The Reading Index will replace speculation about Arab reading habits with concrete facts. According to HE Bin Huwaireb the Index embodies MBRF's belief in the "unequivocal role" that reading plays in the process of acquiring knowledge and complements other initiatives undertaken by the UAE's leadership, such as the Year of Reading 2016 and National Strategy for Reading.

Khaled Abdel Shafi, Director of the Regional hub of the United Nations Development Program (UNDP), underlined the importance of the partnership with the Mohammed bin Rashid Al Maktoum Foundation, lauding the numerous initiatives of the Arab Knowledge Project, as well as the Arab Reading Index – the results of which, Abdel Shafi hoped, will pave the way for an encompassing and visionary strategy that promotes reading and becomes key in building a knowledge-based Arab society.

The Summit will also explore the current status of reading in the Arab world as measured against international indices and, in a dedicated session,



provide an analytical overview of the results of the Arab Reading Index. Meanwhile, another session will examine the potential of current initiatives to develop the state of reading in the Arab region and to spread a reading culture among the youth and the rest of society – a special focus will be placed on the Arab Reading Challenge initiative and the role it plays in reconciling the young generations with reading.

Furthermore, the conference aims to highlight the role that future-focused policies could play in spreading tolerance and open-mindedness, and in building bridges between cultures. The sessions will also examine the "media of the future" concept and the role it can play in forming individual personality, as well as the influence that social media can wield on its traditional counterparts. The media's potential to shape public opinion and change a society's customs will be studied in another session.

As with all previous editions, the 2016 summit will feature the Mohammed bin Rashid Al Maktoum Knowledge Award, which honours individuals and institutions who've made notable contributions to the dissemination and production of knowledge around the world. A spectrum of events and workshops will also be organised on the sidelines of the summit – most important of which will be the University Fair and a group of specialised workshops. ٢

MBRF AND DUBAI PUBLIC PROSECUTION EXPLORE PROSPECTS FOR COOPERATION





MBRF met with the Dubai Public Prosecution to further enhance the 'Year of Reading'

The Mohammed Bin Rashid Al Maktoum Foundation (MBRF), a member of the Mohammed Bin Rashid Al Maktoum Global Initiatives, met with the Public Prosecution in Dubai to discuss cooperation between the two parties.

These efforts reflect the 'Year of Reading' initiative launched by His Highness Sheikh Khalifa bin Zayed Al Nahyan, President of the UAE, and serve to strengthen the strategic partnership between the two institutions.

The meeting was attended by His Excellency Jamal bin Huwaireb, Managing Director of MBRF; Counsellor Ahmed Mohammed Al Hammadi, Senior Chief Prosecutor and head of the Year of Reading Support Group at the Public Prosecution; and heads of departments at MBRF.

His Excellency Jamal bin Huwaireb commented that the Foundation wants to strengthen cooperation between all government entities in the UAE in order to achieve its objectives in the knowledge field through the optimal management of resources, as well as partnerships with various entities to launch initiatives and organise specialised forums that aim to create a supportive institutional culture for the exchange of knowledge.

Through its partnership with Dubai Public Prosecution, MBRF seeks to exchange the knowledge-related resources available between the two parties, and create a synergy that will support the Foundation's initiatives, programmes, and projects pertaining to the knowledge management field.

The Foundation and the Public Prosecution will also work together to consolidate their efforts to support Arabic content by launching knowledge-related products, such as translated books and material, as well as by organising cultural events that are of mutual interest for both parties. The Foundation will support the Dubai Public Prosecution in the fields of science, culture, education, and knowledge in general.

CELEBRATING THE ACHIEVEMENTS OF EMIRATI WOMEN

The Mohammed bin Rashid Al Maktoum Foundation (MBRF) held a special ceremony on August 28 to mark the occasion of Emirati Women's Day, which is an annual event since last year.

The event took place during the 'Reading is Positive Energy' exhibition in Dubai's Zabeel Park, which was attended by a number of prominent Emirati women – particularly from the government sector – in addition to journalists, poets, and social media figures from the UAE.

The celebration began with a panel discussion that included prominent figures of Emirati media, as well as creative Emirati women. The panel shed a light on the current status of women in local and Arab media, as well as on Emirati pioneers in the field. The event also included a poetry night, and a second panel discussion by social media pioneers, which included a number of Emirati female social media celebrities.

His Excellency Jamal bin Huwaireb, Managing Director of MBRF, said: "Emirati women have made their mark on various sectors in the economy, proving their ability to innovate and make wise decisions along the way. This makes them strategic partners in the quest for sustainable development in the UAE."



MBRF held a special event to celebrate the contributions of Emirati women

Two exhibitions were held on the sidelines of the ceremony; the first featured home-made products by Emirati housewives, which visitors could buy. The second exhibition, showcased paintings made by talented female Emirati fine artists, whose works reflect the culture and society of the UAE.

MBRF EXPANDS REACH OF ITS "MY FAMILY READS" INITIATIVE

A large number of government and private agencies have joined the "My Family Reads" initiative according to the Mohammed bin Rashid Al Maktoum Foundation (MBRF).

This initiative was launched in 2014 to spread culture and promote reading among all segments of society and family members in the UAE.

His Excellency Jamal bin Huwaireb, Managing Director of the Foundation, said that MBRF activated and expanded its initiative in order to keep up with the aspirations of the UAE with regards to reading and spreading knowledge in society. His Highness Sheikh Khalifa bin Zayed Al Nahyan, President of the UAE, had announced that 2016 would be the "Year of Reading" where communities in all seven emirates are encouraged to adopt reading as a daily habit.

HE bin Huwaireb also gave credit for the initiative to His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, who had expressed a clear vision that underlined the importance of reading and the need to promote it in order to raise the level of knowledge among Emirati families and the general public in the UAE.

The Foundation has responded by reaching out to government and private agencies to help with disseminating knowledge, and to update the distributed packages to include a wider variety of books that will appeal to all family members.

The initiative has had a wide reach since its launch, and has been warmly received by individuals and families that received its packages – a collection of 20 books from around the world, including classics and best-selling titles, selected according to the Foundation's criteria. These books – translated into Arabic – discuss topics such as history, world heritage, issues concerning the family, administration, the art of dealing with everyday issues, in addition to books for children and young people.

ACCELERATING INTO THE FUTURE

Dubai is using the accelerator model to boost the UAE's innovation credentials





Illustration: Sanil Sadanandan

Roads and Transport Authority

Prototype automated transportation systems that cut congestion by

20%

and reduce CO_2 emissions by

30%

across all modes.

Dubai Police

Test integrated behavioural, genetic and biological systems for identifying, tracking and sharing information on criminals that are

10

TIMES

more accurate and 10 times more efficient.

Dubai Municipality

Test automated, recycled, and nature-inspired building systems that use three times less energy and CO_2 and are

5

TIMES

more effective (including robotics, automation, bacteriological, mycology, algae, biomimicry, regenerative systems, sand-based 3D printing materials, and others).

Dubai Health Authority

Harness Dubai's remarkable genetic diversity to enhance diagnostic speed and effectiveness by a factor of

10

(using genomics, analytics, telepresence and personalised medicine).

The accelerator model has been a key part of the start-up and entrepreneurial scene for more than a decade.

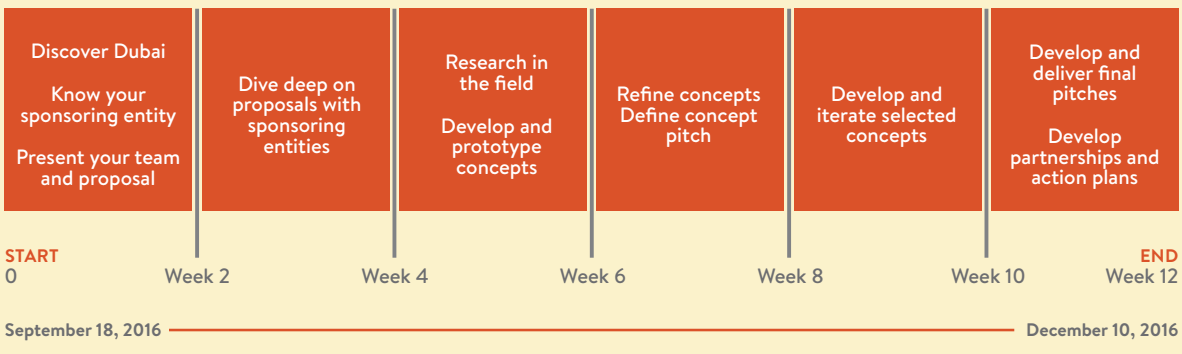
In the United States, Y Combinator, an accelerator founded in 2005, has invested in more than 1,000 start-ups with a combined value estimated at $65bn. Among them, file storage site Dropbox, holiday rental site Airbnb and social news site Reddit.

Twice a year the company invests around $120,000 in a large number of start-ups (107 most recently) and invites them to move to Silicon Valley for three months for a programme designed to refine their company and pitch for investors. Each cycle culminates in a demo day where companies present their ideas to an invite-only audience.

Inspired by the success of these programmes, many of which are based in US start-up hub Silicon Valley, government bodies have been looking at the accelerator model with increasing interest to address their own innovation challenges.

THE SCHEDULE

Six extensive sprints designed to help you arrive at a project ready for development





Dubai Electricity and Water Authority

Reduce water and energy consumption by a factor of

10

and increase production and distribution efficiency through the use of renewables, intelligent and automated systems, biological solutions and other means.



Dubai Holding

Deploy digital solutions across the hospitality, food and beverage, and real estate sectors that reduce paperwork and the need for human intervention by a factor of 10, increase transaction speeds by a factor of

20

and increase customer engagement by an order of magnitude (including Blockchain, digital personalisation, robotics, augmented and virtual reality).



Knowledge and Human Development Authority

Prototype 21st century assessment systems and personalised learning solutions that work across curriculums to offer five times greater flexibility, two times lower cost, and

10

times better learning outcomes (with an emphasis on Arabic language education, STEM, wellbeing, coding, and other disciplines).

In July, Dubai took the model one step further. In a major announcement, Sheikh Hamdan bin Mohammed bin Rashid Al Maktoum, Crown Prince of Dubai and Chairman of Dubai Executive Council, launched the largest accelerator for government services in the world.

"The Dubai Future Accelerators (DFA) is the most ambitious programme in the world. It is designed to link our most powerful and influential government leaders with the world's most ambitious companies and entrepreneurs to create radical new solutions to change the world," said Mohammad bin Abdullah Al Gergawi, Minister of UAE Cabinet Affairs and The Future, and Vice Chairman of the Board of Trustees and Managing Director of Dubai Future Foundation.

The AED1bn ($272m) Dubai Future Accelerators programme envisions prototypes incorporating Artificial Intelligence (AI), robotics, automated transportation, 3D printing, and biotechnology eventually being deployed citywide, crafting a thriving ecosystem for start-ups and entrepreneurs in the process.

But rather than just giving an insight into the future, the programme aims to solve the challenges of today with the backing of seven founding government entities.

"The challenges represent some of the most urgent issues facing cities in the 21st century. They also represent some of the most cutting-edge opportunities to address them," said Al Gergawi.

Selected applicants will be required to work with each entity to address a specific challenge.

SELECTING THE BEST AND THE BRIGHTEST

Since the unveiling of Dubai Future Accelerators in July, the response has been impressive. Entrepreneurs, innovators, SMEs, venture capitalists and even fellow accelerators like Y Combinator have taken notice, according to Dubai Future Foundation CEO Saif Al Aleeli, who is overseeing the project.

On August 16, DFA revealed it had received applications from more than 22,000 companies in more than 73 countries from across all seven continents, including one submission from scientists in Antarctica. This made it one of the largest and fastest growing submission programmes in the world.

The next challenge will be selecting the best and the brightest from this huge applicant list, with an eye to finding the next start-up success stories. Just 35 positions are available on the programme, meaning less than two per cent of applicants will be accepted to take part, similarly to accelerator programmes in Silicon Valley.

"Those lucky enough to be selected will get to experience firsthand how readily we can move mountains together, how quickly we create change,



Above: The Dubai government is seeking to position the emirate as an innovation centre

Below: Autonomous Vehicles are a significiant part of Dubai's Future Agenda

and how anything is possible. Let it start here in Dubai, but let it touch the entire world," Al Gergawi said.

Those that do make it through the application process, vetted by an expert committee of specialists, will be flown to Dubai to test their technologies over a 12-week programme beginning on September 12.

Creative workspace, a prototyping lab and dedicated mentors and partners will be provided along with access to $2m of venture capital per month. But unlike the big accelerators in Silicon Valley, successful applicants will not be required to hand over any equity in their business.

During the process, they will spend time presenting their team and proposal, getting to know their sponsoring entity, perfecting the idea, performing research and developing prototypes, before preparing and developing a final pitch.



This will culminate in the final two weeks ending December 10 where they will present their ideas.

According to DFA, the goal will be to first test, and then scale the programme's seven challenges across the city and region, making Dubai into an emerging centre of global innovation.

AN AGENDA FOR INNOVATION

DFA is the latest step in the emirate and the UAE's path to embracing innovation and becoming a knowledge-based economy. In October 2014, His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai, launched the UAE's National Innovation Strategy with the aim of making the country one of the most innovative nations in the world within seven years.

Following this, the UAE designated 2015 as its 'year of innovation' as part of the Vision 2021 National Agenda to transition to a knowledge-based economy, promoting innovation, research and development.

DFA itself is also part of the wider Dubai Future Agenda, which envisions the emirate becoming the most innovative city in the world through initiatives in areas including 3D printing, autonomous transport and database technology Blockchain.

On top of the obvious economic benefits borne from being a globally recognised innovation centre, among the emirate's key goals are to boost the UAE's ranking on the Global Innovation Index, co-published by Cornell University, INSEAD, and the World Intellectual Property Organisation.

The annual report ranks 128 countries based on 82 sub-indices measuring innovation in relation to economic growth. In recent years the UAE has seen its ranking alter quite considerably,



dropping from 36th in 2014 to 47th last year, before regaining six places in the most recent index to rank 41st in 2016.

It is now the number one ranked economy for innovation in the Arab world, standing first globally for cost of redundancy dismissal, ease of paying taxes, tertiary inbound mobility and state of cluster development, in this year's index.

The country also jumped from 105th to 55th for investments, 73rd to 32nd for market capitalisation, 51st to 20th for total value of stock traded and 48th to 34th for venture capital deals.

However, the UAE still lags behind in several areas including high-tech exports (111th), scientific and technical articles (106th), ease of getting credit (81st), tertiary enrolment in education (89th) and creative goods exports (121st).

To improve its ranking and jostle with this year's top five, comprising Switzerland, Sweden, the United Kingdom, United States and Finland, improvement will be needed in these and other areas.

Speaking after the report's release, Minister of Economy Sultan bin Saeed Al Mansouri said knowledge innovation contributed an estimated 3 per cent to the UAE's GDP.

By 2021 the country hopes to raise this to 5 per cent through 12 initiatives and 39 projects designed to boost the knowledge economy.

