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We research for tomorrow

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We research for tomorrow

The Fourth Industrial Revolution is a phrase that has become ubiquitous in the context of discourse about the future. Despite the challenges it faces and all the concomitant problems, such revolution involves a lot of promise for mankind.

Nowadays, the world is witnessing this revolution with some anticipation, following the huge scientific changes the world has seen, thanks to researchers. Technology has rapidly developed, dominating every aspect of life and saving time, effort, and money. That said, some disadvantages have come to the fore.

Many countries have embraced technology and have realized quickly that they cannot lag behind; the train won't wait. Countries should keep pace or catch up, and move forward, for, those who think they can prevail without technology will definitely regret lagging behind.

Research is at the top of the mechanisms and tools by which countries can cope with the Fourth Industrial Revolution. Research assists with the analysis and interpretation of the phenomena associated with the revolution; new technological innovations could be turned into services and products that conform to our vision for the future.

Since research underlies the core message of Sultan Qaboos University, the talk about the Fourth Industrial Revolution is no longer something new or unusual. Academics and researchers have utilized the research resources offered by the University, and in that, they show they have already entered into the national and global competition. They also confirm their ability to contribute to Oman's vision for the future and bring innovative ideas to the world.

The University would not have entered into this feverish global endeavour without the will of His Majesty to support science and the genuine desire of the university to carry out distinguished projects. There is also an effective management in place to evaluate what has been achieved and to avoid mistakes. Since the harvest is dependent on the seeds sown, the outcomes will meet the expectations.

The new issue of Tawasul sheds light on the University's efforts to utilize its research potential to share this important topic with other circles. Research for Tomorrow, the title of this issue's key feature, includes an interview with the Director of the Communication and Information Research Centre and reports on studies into artificial intelligence in medicine, remote sensing techniques, Blockchain, the Internet of Things, and apps. It also covers scientific studies and student innovative activities related to research efforts at the University.

Editorial Board

Archive pictures

SQU Celebrates 19th anniversary of H.M.'s Visit

A film and scientific fair mirror the new tech revolution

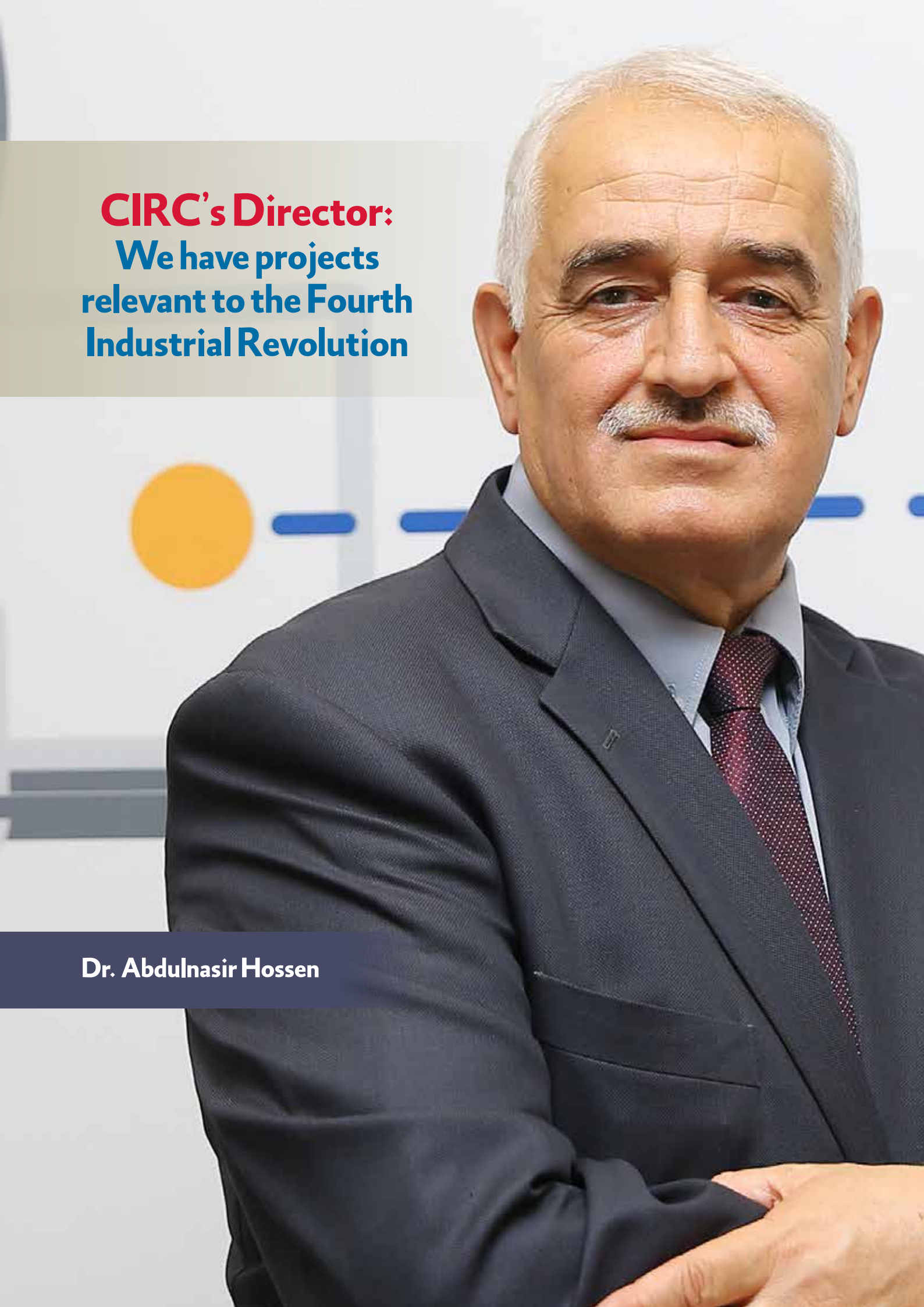
SQU celebrated this month the 19th anniversary of the royal visit of H.M. Sultan Qaboos Bin Said to the University in 2000. The opening ceremony was held in the Grand Hall under the auspices of H.E. Yousef bin Alawi bin Abdullah, Minister Responsible for Foreign Affairs.

The event included two speeches by Dr. Ali bin Saud Al-Bimani, SQU Vice-Chancellor, and Dr. Rahma Al-Mahrooqi, SQU Deputy Vice-Chancellor for Postgraduate Studies and Research. There was also a film that featured SQU's "Research for Tomorrow," produced by the Department of Academic Publication and Outreach. A number of distinguished SQU researchers, academics, employees and students were awarded for their achievements.

A scientific fair showcased distinguished research projects carried out by SQU scholars and covering current issues of immediate relevance to the Fourth Industrial Revolution, which is witnessing heated global competitiveness.

The colleges also marked the occasion by organizing exhibitions and seminars that highlighted their academic achievements.

CIRC's Director:
We have projects relevant to the Fourth Industrial Revolution



Dr. Abdulnasir Hossen

The world is witnessing, day by day, rapid technological developments and huge changes. What was distant yesterday is now possible with the touch of a button, and what used to take days has become available in the blink of an eye. With the current digital transformation in mind, researchers at SQU have taken it upon themselves to deliver solutions that meet short- and long-term needs of the country in technology and communications. They believe that efforts will inevitably yield useful results.

In this article, we interview Dr. Abdulnasir Hossen, Director of the Communication and Information Research Centre (CIRC), who sheds light on selected research activities done by the Centre.

Could you tell us about the Centre … the beginning, goals?

The CIRC was established in 2002 with a mission to promote research and education through government, SQU, and industry partnerships in focused and shared competitive ICT research programs.

