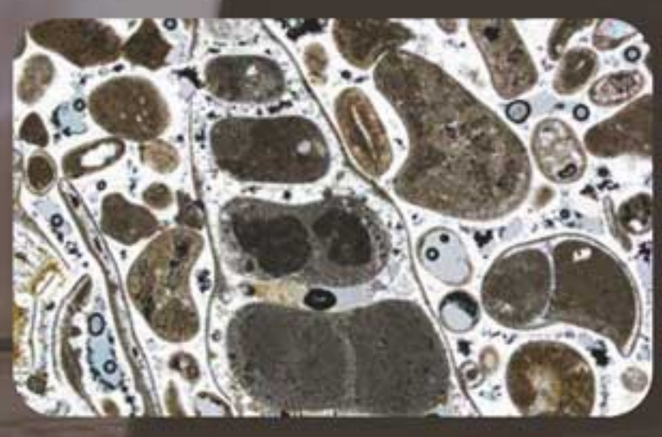
جامعة قطر
QATAR UNIVERSITY

Qatar University Research Magazine

Issue 16, December 2021

Virtual Reality in Medicine

Interview with an Inventor Student: Yosra Magdi Mekki



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Editorial

Significant Contributions

Dear Readers,

The 16th issue of the Research Magazine documents the leading role Qatar University has played in entrepreneurship and innovation, and its firm quest in developing research methodologies to make a tangible difference in producing scientific material and contribute to the development of Qatar's economy. This is featured and manifested through the University's participation in innovative research projects such as the St. Petersburg International Economic Forum (SPIEF) 2021, and the invention of the Marine Clutch, which moved from the experimental stage to commercialization. The cover page of the magazine highlights the invention of the student Yosra Makki in virtual reality, which was instrumental in enhancing QU's support for its students by enabling funds for their innovations, and encouraging their relevant application.

The issue also features distinguished research achievements. We are pleased to announce the launch of the Research Support Blog, an online network that aims to produce an effective research output, in addition to mentioning QU's Health Cluster, which in cooperation with Hamad Medical Corporation, was able to design an innovative educational program that aims at teaching, mentoring and improving the skills of healthcare workers in various disciplines. The College of Education is also collaborating with us by developing a smartphone application that enables visually impaired children to identify all types of food and fruits accurately.

We have also included a research that associates periodontal infections with the risk of complications arising out of Covid-19, and proposes a new method to mitigate airborne pathogens, including the emerging Coronavirus strains. In addition, the Ibn Khaldon Center for Humanities and Social Sciences also conducted a study that used the Social Network Analysis method, while the Social and Economic Survey Research Institute participated with an article which observes general opinions regarding the amendments to the Qatari Labor Law. The QU College of Law shared a comparative study on Qatari Law.

In addition, this issue carries a research study from the College of Business and Economics indicating that taxes are effective means for economic diversification to compensate for any adverse consequences on Qatar's budget. There is also a research study conducted by Qatar Transportation and Traffic Safety Center on the safety and security of pedestrians. We also shed light on a dialogue with Prof. Abdulhamid Al-Ansari on his book "Shura and Its Impact on Democracy," recently published by Qatar University Press. A dialogue with Dr. Nasser Al-Nuaimi, Associate Vice President for Research and Graduate Studies is also included, along with other dialogues with distinguished professors and students to discuss their research and inventions.

This semi-annual issue also covers the most prominent events and activities conducted by QU's Research and Graduate Studies Sector, amongst which Qatar University's Annual Research Forum and Exhibition 2021 was held under the slogan "Building Resilience at Universities: Role of Innovation and Entrepreneurship." A number of ministers and senior state officials attended the Forum.

Finally, the Magazine also details the first ever national competition titled, 3MT (three-minute thesis), organized by the Office of Graduate Studies.

We encourage you to learn more about QU's research achievements, which we are proud to share. These achievements align with the University's contemporary changes, and fulfill Qatar's community and market demands.

A happy reading.

Prof. Mariam Al-Maadeed,
Vice President for Research and Graduate Studies,
Qatar University

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The Research and Graduate Studies Office acknowledges the contributions made in support of publishing this issue. Editorial contributions are also welcomed on the following email: vprgs.eco@qu.edu.qa

News

Qatar University Presents Innovative Projects at St. Petersburg International Economic Forum (SPIEF) 2021

As a pioneer and innovative institution, Qatar University managed to respond to the recurring challenges facing the State through its sophisticated research and academic structure to offer effective and intelligent solutions. These efforts aim to support the Qatari economy, social growth and innovation. Furthermore, innovative research projects support the relations with local and global educational institutions to create knowledge networks. In light of its institutional excellence, research pioneering, and social participation, QU met with 50 institutions operating in Qatar during the St. Petersburg International Economic Forum (SPIEF), the leading platform and one of the key economic forums in the world. SPIEF discusses the major economic issues that faces Russia, emerging markets and the global economic issues. The Forum took place from 2nd to 5th June 2021.

Under the leadership of HE Dr. Hassan bin Rashid Al-Dirham, President of QU, the University participated in the forum with a package of six innovative research projects. The inventions were created by corporations that aspire to go beyond the experimentation phase and proceed with introducing these inventions in various markets. These inventions aim to provide effective and intelligent solutions exclusively in the fields of environment, medicine, energy and technology. Dr. Hareb Al Jabri, Director of QU Innovation & Intellectual Property Office (IIP), said that several branches of science were examined before the University's participation in the Forum. Accordingly, the projects and corporations were selected. They were paid attention by investors in Russia, especially Russian Chamber of Commerce, which expressed their interest in the fields relevant to the environment and energy.

The innovative projects presented by QU in the forum included: (Gernas Air Quality Monitoring) an environmental source powered portable Smart Air Quality Sensor System, led by Prof. Farid Touati, College of Engineering; (Rosie, the services Robot) a robot for Disinfecting Public Places after Covid-19 Pandemic, led by Dr. John John, College of Engineering; (Athlete Spotter) Discovery of Genetic and Metabolic Factors Contributing to Elite Athlete Performance, led by Dr. Mohamed Elrayess, Biomedical Research Center; (OutCool) Cooling Method used in Qatar 2020 Mondial stadiums, led by Dr. Saud Abdul Ghani, College of Engineering; (Algal Technologies Products) Development of Algae Products and Usage in Several Applications, such as: human dietary supplement, animal fodder, high quality dyes and other applications, led by

HE Dr. Hassan Al-Derham, QU President, at the Qatar University Booth - SPIEF Forum.

Left: HE Dr. Hassan Al Derham, QU President, while signing an agreement between Qatar University and Lomonosov Moscow State University (MSU) - SPIEF Forum.

Dr. Hareb Al Jabri, College of Arts and Sciences; (Marine Mushroom) Mushroom Shaped Artificial Reef to Restore Natural Habitats and Fishery Resources, led by Dr. Bruno Welter, Environmental Science Center.

On the margins of the Forum, QU signed separate agreements with three universities. The first agreement was signed with Moscow State University (MSU) to establish mutual academic and research cooperation. It aims at scaling up the internationalization of education, including developing academic mobility, expanding cultural relations, and exchanging educational/ research activities. The agreement was signed to crown the current and future cooperation in fields of Human and Social Sciences and Gulf Studies. Additionally, QU signed a MoU with Saint Petersburg University (SPBU) to develop the scientific and academic cooperation in fields of mutual interest for the colleges of Business and Economy of both universities. The agreement targeted undertaking and promoting joint scientific/academic activities, publishing research, periodicals, text books, educational lectures, organization of seminars, conferences and other joint projects, including student exchange programs. The third agreement was signed with the High School for Economy (HSE) in the legal field; having objectives of academic exchange between students and faculty, developing and implementing joint education programs, cooperation in the publication field, joint research, organization and implementation of joint cultural events face-to-face or online.

Qatar Booth - SPIEF Forum

Moreover, the Qatari corner focused on promoting the International Economic Forum Program through serious discussions on the industrial, economic, investment, technological, and sports capabilities of Qatar. They aim at offering an adequate environment to exchange expertise and generating economic results for both sides. QU excellently represented the participation of Qatar that aimed at promoting and enhancing the academic/research cooperation relations, considering that QU participation resulted in cooperation between QU and Russian Universities in various fields.

QU, MME Sign Agreement over Granting Licenses for Distribution of New Marine Clutch to Fishermen

Qatar University (QU) has a pioneering role in preserving the environment, finding alternatives and solutions, and using environment-friendly materials and innovations. QU directs its research efforts towards preserving Qatar's natural environment and reducing hazards to its ecosystem in order to achieve its aspirations towards sustainable development in its environmental dimension and realize Qatar National Vision (QNV) 2030. In this regard, QU signed an agreement with the Ministry of Municipality and Environment (MME) in the presence of HE Dr. Hassan bin Rashid Al-Dirham, QU President, together with a number of Vice-Presidents of the University on 9th September 2021. The agreement was signed by HE Sheikh Dr. Faleh bin Nasser Al Thani, Assistant Deputy Minister for Agriculture and Fisheries at the Ministry, and Prof. Maryam Al-Maadeed, Vice President for Research and Graduate Studies. The agreement states that QU shall grant all licenses necessary for manufacturing, distributing and using the new marine clutch within the State of Qatar on a permanent basis unless one of the parties expresses its desire to terminate the agreement in accordance with its terms and conditions.

The new marine clutch in its streamlined shape preserves the marine habitats and marine creatures from being damaged and shoveled by old marine clutches, which are currently used by fishermen. It also reduces the seabed friction, its weight can be controlled, and it can be molded using several materials such as metal, steel, or stainless steel.

Based on the agreement, MME will distribute this protected manufactured technology to fishermen in Qatar. An agreement may be entered into with other entities for manufacturing this technology, provided that its confidentiality and intellectual property rights are preserved. According to the agreement, QU will grant manufacture rights to the MME. This is an important step to deploy the new environment-friendly marine clutch and increase its use after being tested to assess its effectiveness for the environment and seeking fishermen's opinions.

From left: Prof. Mariam Al-Maadeed The Vice President for Research and Graduate Studies, Sheikh Dr. Faleh bin Nasser Al Thani, Assistant Deputy Minister for Agriculture and Fisheries at the Ministry (former), and current Minister of Environment and Climate Change, HE Dr. Hassan Al Derham, QU President, Dr. Ibrahim Al-Maslamani, Associate Professor of Marine Biology and the Adviser to the Vice President of Qatar University for Research and Graduate Studies, and Mr. Abdulaziz Al-Duhaimi, Director of Fisheries Department.

The Fisheries Department at MME stated that it has completed preparation of 1,200 environmental-friendly new marine clutches that were manufactured with technical support from QU in accordance with the provisions of the MoU with the University. New marine clutches were distributed free of cost to owners of boats and fishing vessels using fish traps, with two marine clutches for each fishing vessel of 15 kg and the other 30 kg. Distribution took place in several fishing ports such as Al Khor, Al Shamal and Al Wakra. The number of fishing vessels that benefited from this marine clutch was about 255 in addition to 80 boats.

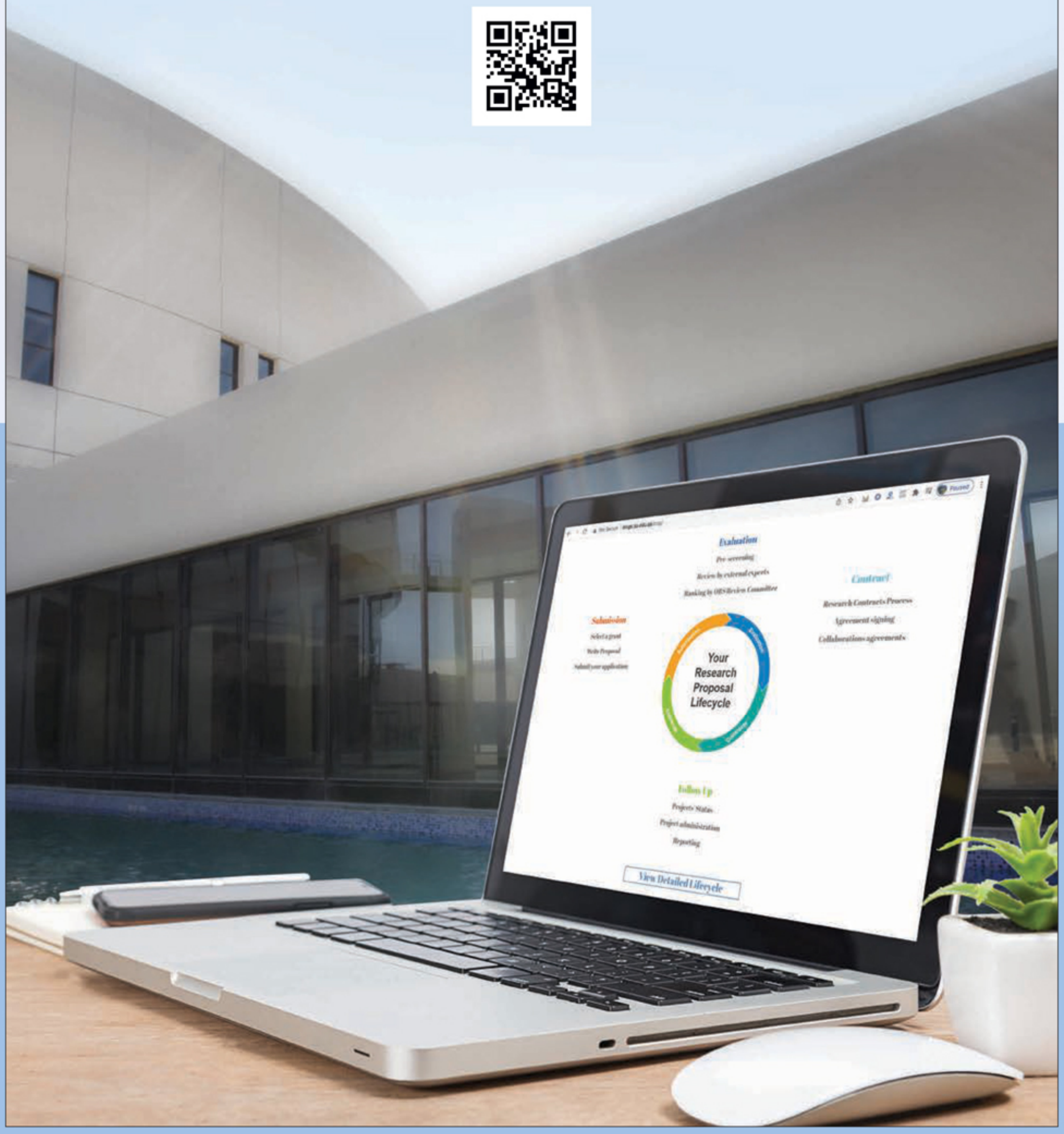
It should be noted that the new marine clutch was made by QU inventors. They are Dr. Ibrahim Al-Maslamani, Assistant Professor of Marine science, and Advisor at the Office of Vice President for Research and Graduate Studies, Mr. Mehmet Demirel, Instrumentation Engineer at the Environmental Sciences Center, together with technical assistants: Dr. David Smith, Dr. Mark Chatting, and Dr. Bruno Welter, researchers from the Environmental Science Center, QU.