"The UAE has all the opportunities and potential to achieve leaps in the field of innovation by adopting and implementing new technologies and standards such as the Internet of Things, a long-term 3D printing strategy, and an inclusive knowledge, and innovation-based manufacturing strategy," Al Mansouri said.

DFA and other similar initiatives will surely go a long way in making this goal a reality.



USING INNOVATION TO SOLVE REAL-WORLD ISSUES

Although Dubai's ambition to solve these very real challenges may seem ambitious, it is reflective of a wider trend where government bodies and charitable organisations are seeing start-ups as the key to solving real-world problems.

In the same month DFA was launched, the World Food Programme (WFP) launched its Innovation Accelerator designed to explore projects that will help to achieve the goal of eliminating world hunger by 2030.

At its launch the WFP said it was supporting more than 12 innovation projects across 10 countries and working with more than 100 internal WFP and external entrepreneurs to explore new approaches, technologies and partnerships.

Start-ups involved in the programme include AgriUP, a low bandwidth smartphone app to provide location-specific information on market prices, weather and farming methods to smallholder farms and the ShareTheMeal app to enable users to provide a hungry child with a meal with a tap of their device and a $0.50 donation.

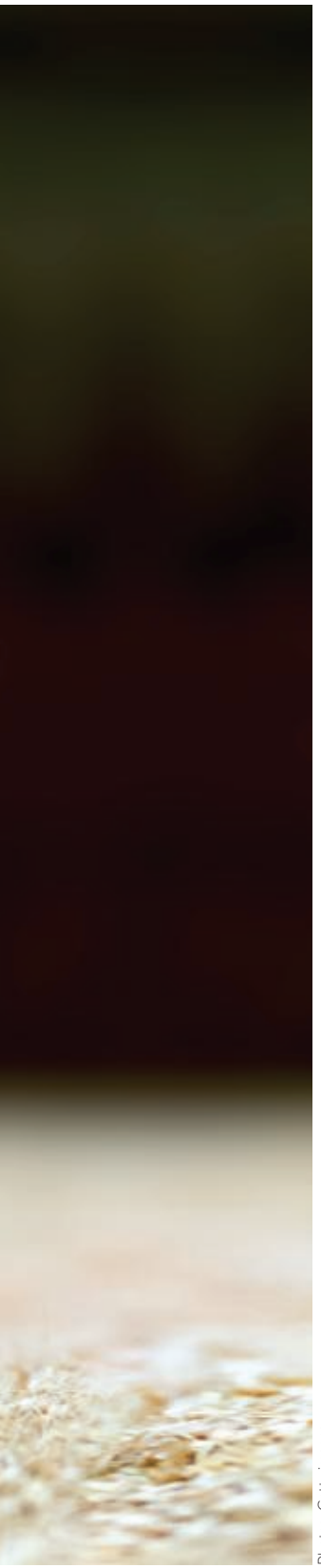
Other programmes have also been undertaken across the world. In the United Kingdom for example, the National Health Service (NHS) Innovation Accelerator aims to create the conditions and cultural change necessary for proven innovations to be adopted faster and more systematically to the benefit of patients and the general population.

The programme, which is designed to address key challenges in the organisation, provides applicants with mentorship, regular meetings with the accelerator team, peer-to-peer learning and support, quarterly events, specialist briefings and access to a GBP30,000 bursary.

In 2015, the programme's first year, it accepted 17 fellows and supported them in taking their innovations to 345 NHS providers and commissioners, raising more than GBP8.9m in funding and winning 12 awards in the process, according to the programme's website.

This year applicants were told to focus on three challenges – prevention, early intervention and long-term condition management and will be announced in October after the application process ended on August 16.





Photos: Getty images

THE ELUSIVE SAND CAT

Sightings of the reclusive sand cat after almost a decade put the spotlight on the UAE's conservation efforts

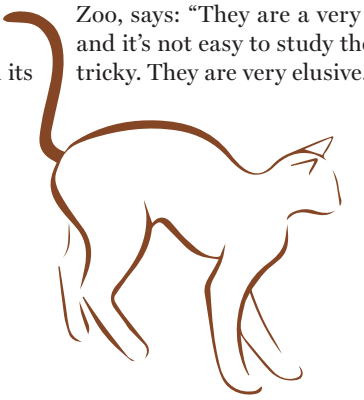
August marked an important turning point in the United Arab Emirates' conservation efforts as wildlife researchers spotted the extremely rare sand cat (*Felis margarita*) for the first time after nearly a decade. The small feline is considered to be an endangered species in the country and its last sighting was in 2005, when less than 250 Arabian sand cats were thought to live in Abu Dhabi. However, even that estimate was based on a "scarcity of records" according to UAE researchers. The sand cat's elusive nature makes it especially difficult for conservationists to collect any data about the species, which limits efforts to protect them.

The sand cat has been listed as a 'threatened species' in the feline's scattered habitats in the deserts of Arabia, North Africa, and parts of Asia according to the International Union for Conservation of Nature's Red List of Threatened Species. In the UAE it is considered 'endangered', as is one of the other five subspecies, the Pakistan sand cat. Habitat destruction, hunting, predators, and collection for the illegal pet trade have impacted their numbers. Feral cats also increase competition for prey, and may be responsible for spreading feline diseases.

A unique aspect of the sand cat is that it is the only cat that lives primarily in the desert. The Arabian sand cat is a nocturnal hunter perfectly adapted to its desert home in Abu Dhabi's Western Region. It does not need to drink water as it can get all it needs from the small birds, reptiles and rodents that it hunts down. It also has special hairs in its ears and on its paws that keep the sand out. The sand cat is sometimes known as the 'Peter Pan' cat as its oversize ears (for cooling), small body (39-52cm) and short legs mean that even full-grown adults look like kittens.

'Elusive' is putting it mildly when it comes to sand cats. They are great diggers and spend their days in burrows, only coming out at night to hunt. Like house cats, they bury their feces, which makes it hard for scientists to track their presence, diet or numbers. They also have large, solitary ranges, with a study in Saudi Arabia putting it at up to 40km^2. And when the creatures cross open spaces they keep low, skulking on bent legs.

Despite these challenges, researchers from the Environmental Agency Abu Dhabi (EAD) and Al Ain Zoo decided to renew their attempts to learn more about the species. Al Ain Zoo is regarded as a leader in sand cat research, as it is home to the world's largest captive population with 33 Arabian sand cats. It maintains specialised holding and breeding facilities for the felines and hosts workshops for regional sand cat experts to develop conservation strategies. In January 2010, the Al Ain Zoo announced the first success of an in vitro fertilisation and embryo transfer procedure on sand cats, resulting in the birth of two kittens at its facilities. Hessa Al Qahtani, head of conservation at Al Ain Zoo, says: "They are a very sensitive species, and it's not easy to study them. They are very tricky. They are very elusive." ›





The sand cat blends in perfectly with the surrounding desert environment

Undaunted, the researchers set up nine motion-sensitive cameras in the Bayouna protected areas in Abu Dhabi's Western Region. They selected a 1,990m² area peppered with sandy plains, small dunes, dwarf shrubs and other indigenous vegetation that makes it the perfect habitat for sand cats. Although the monitored area was rich with rodents, small reptiles and large insects that make up a sand cat's diet, the research team also had a secret weapon. They planted open cans of chicken- and fish-flavoured cat food to increase the chances of sightings. Shakeel Ahmed, the EAD's assistant scientist of avifauna, terrestrial and marine biodiversity, explains: "Mostly, I used the chicken one because it was very successful in studies that were done in Saudi Arabia. It's very effective in attracting the animals."

The plan worked and within a month the treats had lured the shy cats towards the cameras. This first sighting was followed by 46 more of three sand cats – one male and two female.

The first, and most important fact, made clear by these sightings is that sand cats still exist in the wild in the UAE. Conservationists were also excited about these sightings as they were crucial in determining which habitats the cats prefer and what threats they face. Further research and more sightings will be required to fill the gaps in the knowledge and calculate the population size.



OTHER CONSERVATION DRIVES IN THE UAE

Last year, members of the Coordination Committee for the Conservation of the Arabian oryx (CCCAO) – made up of representatives from Gulf Cooperation Council nations, Jordan and Syria – devised a five-year strategy for the conservation of the animal.

The Arabian oryx population size is considered a key indicator of the region's environmental health. As such, the five-year plan will tackle issues of herd management, disease classification, create a genetic survey base and reintroduce the oryx into the wild. The plan will incorporate best practice from member states.

"Arabian oryx represent a cultural symbol and a natural landmark in our region," says Dr Shaikha Al Dhaheri, executive director of the terrestrial and marine biodiversity sector at the Environment Agency – Abu Dhabi. "Its extinction from the wild was a great loss, not only to biodiversity in the Arabian Peninsula, but also on the cultural heritage level."

The rigorous efforts of the Environment Agency and other international agencies have paid off – in 2011, the Arabian oryx was removed from the 'extinct' list and reclassified as 'vulnerable' by the International Union for Conservation of Nature (IUCN).

Another UAE entity that has won recognition for its role in the Arabian oryx breeding programme is Al Ain Zoo. The zoo is not only home to a significant number of healthy Arabian oryx but also went on to achieve a gender balance among the animals – a feat that is difficult to accomplish when breeding animals in captivity.





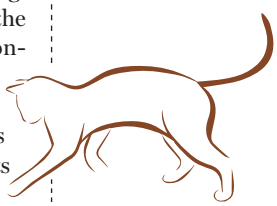
By the end of their first year, sand cat kittens are completely independent

According to Hessa Al Qahtani, the findings are significant. "We don't have accurate data on how many of them there are in the wild, and because of that, the study that EAD conducted at Baynouna in Abu Dhabi, and the finding of three cats, is indeed important because it is going to tell us about the population size," she said.

"It is clear that all field research will be extremely valuable in putting together conservation plans for the sand cats and their habitat, as well as pinpointing those areas and their extent that may be turned into protected areas to conserve the cats," John Newby of the Sahara Conservation Fund said in the academic journal *New Science*.

Thanks to research carried out at institutions such as the Al Ain Zoo, we do know something about sand cat behaviour. For example, we know that sand cat's purr and meow like house cats, but they can also yelp like a small dog. An average litter consists of three kittens born after 59 to 66 days and they grow rapidly, reaching three quarters of the adult size (1.5 to 3.5kg) within five months of birth. Sand cats are fully independent by the end of their first year and reach sexual maturity not long after. However, of 228 sand cats born in zoos globally to the year 2007, only 61 per cent lived to day 30. If similar figures are found in the wild, it may explain why sand cat numbers are declining.

One thing is for sure, cute animals grab the public imagination and help strengthen conservation efforts. There is a reason why the World Wildlife Fund (WWF) has the panda as an emblem. In the sand cat, the UAE has an animal that could become emblematic of its conservation efforts.



GULF GREEN TURTLE CONSERVATION

Sea turtles are important indicators of the world's aquatic environment. Unrestrained coastal developments, urbanisation and industrialisation have taken their toll with global turtle populations showing serious decline. Of the world's seven species of sea turtles, two are present in Gulf waters – the hawksbill turtle (*Eretmochelys imbricata*) and the green turtle (*Chelonia mydas*). The species are, respectively, listed as critically endangered and endangered on the IUCN Red List.

In May this year, Emirates Wildlife Society – World Wildlife Fund (EWS-WWF)launched an innovative marine conser-vation project – Gulf Green Turtle Conservation off the coast of Abu Dhabi. The initiative aims to help preserve the endangered sea turtles as well as protect their habitats in the UAE and wider region. Partnered by the Environment Agency – Abu Dhabi, the project will extend to various turtle nesting and foraging sites across the region.

Over a period of four years, marine experts will tag green turtles with satellite transmitters and obtain,



and analyse, tissue samples to detect links between feeding and nesting populations. The turtles' mating and migration patterns will also be studied in order to identify critical marine habitats.

It is envisaged that Gulf Green Turtle Conservation will emerge as the best source of information on regional turtle ecology by 2020. The programme will provide essential, fact-based information to governments and environmental agencies, helping them to make informed decisions for turtle protection and conservation.



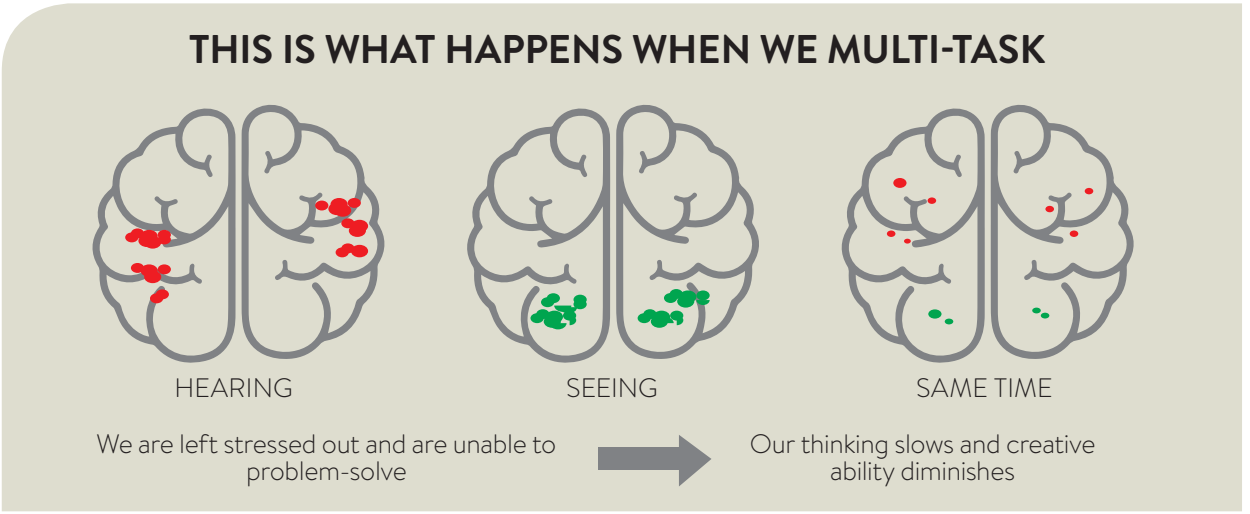
IS THE INTERNET TAKING OVER OUR MEMORY?

New research suggests that the World Wide Web may be throttling our natural thought processes

Researchers at the University of California, Santa Cruz and University of Illinois, Urbana Champaign say that the tendency to rely on things like the internet is stripping the human mind of its ability to think, solve problems and learn and recall new things. Known as cognitive offloading, human reliance on such memory aids increases after every use affecting our thought processes.

Memory has always been considered a process that happens inside the head, but it may soon become a process that occurs with the aid of external agents say the researchers Dr Benjamin Storm, Sean Stone and Aaron Benjamin. They conducted a series of experiments to determine a person's likelihood to reach for a device to answer questions. A test group of 180 college students were divided into two groups and asked to answer a challenging quiz. One group had to answer based just on their memory while the other was allowed to use Google. In the next test, both groups were given easier questions to answer by the method of their choice. Finally, in the last test, the researchers made it more difficult for participants ›

Illustration: Sanil Sadanandan



to search for answers on the internet: they had to walk across a room to access the computer or use a first generation iPod touch. The participants who used Google in the first quiz, reached out for it during the second and third tests too – and much faster than before, despite the difficulties in accessing the devices. Surprisingly, 30 per cent of the participants who referred to the internet did not even attempt to answer a single question from memory.