The Centre seeks to team with industrial partners to generate solutions to current and future technical challenges related to ICT topics. These solutions involve the amalgamation of off-the-shelf technology, advanced prototype technology, and basic IT research. To accomplish this mission, the Centre strives to achieve such objectives as the following: a) to keep abreast of the current advances in modern digital technology and try to transfer it into the Sultanate; b) identify world-standard appropriate technologies and transfer them to the industry; c) increase the number of SQU researchers who enjoy the skills necessary to deal with strategic technologies and their applications; d) organise workshops, symposiums and seminars and hold conferences on ICT issues under the sponsorship of local, regional ,and international companies; e) develop prototypes; f) issue bulletins, introductory booklets, conference proceedings, and special editions of SQU periodicals to disseminate research findings.

We provide services to researchers and students

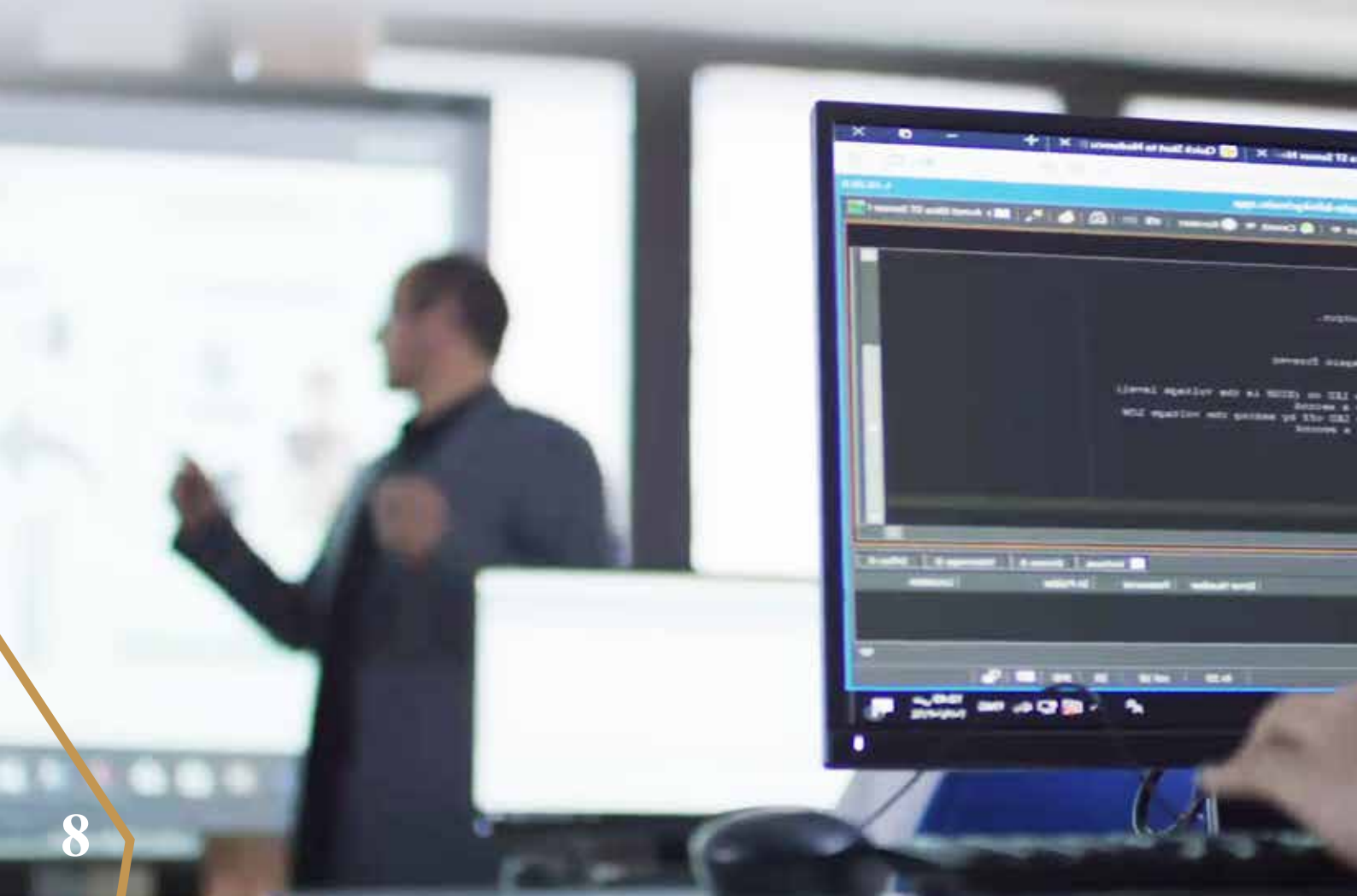
We have collaboration with internal and external agencies

What are the Centre's vision and mission?

The Centre aspires to be locally and internationally recognized as an excellent hub of innovative research in ICT. Its mission is to enhance ICT in the Sultanate through applied research, development, consultancies, and training. We seek to achieve such goals through building strong links with the industry, ministries, and scientific centres at the local and international levels.

What roles does the Centre play in order to achieve its vision and mission?

The Centre has several activities in ICT, including the following: a) conducting applied research in collaboration with other relevant SQU colleges; b) delivering ICT consultancies; c) evaluating ICTs, services, products and policies; d) raising ICT awareness; e) contributing to sustainable technology transfer in the Sultanate; f) delivering training in terms of short courses, seminars and workshops; g) organising conferences and symposiums.



What are the services provided for researchers and students?

The Centre provides many services including consultancy, academic supervision in collaboration with relevant colleges, providing all the requirements for implementing ICT projects, preparing laboratories to create an incubator environment to adopt and develop relevant research projects, raising ICT awareness among students and academics from various disciplines, and delivering training through short courses, panel discussions, and workshops.

What have been the key studies conducted at the Centre since its inception?

Since its establishment, the Centre has carried out several projects, including a) diagnosis of diseases using biomedical signal processing; b) follow-up of patients undergoing coronary artery bypass surgery at SQU Hospital through heart rate test; c) user privacy and control of the flow of data in Android systems; d) M-learning in Oman - development, adoption and dissemination; e) the free and open source software initiative - national deployment plan, reduction of road traffic accidents using alert messages dissemination in vehicular ad hoc networks; f) studying levels of electromagnetic radiation at mobile communication towers.

Nowadays, there is a lot of talk about the Fourth Industrial Revolution. What has the Centre done to keep pace with this development?

The ICT is a vital sector that plays a key role in socio-economic development. ICTs, which falls under the umbrella of the Fourth Industrial Revolution, such as Artificial Intelligence, the Internet of Things, Mega Data and Blockchain, have begun to change and impact economic budgets. Therefore, the Centre is currently implementing several relevant projects, such as: a) Smart Street: Real-time observations of adaptive traffic signals; b) remote monitoring and diagnosis of health care in the Sultanate; c) a vision-based navigation system using the robot application of deep learning techniques and its use as a guide in the National Museum of Oman; d) the stream - renewable spatial management of renewable energy and time scheduling for green cloud computing systems; e) smart urban water management; f) artificial intelligence in medicine - application of neural networks in medical diagnosis; g) the Internet and Things - aspects of security and privacy related to architecture, communications, and data.

Research improves the quality of people's life

Do you have any collaboration with local or international agencies?