In the same context, Prof. Mariam Al-Maadeed, Vice President for Research and Graduate Studies at QU, commended the constructive cooperation between QU and MME, as well as encouraged efforts made by the Ministry to preserve Qatar's environment. Prof. Mariam added that QU, depending on its expertise will participate in all initiatives and events for serving Qatari community, leading to its progress and prosperity. Furthermore, she praised the new marine clutch innovation. It won local and international awards, latest of which was QU Innovation Award at Qatar University Annual Research Forum & Exhibition (QUARFE) 2021, and the platinum medal at the Challenge and Innovation Forum 2021, which was organized by the Qatar Scientific Club.

A photo while distributing the marine clutch to fishermen inside the State of Qatar.

News

Office of Research Support Launches a New Blog



The Office of Research Support (ORS) serves the University's research community in order to pave the way for successful research output in Qatar University. The office serves as the effective intermediary between faculty and funding. It helps faculty and researchers in the preparation and submission of proposals, and finding new sources and opportunities of funding with industry, government and international partners.

To facilitate the growth of research and raise its level of impact in the University, the office reviews, negotiates and executes all research contracts and serves as the institutional liaison with external agencies and organizations on all research administration and contract matters. ORS manages internal and external grants, working closely with Qatar University offices, such as human resources, procurement and finance to facilitate project tasks. Critical to this is ensuring compliance with the policies of the funding agencies and the University.

To achieve its goals, ORS launched its new Blog, an informational web platform that aims to facilitate the communication process by providing useful research support information to the faculty members, researchers and students.

ORS Blog has several sections as follows:

- A "banner" with the most recent information.

- A "Research Proposal Lifecycle" section intuitively explaining the process of a research proposal, from submission to starting the project. It highlights the role of each ORS unit and the steps to be followed by the applicants.

-An "ORS Office" section showing the structure of ORS, with a brief message from the office managers.

- A "Latest News" section providing the most recent information on new call for proposals and new events.

- A "Facts" section highlighting some high level QU research indicators, related to the collaboration with international organizations, industries.

- A "Calendar" section providing some coming deadlines for call for proposals and events.

- A "Statistics" section giving detailed information about the current and previous internal grants cycles.

- A "Submission and Awarded" section providing information about the results of the current and previous internal grants cycles.

- A "Media" section providing videos and media related to internal and external grants.

- A "Grants" section having comprehensive details on the internal and external grants.

- A "QU's Research Pillars" section including QU's research pillars and priorities such as the Core Research Areas and the Transformative Priorities.

- A "Resources" section providing some existing tools and resources offered by the University.

- A "Colleges and Centers" section linking the applicants to the research pages of QU colleges and centers.

For more details, we invite you to regularly visit the ORS Blog:

http://blogs.qu.edu.qa/orsg/.

Qatar University Establishes Water Technology Unit at Center for Advanced Materials (CAM)

The Center for Advanced Materials (CAM) at Qatar University established a Water Technology Unit (WTU) in collaboration with Qatar Electricity and Water Company (QEWC). The idea of creating the unit comes after realizing the importance of water security for Qatar and we hope that this unit will gradually become a full-fledged center to cater the local industry and community and become the center of excellence in desalination and water treatment in the region. Recently, two large reverse osmosis (RO) desalination plants are being built by QEWC in Qatar to minimize the energy used for desalination, such as Umm Al Houl and Ras Abu Fontas RO plants. Recognizing the expertise and strength of CAM in membrane technology and water treatment, QEWC approached CAM for technical support and signed MoU, and then an agreement in May 2018, which was set as a precursor for the establishment of Water Technology Unit (WTU) at CAM.

A photo while HE Dr. Hassan Al Derham QU President, and a number of his QU Vice presidents visiting the Water Technology Unit at the CAM Center.

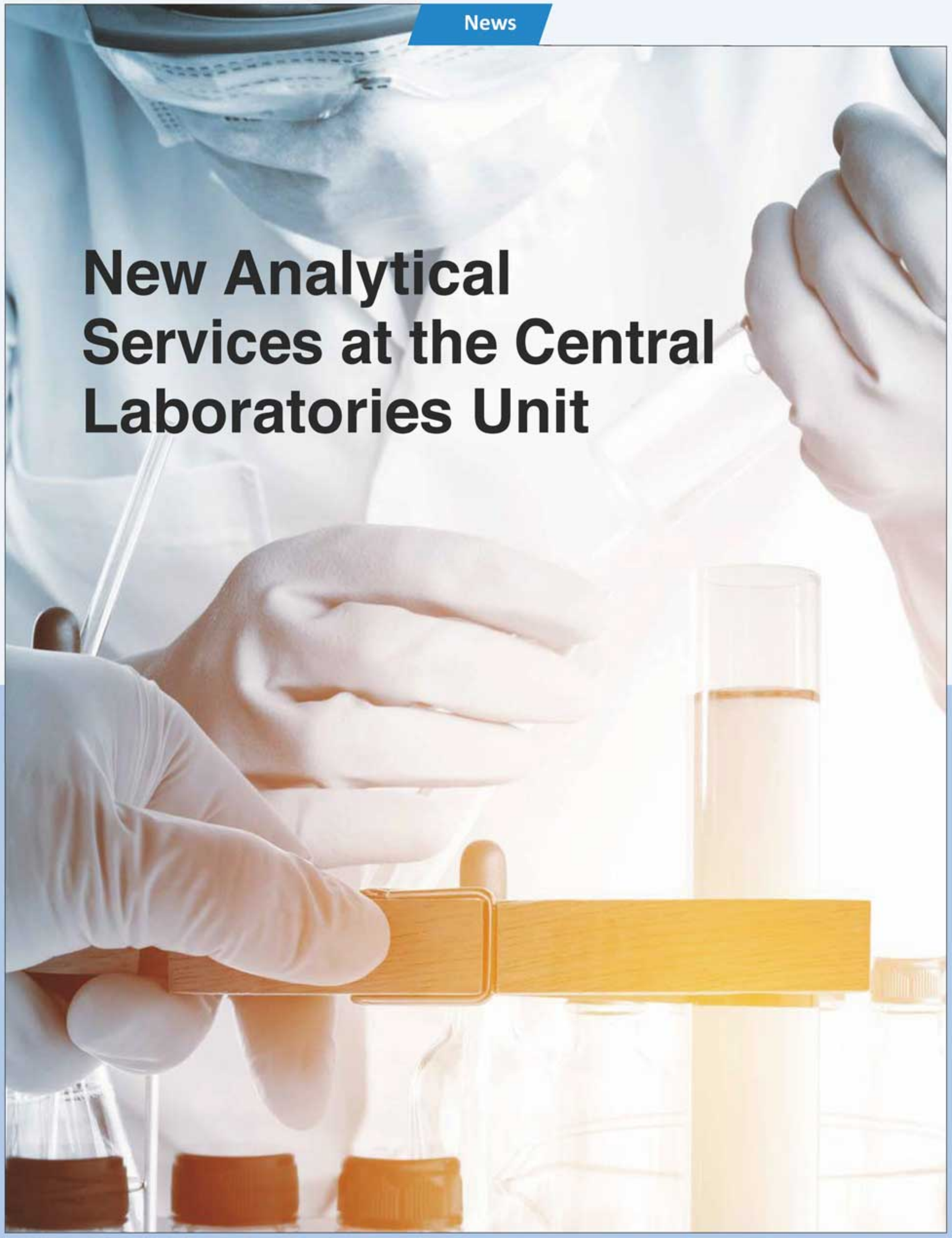
The Water Technology Unit established at CAM-QU will be a strategic industrial research niche that addresses current and emerging issues relating to water quality and scarcity. Furthermore, the WTU will establish a multi-disciplinary research program covering the main areas of water desalination and treatment, which include, but not limited to membrane fabrication and fouling control, brine management, and troubleshooting. The research program of the WTU aligns with the research priorities of Qatar University and coincides with the strategic goals of the Qatar National Vision 2030, which targets the expansion of the desalination capacity of the State of Qatar.

WTU will attract expertise from researchers with diverse experiences and international collaboration. The unit will also be at the forefront of integrating nanotechnology with existing water treatment practices with the goal of optimizing the efficiency of conventional water desalination and treatment technologies in addition to the development of new nano-enhanced membranes, materials and processes. The goal of WTU is to build its capacity and develop local expertise to support the water desalination and treatment industry in Qatar.

WTU has been actively involved in the organization of training programs and cooperating with industry for technical support and outreach activities. The WTU organized a training workshop program on Membrane based desalination technologies, in which engineers from QEWC participated. WTU also is supporting industry, and carried out water analysis and diagnosis for Ras Abu Fontas RO Desalination Plant and has been collaborating with Baladyat Al-Rayyan for checking the water quality in plastic dispenser bottles and tracking the number of bottle refilling using sensor technology. It organized a Research Webinar on water desalination: Innovations in RO technology development in collaboration with Istanbul Technical University on March 3, 2021. WTU organized a technical workshop on "Sustainable Water Environment and Energy Technology" on January 13, 2021, in which experts from Australia, Korea and Qatar gave technical talks. In addition, it conducted Research Wednesday Series on Innovations in Water Treatment Technology and Importance of Academia Industry Collaboration, on October 6, 2021. CAM-WTU also signed MoU with Istanbul Technical University for the development of desalination membranes. Researchers from WTU have been invited as Panelists in Online Sub-regional Panel Discussion-Launch of UN World Water Development Report 2021-Valuing Water.

WTU team is presently engaged in a study to examine the teabags material analysis for the leaching of microplastics into water and water analysis of plastic water bottles. The team designed and fabricated a Lab scale Integrated Water Filtration Unit and design of the 3D print of membrane cells. WTU is also actively engaged in capacity building and conducted summer training internship for more than 15 students on water desalination research, and trained students and young researchers for the water desalination research and the master's thesis project.

New Analytical Services at the Central Laboratories Unit



The Central Laboratories Unit (CLU), as a service unit in the Research and Graduate Studies sector at Qatar University, continues to provide more analytical services to researchers, students and faculty members inside and outside the University.

The Honey Quality Testing Services

The unit recently added a service for testing the quality of honey, among other activities of the Molecular Spectroscopy Laboratory, due to the importance of this type of analysis for the most consumers. This is due to the limited number of providers of this service at the level of the relevant sectors of the State. The method used is characterized by accuracy, speed and low cost, which encourages many to perform it in the CLU laboratories. The chemical analysis method used in the Central Laboratories Unit to determine the quality of honey depends on the measuring of the concentration of Hydroxymethylfurfural in honey samples by using UV/VIS spectrophotometer (Lambda 25).

According to the International Food Standards, the increase in the concentration of Hydroxymethylfurfural in honey is evidence of its low quality, as this chemical compound is generated because of the degradation of honey fructose content (Fructose is one of the main sugars found in honey). The proportion of this compound begins to increase slowly during the storage of honey for long periods, and it forms very quickly if the honey is heated during the production stages. Hydroxymethylfurfural is formed by the decomposition of sugars in honey by heat and is the evidence of heating honey at elevated temperatures after harvest. It is worth noting that Hydroxymethylfurfural is produced in large quantities in honey samples where the pH is lower than five, which then breaks down the components of honey from glucose and fructose. The International Food Standards stipulate that the content of Hydroxymethylfurfural in honey should not exceed 40 mg/kg.

UV/VIS Spectrophotometer

Sample Analysis by using Gas Chromatography - Mass Spectrometry (GC/MS) equipment

With the beginning of the academic year 2021-2022, the unit began to activate the conduct of various chemical analyzers by using the Gas Chromatography-Mass Spectrometry equipment (GC-MS) in the chromatographic laboratory. The applications of the equipment combine the advantages of gas chromatography and mass spectrometry to study the different organic content of the analyzed samples. The applications of the equipment will cover a large package of analyzers that serve the scientific research sector inside and outside the University. The applications include environmental analyzers, multivitamin analysis, plant extracts, medicines, pharmaceuticals, cosmetics, foodstuffs, pesticide residues, organic solvents, forensic medicine and toxicology, in samples with small quantities that are difficult to analyze by other analytical techniques.

Gas Chromatography – Mass Spectrometry (GC/MS)

The Practice Educators' Academy:

A Fundamental Step towards Successful Health Profession Education in Qatar

Dr. Abdullatif AlKhal message about the importance of Practice Educators Academy

Experiential learning is the backbone of many healthcare professional education programs, and clinical preceptors are indispensable in the experiential training of health professional students. The planning, supervision, and assessment provided by clinical preceptors significantly influence the quality of learning and skills gained during experiential education activities. Although preceptors typically receive substantial clinical training, assessment of preceptorship programs in many healthcare education programs found that preceptors do not always get formal training in teaching and precepting.