"Memory is changing. Our research shows that as we use the internet to support and extend our memory we become more reliant on it. Whereas before we might have tried to recall something on our own, now we don't bother. As more information becomes available via smartphones and other devices, we become progressively more reliant on it in our daily lives," said Dr Benjamin Storm, lead author of the study.

Although we are relying more and more on devices to augment our memory, the complete effects of cognitive offloading are yet to be seen. Since memory has been extended, the paradigms used to investigate have to also change. However, according to the research team, the shift towards more technology may not be such a bad thing. While the internet has its flaws, it does have the advantage of having massive amounts of information just a touch away. We no longer need to remember tedious facts and figures, freeing up our memory for other use.

Dr Maria Wimber, lecturer at the University of Birmingham's School of Psychology, believes the internet simply changes the way we handle and store information, so the Google Effect "makes us good at remembering where to find a given bit of information, but not necessarily what the information was. It is likely to be true that we don't attempt to store information in our own memory to the same degree that we used to, because we know that the internet knows everything."

These findings echo Columbia University Professor Betsy Sparrow's research on the Google Effect on memory, which concluded, "Our brains rely on the internet for memory in much the same way they rely on the memory of a friend, family member or co-worker. We remember less through knowing information itself than by knowing where the information can be found."

But is this making us more stupid? Anthropologist Dr Genevieve Bell, a vice-president at Intel and director of the company's Corporate Sensing and Insights Group, believes not. She says technology "helps us live smarter" as we're able to access answers. "Being able to create a well-formed question is an act of intelligence, as you quickly work out what information you want to extract and identify the app to help achieve this. To me, this suggests a level of engagement with the world that's not about dumbness."

Other researchers say cognitive offloading helps overcome mental deficits such as poor memory or math skills. But even then, it has its disadvantages as relying on devices may make our life experience

COGNITIVE OFFLOADING

Canadian researchers Evan F.Risko and his British colleague Sam Gilbert first developed the term cognitive offloading. The phenomenon is not a new one and has been taking place for decades, they say. A person will use technology only when he is convinced it is superior to his own abilities. Take for instance the use of calculators to do math or writing down important dates and events instead of only committing them to memory.



less intense in our memories. For example, a Fairfield University study in 2003 found that taking photos reduces our memories. Participants were asked to look around a museum, and those who took photos of each object remembered fewer objects and details about them than those who simply observed. According to Dr Wimber, by entrusting our smartphones to store our memories for us, we pay less attention to life itself and become worse at remembering events from our own lives. In other words, people may be able to multi-task better with the use of technology but the desire for immediate information prevents us from gaining deeper context. Even though cognitive offloading has been around for years, researchers believe that no technology has impacted the human mind as much as the internet has.

The key remains to find out where the use of technology can improve our life and where it doesn't.

IS TECHNOLOGY MAKING US STUPID?

Life has become more complex but we hardly ever notice it because technology has made complexity simpler than ever. Psychologists explain this dichotomy in terms of two distinct aspects of human intellect, namely fluid and crystallised intelligence.

Fluid intelligence refers to the ability to acquire and process information. In computers, this is called processing speed and RAM capacity – the more you have, the faster and more effortlessly you can multi-task, and the higher the quantity and complexity of stuff you can handle.

Evidence suggests that in humans fluid intelligence has been increasing for decades. The average child from 1950 would be handicapped by today's standard IQ tests, and the average child today would be gifted by 1950s standards.

However, that is just in terms of their fluid intelligence or ability to process complex information quickly and effectively.

The second aspect of intellect – crystallised IQ – refers not to our ability to gather info but what we actually know; in simple terms knowledge. Unsurprisingly, with all the knowledge of the world being now outsourced, crowdsourced, and cloudsourced, the individual storage of information is minimal. Humans today are like most smartphones and tablets – their ability to solve problems depends not on the knowledge they can store but on their capacity to connect to a place where they can retrieve the answer to find a solution. This is what some have labelled the 'hyper-link' economy. The only knowledge we need to have is the knowledge of where to find stuff. Whether that is good or bad for humanity time will tell.

THE "GOOD" NEWS

Google is replacing our brains

Collectively we visit **Google**

7.2

BILLION

times per day and make

3

BILLION

queries

We use Google so much – search has practically replaced our brains

At least we still have each other...

(Social networking has trippled in the last 5 years)

We spend

8

HOURS

per month on **Facebook** with an average of

245

FRIENDS

of whom we know **73.2%**





This art form originated in the royal palaces of Europe, but it didn't take long for it to be embraced by ordinary people

Opera for the People

Carmen is one of the most popular operas

"Opera is complex for those who perform it, but also for those who listen to it. It takes more time, more patience and more spirit of sacrifice. All this is well worth it because opera offers such deep sensations that they will remain in a heart for a lifetime," says Italian tenor Andrea Bocelli. Love it or hate it, people are rarely indifferent to this art form.

The divisiveness that opera engenders may be due to the fact that some regard it as an elitist art form. Indeed, opera was born out of royal entertainment in 17th-century Italy and France. These were spectacular productions celebrating marriages or political visits that were used by kings or nobles to show off their wealth and power. They were unashamed propaganda aimed at impressing foreign dignitaries and other royals, yet it did not take long before opera became a populist art form. Jacobo Peri's *Dafne*, the earliest

composition considered opera, was written around 1597 and was largely inspired by an elite circle of Florentine humanists. The score of *Dafne* has been lost, but another Peri work, *Euridice*, is the first opera score to have survived. The honour of being the first opera to be still performed today goes to Claudio Monteverdi's *L'Orfeo,* composed for the court of Mantua in 1607. The Mantua court of the Gonzagas, who employed Monteverdi, played a significant role in the origin of opera by hiring not only court singers but also one of the first actual 'opera singers' – Madama Europa.

After the Duke of Mantua's death, Monteverdi accepted the Master of Music post for the Venetian republic where his main job was to write religious music. The opening of the Teatro San Cassiano in 1637, the first public opera house, rekindled Monteverdi's interest in the art form resulting in *Il ritorno d'Ulisse in patria* (The Return of Ulysses to His Country) in 1641. By then another public opera house on a grander scale, the Teatro Santi Giovanni e Paolo, had opened in the city. Here Monteverdi's *L'Incoronazione di Poppea* (The Coronation of Poppea) was presented in 1642.

By 1637, the idea of a season of opera performances supported by ticket sales had emerged in Venice. Early Baroque operas blended comedy with tragic elements to attract members of the newly wealthy merchant's class whose tastes were not as 'cultured' as that of the noble class. This also marked the point where opera, for the first time, moved away from the lavish backing and control of royal courts. Naturally, this kind of populist opera offended some sensibilities. As a result comedy in opera was relegated to opera buffa, while opera seria – which was elevated in tone and highly stylised in form – became the leading form of Italian opera until the end of the 18th century. In opera seria the virtuoso parts were written for the main character, and the singer became the star thanks to Italian-born composers such as Alessandro Scarlatti, Antonio Vivaldi and Nicola Porpora.

However, one of the greatest composers of Italian Baroque opera was a German, Georg Frideric Handel, who lived most of his life in London. During his lifetime (1685-1759) opera took Europe by storm and it was a spectacular, expensive affair full of florid arias and ornate stage sets with moving parts.

FAMOUS OPERA HOUSES



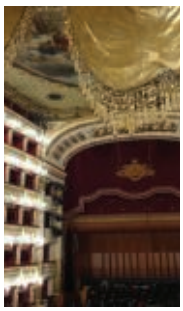
ARENA DI VERONA
Verona, Italy

This Roman amphitheatre, built in AD 30, is one of the best-preserved ancient structures of its kind. It is internationally famous for the large-scale opera performances given in this unusual setting.



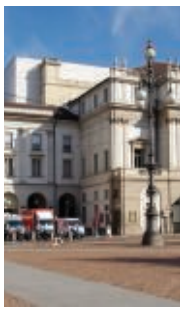
TEATRO SAN CASSIANO
Venice, Italy

When it opened in 1637 it was the world's first public opera house where patrons bought tickets to view operas such as Claudio Monteverdi's *L'Orfeo*. It marked the start of opera for ordinary people.



REAL TEATRO DI SAN CARLO
Naples, Italy

It is the oldest continuously active venue for public opera in the world since its opening in 1737. Christoph Gluck and Johann Bach are among the famous composers who produced operas there.



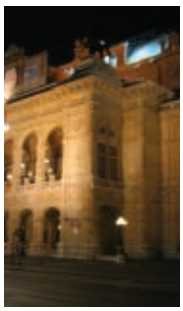
TEATRO ALLA SCALA
Milan, Italy

This is arguably the most famous opera house in the world as the premieres of many beloved operas have taken place here. Giuseppe Verdi and Giacomo Puccini are synonymous with 'La Scala',



OPÉRA-THÉÂTRE DE METZ MÉTROPOLE
Metz, France

It was inaugurated in 1752 and has the distinction of being France's oldest opera house. It still stages around 60 productions annually.



VIENNA STATE OPERA,
Vienna, Austria

This opera house was the first major building on the famous Ringstrasse when it opened in 1869. It was the home of composer Gustav Mahler and hosts the famous Vienna Opera Ball annually.

Opera seria's focus on highly-trained singers, spectacle and artificial plots had its fair share of critics. The inevitable backlash followed that advocated a return to basics where singing, music, ballet and staging should play second fiddle to the story. The director of music at Vienna's court theatre Christoph Willibald Gluck, who advocated "beautiful simplicity", started an opera revolution with *Orfeo ed Euridice* (Orpheus and Eurydice) that was performed in the Austrian capital in 1762.

This, in turn, had a tremendous influence on Wolfgang Amadeus Mozart and Richard Wagner. Mozart not only wrote comedies such as *Don Giovanni* and *The Marriage of Figaro*, but it also marked the beginning of operas in German at the behest of Austrian emperor Joseph II, such as *Die Entführung aus dem Serail* (The Abduction from the Seraglio), which had its Viennese premiere in July 1782. Mozart's last work for the stage, *Die Zauberflöte* (The Magic Flute), was also in German.

Despite Mozart's use of German, he largely stuck to Italian opera norms as evidenced by *Così fan tutte* (So Do All Women). It was left to Richard Wagner to really rock the establishment by fusing music, poetry and painting. In his mature music dramas, *Tristan und Isolde, Die Meistersinger von Nürnberg, Der Ring des Nibelungen* and *Parsifal*, he abolished the distinction between aria and recitative in favour of a seamless flow of 'endless melody'. To ensure he could perform his work the way he wanted, Wagner built his own opera house in Bayreuth. After Wagner opera was never quite the same again as composers such as Richard Strauss, Claude Debussy, Giacomo Puccini, and Benjamin Britten pushed Wagnerian harmony further in the 20th century, which eventually led to modernism in the form of Russian composer Igor Stravinsky that culminated in his work *Oedipus Rex*.

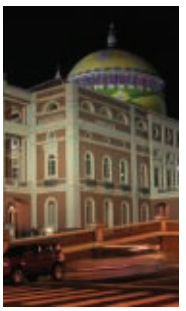
Meanwhile, back in Italy, the bel canto (literally meaning "beautiful singing") opera movement flourished where singing required supreme agility and pitch control. The best know examples of this movement are Gioachino Rossini's *Il barbiere di Siviglia* (The Barber of Seville) and *La Cenerentola* (Goodness Triumphant). Guiseppe Verdi, together with Wagner, dominated the late 19th century. Verdi preferred a more forceful style as exemplified by *Nabuco*, which turned Italian opera on its



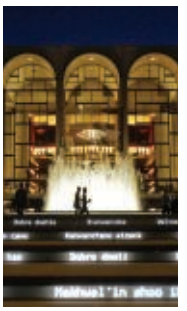
MARGRAVIAL OPERA HOUSE
Bayreuth, Germany
As one of the world's few surviving baroque opera houses it is inscribed on the UNESCO World Heritage List and attracted luminaries such as Richard Wagner and Ludwig von Beethoven.



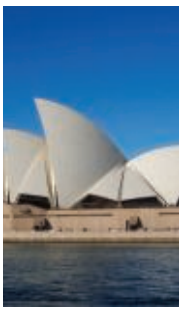
BOLSHOI THEATRE
Moscow, Russia
The Bolshoi Ballet and Bolshoi Opera are amongst the oldest and most renowned ballet and opera companies in the world. The Bolshoi Ballet Academy is world famous for training the superstars of ballet.



TEATRO AMAZONAS
Manaus, Brazil
This Belle Epoque opera house, deep in the Amazon jungle, was built during the great rubber boom and opened its doors in 1897 with the Italian opera, *La Gioconda*, by Amilcare Ponchielli.



METROPOLITAN OPERA
New York, USA
A great city needs a great opera house, and The Met is the largest classical music organisation in North America. It presents around 27 different operas annually.



SYDNEY OPERA HOUSE
Sydney, Australia
The modern-expressionist design of this opera house is one of the world's most famous landmarks and became a UNESCO World Heritage Site in 2007.



DUBAI OPERA
Dubai, UAE
Spanish tenor Placido Domingo inaugurated this 2,000 seat, multi-format, performing arts centre on 31 August, 2016. The distinctive dhow-shaped building is situated next to the iconic Burj Khalifa, the world's tallest building, in the Dubai Opera District.





Above: Wagner's Der Ring der Nibelung is well suited to modern interpretations.

Above Right: La Scala is regarded as the spiritual home of opera.

Right: Mozart's Marriage of Figaro is one of the most frequently performed operas.







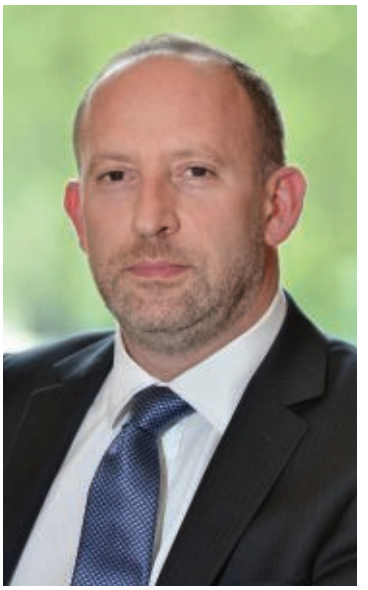
head through dramatic storytelling and incorporating Italian nationalism and patriotism. This gave rise to his greatest works *Rigoletto, Il trovatore* and *La traviata*. The latter is regarded as the world's first 'realistic' opera as it focused on ordinary people's lives and a realistic reflection of society.

Although Wagner and Verdi were the heavyweights of the 19th century, the best-known opera of that period – and possibly the most popular off all time – is French composer George Bizet's *Carmen*, thanks to its catchy melodies and its simple story line of a gypsy and a French soldier falling in love.

Giacomo Puccini, another Italian, dominated the early 20th century with *La boheme* and *Tosca* that continued in the tradition of Verdi. His fluent gift for melody and a new emphasis on realism created some of the most popular works in the Italian grand opera tradition.