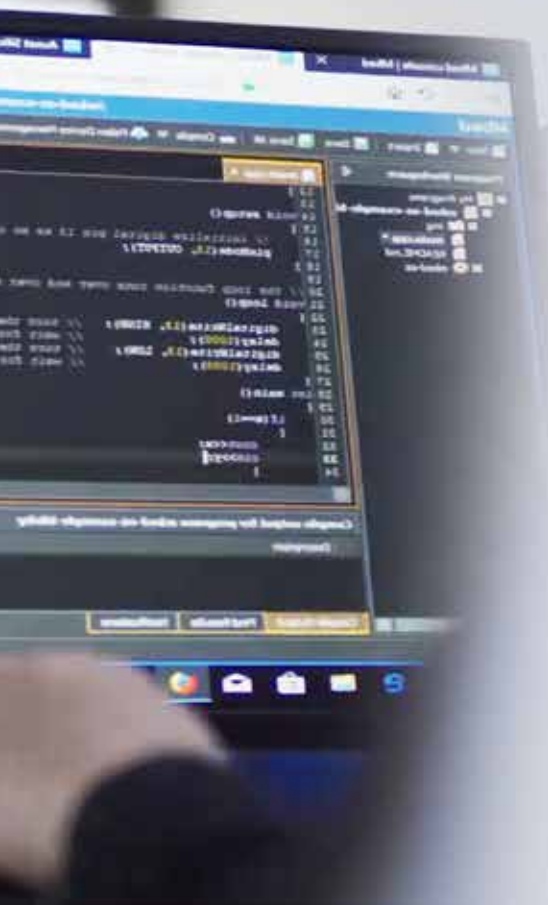
We have cooperation in various fields and with different domestic and global bodies, including the following: TRA, ITA, Oman Oil Company, Omantel, Mumkin, and Oman Blockchain Club. At the international level, we have close relations with Kiel University in Germany and the University of Montreal in Canada.

What is the impact of research on improving ICT locally and globally?

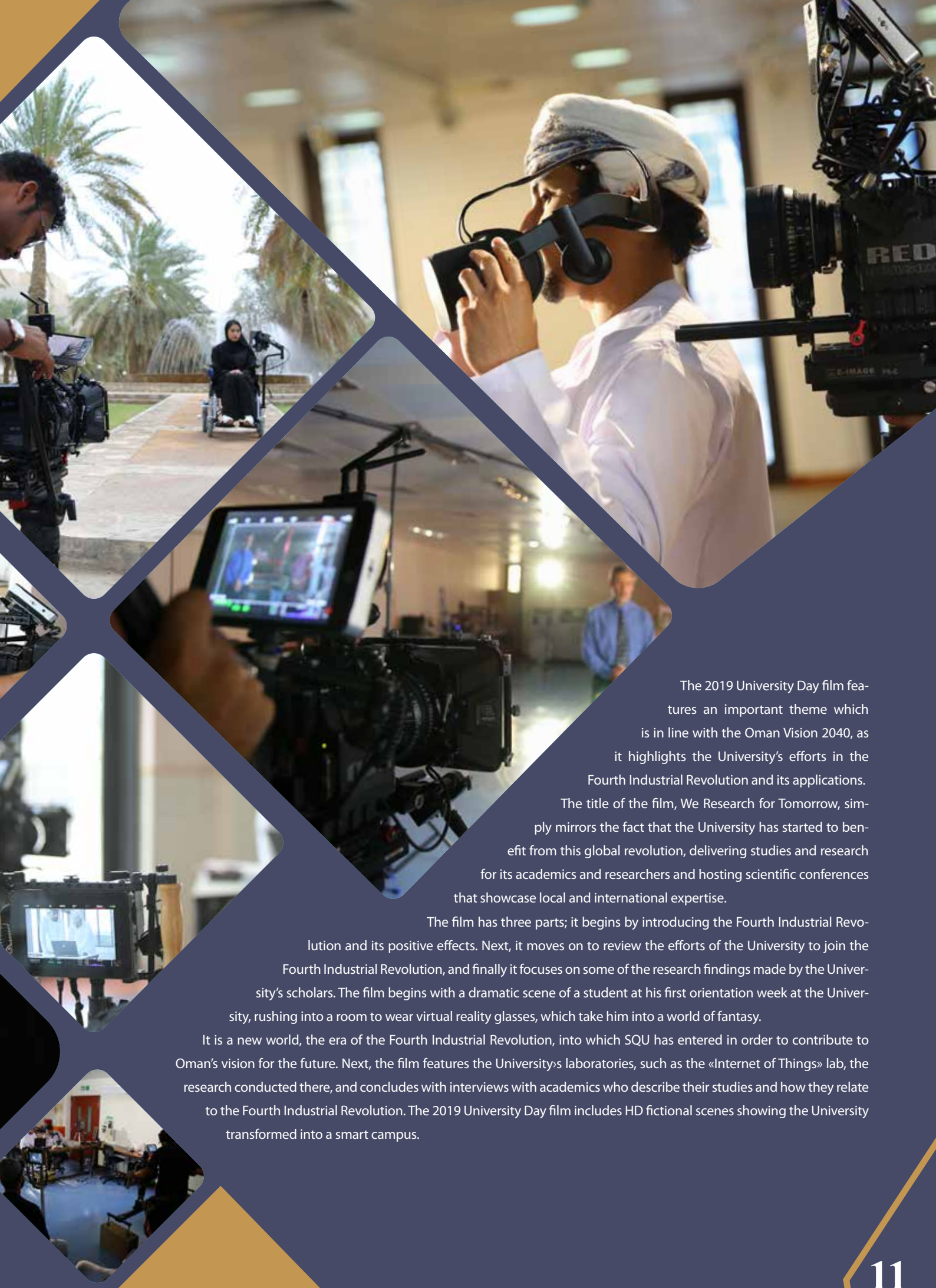
I believe research has had a significant impact on the improvement of ICT services. This is envisaged through the systematic replacement of existing technologies with modern digital ones, creating new job opportunities related to such technologies, and preparing a generation of innovators and entrepreneurs. ITC research also provides great services to other sectors such as health, education, industry, and other fields at the local and global levels.

Are there any challenges encountered, and if so, how do you address them?

Normally any work can involve challenges. At the Centre, we need the following: a) funding to complete the Smart Campus project; b) a research chair in cybersecurity; c) an artificial intelligence research chair; d) two doctoral researchers, one in communications, and the other in networking; e) two specialized labs, one for research into information security, and the other for biomedical engineering research in collaboration with the Medical Research Centre. We also need effective coordination with the TRA and the Information Technology Authority. At the Centre, we work hard to overcome these difficulties. We would like to express our gratitude to the University for its continued support and to all other institutions and companies for supporting the Centre's efforts to become a distinguished institution at the national and regional levels.



We research for tomorrow



The 2019 University Day film features an important theme which is in line with the Oman Vision 2040, as it highlights the University's efforts in the Fourth Industrial Revolution and its applications.

The title of the film, We Research for Tomorrow, simply mirrors the fact that the University has started to benefit from this global revolution, delivering studies and research for its academics and researchers and hosting scientific conferences that showcase local and international expertise.

The film has three parts; it begins by introducing the Fourth Industrial Revolution and its positive effects. Next, it moves on to review the efforts of the University to join the Fourth Industrial Revolution, and finally it focuses on some of the research findings made by the University's scholars. The film begins with a dramatic scene of a student at his first orientation week at the University, rushing into a room to wear virtual reality glasses, which take him into a world of fantasy.

It is a new world, the era of the Fourth Industrial Revolution, into which SQU has entered in order to contribute to Oman's vision for the future. Next, the film features the University›s laboratories, such as the «Internet of Things» lab, the research conducted there, and concludes with interviews with academics who describe their studies and how they relate to the Fourth Industrial Revolution. The 2019 University Day film includes HD fictional scenes showing the University transformed into a smart campus.