At Qatar University-Health Cluster (QU-HC), an innovative educational intervention, "The Practice Educators' Academy", was designed as a continuing education preceptor development (CEPD) program with the aim of developing teaching knowledge, skills, and attitude of multi-disciplinary healthcare professionals who serve as clinical preceptors for students at QU-HC. The QU-HC incorporates the Colleges of Pharmacy (CPH), Medicine (CMED), Health Sciences (CHS), Dental Medicine (CDM), and Education (CEDU). This educational innovation was developed by scholars from the QU-HC colleges. From College of Pharmacy, Department of Clinical Pharmacy and Practice: Dr. Banan Mukhalalati: Lead Principal Investigator and Assistant Professor, Prof. Ahmed Awaisu: Professor and Head of Department, Ms. Sara Elshami: Research Assistant, Dr. Bridget Paravattil: Associate Professor, Dr. Monica Zolezzi: Associate Professor, and Dr. Rasha Bacha: Clinical Pharmacist. From College of Health Sciences: Dr. Ghadir Al-Jayyousi, Assistant Professor and Dr Hiba Bawadi, Professor and Head of Strategy in Health Cluster. From College of Medicine: Prof. Marwan Abu-Hijleh: Professor and Acting Dean, Dr Ayad Almoslih: Section Head, Prof. Alison Carr: Professor and Associate Dean, Dr. Susannah Hart: Assistant Professor. From College of Education (CED) [Prof. Michael Romanowski and Dr. Randa Almahasneh: Assistant Professor. Furthermore, this project involved leaders from Hamad Medical Corporation. From the Medical Education Department: Dr. Abdullatif Al-Khal: Director and Dr. Kristen Al-Amri: Associate Director. It was informed by empirical evidence in the form of a preceptor-focused needs assessment, and an extensive literature review of similar international CEPD programs. The program was designed in five main modules, namely: 1) principles of learning and teaching, 2) planning for experiential learning, 3) teaching and instruction strategies, 4) students' assessment and feedback, and 5) communication skills for effective preceptorship and conflict resolution. Program validation was conducted by national and international experts in health professions' education, experiential learning, and general education. This educational training program was accredited as a group learning activity by the Ministry of Public Health Department of Healthcare Professions (MOPH-DHP) and was approved for a maximum of 11.5 continuing professional development (CPD) units.

On October 23rd-25th, 2020, this training program was offered as an online workshop to preceptors across different healthcare disciplines via a web-based conferencing system – Cisco WebEx©, for over 13 hours. A pilot testing of this program was conducted to examine the program's effect on self-efficacy and knowledge of the clinical preceptors who attended the workshop, utilizing a pretest-posttest pilot intervention study. Assessment of the change in preceptors' self-efficacy and knowledge after attending the program demonstrated statistically significant improvements in their knowledge and confidence in executing activities relevant to the role of preceptors, teaching techniques, critical thinking, providing feedback, and resolving challenges. Preceptors' satisfaction with the program's content and delivery was also examined to ensure its comprehensiveness, appropriateness, and relevance to their practice. Preceptors highly valued the program's usefulness, and reported a high level of satisfaction and encouraging feedback.

"The Practice Educators' Academy Program" is the first of its kind in the country. The findings of the pilot evaluation of this preceptor educational training program suggested its effectiveness as demonstrated by the significant improvements in preceptors' self-efficacy and knowledge scores, as well as through the overall high level of satisfaction with the program. The interdisciplinary nature of this program was one of its most important pillars, which facilitated sharing the perspectives and expertise among preceptors from various educational and clinical backgrounds. Future research should focus on studying the effect of this preceptor-training program on students' experiential learning experience. It is anticipated that such intervention will have significant long-term effects on patient care, health outcomes, and organizational effectiveness.

QU International Research Collaboration Co-Fund (IRCC) Program

Qatar has experienced over the past two decades considerable rates of economic, environmental and social changes. This has led to the emergence of issues such as air pollution, water and land resources, food and water security, identity-related and other socio-economic challenges. With the decrease in funding from various agencies in different countries including Qatar and realizing that these issues are considered as international challenges, creating a new funding scheme like the QU International Research Collaboration Co-Funds (QU-IRCC) is forged by the need to provide opportunities for Qatar and the participating countries seeking solutions to these global challenges and to build on existing strong collaborations.

Encouraging and Fostering collaboration between Qatar University and international universities is essential not only for consolidation of research efforts in areas that are high-priority to Qatar and those countries, but also critical for facilitating researcher-student exchange.

The objective of IRCC is bringing together QU and international researchers and innovators to collaborate on topics of mutual interest. Supporting enabling activities and reducing barriers to bring together the necessary expertise to address challenging research problems encourages interdisciplinary research.

IRCC objectives:

- Implementing joint research and innovation activities;
- Building national human capital in Qatar University and the participating universities;
- Establishing and enhancing research collaboration between Qatar University and international universities and institutions;
- Fostering collaboration between researchers and developing research networks between Qatar University and different universities;
- Optimally utilizing resources, infrastructure and expertise to the joint advantage of the region and the globe;
- Building trust, developing relationships across the countries' institutions, learning from each other's experiences, and helping scientific advancement in a concerted manner to fulfill the Knowledge Based Economy aspiration of Qatar;
- Providing a vibrant cross-pollination research platform to students and researchers by creating 'exchange opportunities.'

IRCC has two tracks-Track 1 is an open program for all international collaboration; Tracks 2 is a specific collaborative program:

- **IRCC Track 1**: IRCC calls one submission cycle per year. The funding for the second year will be subject to satisfactory performance of the first year, assessed through submission of an annual report and a peer-review process.
- **IRCC Track 2**: This ad hoc application track allows colleges and centers that want to strengthen their collaboration with their identified strategic partners to bid for funding at any time of the year. These collaborations are submitted by LPIs, selected by the college/center with a strong strategic commitment.

During the last 3 years, 34 IRCC Track 1 and 10 IRCC Track 2 projects have been funded. IRCC Track 1 remains highly attractive with new submissions for this year from: Malaysia, Netherlands, United Kingdom, Turkey, Portugal, Iran, Australia, USA, Italy, Austria, Canada, France, Brazil and Jordan, totaling 17 new co-funded projects. This year, Qatar University also strengthened its specific IRCC Strategic Track 2 program with more than 10 submitted co-funded projects.

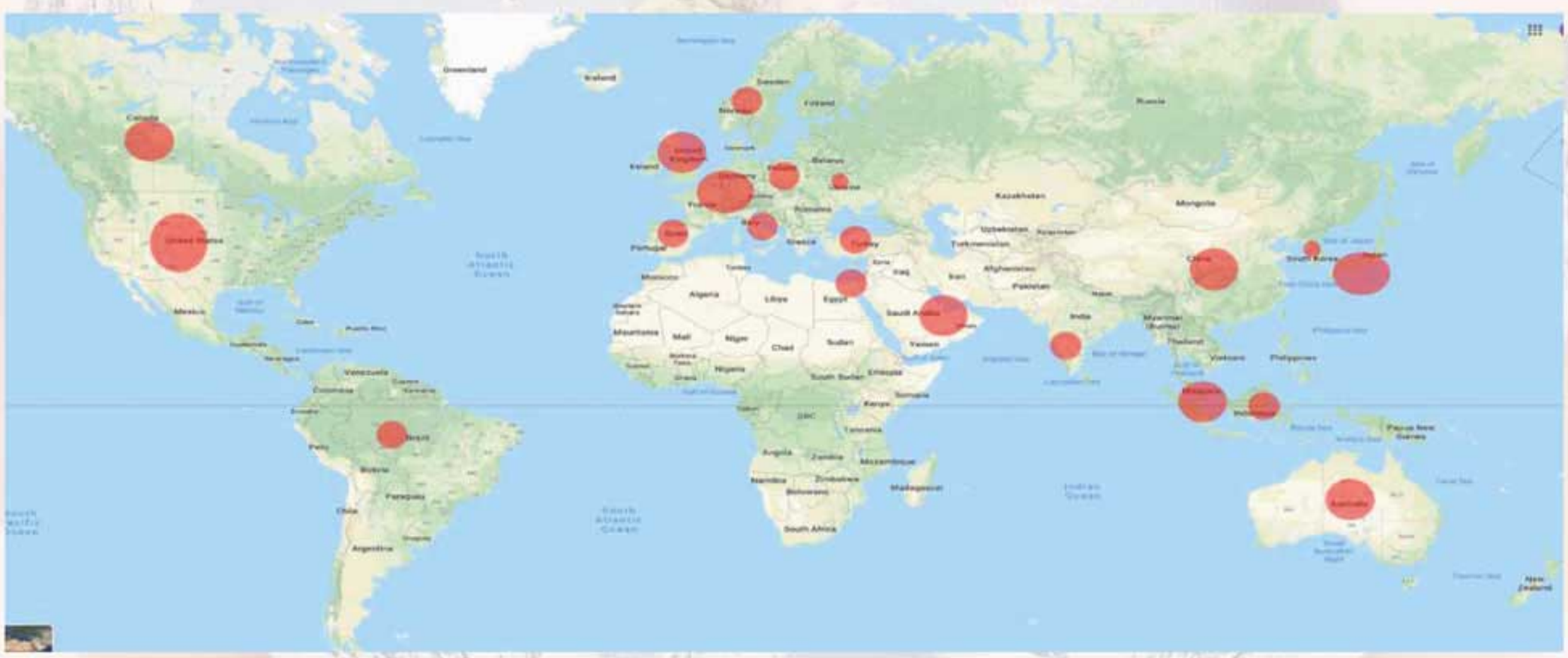


Figure 1. International IRCC Collaboration Map.

Societal Readiness Level (SRL) Scale:

QU Research Internal Grants Evolution

Qatar University continues to strive for excellence through its efforts in education and research, while serving the local and international community, in addition to working through its methods to contribute in achieving the Qatar National Vision 2030.

QU is funding both fundamental and applied research, collaborates with local and global stakeholders and industries through different research programs. Such collaboration provides an opportunity to develop prototypes, systems and platforms. Since few years, Office of Research Support (ORS) follows Technology Readiness Levels (TRL) metrics to measure the contribution of the proposed projects. TRL is an approach of measuring the maturity of technology components for a system. Each technology project is evaluated against the parameters for each technology level and is then assigned a TRL rating based on the project's progress.

TRLs are the most common measure for systematically communicating the readiness of new technologies or new applications of existing technologies (sometimes referred to as heritage technologies) to be incorporated into a system or program. Nine TRLs are a compendium of characteristics that describe increasing levels of technical maturity based on demonstrated (tested) capabilities. The performance of a technology is compared to levels of maturity (numbered 1-9) based on demonstrations of increasing fidelity and complexity as defined in the table hereunder.

Technology Readiness Level (TRL) Scale

Level	Definition	TRL Description
TRL1	Basic principles observed and reported.	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
TRL2	Technology concept and/or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
TRL3	Analytical and experimental critical function and/ or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
TRL4	Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include the integration of "ad hoc" hardware in the laboratory.
TRL5	Component and/or breadboard validation in relevant environment.	The fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment.
TRL6	System/subsystem model or prototype demonstration in a relevant environment.	A representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. It represents a major step up in technology demonstrated readiness.
TRL7	System prototype demonstration in an operational environment.	Prototype near, or at, planned operational system. Represents a major step up of TRL 6, requiring the demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space.
TRL8	Actual system completed and qualified through test and demonstration.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluations of the system in its intended weapon system to determine if it meets design specifications.
TRL9	Actual system has proven through successful mission operations.	The actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Recently ORS introduced a new way called Societal Readiness Levels (SRL) to assess the level of societal adaptation of, for instance, a particular social project, technology, product, process, intervention, or an innovation (whether social or technical) to be integrated into society. In case the societal readiness for the social or technical solution is expected to be low, suggestions for a realistic transition towards societal adaptation are required.

This concept refers to how ready is the society at large to accept a particular innovation, be it technological or social. SRL is a holistic judgment incorporating ethical, legal, social, and economic factors. Its levels range from the point where a particular societal need is beginning to emerge and be identified as such, all the way to society making use of relevant innovations to answer that need. The SRL levels used by ORS are defined in the table hereunder.

Societal Readiness Level (SRL) Scale

Level	SRL Description
SRL1	Identifying the problem and Social readiness; Identification of the generic societal need and associated readiness aspects.
SRL2	Formulation of the proposed solution concept and its potential impacts; appraisal of societal readiness issues; identification of relevant stakeholders for the development of the solution.
SRL3	Initial sharing of the proposed solution with relevant stakeholders: a limited group of the society knows the solution or similar initiatives.
SRL4	Solution validated through pilot testing in controlled environments to substantiate proposed impacts and societal readiness.
SRL5	Solution validated through pilot testing in real or realistic environments and by relevant stakeholders.
SRL6	Solution demonstrated in real world environments and in co-operation with relevant stakeholders to gain feedback on potential impacts.
SRL7	Refinement of the solution(s) and, if needed, retesting in real world environments with relevant stakeholders.
SRL8	Targeted solution(s), as well as a plan for societal adaptation, complete and qualified.
SRL9	Actual solution proven in relevant societal environments after launch in the market.