Today, operatic offerings are more varied than ever. Staging and settings have become key elements of new productions and the great pieces of the repertoire are repeatedly reinterpreted to great success. As a result opera is continuously evolving for the public's enjoyment – a far cry from its royal and elitist roots.

A NIGHT AT THE OPERA



Having spent seven years heading up London's Royal Albert Hall, Jasper Hope is well versed in the arena of world-class entertainment. *Flashes* spoke to the chief executive officer of Dubai Opera about the city's latest landmark.

What does it mean for Dubai to have Dubai Opera?

Dubai Opera is a stunning, iconic building, beautifully designed inside and out, but it's what happens on stage that is so important. It represents a sea change in what audiences here in Dubai can expect. Up until now there have been other shows but nothing that compares to the theatrical experience seen in the other great cities around the world. Now Dubai has the venue to bring big shows to the emirate.

It's been a long time in the making, so tell us about the design?

Its design is representative of an Arabian dhow, which is so significant to the heritage of the emirate. Yet, it's very contemporary. This is not a Victorian theatre. The outside is glass, the inner hull and auditorium is clad in dark wood. The foyer is Italian marble and etched into it are navigation lines – the longitude and latitude lines on an old nautical map – and they form a fantastic pattern in the public foyer.

So what are the best seats in the house?

Dubai Opera is extraordinarily intimate. Even if you're sitting in the very back row of the top tier in the far corner – essentially the worst seat in the house – you can still see the faces clearly, and the acoustics are such that you can hear perfectly.

Tell us about the programme and what we can expect?

You can expect some of the greatest and best productions in the world. Placido Domingo was our opening act – he's one of the most acclaimed opera singers. Then we have Cameron Mackintosh bringing *Les Miserables* to Dubai in November. This is one of the longest-running stage musicals in the history of theatre. Naturally, he will update and adapt the show and choose the cast to suit the Dubai audience.

At Christmas we've got *The Nutcracker on Ice*, combining opera, music, dance, acting, fire, stunning costumes and singing. Again it's thanks to the technical capabilities of the venue that we are able to build an indoor ice arena on stage very quickly.

At the end of September we have the magic show *Impossible coming*. This is unlike anything else on the programme and this was intentional. After a string of operas, musicals, ballets and concerts we move into magic and illusion. This show is truly breathtaking. I saw it in London last summer and I thought we have to have this. We have to do the most amazing shows of every variety.

What about the future?

I believe Dubai Opera will have a far greater impact on the city than purely entertainment. I hope that it will inspire and nurture creativity and talent. One day I hope Dubai will have its very own orchestra, its own ballet troop and opera company. But these things take time. First you have to have a venue in which they can perform. You have to have people coming to inspire the youth to take up instruments and learn music, to join bands, to do all kinds of different art forms. You have to inspire and that's what Dubai Opera will do.

An electric future

New Energy Vehicle (NEV) sales are growing, and if this upward trajectory is sustained it could have a major impact on the world both from an economic and environmental standpoint





Currently, about 15 per cent of manmade carbon dioxide (CO_2) across the world comes from cars, trucks, airplanes, ships and other vehicles. Collectively, cars and trucks account for nearly one-fifth of all emissions in the United States, emitting around 11 kilograms of carbon dioxide and other global-warming gases for every 3.7 litres of fossil fuel. About 2.5 kilograms comes from the extraction, production, and delivery of the fuel, while the great bulk of heat-trapping emissions – more than 9.6 kilogram per 3.7 litres – comes right out of a car's tailpipe. Moreover, CO_2 emissions from road transport and aviation are growing twice as fast as overall CO_2 emissions. It has been estimated that by 2050 transport could account for between 30 and 50 per cent of total global emissions.

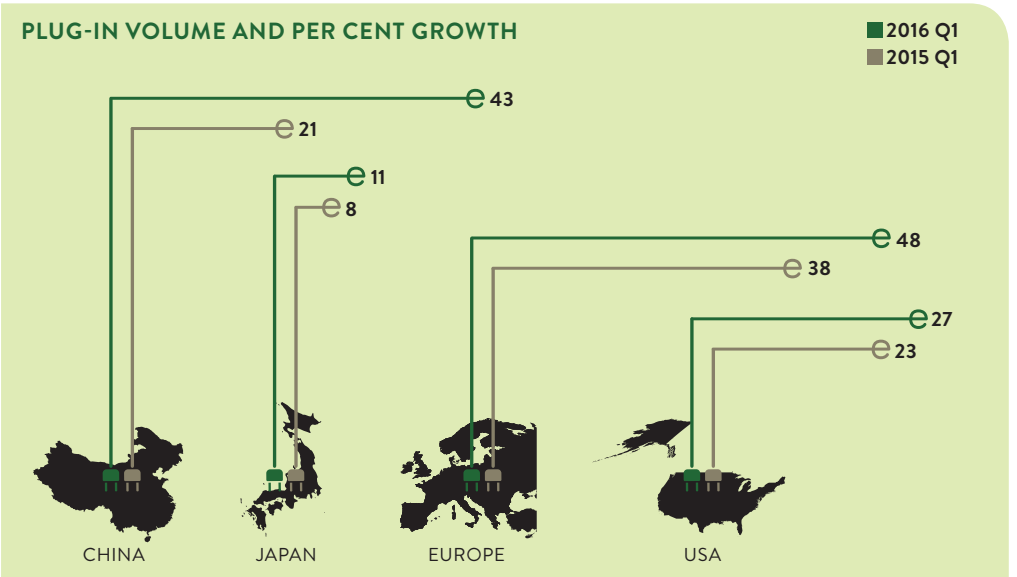
According to a NASA study, vehicles are in actual fact the biggest contributor to global warming as they mainly emit pollutants and greenhouse gases that accelerate global warming. In contrast, the industrial and power sectors release many of the same gases, but they also emit sulphates and other aerosols that cause cooling by reflecting light and altering clouds.

Electric cars and trucks use electricity as fuel, producing fewer emissions than their conventional counterparts. And even if the electricity used to charge them comes from conventional power stations, scientists maintain that emissions from thousands of power plants are easier to control than emissions from millions of individual vehicles. When the electricity comes from renewable sources such as solar or wind, all-electric vehicles produce zero emissions to drive. In other words, electric vehicles powered by renewable energy are what we need to combat global warming.

Figures released by statistics database EV-Volumes show that plug-in sales (both electric vehicles and hybrids) in the first half of 2016 totalled 312,000, which is 49 per cent higher than for the same period in 2015. Plug-in vehicles sales grew 10 times faster than the overall vehicle market, but the world market share is still below one per cent. Thanks to generous subsidies by the central and local government, sales in China were up a massive 162 per cent to 170,000 units in the first half of the year. The US follows at a respectable distance in second place with sales of 64,000.

That subsidies boost the adoption rate of EVs is beyond question. The main reasons for the stellar growth of NEV sales in China are generous subsidies by the central and local government. The maximum subsidy from central government is about 45,000 yuan or $6,740. The subsidies at a local level differ per city but the maximum is about 50,000 yuan or $7,500, adding up to a total subsidy of $14,240.

Above: According to a NASA study, vehicles are in actual fact the biggest contributor to global warming as they emit pollutants and greenhouse gases



On top of that many cities offer other incentives, such as free licence plates (getting a plate for a petrol-powered car can cost up to $12,000 in a city like Shanghai), and free parking places. Moreover, China is also adding the convenience factor by installing public charging stations. In late June there were 85,000 public charging stations in China, up 65 per cent compared to the end of 2015.

The role of subsidies and government support for NEVs is particularly pertinent to Dubai, which is planning to cut the emirate's carbon emissions by 16 per cent before 2020. The task of reducing harmful vehicle emissions falls on the Dubai Green Mobility Initiative Committee, which is part of the Dubai Autonomous Transportation Strategy, launched earlier this year by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai. This strategy aims to ensure 25 per cent of cars on Dubai roads will be self-driving by 2030.

Below: The Dubai Green Mobility Initiative Committee is working on new government incentives to encourage people to buy electric cars so that the emirate has cleaner air and transitions to a greener economy



The fact that 10 per cent of Dubai government's vehicle fleets will consist of electric and hybrid vehicles in the next few years shows that the Dubai Green Mobility Initiative Committee is taking its work seriously. Dubai Electricity and Water Authority's (Dewa) Green Charger initiative, which aims to establish electric vehicle charging stations across Dubai, has installed 100 charging stations since 2015. According to the Roads and Transport Authority (RTA), Dubai already has around 200 electric vehicles registered, including around 50 light passenger vehicles, as well as electric powered construction and commercial vehicles, and buses.

Saeed Mohammad Al Tayer, managing director and chief executive officer of Dewa, has also confirmed that the Dubai Green Mobility Initiative Committee is working on new government incentives to encourage people to buy electric cars instead of traditional petrol-powered vehicles so that the emirate has cleaner air and transitions to a greener economy.

On a federal level the UAE's Emirates Authority for Standardisation and Metrology (Esma) set new standards in July that all EVs entering the country will have to meet, thereby regulating the sale and use of battery-powered vehicles. The requirements include the material used in the batteries, its adaptability to local weather conditions, as well as stringent crash and fire safety levels. Furthermore, the regulation specifies a test procedure to determine the 'electric range' and electric energy consumption of EVs. This cleared the way for Toyota to launch its popular Prius hybrid in the country.

But what does the future for NEVs in the United Arab Emirates and beyond hold? According to a report by Bloomberg New Energy Finance the electric vehicle revolution could turn out to be more dramatic than governments and oil companies have yet realised.

The study forecasts that sales of electric vehicles will hit 41 million by 2040, representing 35 per cent of new light duty vehicle sales. This would be almost 90 times the equivalent figure for 2015, when NEV sales were estimated to have been 462,000, up some 60 per cent on 2014.

This projected change between now and 2040 will have implications beyond the car market. The research estimates that the growth of EVs will mean they represent a quarter of all cars on the road by that date, displacing 13 million barrels per day of crude oil but using 2,700TWh of electricity. This saving would be equivalent to 11 per cent of global electricity demand in 2015.

Colin McKerracher, lead advanced transportation analyst at Bloomberg New Energy Finance, says: "At the core of this forecast is the work we have done on EV battery prices. Lithium-ion battery costs have already dropped by 65 per cent since 2010, reaching $350 per kWh last year. We expect EV battery costs to be well below $120 per kWh by 2030, and to fall further after that as new chemistries come in." That means the cost of ownership for NEVs will become cheaper on an unsubsidised basis than internal combustion engine cars by the mid-2020s, even if the latter continue to improve the average mileage per gallon by 3.5 per cent per year.

Currently, the oil price is low as there is a daily over supply of two million barrels, a figure that NEV growth is predicted to displace as early as 2023. This means the predicted displacement of 13 million barrels per day of crude oil by 2040 will have a massive impact on oil prices and therefore all oil producing countries. That also raises the question of how the projected 2,700TWh of electricity consumed by NEVs in 2040 will be generated by 2040?

The likely answer is renewables. Since 2013, the world has been adding more electricity-generating capacity from wind and solar than from coal, natural gas, and oil combined. Electric cars will reduce the cost of battery storage and help store intermittent sun and wind power. In the move toward a cleaner grid, electric vehicles and renewable power create a mutually beneficial circle of demand.



Above: The RTA is enlarging its fleet of hybrid taxis

If the projections by Bloomberg New Energy Finance are right, and they have been supported by a number of other organisations and think-tanks, there will be a hugely positive impact on the environment. According to the US Environmental Protection Agency (EPA) an average fossil fuel-powered car emits between 4,800 to 6,700 kilograms of CO_2 annually. So replacing 40 million regular cars with NEVs from 2040 could prevent 1,968 billion kilograms of CO_2 from entering the atmosphere every year. That is a healthy outlook for people and the planet alike.



KEY FEATURES OF THE UAE'S EV STANDARDS

- Adaptability of the batteries to high ambient temperature.
- Protection of drivers and passengers against electric shock.
- Safety of batteries against explosion due to overheating.
- Safety of the vehicles in case of front and side impact.
- Vehicles' ability to withstand sand storms and dusty conditions.

PEAK PERFOR

Olympic and world records are still tumbling despite some scientists claiming that the peak of human performance has been reached. So how is it that athletes keep on improving?

The Olympic motto is Citius, Altius, Fortius, which is Latin for 'Faster, Higher, Stronger'. Judging by the way records have tumbled through the decades, it seems the Olympics definitely lives up to its motto.

The question is, how is it that athletes keep on getting better? Through calculations of maximum power output, oxygen use, heart function and other factors, some researchers have attempted to predict what the absolute limits of human ability will be. Much-debated estimates include 1:58 for the marathon (a five-minute improvement over the current men's record of 2:03.38), and 9.48 for the men's 100m. Whether these limits are true only time will tell.

At one point, it was deemed impossible that anybody could run a mile (1,609.344 metres) in under four minutes. That myth was shattered in 1954 when Roger Bannister ran it in 3.59.4 seconds at Oxford University's Iffley Road Track. Two months later, both Australia's John Landy and Bannister completed the mile in under four minutes at the British Empire and Commonwealth Games. In 1994 the Irish runner Eamonn Coghlan became the first man over the age of 40 to run a sub-four-minute mile. All in all, the record for the mile has been lowered by almost 17 seconds in the past 50 years, although no woman has run it in under four minutes.

The 100 metres event has an equally impressive record. In 1912 the record for men stood at 10.6 seconds and 50 years later it was at 10.0. The first time under 10 seconds was set at the 1964 Olympics when Bob Hayes ran it in 9.9 seconds. The current record, which was set by Jamaican sprint star Usain Bolt in 2009, is 9.58 seconds. This time broke his previous world record of 9.69 seconds – the biggest improvement in the event since the start of electronic timing in 1977.

At this year's Olympics in Rio de Janeiro 27 world records and 91 Olympic records were broken, despite often-repeated claims that the human race is butting up against the limits of athletic performance. So what is the secret of this continuous upward trend in human athletic performance?



MANCE

The answers appear to be selection, numbers, training, technique, technology and will power. In the early part of the 20th century the accepted wisdom was that the average body type (medium height, and medium weight) was best for all athletic endeavours. That's why, in the 1920s, an elite high-jumper and elite shot-putter were the same average size. Thanks to sport scientists and coaches that idea faded away as it was realised that specialised bodies would fit better into certain sports. That's why shot-put athletes are now taller and heavier than a high-jump athlete, and the height of basketball players keep rising. At the same time, gymnasts have become shorter as physics dictates short people are better equipped to launch themselves through the air at all kinds of angles.

At the same time media proliferation through first radio, then television and now the Internet meant that not only more people were exposed to sport, but thanks to advertising, rising prize money and endorsements there were both glory and financial incentives to be had. This ushered in the era of the professional athlete who could train full-time, which in turn had an impact on both training methods and performance. Roger Bannister had to fit his 45-minute training sessions around his university lectures, while the modern athlete can train all day, every day. With more money and fame at stake, more people are drawn to sport and they often start younger – which gives them more time to perfect their technique – and have better facilities than previous generations. These rising numbers, in turn, also affect performance.