Artificial Intelligence in medicine

Artificial intelligence (AI) has hitherto unimaginable capabilities and applications which could revolutionize every area of our life, including medicine, in the next few years.

Researchers at SQU have recently used artificial neural networks (ANN), which is an artificial intelligent tool, in classification tasks for medical diagnosis. They have produced interesting research studies, three of which will be outlined below.

Application of neural networks in medical diagnosis

The application was designed to automatize the diagnosis of obstructive sleep apnea (OSA) , congestive heart failure (CHF) and preeclampsia using neural networks. The objective is to have simple non-invasive methods for the classification of patients from normal controls, to help doctors in their tasks and simplify the process of diagnosis, and reduce the pressure on hospitals and also the cost of health care.

Three different neural networks are implemented in this project to diagnose OSA, CHF and preeclampsia. Three types of features are to be extracted from the heart

rate variability (HRV) signal and to be used: Frequency domain features, time-domain

features, and statistical features of the morphology of the signal. Data for OSA and CHF are taken from the MIT-data bases, while the preeclampsia data has been taken from SQU Hospital.

The three types of neural networks are to be tested and compared in their efficiency of the classification of patients from normal controls for the three diseases under investigation.

Investigation of heart rate variability of patients

Myocardial revascularization by coronary artery bypass grafting (CABG) is an effective measure for reducing symptoms and the rate of mortality in patients with unstable or severe coronary artery disease.

Researchers have carried out a study to evaluate non-invasively HRV in patients undergoing CABG before surgery, and to monitor the status of patients through HRV investigation on day 6 and day 30 after the CABG operation.

The work is based on a soft-decision wavelet-based technique to measure the power of the three main bands of HRV in 24 patients undergoing the CABG operation, before surgery (Group 1: G1), and 6 days (Group 2: G2) and 30 days (Group 3: G3) after the operation.

The research shows how new artificial intelligence techniques can assist medicine and provide the doctors with more efficient diagnosis techniques, and at the same time is cheaper and less complex than classical diagnosis techniques presently used in hospitals.

Mobile healthcare system for monitoring and diagnosis

The idea of providing medical information and health care services to a remote patient has made telemedicine emerge as a fast and rapidly expanding area of research.

The adoption of wireless technology has made possible new applications in healthcare provision, such as remote routine check-ups, emergency and rescue situations, and sports science physiological measurements. The technology should allow medical services to be delivered to any location within the coverage of a cellular network. A patient from a rural area can be given a routine checkup via a cellular network without having to commute regularly to a hospital.

The aim of this research project is to study, design and implement a telemedicine system for sleep disorders in Oman.

Initially, a Center-to-Center (C2C) work model between the Ibri health center and SQU hospital will be developed. Then, at a later stage it will be extended to cover a longer distance: between Salalah hospital and SQU hospital. A fully Body Area Sensor Network is required to perform continuous healthcare monitoring. The biomedical signals, such as electrocardiogram (ECG), oxygen saturation, heart rate, blood pressure, temperature, and so on should be collected in the health center, for patients who need healthcare monitoring. The more biomedical signals transmitted, the more the details on the patient's condition that will help the doctor at SQU hospital to control and diagnose instantly.

More attention will be given to achieving both sensing and monitoring wirelessly. Unlike other systems, the research work will be focused on the development of a technique that can allow a telemedicine link to provide bidirectional data transmission between the patient (in one center) and the specialist (in another center) where the data will be collected and analyzed.

The project will initiate further research in order to develop the expertise of SQU in this new technology, and hence keep it abreast of advances in biomedical engineering.

Smart wheel-chair based on eye tracking

Kifah begins her day wondering who is going to help her move from one place to another, for she is totally paralysed.

The answer has come from researchers at SQU who managed to develop a smart wheelchair for people with special needs, specifically those who suffer from complete paralysis and are completely dependent on their parents or family members.

Tawasul interviewed Dr. Ashraf Selim, from the College of Engineering, who spoke below about the invention.

The beginning

The project began with an idea that was introduced three years ago. The goal was to develop a wheelchair that could be controlled by the patient through brain signals. However, the researchers found that this process required a high level of concentration on the part of the patient, and any simple error could lead to wrong movements. So, it was suggested that the chair could be made smarter through a screen with the site map, controlled by the patient. Through eye tracking, therefore, the patient can choose the direction, and the chair will move accordingly using intelligent algorithms.

The target group

The Smart Wheelchair targets people with special needs, specifically, those who have complete disability, as well as those who have been injured and have lost their fingers or limbs.

Three key benefits

- Very helpful for paralyzed patients
- Less burden on those who take care of them
- Much freedom for the patient to control movements.

Advantages

- The patient can control the wheelchair with eye tracking
- The wheelchair turns into a self-moving robot
- The wheelchair is safe; it has automatic brakes for bumps or sudden situations during movement.

The project stages

- Buying an ordinary electric chair
- Removing the handle and trying to figure out how to give orders to the chair to move
- Setting up a special controller that gives orders to the chair to move through its own electronic circuit
- Buying an add-on controlled module that tracks the eye focus movement and programming it on the chair to enable the patient to control the movement of the chair through the eye
- Installing a small computer and interpreting the intelligent algorithms needed for smart navigation, so that the chair can navigate, once it receives a signal from the eye of the patient.

Affordable cost

The smart chair costs between 1000-1200 OMR. Old chairs can be upgraded to smart ones by adding algorithms at a lower cost.

From idea to product

The project team intends to commercialize the chair and establish a company that would develop the product on a wider scale.

Remote Sensing & GIS utilizes satellites to detect changes

Satellite images provide a large amount of remote sensing data with cost-effective efficiency and local value, which contributes to the use of the Fourth Industrial Revolution to train machine learning algorithms to perform remote sensing functions such as observation, classification, prediction, detection of variables and radical identification of causes of change. This will also help to understand climate change and biodiversity in different sectors.

With this in mind, SQU's Remote Sensing and GIS Center, headed by Dr. Yaseen Al Mulla, has invested in this new technology to carry out various research projects across the Sultanate. These include the potential extraction of diamonds in Al Batinah, remote sensing and analysis of the geospatial data of the ecosystem in the Bar Alhakman region, sustainable development of fisheries and aquaculture in Musandam, the IP-based simulation model for wheat growth forecasts in the Sultanate, and the conservation and sustainable development of a fragile, arid and mountainous environment (the Green Mountain).

At present, the Center is applying new and advanced techniques to several research projects, including a joint research project between SQU and the University of Nizwa for the maintenance of frankincense trees in the Sultanate, assessment of the effects of cyclone Mkono on the frankincense tree using remote sensing techniques, and producing a comprehensive interactive environmental Atlas in the Sultanate.

Other projects are the identification and evaluation of freshwater springs in the marine waters near the coast of Quriyat (Dagmar); a feasibility study of marine water quality control network in the coastal areas of the Sultanate; development of a land cover monitoring system for vegetation cover change in the Dhofar mountains by aerial photography using UAVs; assessment of the quality of air in urban areas in the governorate of Muscat and the four industrial zones of Rasayl, Nizwa, Sur and Ristut; three-dimensional measurement and assessment of water sources of submerged marine springs in the Sultanate; development of an innovative method to maintain the productivity of irrigation water using an instantaneous wireless monitoring system; detection of stressful plants in Al Batinah; and examining the changes in frankincense in Dhofar.

E-assessment of fish freshness

Scientific agencies assert that fish is important in a healthy diet as it is one of the essential food sources that we should maintain.