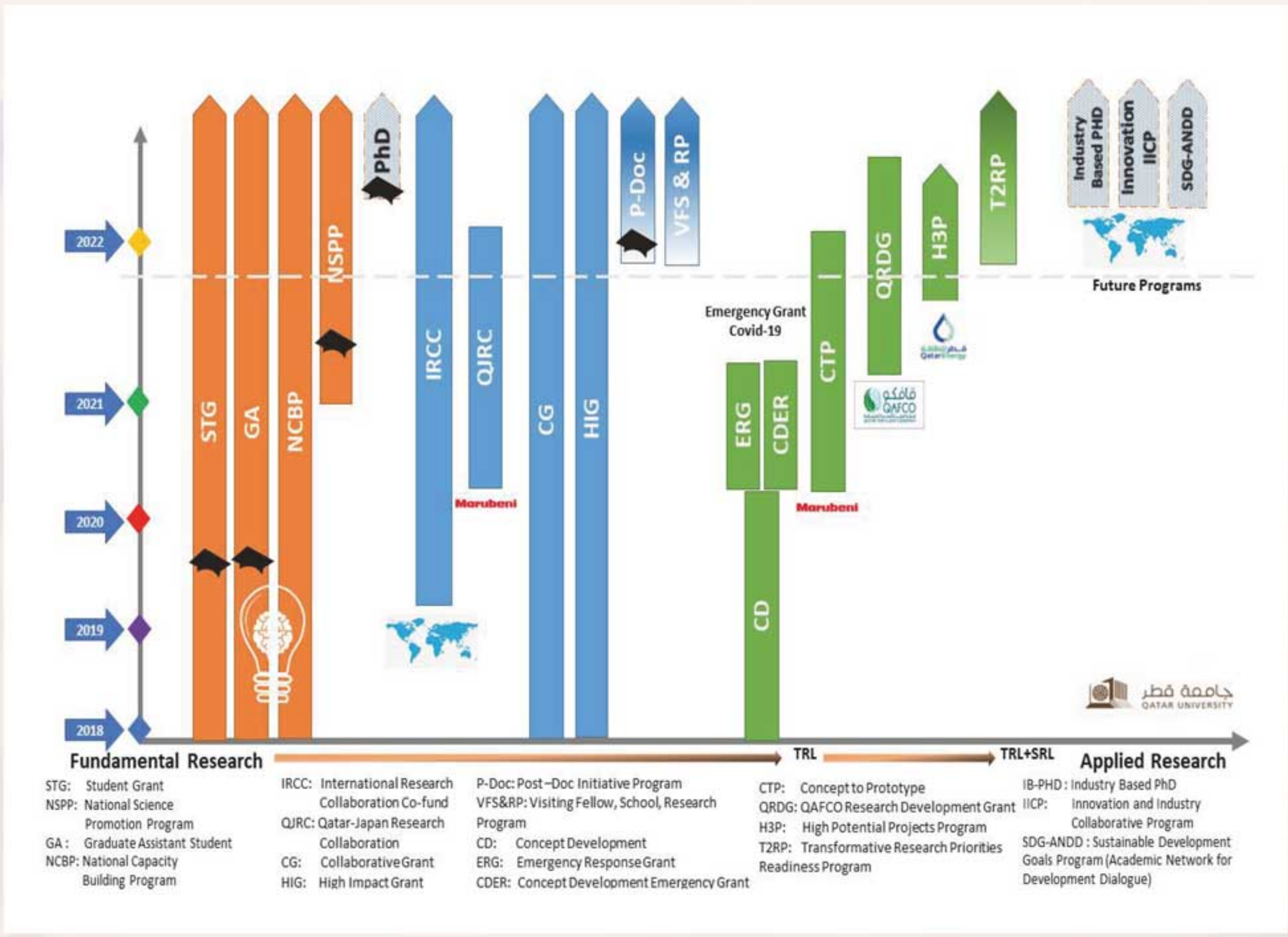


Figure 1. The existing QU internal calls and their evolution in terms of TRL/SRL.

A Strategic Vision for the Student Research Internship Programs at Qatar University

Experiences of pioneering universities and major corporations have confirmed that research internship empowers students to gain unique skills beyond the boundaries of a regular classroom. These skills would spearhead the students' access to the labor market in a conscious and planned manner. Engagement in internship programs develops interpersonal, teamwork, professional expertise, and time management skills of trainees.

Another significant aspect of research internship programs is that they effectively contribute to improving students' communication tools and building their confidence and self-efficacy. Conclusively, this assures that students with training experience are the quickest in securing jobs. Overall, the results of many studies show that training plays a major role in shaping the career path of students.

The strategic vision of the (summer and winter) research internship programs for students at Qatar University research centers is focused on making it an effective, sustainable, attractive and powerful tool for building human resources.

Students of Qatar University are in the heart of such developments, as well as instructors overseeing the training program. The programs are designed to be research-oriented in a broad spectrum of natural, health, applied, and human sciences. Eventually, students would gain skills in addressing clear, specific and decisive topics both within the State of Qatar and abroad. The programs aim also to provide students with skills in problem solving and understanding across a participatory scientific framework, as well as scientific writing.

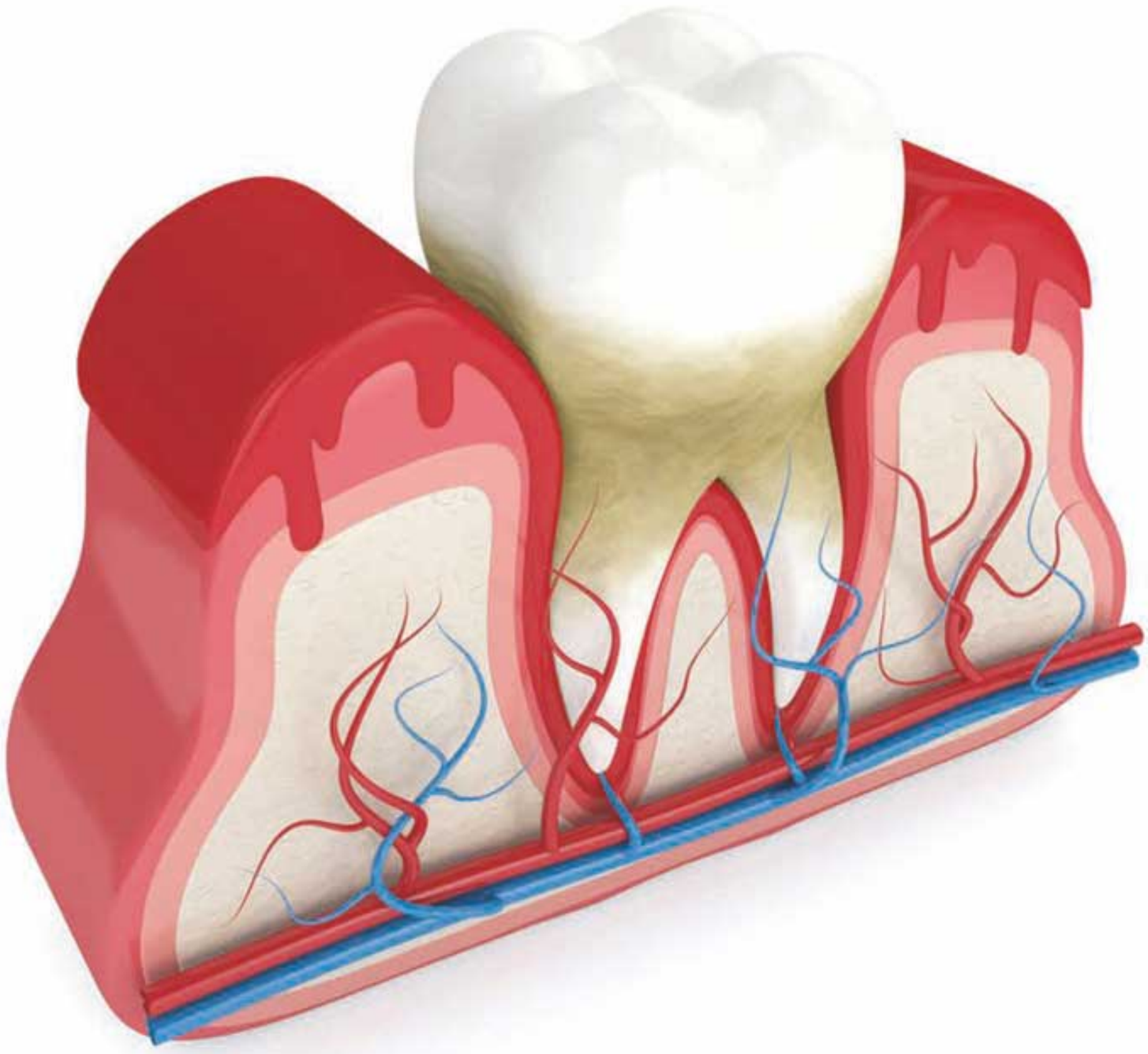
The research internship programs for students have been developed in full alignment with the strategic research priorities of the University and the Qatar National Research Strategy. Research centers of the Research and Graduate Studies Sector and various colleges develop training topics, which are carefully selected to adhere to research methods and techniques that would have a positive impact on Qatar's society and economy.

The University's strategic view is looking forward to:

- Involving more research centers at Qatar University with highly qualified mentors.
- Involving more students and interested employees from government and private sectors.
- Designing special research training courses tailored to the specific needs of stakeholders in Qatar.
- Establishing strategic and comprehensive collaboration frameworks between Qatar University and national and international institutions and foster relations so that the University can continue to lead education and research in Qatar and optimally respond to the needs of students and stakeholders.

Study Shows Gum Infections Linked to Higher Risk of Suffering from Severe COVID-19

Prof. Faleh Tamimi
Associate Dean for Academic Affairs, College of Dental Medicine – Qatar University



Bleeding gums when brushing your teeth might seem a common and trivial inconvenience, but research from Qatar University shows that it can put you at serious risk of developing severe COVID-19. About eight in ten people over the age of 35 years have had some level of gum disease. The mild form of the disease is called gingivitis, but if it is not treated, it can evolve into a more serious gum infection called periodontitis (Figure 1).

The research team spearheaded by Dr. Nadia Maarouf, Associate consultant from Hamad Dental Center, and lead by Dr. Faleh Tamimi, Professor at Qatar University, speculated that this strong association between COVID-19 and oral health could be caused by the fact that periodontitis causes a chronic inflammation that makes patients more susceptible to the severe and dangerous inflammation caused by COVID-19.

Figure 1. Photo of the mouth of a patient with Periodontitis.

The researchers investigated the records of 568 patients that suffered from COVID-19, and they found that a significant portion of the patients that suffered severe COVID-19 complications and even death, had advanced periodontitis, a type of chronic inflammation of the gums. After adjusting for several factors such as patient's age, gender and chronic diseases, the link between periodontitis and COVID-19 complications was statistically significant, and it revealed that patients with periodontitis were at least 3 times more likely to experience COVID-19 complications regardless of age, gender and other patients' conditions.

Periodontitis is mostly caused by poor oral hygiene and lack of maintenance of the dental condition, thus the findings of the study highlight the importance of maintaining a good dental care, and the regular teeth and gum check-ups. Dentists might also play an important role in prevention of the advancement of Gum Diseases.

This work has just been highlighted by "nature" the most prestigious scientific journal in the world (Nguyen T, 2021). Moreover, the study was also endorsed by several prestigious scientific organizations such as the American Academy of Periodontology, the International Association for Dental Research and the European Federation of Periodontology among others. This study spearheaded by Dr Tamimi was shared by news outlets all around the world including very relevant TV stations and newspapers such as Fox News, The Times, El Pais, ABC news, and CBC, among many others. This article had also one of the highest altimetric indices in the entire scientific literature (Altmetric index = 1041) (Figure 2). The altimetric index is an index designed to showcase the attention and influence of research and indicates how often journal articles are discussed and

Prof. Faleh Tamimi

used around the world. In this context, the altimetric index of this article is probably the highest ever in the field of dentistry, and one of the highest in the history of Qatar.

Reference:

Marouf, N., Cai, W., Said, K. N., Daas, H., Diab, H., Chinta, V. R., Hssain, A. A., Nicolau, B., Sanz, M., & Tamimi, F. Association between periodontitis and severity of COVID-19 infection: A case-control study. J Clin Periodontol. 2021 Apr; 48 (4): 483-491. Doi: https://onlinelibrary.wiley.com/doi/full/10.1111/jcpe.13435.

Nguyen T. Investigating the mouth-COVID connection. Nature. 2021 Oct 27. doi: 10.1038/d41586-021-02922-8. Epub ahead of print. PMID: 34707275.

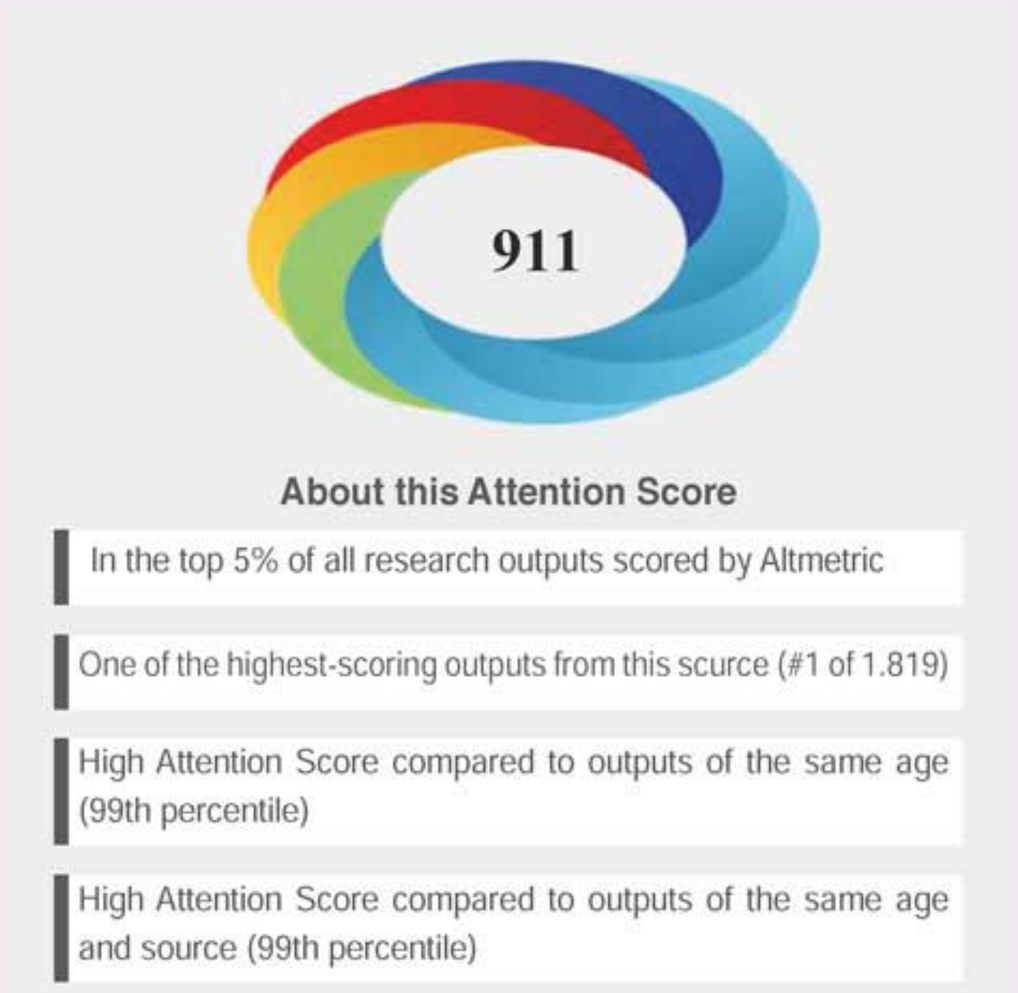


Figure 2. Screen shot of the altimetric index of the study published by the team lead by Dr. Tamimi.