More people in more places trying more sports increases the chances that individuals with innate talent will end up in a sport they'll excel at. Furthermore, thanks to increasing media exposure, more people from specific regions are joining the athletic fraternity. After the 1968 ›

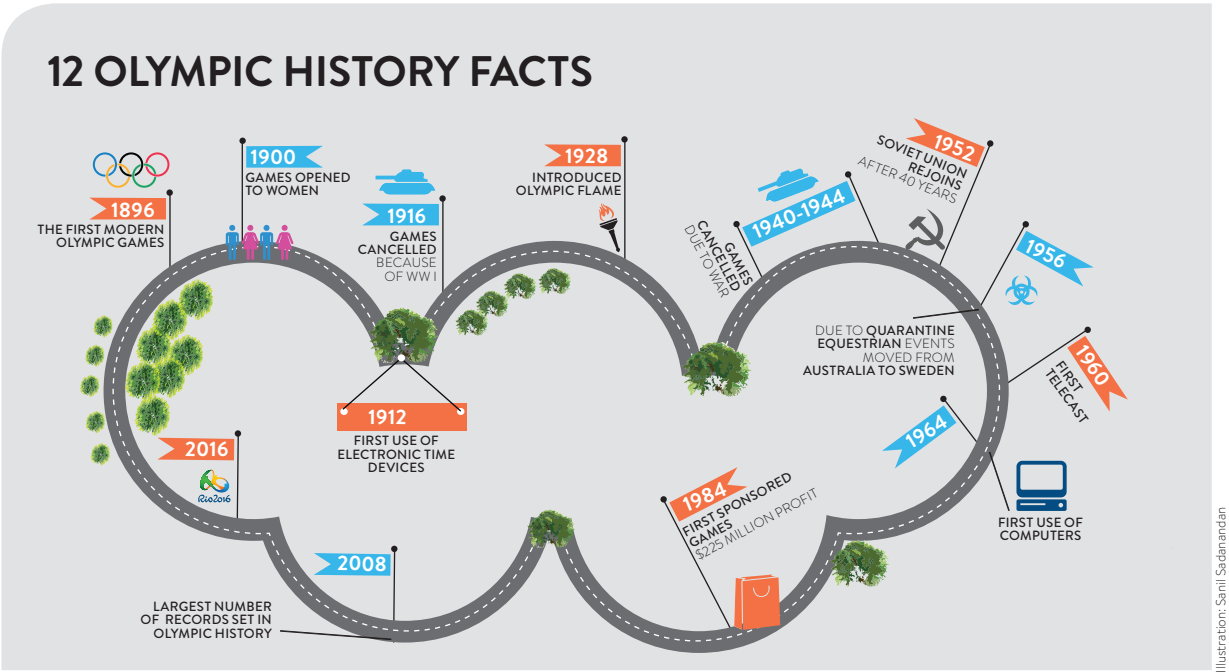


Illustration: Sanil Sadanandan

Olympics in Mexico City, where East African runners had great success, more children in the region were inspired to try out for athletics. The same has happened in Jamaica, thanks to Usain Bolt's success.

This had the effect of bringing people into sport that were genetically advantaged when it came to certain disciplines. Kenyan long-distance runners are among the world's most successful, but nearly all these runners come from the Kalenjin tribe. The Kalenjin, due to living in low-lying areas with a hot and dry climate, have a unique physiology. Their legs are very long and thin at their extremity for cooling purposes, but long and thin legs are also more energy-efficient and therefore an advantage in long-distance running. People from India and Central and South America are still under-represented in sport, and there is every chance there may be another group of people with a unique physiology. The Tarahumara tribe in Mexico, for example, has a tradition of long-distance running where up to 320km are covered in a day between far-flung villages.

Technique has also made a tremendous difference in some sports. In swimming, the flip resulted in huge time improvements. In the past, swimmers used to stop and turn, but doing a somersault underwater is quicker and more efficient. In high jump, the Fosbury Flop won Dick Fosbury the gold medal at the 1968 Olympics and it has been the dominant jumping style ever since. Sport scientists make use of biomechanics – a discipline that assesses the effects of forces on humans and, vice versa, the effects of forces that humans apply – to fine-tune technique. A springboard diver who is aware that gravity acts perpendicularly to the

DATA-DRIVEN PERFORMANCE

The increasing use of data is giving modern athletes the edge. For example, Great Britain's Olympic boxers use the iBoxer software that has data on Team GB's boxers and their opponents, including detailed fight analysis that reveals threats and opportunities for the fighters, helping them refine their tactics. Sailing Team Germany (STG) partnered with business software firm SAP in 2011 in an effort to arrest the nation's decline in the sport after Sydney 2000. A key component of this is building virtual models based on real data, enabling tricky, ever-changing conditions such as currents and wind to be analysed. US-based design software company Autodesk worked with German para-cycling champion Denise Schindler to create a 3D-printed polycarbonate prosthetic leg that delivers improved power output. Motion-tracking systems, wearable jump monitors and Dopler radar are helping American athletes to perform better. This use of cutting-edge technology raises the question whether athletes from rich countries have an unfair advantage over those from poorer countries. In other words, is it sporting?





earth's surface has a better understanding of what trajectory gives an optimal flight path for a dive. Ski jumpers learn to lean forward during the jump to deflect air downward. In response, the air pushes them upward, which leads to greater distance. In many cases, athletes with the best technique win.

In sport, the laws of mechanics don't apply to the athlete alone. Mechanical principles inform technologies that are used to improve the efficiency of sport equipment and playing surfaces. Modern track shoes, speed skates, skis and slick bodysuits for swimming and cycling have all played a role in improving athletic performance. When Jesse Owens won the 100 metres at the 1936 Berlin Olympics with a time of 10.3 seconds he used a trowel to dig holes in the ground for his starting position and ran on a soft cinders track that stole a lot of energy. In comparison, Usain Bolt uses starting blocks, has better footwear and runs on a surface that is designed for maximum speed. According to modern biomechanical analysis, if Owens had run on the same surface he would have finished a stride behind Bolt. Lighter bikes, deeper swimming pools, fibreglass pole-vaulting poles, synthetic tracks: Each improvement propels athletes to better performances, even if they're no more fit or talented than their predecessors.

The role of technology is especially visible in Paralympans. New Zealand runner Liam Malone, a double amputee, won the 400 metres at the Rio Paralympics in 46.20 seconds, which was just 0.11s outside of New Zealand's able-bodied record. This time was only possible due to special carbon-fiber-reinforced polymer prosthetics – also known as 'blades'.

Arguably the most important factor responsible for records tumbling is mind over matter. As athletes learn more about what the human body is capable off they are willing to push themselves further. When someone finally does break a time-to-beat, a fresh record can give the next generation of Olympians a whole new idea of what's possible. When inspired, the mind can exert powerful control over the body.

Michael Joyner, an exercise researcher at the Mayo Clinic in the US, says: "There's no evidence that people going faster today have better engines than people 30 or 40 years ago. Believing something can be done frequently means it can be done."

Nothing exemplifies this better than the four visually-impaired athletes who all finished the Paralympic 1,500m final with faster times than the Rio Olympic gold medal winner. The ground-breaking race saw Algeria's Abdellatif Baka smash the Paralympic world record with a time of three minutes and 48.29 seconds, which was 1.7 seconds faster than US runner Matthew Centrowitz who claimed gold in the men's Olympic 1,500m final last month. Where there's a will, there's a way.

Top left: US sprinter Jesse Owens would have posted times close to Usain Bolt if he had the advantages of modern technology

Top right: Abdellatif Baka smashed the Paralympic 1,500m record and ran faster that the runner who claimed gold in the Rio Olympics

MOHAMMED BIN RASHID AL MAKTOUM FOUNDATION'S PARALYMPIC CONTRIBUTION

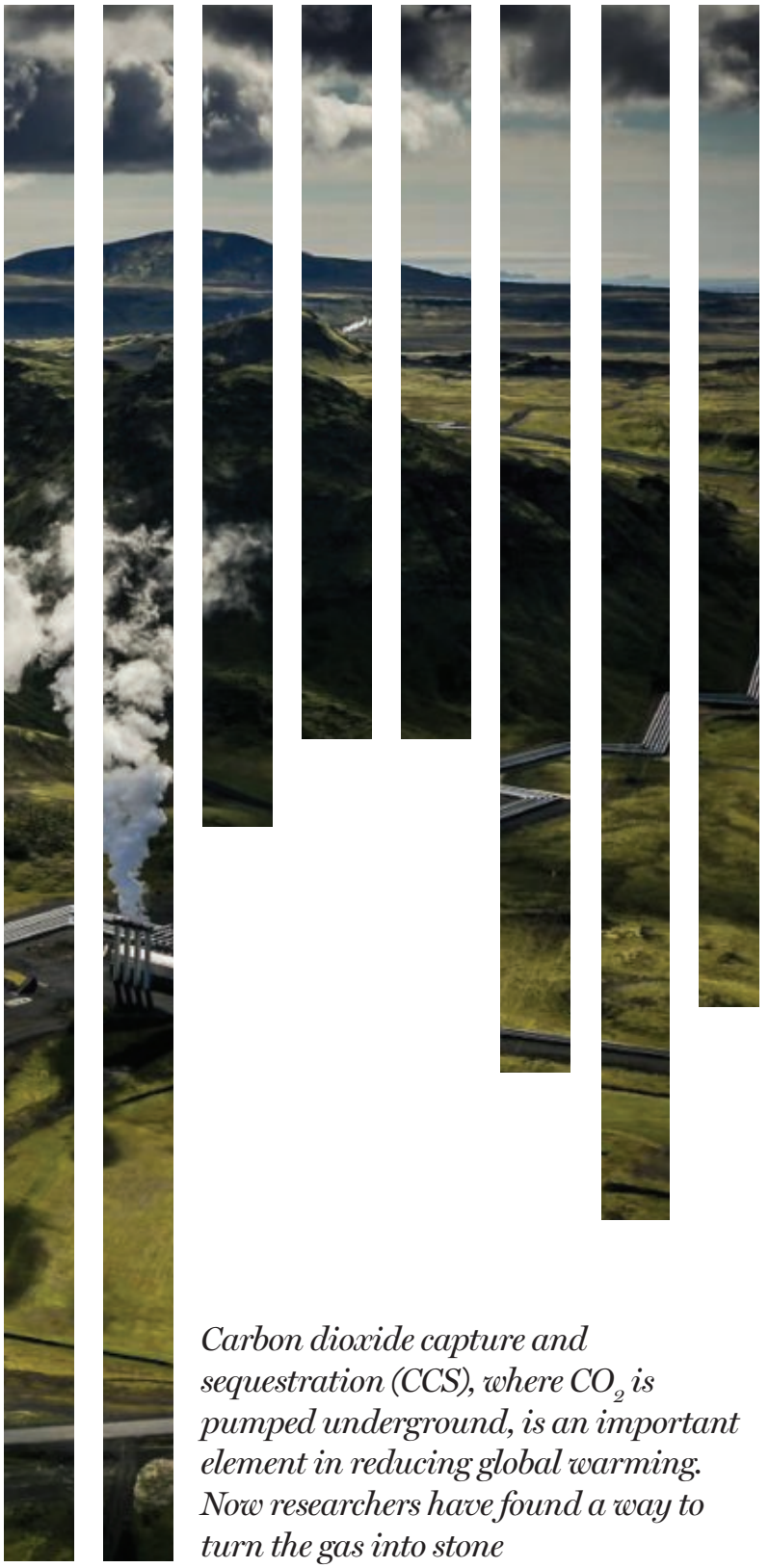
The Mohammed bin Rashid Al Maktoum Foundation (MBRF) translated the Paralympic Summer Games' rules into Arabic in time for the event in Rio de Janeiro. The translated rules are published on the portals of international sports federations.

The Foundation took on the translation project – in partnership with Dubai Club for the Disabled – last year, in an effort to encourage athletes with special needs to participate in world championship events, as well as to support coaches in the Arab region.

The rules of 24 accredited sports games were translated into 24 Arabic booklets, which will be launched at the Frankfurt Book Fair in October. This makes the information readily available for all stakeholders, in addition to promoting the Arabic language and placing it on par with other languages used by the International Paralympic Committee and its affiliates.

TURNING CO_2 TO STONE





Carbon dioxide capture and sequestration (CCS), where CO_2 is pumped underground, is an important element in reducing global warming. Now researchers have found a way to turn the gas into stone

Global warming is occurring and that is an accepted scientific fact. That an increase in greenhouse gases, such as carbon dioxide (CO_2), will make the world warmer was a theory first proposed by Swedish scientist Svante Arrhenius in 1896. How much the world will warm up is still a matter of debate, however. This issue is called 'climate sensitivity', the amount the temperatures will increase if CO_2 is doubled from pre-industrial levels. Climate models have predicted the least temperature rise would be on average 1.65°C, but upper estimates vary a lot, averaging 5.2°C. Current best estimates are for a rise of around 3°C, with a likely maximum of 4.5°C.

According to an ongoing temperature analysis conducted by scientists at NASA's Goddard Institute for Space Studies (GISS) the average global temperature on Earth has increased by about 0.8°C since 1880. The bad news is that two-thirds of this warming has occurred since 1975, at a rate of roughly 0.15-0.20°C per decade.

This rise in temperature is paralleled by an increase in CO_2 in the world's atmosphere. According to the World Bank, total carbon dioxide emissions from fossil fuel in 2014 amounted to 9.795 gigatonnes (Gt). From 1870 to 2014, cumulative carbon emissions totaled about 545 Gt and the 2014 level of CO_2 in the atmosphere was 43 per cent above the level when the Industrial Revolution started in 1750.

In order to prevent catastrophic climate change the world has to cut CO_2 emissions. Last December in Paris nearly 200 countries agreed on a binding global compact to slash greenhouse gases and keep global temperature increases to "well below" 2°C. The recent news that the US and China will ratify the Paris agreement was welcome, as they are two of the largest polluters. However, while 180 countries have now signed the agreement, 55 nations – covering at least 55 per cent of global emissions - still need to formally ratify the treaty to put it into legal effect.

Against this background, it is clear that any method that will cut carbon emissions is crucially important. Carbon dioxide capture and sequestration (CCS), where CO_2 is pumped underground to prevent it from entering the atmosphere, is one such development. But even if the CO_2 is pumped underground, there is still a chance that it will escape.

However, that problem may have been solved to some extent. In Iceland, researchers from Columbia University's Lamont-Doherty Earth Observatory and other institutions conducted an experiment where they pumped CO_2 and water underground into volcanic rock. This was part of a pilot programme called the CarbFix project, which launched in 2012 at the Hellisheidi power plant in

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Above: A scientist displays a piece of solidified CO_2.

Middle: Iceland's Hellisheidi power plant was the setting for the CarbFix experiment.

Right: Abu Dhabi is using CO_2 sequestration to enhance oil recovery.

Iceland – the world's largest geothermal facility. Here, reactions with the minerals in the deep basalts convert the CO_2 into a stable, immobile chalky solid. What was even more encouraging was the speed at which this process occurs. "Of our 220 tonnes of injected CO_2, 95 per cent was converted to limestone in less than two years," said lead author Juerg Matter from Southampton University, UK. Previous studies suggested that it would take hundreds or even thousands of years for the calcite to form.