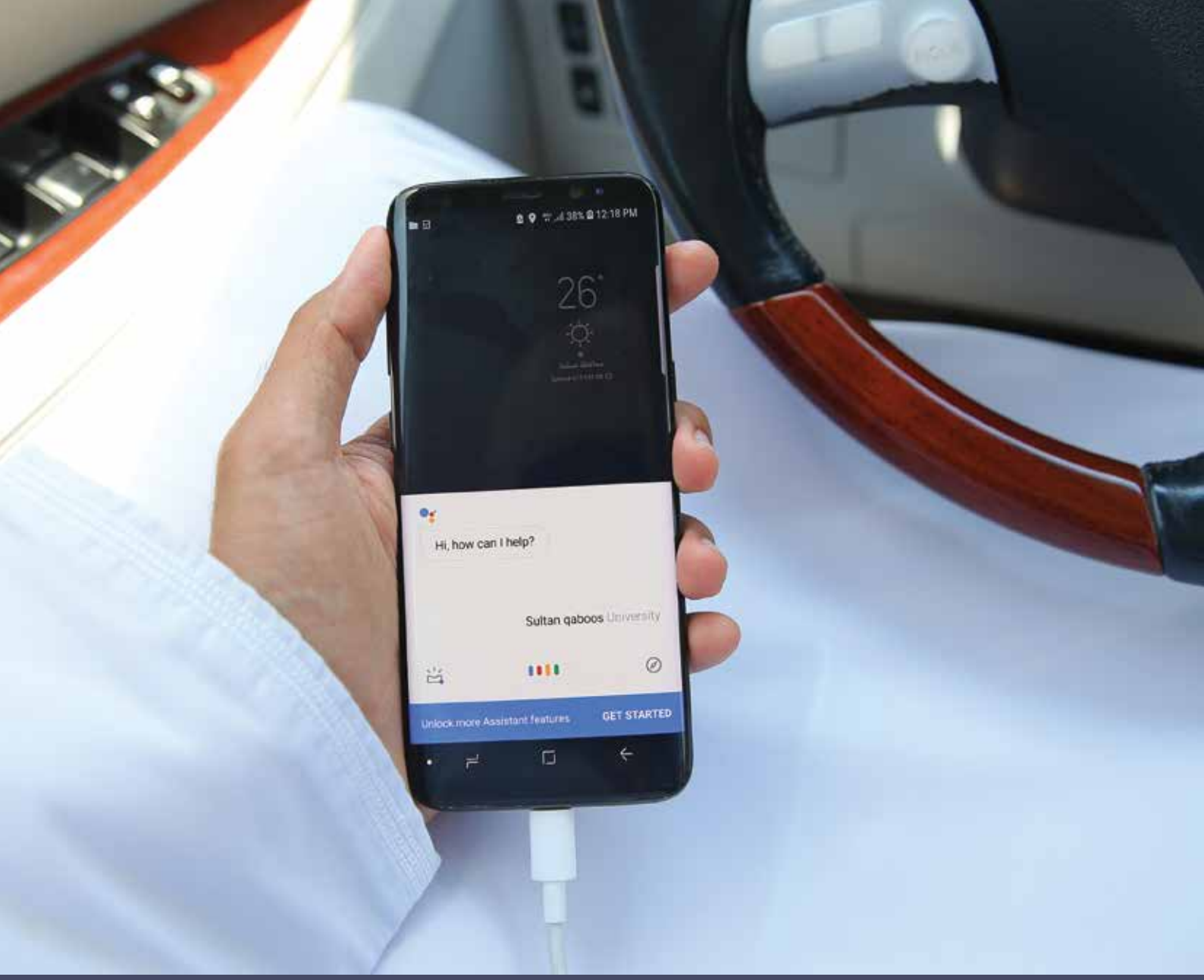
One of the questions fish consumers usually ask when buying fish is whether they fresh? The answer is often "yes", but another logical question that arises is how one can make sure they are fresh.

The answer to this question is offered by a scientific study at the College of Agricultural and Marine Sciences at SQU. A research team is developing reliable methods to determine fish freshness easily and quickly.

On this, Dr. Nasser Al-Habsi, a team member, said: "The team is working on a research project to overcome the existing barriers in the evaluation of fish and marine products. It will focus on advanced techniques, such as e-nose and e-tongue, for evaluating fish freshness, in comparison to other spectral techniques, including infrared and time-domain spectroscopy as well as nuclear magnetic resonance."

Al Habsi pointed out that the suggested techniques are modern and would complement or replace traditional ones for assessing fish in terms of quality, safety and chemicals, as well as examining texture, a process which is tedious, expensive, and time-consuming.

He added that the research findings would provide the scientific basis, standard protocols and guidelines for the evaluation of fish and marine products. Since its launch, he concluded, the project has focused on capacity building at both SQU the United Arab Emirates University and has also focused on training postgraduate students and research assistants.



Zajel: a smart service at SQU

SQU students have successfully been making their presence felt at local, regional and international scientific forums. Recently, a team of five students won first position in the Smart University Ideathon competition organized by the Information Systems Group at the College of Economics and Political Science, in collaboration with the Smart Cities platform. The contest was designed to use the fields of the Fourth Industrial Revolution in solving a campus based problem using such criteria as the element of innovation, applicability, study feasibility, effort, understanding the problem, finding a solution, and presentation. Tawasul met with the winners, who reflected on their project.

A question led to an idea

According to the team, the idea of the program came into being after some deep thinking and reflection on how to deliver a smart solution to the issue: "The day we registered the idea, we participated in the Google GDR Muscat Developer event, in which Google experts hold several workshops on the latest technologies. We learned about the prospects of voice assistant apps, the feasibility of such, and the efforts needed to translate the idea into a product. So, we formulated our initial idea immediately and consulted a Google expert, who liked the idea and encouraged us to participate in the event and develop the product."

Smart solution

They went on to clarify: "There is no need to install Zajel as it is available on any device with the Google Voice Assistant. The latest official statistics from Google estimate that over 500 million devices are supported with the Voice Assistant worldwide. Therefore, the application could contribute to covering activities held within the University campus." They added: "The app also examines the behavior and preferences of users, and thereby suggests the activities that suit their tendencies. The application also provides accurate statistics and data on the effectiveness and responsiveness of activities, resulting in future decisions by which events can be developed so as to meet the expectations of the target group. It is also accessible to people with special needs through voice commands. Not only is this service the best way to promote the University and its services, it will be available on more than 500 million devices worldwide. This takes place through a calling application in the phone. It is simple, easy and very effective."

Enriching experience

The opportunity to participate in the competition and win awards has contributed a lot to the team, according to Ziad Al Gharabi, one of the team members: "The contest helped me balance business and work within a limited scope of time, circumstances and capabilities, as it coincided with my participation at COMEX in Google Developers and being selected for Hackton Digital Innovations by the National Youth Committee. All these circumstances required balancing between my activities and my studies. Anyway, we managed to win the first position in the University, and third place at COMEX, and I did not miss any lecture in that week." Al-Azhar Al-Abri, another member, reflected on his participation: "We managed to schedule our time early enough, which made us work as a team with the resources at hand. We tried to communicate the idea of the app, its benefits and how it would work within the University campus." Abrar Al-Shibli, a team member, emphasised that working together as a team, with diverse skills and know-how, was very important for enriching their knowledge: "This is what happens when we work as a team to provide the best idea and achieve the desired goal. The contest has helped us polish our skills in problem solving. This will enable us to contribute to the environment we act within, be it the University, competitions or any other events, because we are more aware of the challenges we face and the need for development."

Samia Al-Balushi pointed out that "the experience of participating in the Ideathon Competition was very useful, and the team members gained many skills related to team work, problem solving and technology adaptation to create a smart environment at the University. The guidance we received from supervisors helped us to improve the initial idea and increase its efficiency."