Smartphone-based Food Recognition Application using Multiple Deep CNN Models for Children with Visual Impairments

Dr. Abdulnaser Fakhrou, Associate Professor of Psychological Sciences, College of Education

Jayakanth Kunhoth, Research Assistant, College of Engineering

Prof. Sumaya Ali Al-Maadeed, Professor in Computer Engineering, College of Engineering

Qatar University

The data provided by WHO describes that globally there exist about 285 million visually impaired individuals. Among 285 million individuals, 19 million fall under the 0-14 age category. The main causes of visual impairments in children are nutrition deficiency, premature birth, birth defects, infections, etc. Vision impairments can negatively affect the social and cognitive development of a child. People with visual impairments utilize various assistive systems in their day-to-day life for multiple tasks such as object recognition, navigation, text recognition, etc. The advancement of technology in recent years made the development of assistive systems simpler. Current technological advancement allows developers to embed assistive technology in smart handheld devices.

This work developed a precise smartphone application to recognize food dishes as well as fruits for children with visual impairments. Children with minimum knowledge of smartphone operation can utilize this application to identify the food dishes and fruits from natural scenes. This food recognition application with a trained deep CNN model can be utilized to improve the experience and confidence of children during dining activities. Moreover, the application can be extended for educating children with visual impairments. Most of the existing food recognition systems were developed for food calorie estimation as well as dietary assessment. In this context, the proposed smartphone-based system is novel in terms of its application. The overall architecture of the proposed device is given in (Figure 1).

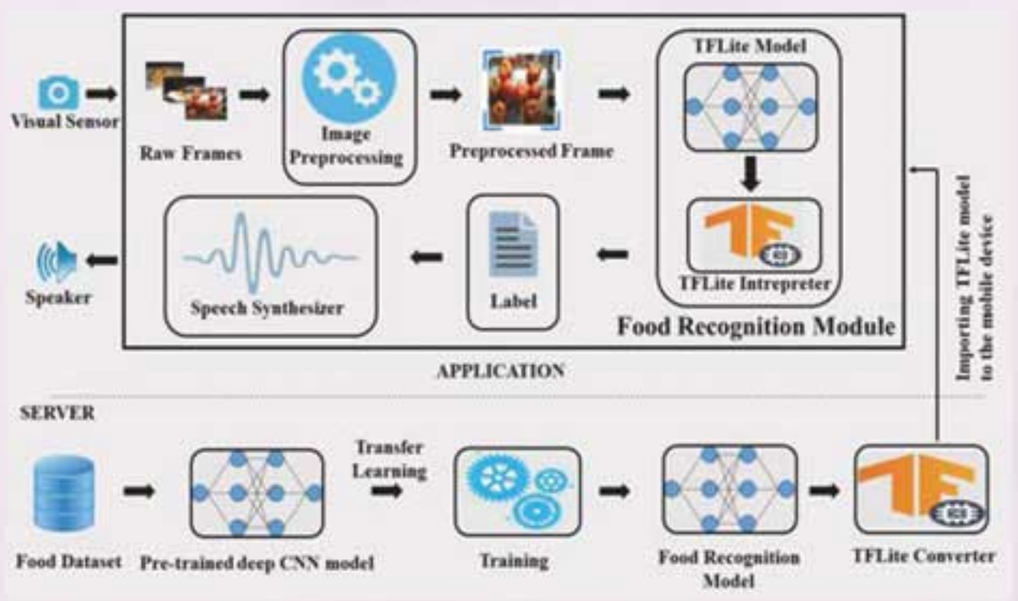


Figure 1. Overall system architecture

The proposed system is comprised of two parts; an Android application for real-time food recognition and a server-side for building the deep CNN model for food recognition. The Android application is configured to capture the images continuously using the embedded camera and run inference on each image for recognizing the food in real-time. The application will read out the name of the recognized food item via the speaker.

On the server side, an ensemble of deep convolutional neural networks is used for recognizing the food dishes and fruits. The deep CNN model for food recognition is developed by transfer learning methodology and the average voting ensemble method. The trained model is optimized and quantized to work in the Android application. If the original trained deep CNN model (unoptimized and nonquantized model) is directly deployed in the edge devices like smartphones, the smartphone will either run out of memory, or prediction on the image will be very slow. Because of that, the trained raw deep CNN model was optimized and quantized before loading to the Android application. Model optimization will reduce the latency as well as inference cost. Moreover, an optimized deep CNN model can be deployed in smartphones that are having processing, memory, and storage constraints. Once the model is trained, it is converted to the TensorFlow Lite (TFLite) format (optimized and quantized model). The TensorFlow lite framework provides a collection of tools for deploying the TensorFlow machine learning models in edge devices like smartphones. During TFLite conversion, the model is optimized and reduced in size by about 90%. The optimized TFlite model is loaded in the Android application for recognizing the food images.

Once the Android application is loaded with the food recognition deep CNN model, then the application does not require any aid from an external server or pc. It can process the images and run inference on the images in real-time without any internet connection. The visual sensor embedded in the mobile device or the smartphone camera is assigned for capturing the scenes in front of the user. The captured frames are subject to preprocessing since the raw image format does not match with the input of the deep CNN model. The image preprocessing function will extract each frame and preprocess the frame according to the input format of the deep CNN model. Later, the optimized deep CNN model runs inference on the preprocessed image frame. The output of the deep CNN model is the probability values for each class. The resulted probability values are interpreted into the class labels using the interpreter. Moreover, the labels with a confidence value of more than 90 % are only considered for speech synthesizing. The speech synthesizer is used to generate voice feedback for the users. Once the speech synthesizer receives the recognized label which is having a confidence

Dr. Abdulnaser Fakhrou

value of more than 90 %, it generates the speech using Android text to speech SDK. The recognized label name is notified to the user via the speaker of the smartphone.

The evaluation of the proposed approach is carried out in three different food recognition datasets. The first dataset consists of 29 food dishes and fruits. The second data set consists of 121 food classes from 11 different cuisines around the world. The third dataset consists of 24 dishes from Turkish cuisine. The sample images of the datasets are given in Figure 2.

The deep learning ensemble model developed for food recognition achieved a maximum accuracy of 95.54% in food dataset 1. Furthermore, the deep learning ensemble model surpassed multiple state of art methods in terms of food recognition accuracy in dataset 2 and dataset 3 by obtaining a value of 84.95% and 89.4%, respectively.

While developing a system for people with visual impairments, the response time of the system is one of the main metrics to be considered. Especially in the case of systems that use the deep CNN models for prediction, inference time, or prediction time of the deep CNN models in real-time are analyzed. Because generally, deep CNN models require a high computational and high memory environment to work well without delay. The obtained experimental results show that the proposed mobile application with the trained deep CNN ensemble model can recognize the food in less than 500 milliseconds in real situations.

Figure 2. Food dataset.

Communicating with Ca^{2+} Signals to Control Cellular Processes

Dr. Nagendra Babu Thillaiappan

Assistant Professor of Pharmacology, College of Medicine – Qatar University

Research Team: Prof. Colin Taylor, Ms. Holly Smith, Dr. Peace Atakpa

University of Cambridge, UK

Cells must constantly communicate with each other and external cues to maintain functional integrity. Such communications can occur through electrical or chemical impulses, the latter of which, can be initiated by stimuli arriving at the cell surface (e.g. hormones – *first messenger*) and mediated through signaling messengers within cells (second messenger) to generate a functional output. Calcium ion (Ca^{2+}) is the simplest and the most ubiquitous of all such signaling messengers within cells. Increases in intracellular Ca^{2+} concentration regulate a wide variety of biological processes as diverse as fertilization, gene transcription, cell division, immunity, learning and memory and cell death. It is therefore critical for Ca^{2+} signals to be specific and tightly regulated, as it could mean life or death for the cell. A fundamental feature of Ca^{2+} signals that allows them to regulate such diverse cellular functions, while maintaining exquisite specificity, is through their organization in space and time. Cells have evolved a vast repertoire of Ca^{2+} transport machinery that includes ion channels, pumps, ion exchangers and Ca^{2+} buffers, which are precisely located within cells, to generate Ca^{2+} signals with distinct spatial and temporal signatures that encode desired function (Figure 1). Consequently, any dysregulation in Ca^{2+} homeostasis within cells often underlies several pathologies including diabetes, hypertension, cancer and a number of neuropathologies.

Dr. Nagendra Babu Thillaiappan

Inositol trisphosphate receptors (IP_3Rs) are ubiquitous Ca^{2+} release channels in the membranes of endoplasmic reticulum – the major intracellular Ca^{2+} store – of most animal cells and they constitute a conserved mechanism of Ca^{2+} release within cells. Activation of IP_3Rs requires both IP_3 – that primes IP_3Rs – and Ca^{2+}, which then initiates channel opening. Such a dual regulation by IP_3 and Ca^{2+} allows IP_3Rs to produce regenerative Ca^{2+} signals, as Ca^{2+} released by an IP_3R can activate its IP_3-bound neighbor, by a mechanism known as Ca^{2+}-induced Ca^{2+} release (CICR). From opening of a single IP_3R at low IP_3 concentrations ($[IP_3]$) to opening of a cluster of IP_3Rs as $[IP_3]$ increases, Ca^{2+} signals, through CICR, can propagate into much larger Ca^{2+} waves that engulf the whole cell. CICR thus influences the ability of cells to generate Ca^{2+} signals with distinct spatial spread and temporal dynamics. By linking several extracellular stimuli, that activate cell-surface receptors to produce IP_3, and a diverse range of cellular functions, IP_3Rs play a major role as Ca^{2+} signaling hubs within cells. Ca^{2+} puffs, initiated by a small cluster of ~8 IP_3Rs, are the smallest such regenerative Ca^{2+} release events from IP_3Rs (occupying few microns in space and lasting ~200 milliseconds). Cells express thousands of mostly mobile IP_3Rs, but Ca^{2+} puffs occur at rather immobile locations within cells. In attempting to address this apparent conundrum, recent research has shown, using an EGFP-IP_3R1 HeLa cell line generated through gene-editing and high- and super-resolution microscopy, that only a small population (~25%) of immobile IP_3Rs located near the plasma membrane (PM) are licensed to initiate Ca^{2+} signals. This work revealed that there is a hitherto unknown level of IP_3R regulation that endows immobile IP_3Rs near the PM with the capacity to initiate Ca^{2+} puffs.

This raised puzzling questions: What makes IP_3Rs immobile near the PM? How are they licensed? Presence of cortical actin cytoskeleton in most cells and the identification of several actin-binding proteins as interacting partners of IP_3Rs led us to consider whether IP_3Rs could be anchored to actin filaments that makes them immobile. Total internal reflection fluorescence microscopy (TIRFM) revealed that some IP_3Rs (~27%) colocalize with actin filaments (Figure 2A),

similar to the proportion of immobile IP_3Rs (~25%). Live-cell imaging confirmed that immobile IP_3Rs specifically associate with actin filaments (Figure 2B). How IP_3Rs interact with actin – whether directly or through other proteins, was an enigma for researchers.

KRAS-induced actin-interacting protein (KRAP) is a widely expressed cytosolic protein, upregulated in cancer cells and has been shown to affect localization of IP_3Rs and the Ca^{2+} signals, albeit with its functions poorly understood. Therefore, KRAP's role in licensing of IP_3Rs was examined. TIRFM revealed that a subpopulation of IP_3Rs (28%) colocalize with KRAP (Figure 2C), which was limited to cell peripheries near the PM. Live-cell imaging confirmed that immobile IP_3Rs specifically associate with KRAP. Nanoscale-resolved (~25 nm resolution) super-resolution microscopy further substantiated these findings (Figure 2D). These results clearly indicated that KRAP tethers IP_3Rs to actin and immobilizes them (Figure 2E). The influence of KRAP on Ca^{2+} signals was then assessed using cells loaded with a Ca^{2+} indicator, through stimulation of endogenous signaling pathways to generate IP_3. In cells with KRAP expression reduced by RNA interference, IP_3Rs were no more immobile, Ca^{2+} puffs were almost completely abolished and the intracellular sites at which they occur, were massively reduced; these effects were reversed by a siRNA-resistant version of KRAP (Figure 2F), indicating clearly that KRAP is the *licensing factor* of IP_3R-mediated Ca^{2+} signals. Correlative imaging revealed colocalization of Ca^{2+} puffs with IP_3Rs and KRAP (Figure 2G) and unambiguously confirmed that KRAP-licensed

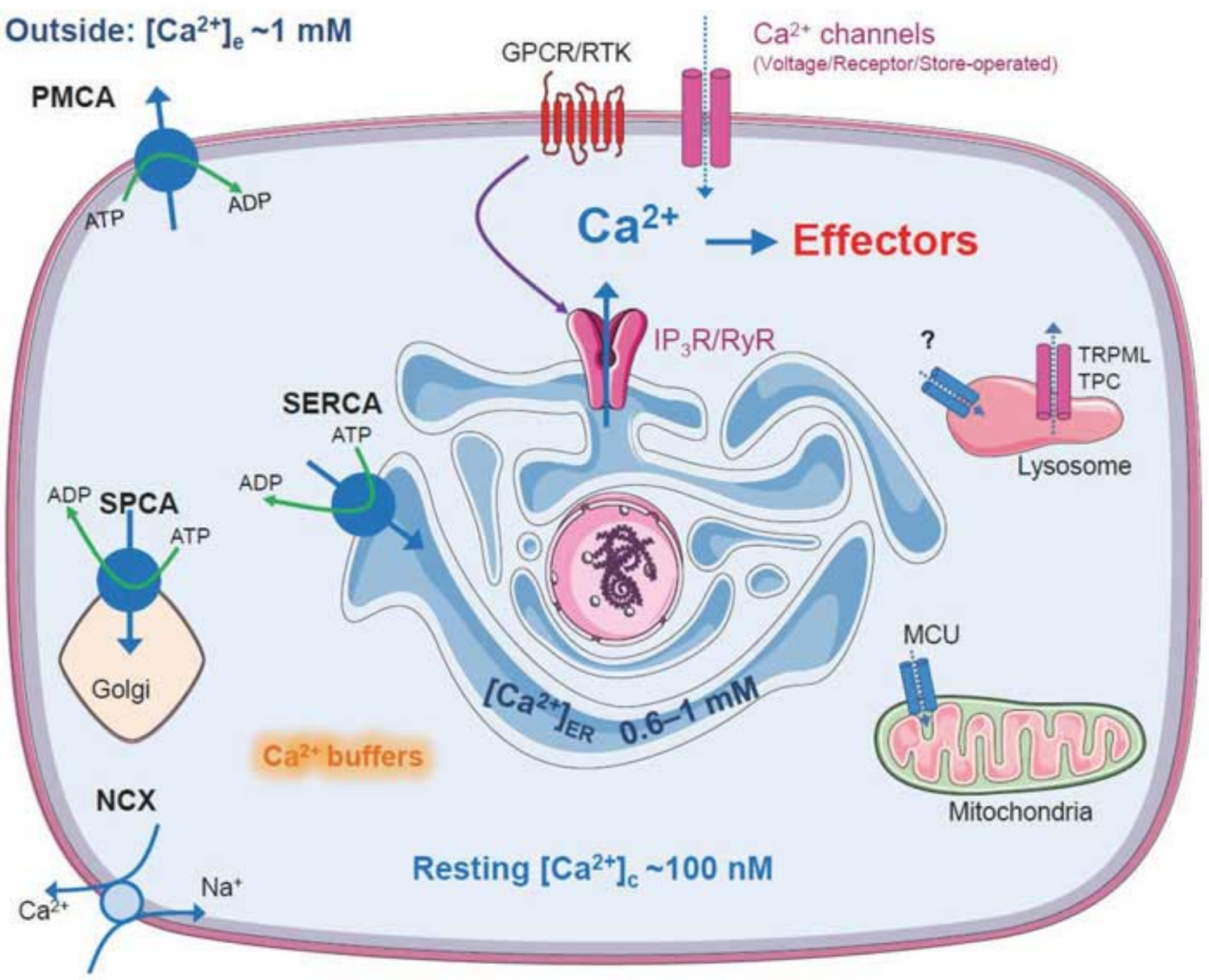


Figure 1. Cellular Ca^{2+} levels are tightly regulated to code for specific functions.