Dozens of pilot projects around the world have sought to test CCS as a way of curbing CO_2 emissions from power plants. Previous experiments have seen pure CO_2 injected into sandstone, or deep, salty aquifers. Chosen sites – which have included disused oil and gas wells – have relied on layers of impermeable capping rocks to hold down the carbon dioxide. However, very few have been scaled up, owing to prohibitive costs, estimated at $50 to $100 per ton of CO_2 sequestered. Furthermore, the fear is always that the CO_2 could find a way to leak back out into the atmosphere.

The CarbFix project, on the other hand, solidifies the unwanted carbon in place. At the Hellisheidi geothermal power plant outside Reykjavik the researchers combined the waste CO_2 with water to make carbonic acid – a slightly acidic liquid that was then 500 metres down into the volcanic basalts that make up so much of the North Atlantic island. The low pH water (3.2) worked to dissolve the calcium and magnesium ions in the basalts, which then reacted with the carbon dioxide to make calcium and magnesium carbonates. Cores drilled into the experimental site pulled up rock with the tell-tale white carbonates occupying the pore spaces.

The researchers also tagged the CO_2 with carbon-14, a radioactive form of the element. In this

CARBON STORAGE AND SEQUESTRATION IN THE UAE

The UAE's contribution to global carbon emissions is about 0.2 per cent of the world total, according to the Environment Agency Abu Dhabi (EAD). Figures from the Ministry of Energy indicate the UAE released 199.65 million tonnes of carbon dioxide and other greenhouse gases in 2013.

The UAE is looking at numerous ways to decrease its carbon footprint. Abu Dhabi, which produced nearly 3.5 million barrels of oil per day in 2014 to rank as the world's sixth-biggest producer, is looking at an innovative way to not only decrease its carbon footprint but actually make it pay through carbon dioxide capture and sequestration (CCS).

In November 2013, Abu Dhabi National Oil Company (ADNOC) and Masdar signed a joint venture agreement to create Al Reyadah (Arabic for 'leadership'), the Middle East's first company focused on exploring and developing commercial-scale projects for CCS. One such project is injecting CO_2 into oil wells, thereby increasing the pressure which leads to enhanced oil recovery (EOR).

Al Reyadah comprises three elements; industrial capture of the CO_2 from the Emirates Steel Industry facility (it is the world's first CCS in the iron and steel sector); compression, dehydration and transportation of the CO_2 from the Masdar carbon capture facility to ADNOC's Rumaitha and Bab onshore oil fields; and finally the use of injected CO_2 for enhanced oil recovery.

The Abu Dhabi CCS Project will capture approximately 800 tonnes of CO_2 per year for use in EOR, however this represents a fraction of the potential for CO_2 EOR within the UAE.

way, they were able to tell if any of the injected CO_2 was leaking back to the surface or finding its way out through a distant watercourse. No such escape was detected.

"This means that we can pump down large amounts of CO_2 and store it in a very safe way over a very short period of time," said study co-author Martin Stute from Columbia University's Lamont-Doherty Earth Observatory, US. "In the future, we could think of using this for power plants in places where there's a lot of basalt – and there are many such places. You can find basalts on every continent and, certainly, you can find them offshore because all the oceanic crust – so below the seafloor – is all basaltic rocks. In terms of the availability of basaltic rocks to take care of CO_2 emissions globally – no problem."

Unpublished data from a similar project in basalt near the Columbia River near Wallula, Washington, point to a similar conclusion.

The technique still has to clear some high hurdles to become commercially viable. Capture of CO_2 at power stations and other industrial complexes is expensive, and without incentives it is currently deemed to be uneconomic. The infrastructure needed to pump the gas to the burial site also has to be considered. "Without a price on carbon emissions, there's no business case," admits Stute, who hopes policymakers will create such an incentive. Otherwise, projects in basalt could suffer the same fate as the dozens of conventional CCS projects around the world that have failed to be commercialised.

Another negative of the CarbFix approach is that a substantial amount of water is required with 25 tons for each ton of CO_2 buried. According to Stute seawater could be used, which would be in plentiful supply at coastal sites. Another is that subterranean microbes might break down carbonate to methane, a powerful greenhouse gas, but this was not seen in the Iceland research.

The Hellisheidi geothermal power station has now moved beyond the experimental stage and is routinely injecting CO_2 into the subsurface in larger quantities. The aim is to bury 10,000 tonnes of CO_2 annually. The company is also burying hydrogen sulphide – another byproduct from the plant.

"This is a great step forward," says Sally Benson of Stanford University in Palo Alto, California, a geologist unaffiliated with the project.

The UN's Intergovernmental Panel on Climate Change (IPCC) has concluded that CCS is hugely important to tackling climate change in the most cost-effective way. Without CCS, the costs of halting global warming would double, the IPCC said. Proof of permanent storage could ease some of carbon capture's commercial problems. One of them is obtaining insurance coverage, because insurers are concerned about the long-term financial risks of storing carbon dioxide in a gaseous or liquid form underground, which include the possibility of leakage.

Other innovative approaches to CCS are being explored, including an ExxonMobil-backed project using fuel cells to make capturing CO_2 cheaper and one from Ford which uses CO_2 to make foam for use in their vehicles. Groups are also working on chemical advances to capture CO_2 more easily.

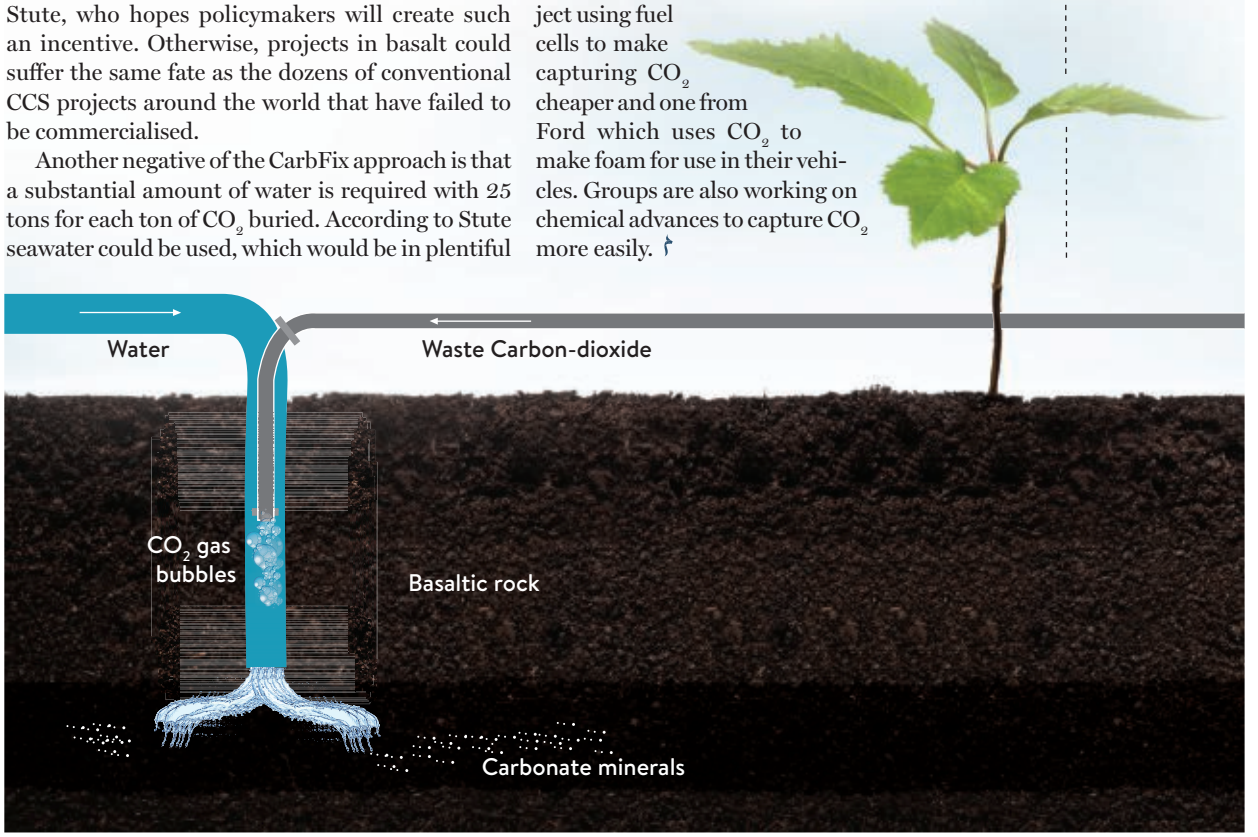
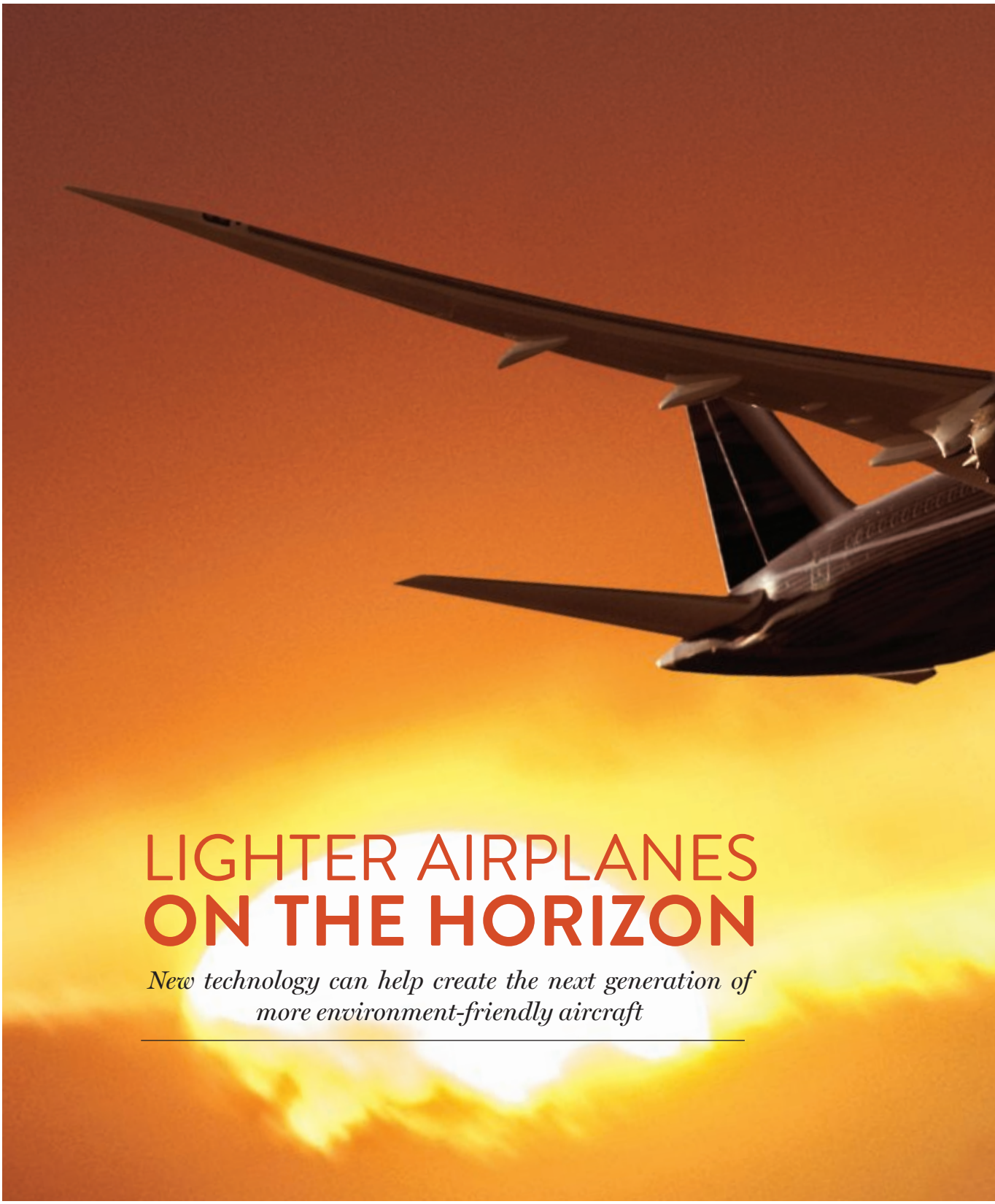


Illustration: Sanil Sadanandan



LIGHTER AIRPLANES ON THE HORIZON

New technology can help create the next generation of more environment-friendly aircraft

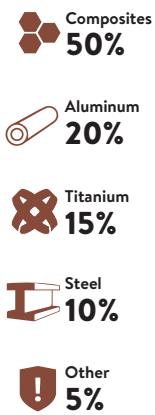


Modern aircrafts are lighter, more fuel efficient and therefore more environmentally-friendly than their predecessors. The Boeing 787 Dreamliner is constructed of 50 per cent composites with aluminium making up only 20 per cent, titanium 15 per cent, steel 10 per cent and other materials five per cent. As a result, the 787 lost 500kg and shrank fuel usage as much as 20 per cent. The new 777Xs, with the first deliveries slated for 2020, aim to curb fuel usage by another 12 per cent.

There are many advantages to composites. They are light weight, have a good strength-to-weight ratio, corrosion resistance, design flexibility, durability, and retain their shape well – which is known as dimensional stability. But they also have some disadvantages. For example, as composites are often constructed of different ply layers into a laminate structure, they can 'delaminate' between layers where they are weaker. And as delamination and cracks in composites are mostly internal, it requires more complicated and costly inspection techniques for detection.

However, these problems may be a thing of the past as aerospace engineers at the Massachusetts Institute of Technology (MIT) have found a way to strengthen the existing composites planes are made of, paving the way for lighter flying machines. The engineers say that carbon nano tube (CNT) stitches can be used to bond layers of the composite material used to manufacture jets, making it stronger and more resistant to damage.

TOTAL MATERIAL USED IN 787 BODY
(by weight)



Aircraft manufacturers such as Airbus and Boeing use composite materials such as carbon fibre reinforced plastic for their passenger jets. The material is extremely light and resilient and reduces the weight of the aircraft by almost 20 per cent compared to aluminium-bodied aircraft. However, a significant disadvantage of composites is the relative ease (compared to aluminium) with which their multiple bonded layers break apart. That is why composites are not used where there are high compression loads, although they are excellent at handling tension loads such as on the wings.

Now, MIT engineers have discovered a way to bond the composite layers by fixing clumps of carbon nanotubes – atom thin rolls of carbon – on a polymer matrix that was then pressed between layers of carbon fibre composites. The microscopic, vertically aligned nanotubes embed themselves within the crevices of each composite layer, 'stitching' them together. Upon testing, the engineers found the stitched composites to be 30 per cent stronger than existing composite materials.

The MIT team believes the technology may be particularly useful for airplane parts that require nuts and bolts. Conventional composites are made up of layers of horizontal fibres held together by a polymer glue. Engineers describe this as a weak and problematic area: when nails or bolts are pushed through the composite materials, they break thousands of carbon fibres, thereby damaging the material. That is the main reason the use of composites is limited to certain parts of modern aircraft design.