Important role

The team appreciated the role of the University in supporting and organizing such events, which provide students the opportunity to innovate and come up with ideas that facilitate their university life. They hoped that the University would provide the support and guidance needed in order to implement their technology, so as to be the primary platform for disseminating the news and announcements of the University.

The 'Internet of Things' lab: a leading developer of smart campus solutions

SQU has been making huge efforts to keep abreast of the latest advances in different research areas, given the important role of science in improving the lives of individuals at all levels.

The Internet of Things (IoT) Laboratory, which was recently opened at SQU, is indicative of the University's keenness to attain technological status and join global players in the Fourth Industrial Revolution.

IoT

The IoT Lab has been set up at the Communication & Information Research Centre (CIRC), with the support of the Omantel and Momkin companies in order to promote IoT in the Sultanate and the region, through training, research and collaboration with academic institutions and companies.

Vision and mission

The IoT Lab has as its vision the transformation of SQU into a leading developer and exporter of smart campus solutions in the region by 2022 by utilizing ICT and other technologies. Its mission is to:

- support the development of Smart City solutions in order to improve the quality of life of Omani citizens
- use, develop, test, study and conduct research in the Internet of Things
- act as a platform for the development of different vertical applications that are also dedicated to other research areas of the University.

Objectives

The Lab aims to:

- raise awareness of the use and development of smart city solutions
- provide an attractive environment for research and communication between users and internet experts, smart objects and cities
- provide a space for sharing experiences and discussing future applications of the Internet and Smart Cities
- enable students and academics to use the full range of Internet technologies to increase research capabilities.

Introducing Blockchain in public sector: research

Said Al-Barami –College of Arts & Social Sciences

Information security, in the past three decades, has become an essential requirement of public and private organizations, owing to the growing number of different types of cybercrimes and hackers.

Although most of such agencies rely on storing their data in a centralized and direct center, e.g. Cloud Storage, they remain vulnerable to various threats from hackers.

In 2014, a new technology called Blockchain came into being. It is a distributed database with the ability to manage an ever-growing list of records called blocks. It is designed to store the data and block any attempt to modify it. Thus, when any information is stored in a blockchain, it will become impossible to change it later.

A new study has been conducted by Said Al-Barami, an engineer, to see how government agencies can benefit from Blockchain. The research, the first of its kind in the Sultanate, is part of the requirements to obtain a PhD degree at the College of Arts and Social Sciences, SQU.

The research has as its goals to investigate Blockchain technology, enhance the current information security standards at government agencies, assess the current status of information security in the Sultanate and support it, study the risks of relying on centralized data storage for government institutions in the central servers and using cloud computation, and examine the possibility of converting government data into the Blockchain decentralized storage system.

The researcher stressed that the application of this technology in government institutions will block cybercrimes and protect their databases from penetration.

The study was based on personal interviews and a questionnaire distributed to IT staff in all government ministries and agencies.

Fourth Industrial Revolution: To start and compete or slow down?

Dr. Hafidh Al-Shehhi –College of Economics and Political Science

Technology is no longer just an instrument of development and support; it has become the centre of international and commercial competitiveness, especially, now, in the age of the Fourth Industrial Revolution, a new industrial revolution led by science, artificial intelligence (AI), the internet of things technologies, large data, data science, and smart city applications. Gartner, the global consulting and research firm, estimated the size of the AI market in 2018 at $1.2 trillion, prompting the world›s top competitors to try to capitalize on the large economic opportunities offered by these new technologies. China, for example, has allocated more than $ 7 billion to invest in AI technology until 2035, and, in 2018, the U.K. invested $ 200 million in AI through joint ventures between the public and private sectors. The European Union has decided to increase its investments in this area by more than 70% to reach 1.5 billion euros for 2018-2020. The years 2017 and 2018 saw great international competition to develop national action strategies in AI. In 2017, Canada, Singapore, Japan and China launched their own strategies, followed by similar strategies in 2018 by France, Britain, the U.S., South Korea, India, Germany and other major countries. This rapid race, which occurs in parallel to the accelerated global technological development, prompts a couple of questions: What is the benefit of all this competition? What are the expected economic returns? In other words, what are the expected losses if our countries do not rush to take advantage of these new technologies?

To answer these questions, we must analyse the view of countries and decision-makers about the technology; some seek opportunities and some show fear or reluctance to embrace any new technology. Today, we see China and the United States belonging to the former group, getting into a technological cold war to take advantage of all opportunities provided by industrial revolution technologies. The United States is waging a media and legal battle against Huawei, which is said to have a strong relationship with the Chinese government, accusing it of trying to spy on the US by exporting phones and data servers with spyware. As a result, Canada has taken into custody the financial director of Huawei, who is also the daughter of the founder of the company, for fraud. Another group of countries and decision makers could pause in an attempt to benefit from the experiences of major countries and avoid making mistakes or losing investments. Arab and Gulf countries, in general, seek to take advantage of modern technologies without rushing in an attempt to create the appropriate environment and set priorities before implementation. In the Sultanate, efforts have been made to plan for the adoption of the techniques of the Fourth Industrial Revolution through various quarters. The Industrial Strategy 2040 of the State is in line with the Oman 2040 Vision in keeping pace with the Fourth Industrial Revolution. Some agencies have also announced agreements to develop modern technologies-based smart cities; one such agreement was signed by the Sultanate with the Republic of Korea last year to transform Duqm into a smart city, and Omran plans to transform the project of Al-Arfan into a smart city.

In addition, there have been efforts to build capacity and raise awareness in this regard. In recent years, we have seen a trend to organize Hackathon events from several quarters. The most recent include Hackathon Sohar which was organized by the Smart Cities Platform, and the Asyad Group, which produced AI-based smart solutions. Although commendable, such efforts lack in guidance. Today, Oman needs to intensify and bring together all efforts towards a national vision that shows us how different sectors of the State can benefit from the Fourth Industrial Revolution, who is responsible for its development, and what the most important projects to focus on in the next five years are.

High-speed laser lab for researchers and students

SQU provides an integrated research environment that includes the equipment and technologies required for conducting research projects and experiments. In this article, we shed light on a new piece of technology installed in the Department of Chemistry, College of Science.

The technology

It is a laser lab of high-efficiency solar cells built of new modified semiconductors.

Applications

The laser lab is capable of measuring femtosecond dynamics (one billionth of a second) using the latest tools to study high-speed chemical and physical reactions. Laser spectroscopy provides a unique way to study emerging applications in various fields related to chemistry, physics, materials science and nanotechnology. In this plant, two laser beams are generated: one to initiate the reaction, and the second beam to follow the state of the reaction in a precise manner so that the main dynamic processes can be understood in many important research areas.

Advantages

The system is an essential source for studying the chemical and physical properties of new materials used in the construction of modified semiconductors in solar cells. It provides students, both under- and post-graduates, with integrated training in a wide range of scientific research tools that combine physical, theoretical and organic chemistry, and the opportunity to apply their skills in a practical and innovative way. The facilities for this project will form the core of a new photovoltaic research center.

Potential uses

The laser lab could become the foundation of the solar energy program at the University›s Nanotechnology Research Center.

Costs

It has taken a whole year to design and build the lab to the value of OMR 300,000.

Economic Feasibility Study Preparation and Analysis: a new publication

Theme

A feasibility study, by definition, incorporates knowledge from different disciplines: Accounting, Economics, Finance, Management, Operations Management, and Marketing. Given the societal shifts toward entrepreneurship, consumer awareness, and the high degree of competition, as well as the costs of setting up a new business, an increased demand for feasibility studies has arisen. This book has come to fruition due to a felt need for a resource that can guide professionals and economists to develop and write feasibility studies.