Cells tightly control intracellular Ca^{2+} concentration ([Ca^{2+}]c) using an elaborate ion transport machinery that includes ion channels (e.g. IP_3R, ryanodine receptors [RyR]), pumps (Ca^{2+} ATPases within PM [PMCA], ER [SERCA], and secretory pathway [SPCA]), ion exchangers (Na+/Ca^{2+} exchanger [NCX]) and several Ca^{2+} sequestering buffers (e.g. parvalbumin). Ca^{2+} is stored at high concentrations in compartments within cells and in extracellular fluid. Rapid increases in [Ca^{2+}]c is achieved by the openings of Ca^{2+} channels within PM and ER. Receptors within PM sense external stimuli and cause IP_3 synthesis. IP_3 and Ca^{2+} bind to, and activate IP_3Rs to release Ca^{2+} from ER. STIM1 senses loss of ER Ca^{2+} and activates Ca^{2+} entry through Orai Ca2+ channels at ER-PM junctions. Spatially-organized Ca^{2+} signals bind to Ca^{2+}-sensitive effectors and regulate diverse cellular processes.

IP_3Rs initiate Ca^{2+} puffs. Global Ca^{2+} signals were equally abolished by loss of KRAP (Figure 2H) signifying the requirement of KRAP for all IP_3-evoked local and global Ca^{2+} signals. Moreover, overexpressing KRAP increased the number of immobile IP_3Rs, the frequency of Ca^{2+} puffs and the number of puff sites (Figure 2I) confirming their pivotal role in Ca^{2+} signaling.

These results conclude that the spatial distribution of IP_3Rs and thus the spatial organization of all Ca^{2+} signals they generate are determined by the licensed IP_3Rs through their interaction with KRAP. As KRAP is shown to be upregulated in KRAS-transformed cancer cells, and mutations in KRAS gene occur in ~25% cancers, Dr. Nagendra's current research focuses on understanding mechanistically how KRAP expression levels in cancer cells affect intracellular Ca^{2+} signals and the consequences for cellular processes that drive oncogenic transformation. The consequences for KRAP's role in immunity, differentiation and other neuronal disorders are of strong interest and remain largely unexplored.

Link to the recent publication:

https://www.nature.com/articles/s41467-021-24739-9

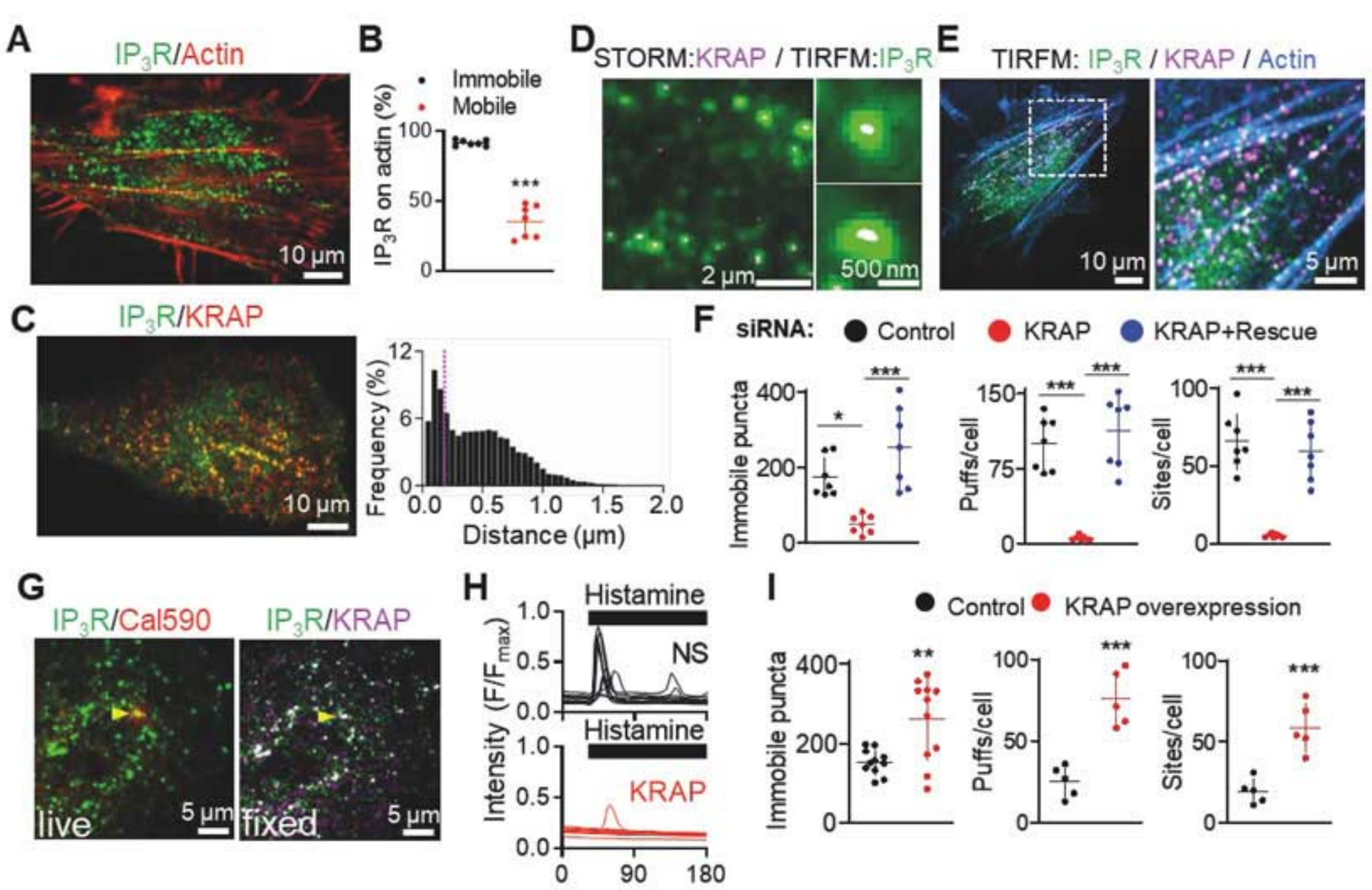


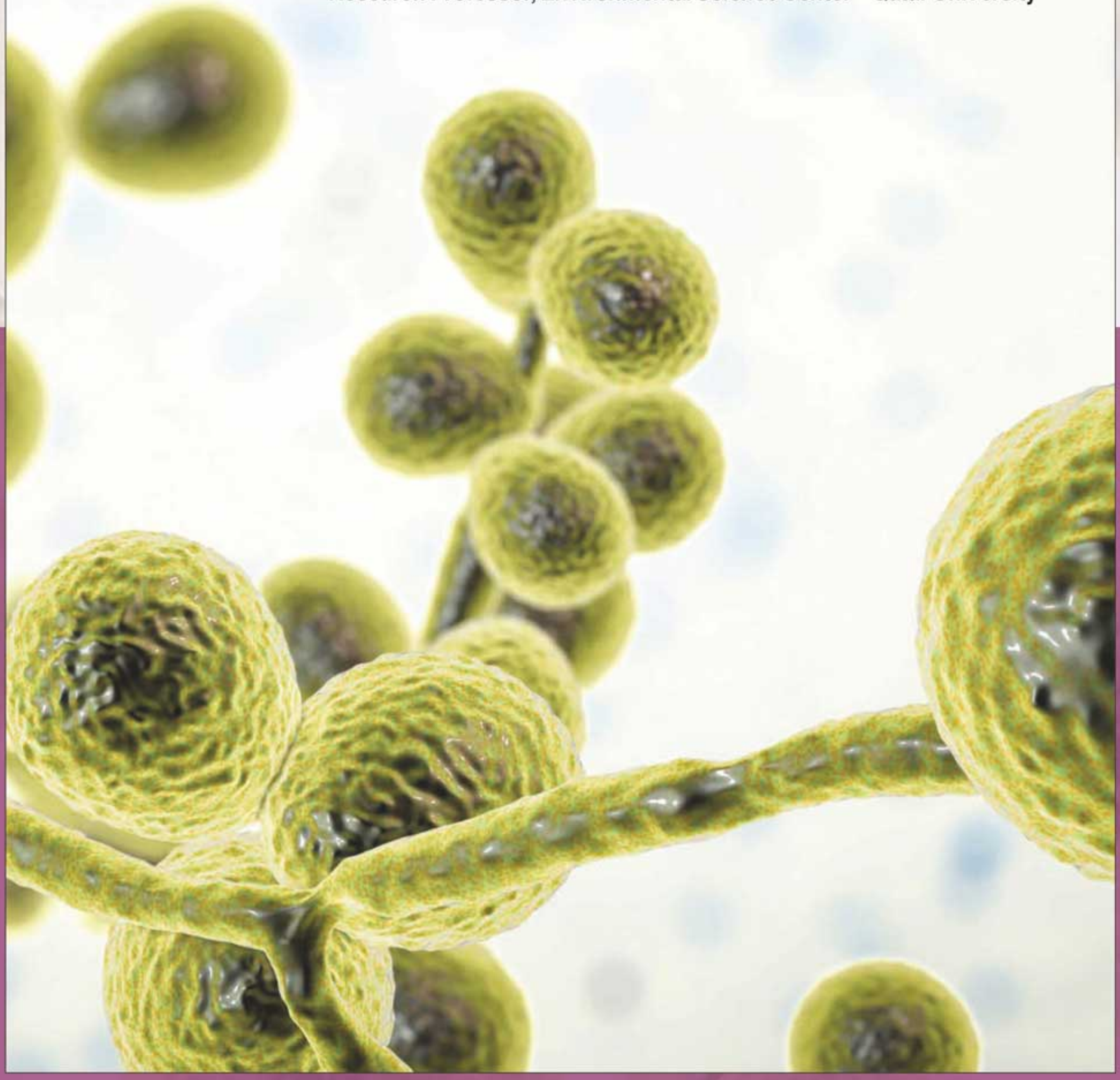
Figure 2. KRAP connects IP_3Rs to actin and licenses them to generate cytosolic Ca^{2+} signals.

A. Overlaid TIRFM images of IP_3R and actin show colocalisation of some IP_3Rs (~27%) with actin. B. Live-cell imaging reveals that only immobile IP_3Rs colocalize with actin. C. Overlaid TIRFM images of IP_3R and KRAP show colocalization of a subpopulation of IP_3Rs with KRAP (left panel). ~28% of IP_3Rs are within 160nm from the nearest KRAP puncta (right panel). D. Super-resolution STORM image of KRAP overlaid on TIRFM image of IP_3R (and enlargements) reveals their colocalisation at nanoscale. E. TIRFM images of a whole cell and enlargement (boxed area) clearly show that colocalisation of IP_3Rs and KRAP occurs only on actin, confirming their tripartite relationship. F. KRAP knockdown resulted in loss of immobility of IP_3Rs and of Ca^{2+} puffs and sites, which were reversed by siRNA-resistant KRAP. G. Correlative-TIRFM imaging revealed colocalisation (arrow) of an IP_3R punctum and a Ca^{2+} puff in live cells (left panel) and association of the same IP_3R punctum with KRAP (arrow) revealed after fixation and immunostaining (right panel). H. Global Ca^{2+} signals were completely abolished in cells without KRAP. I. Overexpressing KRAP results in more immobile IP_3R puncta, higher frequency of Ca^{2+} puffs and an increase in number of puff sites.

A Study on Diversity of Mycorrhizal Fungi in Qatar

Prof. Juha M. Alatalo

Research Professor, Environmental Science Center – Qatar University



Microbial diversity and mycorrhizal fungi play a crucial role in ecosystem functioning. Mycorrhizal fungi are known to form positive symbiotic relationships with more than 85% of the world's plant families, and are of great importance for many of the crop species that humans cultivate. The fungi support the plants and facilitate their growth by increasing their uptake of water and mineral nutrients. In return, the fungi receive sugars and other organic molecules produced by the plants through the process of photosynthesis. Plants which benefit from mycorrhiza are often more resistant to diseases and draught than plants which do not. The mycorrhizal fungi are found in the roots of the plants, where their presence helps to "extend" the root system into a larger area. The most common form (around 70%) of mycorrhizal fungi are the arbuscular mycorrhizas (AM fungi), whose hyphae (filamentous cell structures) invaginate the cell membrane inside the plant cell walls. Another important group takes the form of ectomycorrhizal fungi (around 10%), whose hyphae cover the root tips of the plants (mostly trees).