Carbon nanotubes – 10 nanometres in diameter which is nearly a million times smaller than carbon fibres – are a much better bonding medium for composites. They can be sandwiched in easily without disturbing the larger carbon fibres, maintaining the composite's strength. The larger surface area of the carbon nanotubes allows them to bond better with the polymer matrix, making the composite stronger than before.

A series of tests were conducted to gauge the material's strength. In a tension-bearing test, researchers put a bolt though a hole in the composite and then pulled it out. Existing composites typically break under such pressure but the stitched composites withstood 30 per cent more force before cracking. In an open-hole compression test – where force is applied to squeeze the bolt hole shut – the stitched composites displayed 14 per cent more strength before cracking.

"The strength enhancements suggest this material will be more resistant to any type of damaging events or features,"

EMIRATES LEADS THE WAY

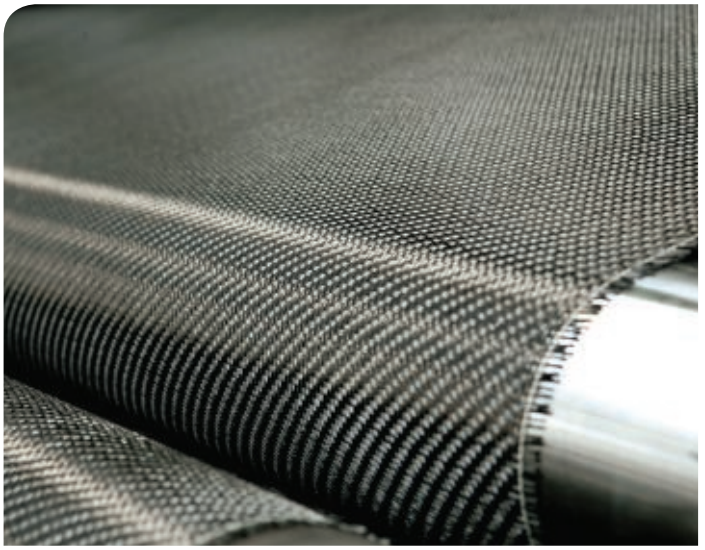


Dubai-based Emirates currently has a fleet of 244 aircraft, with another 262 on order. At list prices, these aircraft are worth US$120 billion. Yet at the same time, the airline is retiring 26 aircraft this year, at an average age of 15.7 years. This is well below the industry norm, which normally retire aircraft at 25 years. In fact, Emirates will take delivery of 36 new aircraft this year, which puts the average age of the fleet at 5.6 years, one of the youngest in the world. In contrast, the average fleet age for the top five American carriers is 13.6 years, while the average age for the top five European airlines is 10.7 years.

According to Sir Tim Clark, President Emirates Airline, "Emirates has a global footprint as the world's largest international airline, and we have a responsibility to our customers, the communities we serve, and the planet. We are fully committed to flying a modern fleet that is better for the environment."

The new aircraft Emirates is taking delivery of this year include 20 Airbus A380s and 16 Boeing 777-300ERs, which emit 12 per cent less carbon dioxide than the aircraft being retired.

Emirates, together with other Gulf carriers, carry considerable clout when it comes to aircraft design and performance as they are amongst Boeing and Airbus' biggest customers. After pressure from Emirates, Etihad and Qatar Airways, for example, the Airbus A350-1000 was delayed by two years as Rolls-Royce developed engines with more thrust.





Left: Carbon fibre reinforced plastic is extremely light and resilient and reduces the weight of the aircraft by almost 20 per cent

says Brian Wardle, co-author of the study and professor at the Department of Aeronautics and Astronautics (AeroAstro) MIT. "And since the majority of the newest planes are more than 50 per cent composite by weight, improving these state-of-the art composites has very positive implications for aircraft's structural performance."

Although advanced composites are unrivalled in their ability to bring down fuel costs, the aerospace industry has been wary of them due to their low damage tolerance. The new technology serves as a breakthrough in the use of advanced composites paving the way for their complete potential to be realised. According to Chris Red, president of Composites Forecast and Consulting LLC, a mere 0.45 kg of weight savings reduces annual fuel expenses (at $3/gal) by US$175 to US$432 per year for passenger jets, dependent on aircraft size and annual flight hours. And that's why composites will be used more and more.

MADE IN THE UAE

The aerospace sector is an important part of both Dubai's and the UAE's efforts to diversify the economy. Dubai Aerospace Enterprise (DAE) has two divisions: engineering, which maintains, repairs and overhauls aircraft; and capital, which is the region's leaser of aircraft. The company currently has 4,000 employees.

Strata, the wholly owned subsidiary of Abu Dhabi government investment firm Mubadala, is an advanced composite aerostructures manufacturing facility based in Al Ain that produces high-quality component aircraft products for original equipment manufacturers.

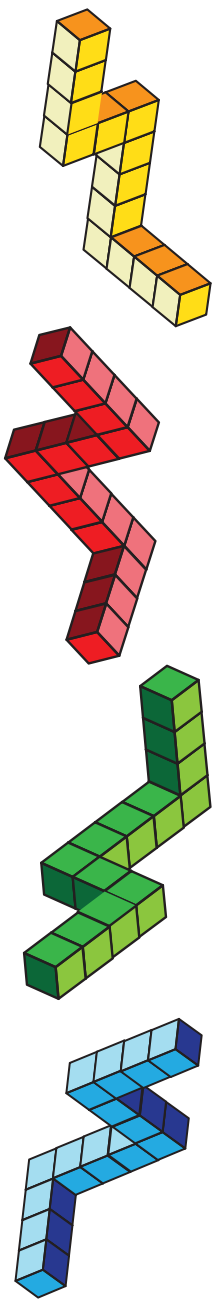
Strata signed $1bn worth of contracts with European plane maker Airbus in July to build composite components and completed major assemblies for the company's small and midsized aircraft. This follows on from a 2013 deal in which the company agreed to supply up to US$2.5 billion in advanced composites and aerostructures to Boeing's aircraft manufacturing programmes.

The UAE has a target of creating 10,000 aerospace jobs in the next 15 years. This is an important aspect of creating a knowledge-based economy. Young Emirati talent is already working alongside academic and industrial specialists at key academic institutions such as Khalifa University, UAE University and Masdar Institute, to develop made-in-the-UAE intellectual property and technology.



SPATIAL REASONING AND MATH ABILITY ARE LINKED

Measuring spatial reasoning in infancy can help predict later math skills



Want to know if your 6-month old baby will ace math in school? A new study by psychologists at Emory University says this is now possible – all parent's need to do is measure their baby's spatial reasoning skills.

A lot of research has been done into the development of spatial reasoning in humans, with the earliest ground breaking work being done by Jean Piaget and Barbel Inhelder. In *The Child's Conception of Space* they outlined that the development of spatial awareness is already underway in new-born babies. To begin with, a baby's world is limited to the space close around him/her. Gradually, the baby explores objects within reach and begins to develop concepts such as 'near', 'far', 'up', 'down', 'big' and 'little'. As the child gains the ability to move around, his/her world expands and new spatial ideas such as 'here', 'there', 'in', 'out', 'around', 'under' and 'over' form. Eventually these concepts are linked with language and refined and clarified to apply to a variety of situations.

Further research suggests that spatial thinking is an important predictor of achievement in STEM, or science, technology, engineering and mathematics. Furthermore, the development of 'number sense' and spatial thinking are closely tied, and early spatial intelligence appears to predict a child's performance in mathematics. That this is true even in babies has been bolstered by the study at Emory University that shows that spatial reasoning skills in infants – as young as six months – are indicative of both the continuity of this ability, as well as mathematical development.

Lead by Stella Lourenco, a psychologist at Emory University, a team of researchers tested 63 infants between the ages of six to 13 months for their ability to transform or rotate objects in their minds. This visual-spatial skill is known as mental transformation and is considered a trademark of spatial intelligence. Previous research has shown that spatial aptitude measured in 13-year olds can foretell their professional and creative accomplishments



in science, technology, engineering and math more than three decades later. Lourenco's study is the first attempt made to measure spatial intelligence in children in infancy.

In an experiment known as change-detection paradigm, the babies were shown a series of paired video streams of two matching shapes, which changed orientation in every presentation. While one video stream rotated the shapes at regular intervals to make them mirror images, the shapes in the other stream were presented only in non-mirror orientations. Researchers then used eye-tracking technology to measure which videos the babies looked at and for how long.

Fifty-three children of the original sample returned to Lourenco's lab at age four to complete the study. They were tested again for mental transformation ability as well as simple ›

symbolic math concepts. The children who had spent more time looking at the mirror stream of images as babies displayed higher mental transformation abilities and also performed better on the math concepts.

Complex symbolic math came into human evolution much later and psychologists believe that the brain's spatial reasoning pathways formed the foundation for it. "Our work may contribute to our understanding of the nature of mathematics," Lourenco says. "By showing that spatial reasoning is related to individual differences in math ability, we've added to a growing literature suggesting a potential contribution for spatial reasoning in mathematics. We can now test the causal role that spatial reasoning may play early in life."

The revelation may also help parents and educators find ways to improve a child's mathematical ability. It may also help explain why some people embrace math while others feel they are bad at it and avoid it.

"Spatial reasoning is a malleable skill that can be improved with training," Lourenco says. "One possibility is that more focus should be put on spatial reasoning in early math education."

That a focus on spatial reasoning improves math results has already been proven. In one study after a single, 20-minute session of practice with mental rotation puzzles, kids (ages 8-6) earned higher scores on a math test compared with control-group peers.



In addition to helping improve regular early math education, the finding could also help children with math disabilities such as dyscalculia.



WHAT IS SPATIAL REASONING?

Spatial intelligence refers to our ability to think about objects in three dimensions. It comprises of two aspects: spatial visualisation and spatial reasoning. Spatial visualisation is our ability to create spatial images in our mind while spatial reasoning is our ability to mentally manipulate these images without touching them physically. Spatial reasoning is important for everyday aspects of our life. Reading maps, doing puzzles and understanding diagrams are all activities that involve spatial skill. Many technology-related jobs, such as designing computer hardware or reading medical X-rays, require the ability to understand space. Usually people with strong visualisation skills also demonstrate sound spatial reasoning skills. Studies show that spatial intelligence can be developed through practice.



A MAN WITH FORESIGHT

Sulaiman Al-Kaabi is fascinated by the field of future foresight and has done much to promote it in the UAE and the region

Sulaiman Al-Kaabi is a 'professional futurist' and a leading researcher in future studies and scenarios in the UAE. He has a master's degree in science from the University of Teesside, UK, a bachelor's degree from Abu Dhabi Police College and is currently preparing his doctoral thesis at the University of Bradford, UK entitled *Strategic Foresight: A New Approach in the UAE Government.* He is also the first citizen of the UAE and the GCC to earn a membership at the Association of Professional Futurists (AFP) in the United States.

The Emirati, who was born in 1981 in the town of Dibba in Fujairah, says the field first caught his attention in 2013, which made him "highlight the importance of establishing a centre dedicated to forecasting the future at the Ministry of Interior, a centre which aims at spreading such a concept among staff, as well as the public. I also called for applying future foresight tools in various Ministry departments."

What exactly is future foresight, and how is it applied? Al-Kaabi defines future foresight as a group of activities aimed at enhancing decision making for a more strategic position in the future by being poised for any possibility. "Our concept is not one future but rather



> *Our concept is not one future but rather identifying a number of possibilities that may occur*



identifying a number of possibilities that may occur," explains Al-Kaabi. "Our mission is to be ready for all of them. It's worth mentioning that future foresight not only seeks to identify and define risks to avoid them, but also to detect future opportunities in order to take them. Mind you, future foresight is not clairvoyant; we are not claiming that we can foretell the future, but we can assess probabilities and be prepared to deal with them."

One of the best-know futurologists was Alvin Toffler, whose best-selling books *Future Shock* and *The Third Wave* foresaw technological advances such as personal computers, the Internet, mobile communication and cloning. Prominent statesmen such as China's Zhao Ziyang, Singapore's Lee Kuan Yew and South Korea's Kim Dae Jung were influenced by Toffler's writings, as was CNN founder Ted Turner and Mexican billionaire businessman Carlos Slim.



The Future Wheel is a simple tool that helps to identify the possible consequences of change

Another luminary who is interested in the future is His Highness Sheikh Mohammed Bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai. Among his best known quotes are "While others try to predict the future... We create it" and "The future waits for no hesitant man". No wonder then that His Highness was the main inspiration behind Al-Kaabi's idea of launching a scientific, knowledge-driven encyclopaedia entitled *Foresight Future*. "The encyclopaedia aims at enhancing future foresight thinking among the Arabs by outlining its concept in the hope of instilling its approaches in Arab culture in the coming era," says Al-Kaabi. The first chapter, titled 'Future Foresight', deals with the most prominent idioms in strategic futuristic studies, which will assist researchers and academia and provide access to specialised reference book.

When asked about the difference between future foresight, strategic planning, and predicting, the pioneer of UAE future foresight explains: "Strategic planning's span may reach five or 10 years, whereas forecasting the future extends to more than 25 years. Another crucial difference between future foresight and strategic planning is that the latter normally only looks at one specific field such as the economy, security and education to name a few. Future foresight takes a broader perspective and considers the interactions between different fields such as the economy, society and politics."

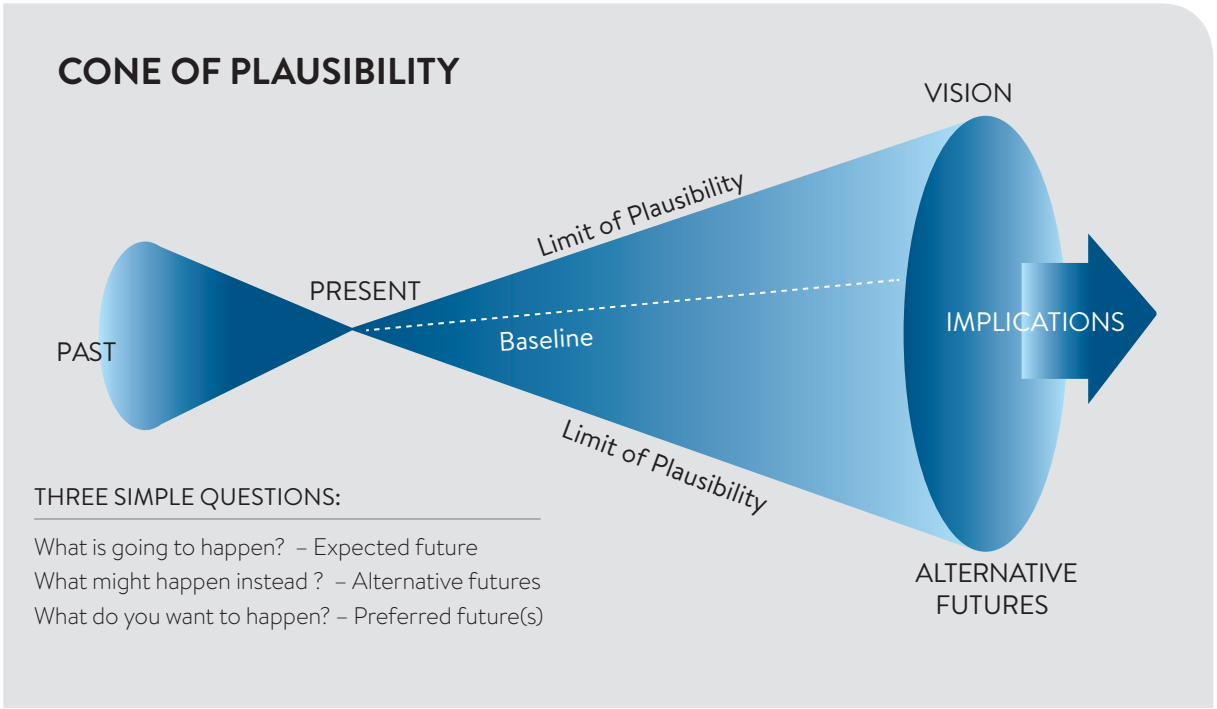
On the techniques and ways to employ future foresight, Al-Kaabi says: "Among the widely-used futures studies techniques and tools applied are scenario planning, Delphi method (a structured communication technique or method, originally developed as a systematic, interactive forecasting method which relies on a panel of experts), the Futures Wheel (a method for graphical visualisation of direct and indirect future consequences of a particular change or development) method, and simulation. Anticipating the future is not confined to an expert team; it goes further to encompass the public. All one needs to easily predict the future of any specialisation is a creative imagination. For example, back in 1992 the renowned cartoonist Steven Johnson drew a set of imaginary future-glasses, which Google Glass made reality."