Objectives

This book presents an overview of the major theoretical as well as practical aspects of a feasibility study. It teaches and guides the reader through a step-by-step format. The information in this book will provide its readers with the basic knowledge and skills needed to prepare and write a proper feasibility study.

It falls into five parts and eleven chapters. In Part One, the introductory concepts and definitions, as well as the seven sections of a feasibility study, are defined in two chapters. Part Two presents Market, Technical, Legal, Organizational and Managerial, and Financial Analyses, in five chapters. Part Three illustrates the concepts of "Time Value of Money" and "Investment Decisions Methods", in two chapters. A practical example is explained in Part Four. Finally, Part Five summarizes the concluding section of a feasibility study.

Significance

This book targets an array of readers. Undergraduate students in colleges of business can benefit from this book and so can Undergraduate students from other colleges if they plan to commercialize their final year projects. Besides, it is a very good guide for professionals who work in accounting, finance, economics, and marketing consultancy offices. It can be a reference for banks and financial institutions for reviewing feasibility studies for funding decisions, as well as venture capitalists supporting business owners financially. The book can also be used as a guide for business owners and entrepreneurs to prepare a feasibility study.

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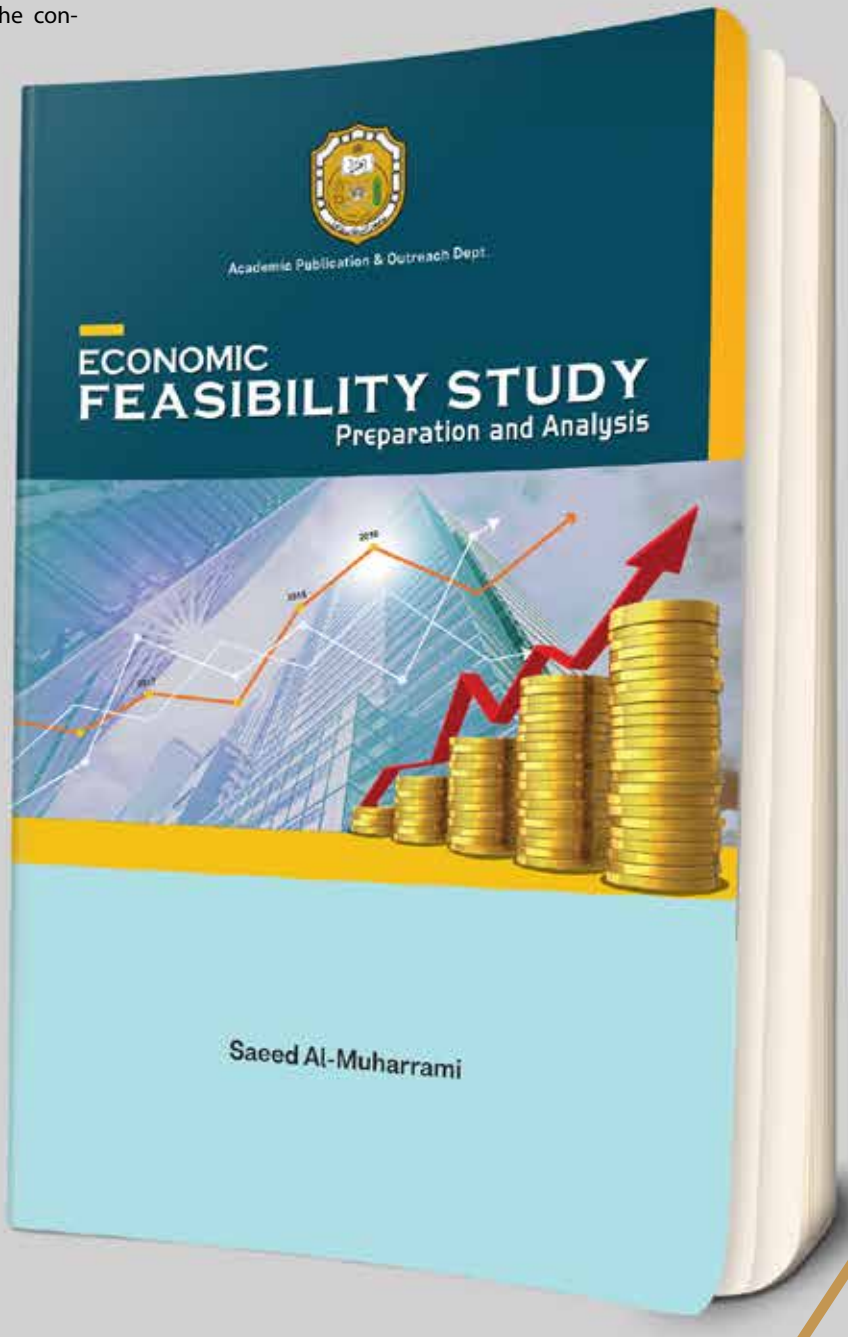


Research presents important findings Investigating the pedigree of horses in Oman

Dr Mohammed Al Abri – Department of Animal and Veterinary Sciences

Purebred Arabian horses is an expression that often makes headlines in horse racing news, which gives rise to a number of questions about their genetic background, and the kind of horses we have in the Sultanate.

To address these queries, Tawasul interviewed Dr Mohammed Ali Al-Abri – Assistant Professor at the Department of Animal and Veterinary Sciences, College of Agricultural and Marine Sciences. He has conducted a research project, the first of its kind, to examine the population structure and genetic diversity of the Arabian horses in Oman.

The research was in collaboration with the University of Florida (Dr Samantha Brooks) and The Royal Cavalry of Oman.

Al-Arbi sheds light on the historical background of the horses and their important uses in farming, war, trade and transport. Ever since wild horses started to be tamed, about 5,500 years ago, there have been some 400 different breeds that have evolved due to the selection of many desirable traits.

He added that Arabian horses have always topped the list of horses preferred by breeders, because of their metabolic efficiency, ability to withstand harsh desert climatic conditions, and unwavering loyalty. For these reasons, he said, purebred Arabian horses have become very important for the survival of Bedouins and their culture in the Arabian Peninsula, where they had for centuries followed and carefully examined the pedigree and ancestry of their horses.

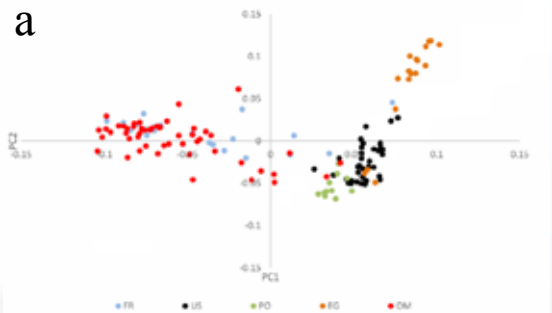
Dr Al-Abri remarked that, notwithstanding the importance and utility of horses, no studies have been carried out to investigate the genetic background of Omani Arabian horses. "Unfortunately, many horse owners abandoned their horses after the introduction of modern transportation in the 1970s, which resulted in

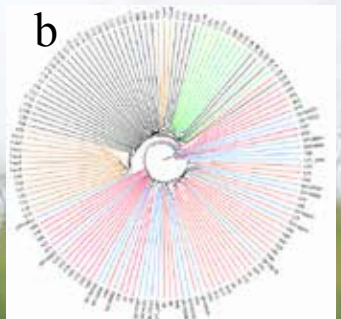
a decline in the Arabian horse population. Moreover, the recent introduction of new Arabian horse bloodlines in Oman has resulted in an ambiguity regarding the origins of Arabian horses in Oman today."