Mycorrhizal fungi are found all over the world, with widespread distribution and many species, which can inhabit different habitat types. However, as is the case for many species, research into the diversity and ecology of mycorrhizal fungal communities has been conducted primarily in Europe, North America, and recently in China, with very few studies originating from the Arabian Peninsula. In order to fill this gap in our knowledge, the research team at ESC analyzed the diversity and drivers of mycorrhizal fungi across 19 sites in Qatar (Figure 1), using environmental DNA (E-DNA), high-throughput sequencing, and bioinformatics, with a particular focus on AM fungi. The habitats studied ranged from sandy desert, rawdha, sabkha and saltmarshes to mangrove (Adenan et al., 2021) we used a high-throughput sequencing technique to explore AM fungal diversity and community composition in different habitats across Qatar. We identified a total of 79 AM fungal taxa, over 77% of which were species from the Glomeraceae family. The lowest AM fungal diversity was observed in saltmarsh and in one rawdha site, while the highest richness, effective number of species, and diversity were observed in rawdha and sabkha communities. NMDS and multiple regression analyses showed that AM fungi were negatively correlated with soil pH and TC, but positively correlated with K and NO3–. AM fungi also were positively correlated with Cd, with the latter suggesting that very low levels of heavy metals may not always be harmful

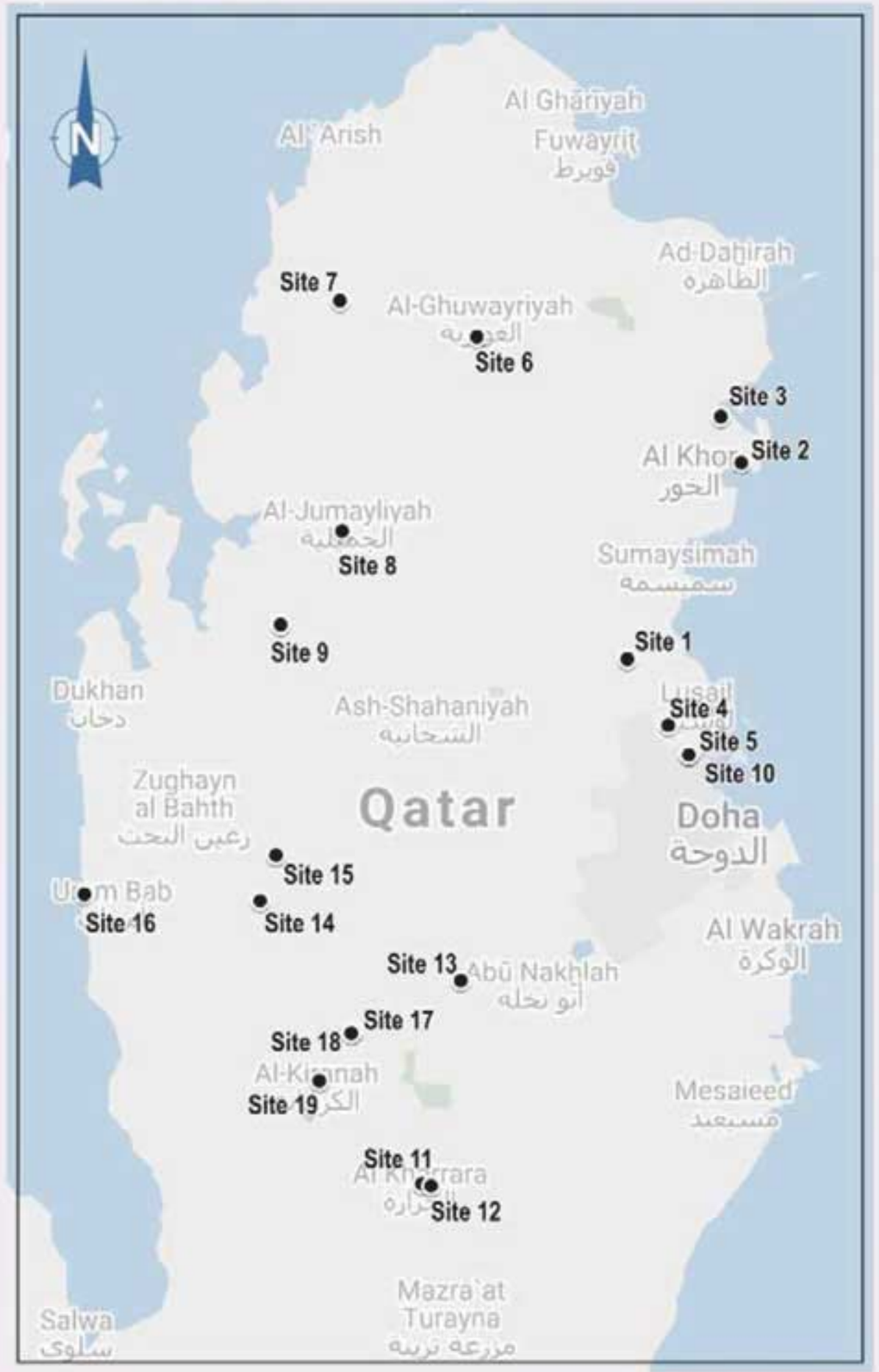


Figure 1. Locations of the 19 sites sampled for soil microbial diversity.

to AM fungi. These findings provide baseline information on AM fungal assemblages and the chemical drivers of diversity across communities in Qatar. This work partly compensates for the current lack of broad-scale studies in the Arabian Peninsula by providing understanding of overall patterns of AM fungi and their drivers in the region. The results of the research, constitute the first comprehensive study on mycorrhizal diversity and the soil chemical factors affecting its distribution in the Arabian Peninsula. Moreover, contributions from the research were included in the study published in New Phytologist regarding the factors that control the niche space (or living conditions) of AM fungi globally (Davison et al., 2021).

Given that AM fungi form positive symbiotic relationships with many of the crop species cultivated by humans, the results can serve as the foundations from which the research team can identify potential AM fungal species that occur naturally and are well adapted to the local Qatari

The research team from left: Dana Abumaali, Sara Al-Hadidi, Prof. Juha Alatalo, and Dr. Talaat Abdelfattah.

conditions, which could then be used to improve local crop production and food security. If in future, the research team intends to widen the sample to include agricultural lands, there are several questions that need to be addressed. For example, are there similarities between the AM fungal communities found in agricultural and natural habitats? Can the use of naturally occurring AM fungal species contribute to better stress tolerance? Lastly, can AM fungi which occur naturally in highly saline conditions improve crop production in lands with rising salinity levels? In addition to AM fungi, the research team screened the diversity of nitrogen fixing and total bacterial communities (and their biomass) (Oja et al., in prep) at the same 19 sites. In fact, using E-DNA, the research team successfully sequenced all the major organism groups (archaea, bacteria, AM fungi and total fungi, protists, total eukaryotes) from the soils in different habitats. In future (after completing bioinformatic analyses), this sequencing will produce the first complete map of the biodiversity found in Qatari soils across the diverse habitats sampled.

The research team while studying the sites.

Research team:

LPI: Prof. Juha M. Alatalo, PI: Dr. Talaat Abdelfattah, Research Associate Professor, Environmental Science Center - Qatar University, PI: Dr. Mohammed Alsafran, Director of Agricultural Research Station - Qatar University, Postdoc: Dr. Jane Oja (2020), Environmental Science Center - Qatar University, MSc students: Sakeenah Binte Adenan (graduated 2020), Dana A. Abumaali, Research assistant: Sara H. Al-Hadidi.

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For more information about this research achievement, you can browse the following links:

https://doi.org/10.1007/s00572-021-01052-3.

https://doi.org/10.1111/nph.17240.

Innovation
Oasis

Interview with an Inventor: Yosra Magdi Mekki

BSc. Student (third year) - College of Medicine
Qatar University

Prof. Susu Zughaier and Student Yosra, while participating with virtual reality debates in the Qatar University Annual Research Forum and Exhibition 2021.

Qatar University is proud of achieving its mission to enable graduates to contribute to the prosperity of their society. The University nurtures its talented students, provides them with an educational research environment that supports their research projects, helps them fund and apply their creative inventions. In this issue, we put Ms. Yosra Mekki under the spotlight. She is a third-year BSc student in the College of Medicine at Qatar University, and the owner of two award-winning inventions. We will get to know more about them through our interview with her.

Yosra Mekki, how do you introduce yourself to the University community?

I am a third-year medical student at Qatar University. Although I chose medicine as a major for several reasons, coding and everything tech-related has always been my passion. It is usually difficult to explain, but I enjoy a combination of the two. Medicine is simply the study of the human body and how it functions. However, I grew up as an internet kid, browsing endless websites; learning all sorts of ways to integrate technology into my daily life. I am mainly interested in virtual reality, machine learning and their application in all aspects of medicine. In fact, had it not been for the wide opportunities medicine offers within this realm, I would have probably studied computer science or biomedical engineering. I like to work on my projects during weekends, holidays, and any free time at hand.

Your invention combined software engineering and medical science, could you tell us about it in a simplified way?

Virtual Reality (VR) is used as a simulation model in student-patient interactive medical education, and shown to enhance learning outcomes. The rise in global burden of infectious diseases accompanied with the significant rise in antibiotic resistance prompts immediate action to combat the emerging threat of antibiotic resistance in bacteria. Catheter associated urinary infections (CAUTI) are the leading cause of hospital-acquired infections. The aim of this research is to develop a virtual reality (VR) based educational tool depicting the process of CAUTI caused by antibiotic resistant bacteria. The VR-CAUTI module is designed to bring awareness and provide insights to healthcare providers and community, which help in reducing the burden and spread of antibiotic resistant infections. VR based modules have the potential to render medical education compatible with the current 4th industrial revolution.

Our invention brings across challenging ideas in an engaging manner. When you put on the headset, you are taken inside a human bladder, the same way a catheter is, and can follow the journey of the catheter-induced infections in an engaging and cinematic experience. There is also an interactive element to it, where the end user can shoot at or try to destroy the 'evil' bacteria, which, inevitably become resistant and persist inside the bladder.

In what areas can "Virtual Reality Headsets" be applied?

Virtual reality's applications are endless. I cannot think of a single field where it would not prove useful.

How will "Virtual Reality Headsets" serve education at Qatar University?

Having worked at the Virtual Reality Section part-time for over 2 years now, I can envision immense benefit to be gained. From interactive modules that explain difficult concepts within challenging fields, to more creative presentations and better collaboration. Because of the COVID-19 pandemic, many universities now hold lessons using VR-powered platforms, including Stanford University's Medical School, which currently performs experiments with a virtual anatomy lab. Moreover, I have been using VR headsets during our problem-based learning sessions to present anatomical content. It is always a win-win situation - colleagues find it appealing and entertaining, whilst maintaining a solid grasp of the concepts. To go from textbook-based figures to seeing the human body the same way you would look at a person standing in front of you, becomes a huge leap.

What are the two awards your invention received?

It won the Best Demo Award at the IEEE International Conference on Informatics, IoT, and Enabling Technologies (ICIoT'20) in February 2020, as well as the Best Poster Award for Undergraduate Students in the category of ICT (Information Communications Technology) in October 2020.

We learned that your invention received funding from Qatar National Research Fund. What are the expected accomplishments of this funding?

We plan to expand the project to the second phase to depict molecular mechanisms of antibiotic resistance in bacteria. This work will get feedback from medical students as the end users of this virtual class, teaching them about molecular mechanisms of antibiotic resistance. I also hope to encourage medical students to learn and further engage with the world of VR, as well as possibly devise a scale to measure how effective VR really is in medical education.

Are you seeking to obtain a patent registered at Qatar University?

Yes, in sha Allah.

How did Qatar University support your invention?

I am grateful to Qatar University for providing me with the tools and environment I would need to be able to merge, and find a balance between the two fields I mentioned. The support I found from mentors like Prof. Susu Zughaier, Associate Professor of Basic Medical Sciences, College of Medicine at Qatar University, and VR experts like Mr. Mohamed Hammami, and Mr. Ramzi Ayesh, is invaluable. For a student planning to launch themselves into the world of research during medical school, concrete time management skills and a solid support system are needed. Moreover, the University houses both engineering and medical colleges, which makes for many exciting cross-collaboration opportunities. For instance, lately, I have worked with Prof. Sumaya Al-Maadeed Professor in Computer Engineering, and Dr. Muhammad Chowdhury, Assistant Professor of Electrical Engineering, from College of Engineering at Qatar University, as well as Prof. Susu Zughaier, on the QU Coughscope; an app that can predict your chances of COVID-19 infection based on your cough sound.

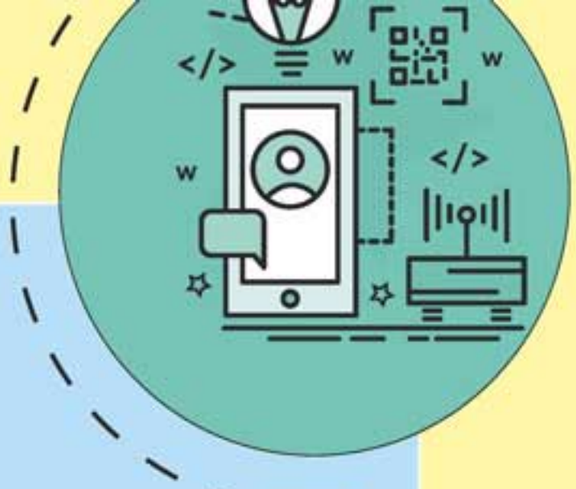
What difficulties did you face in your path to achieve this accomplishment?

Difficulties are present everywhere. In retrospect, I am glad I went through these challenges as they give you the chance to learn patience, grit and perseverance. For one, balancing between my medical studies, exams, and research goals was quite a challenge. By then, I had also started working part time at the VR Section of Qatar University.

From your point of view, what is the importance of inventions in developing societies?

As the old saying goes, necessity is the mother of invention. It is a process, you cannot get there overnight. Humans notice issues and promptly begin devising new tools or technologies to solve them in the community, at work, at school, and at home. Many inventions, such as the advent of electricity, have drastically transformed our way of life. The importance of inventions can never be limited to one field, without which, as humans, we would not be able to enjoy the current level of comfort and ease we experience today. As a medical student, it matters to me that we are now able to live longer, healthier lives, as well as make better use of the resources around us thanks to the ability to recognize the need where it applies.