Al-Kaabi gives a simple example of how the public can employ futurology. "Let's imagine there's an employee who wants to retire the following year and he or she wants to make sure it is the right decision. In this case, using the Futures Wheel method is highly recommended. This way, the direct and indirect factors that will shape the employee's future will be clear enough to decide whether to go ahead or be more patient."

On a government or international level, Al-Kaabi says: "Strategic future foresight is one of the most modern and beneficial approaches to the future. By focusing on the long-term strategic sides of the future, it reveals changes that may take place, and tackles the obscure and as yet unknown aspects of the future. By employing future foresight a bigger scope of the opportunities, as well as possible threats is provided, thereby reducing the impact of surprise factors as much as possible."

According to Al-Kaabi, future foresight is now in wide use. "It has definitely become more common and has been adopted by many global organisations such as UNESCO, OECD, the European Commission, as well as the World Economic Forum. In addition, a number of multi-lateral future foresight agreements have been concluded between North Asian and North European states."

Future foresight appears in different forms in national future



The Cone of Plausibility defines futures that might reasonably occur

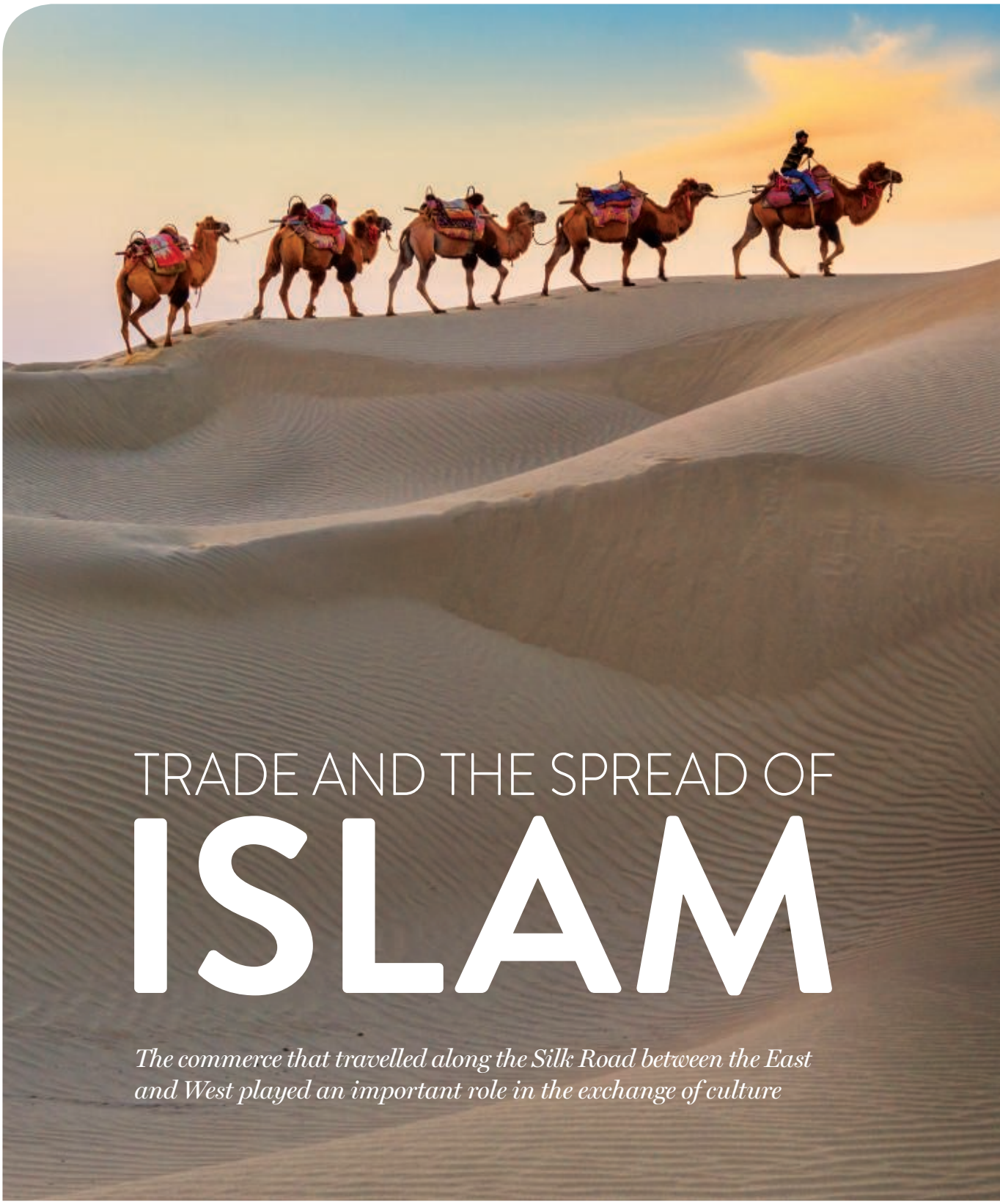
forecasting programmes. Some programmes are centralised – Canada and the US for example – and decentralised in other agencies.

For instance, Singapore started applying future foresight in the late 1980s and has two main entities: Risk Assessment and Horizon Scanning (RAHS), and the Centre for Strategic Futures. However, other agencies include future foresight units as well. "The nation's Civil Service College works hand in hand with the Centre for Strategic Futures, which plays a huge role in the former's activities," explains Al-Kaabi. "The programme is carried out by a team, which in turn has several teams under it, working together to fulfil specific tasks."

Canada's foresight capabilities are embodied in Policy Horizons. The group's three main missions are to anticipate the future by employing scanning and foresight to identify the possible challenges and opportunities for a period of 10 to 15 years, experimenting with innovative methods and technologies, and exploration by cultivating new ideas and knowledge.

On the national government level, Finland has the most widespread foresight capabilities of any government. "The Committee for the Future is present in parliament, plus there are special research departments at universities," says Al-Kaabi. "Finland's history with foresight dates back to the 1990s when it was stipulated in the constitution that a report on the future of the country would be issued every four years. In this manner the government has created a vision of the country's future spanning the next five to 15 years. The parliament examines each report and responds by adding modifications before endorsing it. This make's the report binding to the government." According to Al-Kaabi, the UAE is streets ahead of other Middle Eastern countries when it comes to using future foresight. Besides establishing the Future Foresight Centre at the Ministry of Interior, Al-Kaabi proposed last year that a federal future foresight centre should be established with direct links to all government departments. Al-Kaabi has also run numerous workshops on future foresight, held lectures and invited international experts to the UAE. Moreover, he launched a personal initiative by establishing the first Arab future foresight e-site that aims at raising awareness and disseminating the concept of future foresight in the Arab World based on its scientific principles.

As for the UAE's application of foresight in its policies, Al-Kaabi reveals that plans have been made to send Emirati citizens to study future foresight abroad. Furthermore, Al-Kaabi is now collaborating with the Ministry of Education to include futures studies in the schools and universities curricula. This entails training teachers to adopt more forecasting thinking rather than the traditional one, and passing it to the students. According to Al-Kaabi, the UAE's experience with future foresight has "put the country in the lead. By making the Emirati institutions the main provider of future visions it has become a regional leader regarding this field."



TRADE AND THE SPREAD OF ISLAM

The commerce that travelled along the Silk Road between the East and West played an important role in the exchange of culture



The Silk Road, which was formally established during China's Han Dynasty in 130 BCE, marked the beginning of international trade. The Silk Road was not a single thoroughfare from East to West but a combination of routes, which makes the name Silk Routes more historically correct. Merchants had a wide choice of routes crossing various regions of Eastern Europe, the Middle East, Central Asia and the Far East, as well as maritime routes, which transported goods from China and South East Asia through the Indian Ocean to Africa, India and the Near East.

Different kinds of merchandise such as gold, silver, textiles, spices, grain, vegetables and fruit, animal hides, tools, wood work, metal work, religious objects, art work, precious stones and much more travelled along the Silk Road. However, it was the popularity of Chinese silk that gave the trade route its name. By the time of the Roman Emperor Augustus (27 BCE – 14 CE) trade between China and the West was firmly established and silk was the most sought after commodity in Egypt, Greece and Rome. Silk was so popular that the Roman Empire had a trade deficit with China.

However, the greatest value of the Silk Road was the exchange of culture. Art, religion, philosophy, technology, language, science, architecture and every other element of civilisation were exchanged through this trading network. Therefore the Silk Road played a significant role in the development of the civilisations of China, the Indian subcontinent, Middle East, Europe, the Horn of Africa and Arabia by opening long-distance political and economic relations between the civilisations.



A striking example of this exchange is the spread of Islam from the Arabian Peninsula throughout all of Africa, parts of Europe, Asia and beyond. Regardless whether small minorities or entire regions converted to Islam, trade along the Silk Road played an integral role.

The Prophet Muhammad (PBUH), the central figure of Islam, was born approximately 570 CE and died in 632 CE. After the Prophet's death the initial spread of Muslim rule and authority to neighbouring regions was mainly though conquest. However, most Muslims followed the Quranic injunction "There is no compulsion in religion" (Verse 256 of Al-Baqara) and spread their faith more by example than by coercion.

The role of the Silk Road and trade in the spread of Islam is easy to see in a geo-political context. The Holy City of Mecca, on the Arabian Peninsula, was a renowned centre of trade. Within the first century of Islam's establishment on the Arabian Peninsula there was a rapid expansion of the Arab Empire during the Muslim conquests. As a result three of the most significant empires in world history were formed. The earliest period of Islam was dominated by the Rashidun Caliphate, which was then followed by the Umayyad and Abbasid Caliphates. All three Caliphates encompassed parts of North Africa including Egypt, the Arabian Peninsula and the region that makes up the modern states of Lebanon, Syria, Iraq, Iran and parts of Turkey. With an empire stretching along the Mediterranean Sea to the Red Sea and the Arabian Gulf, the Arab world exercised significant control over the Silk Road trade routes.

THE NEW SILK ROAD

China is spending around $1 trillion to rebuild the Silk Road, a massive trade network across Eurasia. Now called One Belt, One Road, China's plan to build trade routes over land and sea into Europe and Asia may be the most significant global economic initiative in the world today. It calls for the integration of the region into a cohesive economic area through building infrastructure, increasing cultural exchanges, and broadening trade. The Silk Road Economic Belt will connect China with Central Asia, Russia and the Baltic countries in Europe; with the Arabian Gulf and the Mediterranean Sea through Central Asia and West Asia; and with Southeast Asia, South Asia and the Indian Ocean.



Left: The influence of Islamic architecture is apparent in Bukhara, Uzbekistan.

Below: The making of silk was a carefully guarded secret by the Chinese.

As Muslim dynasties expanded and began ruling territories with non-Muslim populations, laws were established to create a hierarchy where Muslims dominated. Non-Muslims were ordered to pay the jizya, a poll tax that allowed them to practice their religion and receive protection from the Muslim ruler. However, converts to Islam reaped greater benefits than those simply paying the jizya, which resukted in more converts to the faith.

Maritime trading links were established between Arabia and China from as early as the 8th century CE. Technological advances in the science of navigation, astronomy, and also ship building techniques made long-distance sea travel increasingly practical. Lively coastal cities grew up around the most frequently visited ports along these routes such as Zanzibar, Alexandria, Muscat and Goa. As early as 1120, Muslim traders were interacting with Malaysian traders and by the 16th century ruled Indonesian islands and established strong communities of Muslims in the Malay Peninsula and the southern Philippine Islands. These cities



became wealthy centres for the exchange of goods, ideas, languages and beliefs, with large markets and continually changing populations of merchants and sailors.

The Muslim practice of direct trade offered further exposure to the religion: Rather than





Top: The West's demand for Chinese silk gave the Silk Road its name

Right: The spice trade influenced cuisine along the Silk Road

working through intermediaries, Muslim merchants would travel to the trading destinations, thus allowing exposure to the religion within other countries as well. In Southeast Asia, an area with a high Muslim population today, Islam spread through trade between India and Arabia.

Islam wasn't the only religion disseminated along the Silk Road. Buddhism also travelled the Silk Road with its art and shrines being found as far apart as Bamiyan in Afghanistan, Mount Wutai in China, and Borobudur in Indonesia. Christianity spread in the same way, as travellers absorbed the cultures they encountered and then carried them back to their homelands with them.

Beside religion and cultural exchanges, numerous technical advances were propagated worldwide by the Silk Road. From China came the techniques of making paper, ceramics, cast iron and gunpowder. The development of printing press technology and paper money also originated there. Similarly, irrigation systems across Central Asia share features that were spread by travellers who not only carried their own cultural knowledge, but also absorbed that of the societies in which they found themselves.

By 650 CE, people in the Islamic Empire were farming silkworms and weaving silk. Sugar cane was grown in parts of the Abbasid Caliphate by 750 CE, and a hundred years later they bred the citron with the bitter orange to make the world's first lemons. By 1000 CE, West Asian blacksmiths had learnt how to make steel from manufacturers in China and India.

The rise of the Ottoman Empire, which embargoed trade with the West, ushered in a new era of trade dominated by European countries. The West was aware that huge profits would be made by anyone who could find a direct trade connection with Asia, and this resulted in the Age of Discovery. The ocean route from Europe to the East was initially discovered by the Portuguese expeditions of Bartolomeu Dias and Vasco da Gama. When Christopher Columbus arrived in America in 1492, he was actually searching for an alternative trade route to China. With the opening of these direct sea routes the Silk Road went into decline, although trade along some of its routes still continues today.

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