In his research project, the academic aimed to clarify the genetic background and levels of genomic inbreeding of Omani Arabian horses. To that end, a total of 72 hair samples from 24 horses from Sharkiah, Dahira and Batinah were obtained. DNA was extracted using standard methods and approximately 65,000 genome wide SNPs genotypes were obtained per animal using the Equine SNP70 SNP chip. In addition, genotypes belonging to 22 French Arabians, 17 Egyptian Arabians, 11 Polish Arabians, and 36 American Arabians, genotyped using various density platforms, were included in the study.

He added that Multi-Dimensional Scaling Analysis (MDS) (Figure – a) and Phylogenetic Tree Analysis (Figure – b) had shown that the majority of Arabian horses in Oman have descended from French Arabian horses.

"In line with our expectations, no pure Omani Arabian bloodlines exist today in Oman. This was confirmed both by the horse owners as well as the MDS analysis. The average genomic inbreeding levels in the French and Omani Arabian horses (-0.009 and -0.05) were the lowest compared to the Egyptian (0.156), Polish (0.05) and US Arabians (0.043). In addition, the genomic relationships obtained confirmed the pedigree relationships of the Omani Arabians included in the project and revealed some new, previously unknown, relationships to the owners. Our results are critical for decision makers as well as owners in shaping future policies and decisions in Arabian horses breeding and management."





Science says

New treatment brings hope to patients with paralysis

Dr. Jumana Saleh - College of Medicine and Health Sciences

Injuries to the spinal cord can cause paralysis and for many, paralysis is a life sentence. However, things are changing. Great hope is emerging from the stimulation of the spinal cord with electricity. A recent study published in Nature on October 31, 2018, revealed promising results. Three patients had very badly injured spinal cords and had been paralyzed for at least four years before the new form of treatment was introduced. The patients still had some nerve connections at the site of their injuries; however, even after intensive therapy none of them had been able to regain any movement. In this study, as the patients were undergoing training for five months, they were also treated by zapping the nerve cells in their spinal cords with electricity by introducing a small device into their bodies to emit electrical pulses.

Fortunately, after this treatment all the patients were able to walk with some support. Two of them could walk with supports without electrical stimulation. This suggests that the treatment may have helped strengthen the links between the brain and spinal cord. Sending pulses of electricity to the spinal cord can trigger the muscles to move. Renowned neuroscientists believe that this kind of recovery is "extremely exciting". The treatment was a technological challenge, says Grégoire Courtine (2018), the coauthor of this study at the Swiss Federal Institute of Technology in Lausanne. Courtine's team designed a wireless system to control it. The device sent electrical pulses to specific groups of neurons at precise times, and those times could be set to match how patients wanted to move their muscles by targeted stimulation. Within a week of starting this therapy, all three patients could walk as their spinal cords were being stimulated.

After five months, two patients were able to walk hands-free when they were wearing a harness that supported 35 percent of their body weight. The third patient, who had more severe injuries, needed greater help. Interestingly, the two patients later were able to move without electrical stimulation. They could go from sitting to standing and walk short distances with crutches. The third patient could move his legs without stimulation. Courtine and his colleagues hope to test the technology in people with more recent injuries. After paralysis, the muscles and nerves usually start to waste away. If doctors could start the treatment sooner, patients might be able to make even greater recoveries.

Two other major studies had similar results. Patients who no longer had any working nerve connections between their spinal cord and leg muscles showed similar recovery from paralysis. Showing that nerve zapping can help different types of patients "is really important," says Susan Harkema, a neuroscientist at the University of Louisville in Kentucky. In people with different types of long-term spinal cord injuries, "we've showed people can recover with training and stimulation". The study was published in the renowned New England Journal of Medicine.

SQU, Be'ah join hands for a green campus

Dr. Amer: The collaboration promotes the "Green Campus" mission

Dr. Mohab: We seek in-country value

Our environment faces huge challenges every year. The world's population is on the rise, coupled with the expansion of industrial, commercial, and tourism projects, all of which cause direct and indirect environmental pollution. The Sultanate has not been spared by such challenges, which is why H.M.'s directives to diversify the sources of energy and use renewable energy have been translated into a directive issued by the Council of Financial and Energy Resources for the Electricity Sector in the Sultanate. The main purpose of the directive is to ensure that the rate of renewable energy use is at least 10% of the total energy consumption by 2025. The implementation program aims to increase this to 11% by 2023, and the Oman Vision 2040 aims to achieve 20% by 2030 and 35-39% by 2040. The Sultanate has signed several international agreements to contribute to the reduction of environmentally harmful emissions. It has also established various bodies to conduct joint research in various environmental fields, and to improve efficiency and management. One such endeavour is the cooperation between SQU and the Oman Environmen-

tal Services Holding Company (Be'ah) to establish a partnership to strengthen the 'green campus' mission of SQU.

In this regard, Dr. Amer Al-Hinai, Director of the Sustainable Energy Research Center (SERC) at SQU, said that a research team had carried out a field study to examine the readiness of green campus and ensure zero gas emission for a sustainable campus environment. This was done in collaboration with several agencies including Be'ah. He added that the study was carried out by SQU, represented by the Office of International Cooperation and SERC, in collaboration with the Institute for Applied Material Flow Management (IfaS), at the Travelling University, Germany. The team included a group of postgraduate students and researchers from both universities, as well as staff from Be'ah. Al-Hinai stated: "The cooperation between the University and Be'ah was not the first. A bilateral cooperation program was signed in order to establish a mutually beneficial partnership that would enhance the University's "Green Campus" mission. The cooperation program aims to promote the strategic goals of Be'ah with regard to achieving landfill diversion and promote circular economy initiatives across the Sultanate, through the establishment of a Reuse Center within the premises of SQU."

On the other hand, Dr. Mohab Al-Hinai, Head of the Environmental Center of Excellence (ECE) at Be'ah, stressed that the partnership between SQU and Be'ah would help meet the goals of both parties: "Such goals include promoting the best practices for campus sustainability by encouraging active participation in green initiatives as well as achieving Be'ah's strategy of waste diversion from landfill by introducing waste reduction and reuse practices, thus reducing carbon footprint and green gas emissions from landfilling."

He went on: "The partnership also seeks to achieve In-Country Value through creating employment and ensuring Omanization. It also aims to strengthen and unify existing reuse efforts across the Sultanate under one umbrella to optimise the Centre's operations."

He pointed out that Be'ah had launched its nation-wide waste diversion strategy, which estimates that by 2020, it would be essential to divert 60% of waste from landfills and 80% by 2030. He underlined that the company focuses on forming a pre-disposal waste diversion mindset promoting the concept of 3Rs, 'Reduce, Reuse & Recycle,' through the establishment of a joint 'Reuse Center' in collaboration with SQU, which is currently exploring opportunities to promote its sustainable development culture and practices within the campus community.

Dr. Al-Hinai added that the Reuse Centre initiative would encourage university staff and students to be actively involved in waste reduction and minimization activities. It will also provide environmental, financial, economic and social benefits for all stakeholders involved and will become a centralized hub promoting sound environmental practices across the country, he said.

He mentioned that the ECE provides innovative solutions and modern technologies to address waste problems and enhance the capabilities of the environmental sector in the Sultanate to compete with global expertise. The company also launches programs for Omani capacity building in environmental sustainability, raising awareness and finding solutions to negative practises in dealing with waste, he concluded.


بيئة
be'ah
جريمة بحق البيئة
#مطلوب ـ للعدالة
A crime against the environment