Innovation
Oasis



Environmentally Powered Smart System for Urban-Scale Mapping and Assessment of Outdoor Air Quality in Qatar

Prof. Farid Touati, **Professor of Electrical Engineering,**

Hasan Tariq, **Research Assistant**

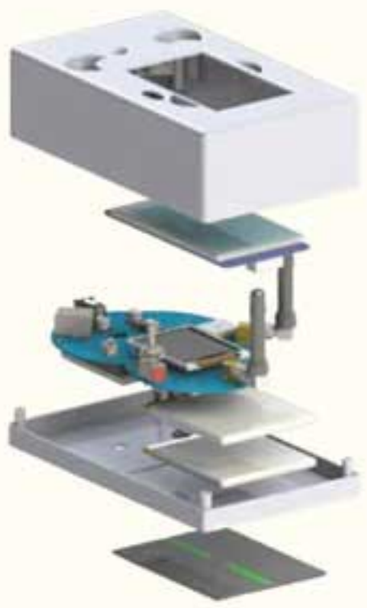
College of Engineering – Qatar University

A US-patented autonomous handheld programmable multi-sensor outdoor air quality (AQ) sensing system was developed in the Department of Electrical Engineering of the College of Engineering, Qatar University. Ensuring a safe and healthy environment, especially during the COVID-19 pandemic, while Qatar stands on the threshold of hosting the FIFA World Cup 2022, was the rationale behind this effort. The real-time geospatial study of prime environmental variables impacting lives was sensed at static and mobile monitoring nodes to probe the AQ. Abiding by standards was ensured by implementing the AQ indexes recommended by WHO and international EPAs, especially US and EU. Five EPA recommended commercial grade air quality index sensors (particulate matter, Ozone, Sulphur dioxide, Nitrogen Di-Oxide, and Carbon Mono-Oxide) as well as Carbon Di-Oxide and Volatile Organic Compounds (VoCs) sensors were networked on board. For environmental profiling and vertical and horizontal (mapping), a combination of sensors were utilized to measure accuracy-improved position (GPS) as well as temperature, pressure, humidity, wind speed, and altitude. Harsh climatic conditions and fragility constraints in the commercial outdoor smart sensing systems harnessed the SeReNoV2 node to a consumer usable development format in two versions as shown in Figure 1. The developed air quality system (AQS) has been a success story in ARC2018 and ARC2020 and many research forums locally presented in Figure 1 (b). Furthermore, this system was

selected to represent Qatar in the biggest Euro-Asian Technology and Innovation competition in Russia named SPIEF2020 and SPIEF2021 as shown in Figure 1 (a).

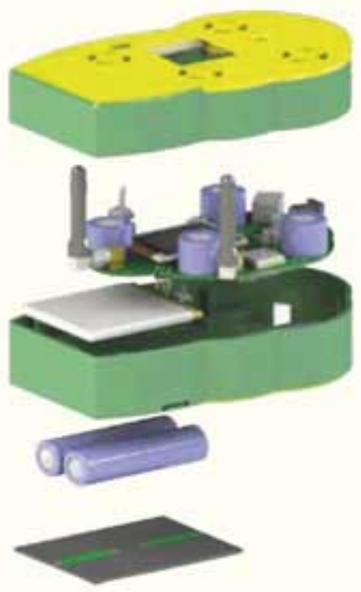
Focusing on Industry 4.0 challenges, a structured research directive was adapted at all three layers: a) the motherboard comprised latest microprocessor, RAM and ROM with peripheral interfaces and local display screen; b) for internet connectivity 3G and WiFi adapter were integrated; c) licensed sensors were used for measurement of air quality variables, environmental variables, and typographic

a - Verion SPIEF2021



b - Lab Version 2

c - Version ARC2021



d - Lab Version 1

Figure 1. Two-Product Versions of NPRP10 AQS.

variables; and the energy harvesting section used the in-practice and reputed solar charger and battery protection mechanism delivering an instantaneous power of 2.2W.

Two deployment methods were performed during the project span. First, the system was deployed as a static measurement station on four sites in Qatar University and later as a mobile mapping

Prof. Farid Touati

station placed on a Toyota CAMRY, patrolling in Doha for 3 AQ mapping (AQM) Trips, as shown in Figure 2. Real-time urban AQ mapping was observed in the IoT platform. AQ was mapped, processed, and forecasted at national landmarks in Qatar, for the future, to ensure maximum environmental safety for citizens and tourists. Nevertheless, it serves as an adequate and precise AQM platform as well as a reliable tool for EPAs, MME, QP, MoPH, and ASHGHAL for commercial applications.

This is the first AQM system platform for environmental mapping and profiling in Qatar and is expected to serve as a model reference architecture for future urban-scale environmental artificial intelligence (AI) systems in Qatar. The NPRP10 research team is planning to collaborate with QU Innovation Office to establish a Product Innovation Lab that will practically train, assist, and process the innovations done from funded projects.

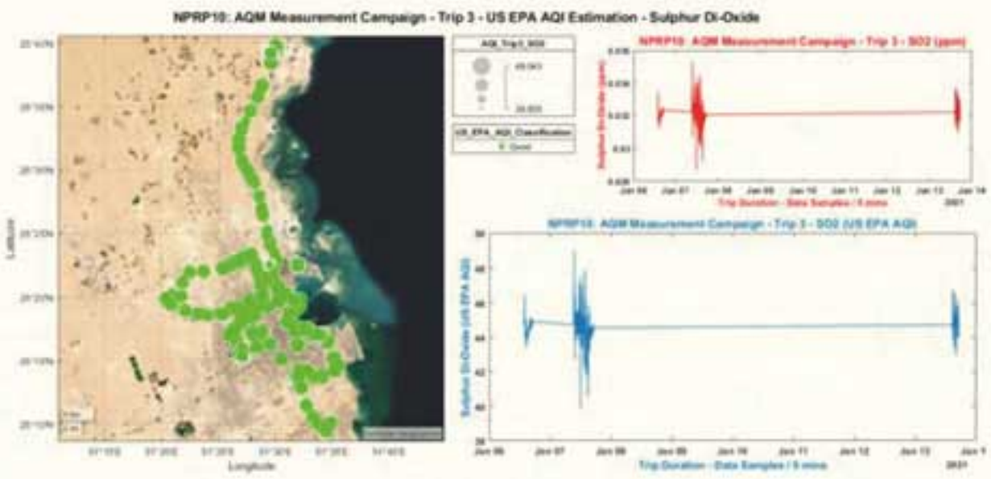


Figure 2. Real-time mobile AQM on a Toyota CAMRY patrolling in Doha for QNRF AQM Campaign.

Novel and Green Material for the Treatment of Industrial Wastewater

Dana Izzat Alresheq, Research Assistant, Gas Processing Center (GPC),

College of Engineering - Qatar University

The research team from College of Engineering, from left: Prof. Hazim Qiblawey, Prof. Mustafa Nasser, Prof. Ibnelwaleed Hussien, and Dana Al-Resheq.

Wastewater from industrial activities represents a serious problem as it is produced in large quantities and usually contains harmful and toxic substances to the environment. Specifically, contaminated wastewater with very fine suspended particles known as a colloidal suspension. Owing to the repulsive forces between the particles with similar charges, colloidal suspensions are highly persistent and stable. The interest in this type of wastewater arises from the difficulties and challenges associated with its treatment process. One of the most popular treatment techniques for colloidal suspension is through coagulation/ flocculation

which is a physicochemical separation process. Coagulation/ flocculation is a reliable and efficient technique to clarify colloidal suspension. It requires the addition of a chemical agent known as coagulant/ flocculant to bring the colloids in wastewater together forming larger particles that will settle down under the influence of gravity as indicated in (Figure 1). Currently, the chemical agents employed in the industrial field demonstrate some challenges regarding their limited efficiency and negative impacts on the environment. In this regard, it has become necessary to identify new environmentally friendly materials with greater treatment potential.

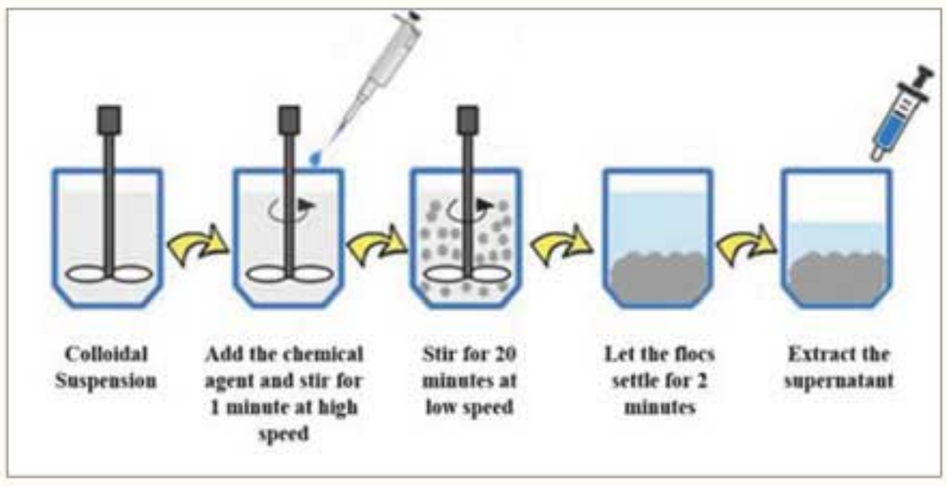


Figure 1. Schematic illustration of the coagulation/ flocculation process.

To meet the need for green materials in the wastewater treatment field, a research team from Gas Processing Center including Prof. Mustafa Nasser, Research Professor, Prof. Ibnelwaleed Hussien, Research Professor, Prof. Abdelbaki Benamer, Research Professor, and Ms. Dana Al-Risheq, a MSc. environmental engineering graduate, alongside Prof. Hazim Qiblawey from the Chemical Engineering Department at Qatar University examined multiple green materials for the treatment of colloidal suspension through coagulation/ flocculation process. The investigation led to discovering the novel application of choline chloride based natural deep eutectic solvents (NADESs) as a coagulant for colloidal suspensions. The research group was able to synthesize, characterize, test, and prove for the first time the effectiveness of choline chloride based NADES as a coagulant.

Natural deep eutectic solvents are chemical mixtures of two naturally abundant components such as choline chloride, organic acids, amides, and sugars. They are known for their simple and time-efficient synthesis method, biodegradability, and non-toxicity. In literature, a wide variety of NADES applications were reported in different fields including pharmaceutical, oil, and gas. However, there were no studies on the applications of NADES for wastewater treatment. The research group led by Prof. Mustafa Nasser noticed the potential of using choline chloride based NADES in the coagulation/ flocculation process after analyzing the chemical structure of the compound (Figure 2). The similarity in NADES's structure with polyacrylamide, which is a widely used flocculant in the industry, drove the research group's attention to investigate its treatment efficiency for colloidal suspensions. They proposed that the positive charge in the NADES's structure will reduce the repulsive forces between the negatively charged colloidal particles. Hence, the particles will come together forming a greater mass that will settle with gravity and thus, separate the liquid and solid phases.

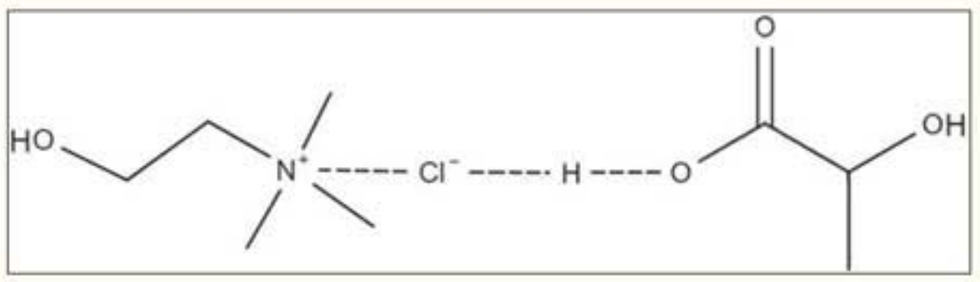


Figure 2. Molecular structure of choline chloride: lactic acid NADES.

The experiments were conducted using bentonite clay minerals to represent colloidal particles in suspension. NADES was synthesized from choline chloride and an organic acid (i.e., lactic acid) with continuous mixing and heating until a homogeneous mixture is formed. The efficiency of the synthesized NADES as a coagulant was determined according to specific criteria which include reduction in the turbidity of the treated suspension and the size of settled particles. The tested NADES was found to be highly efficient for the treatment of bentonite suspensions. It significantly reduced the turbidity of the system by more than 99% with a relatively small dosage. Furthermore, the size of the formed particles was sufficient for them to settle and produce clarified water within two minutes. The results of the coagulation process using choline chloride: lactic acid based NADES were compared to well-established coagulant/ flocculants available in the market and found to be competitive in terms of its efficiency and environment-friendliness. As a result, a US patent (US 11, 136, 249) was filed, granted, and published on this novel application which represents a step closer towards a greener and safer world.

Innovation Oasis

Inventor Business Card:

Dr. John-John Cabibihan

Associate Professor of Mechanical Engineering,

College of Engineering

Qatar University

جامعة قطر
QATAR UNIVERSITY

Dr. John, how would you introduce yourself to the QU community?

My name is Dr. John-John Cabibihan, Associate Professor of Mechanical Engineering. Here is my biosketch: https://www.johncabibihan.com/biosketch.

Tell us about your inventions?

Over the years, my work and my inventions have been focused towards healthcare robotics, more specifically in assistive and social robotics for the therapy of children with autism, lifelike prosthetics, bio-inspired tactile sensing, human-robotic touch and gestures, and robotic surgery.

From your point of view, what are the most important values that an inventor shall carry during his/her journey?

At the early part of my journey, I was fortunate to read the book "How to think like Leonardo da Vinci" by Michael Gelb. In that book, it was observed that the Renaissance Artist/Engineer/Scientist Leonardo da Vinci had a keen sense of curiosita (i.e. curiosity). In my view, that kind of curiosity in addition to the drive in addressing human needs and concerns are the most important values that an inventor should have.

If you were to create an invention to serve humanity, what would it be?

It depends on the scale. There are global problems and there are problems that are usually left aside in terms of priority. I look for those problems that are typically ignored by investors and those that do not necessarily translate to high market projections and latent demand. My decision process is rather simple: "Can this creation/invention help uplift the dignity of a person?" If my answer to that is a yes and the problem aligns to my team's capabilities, then we channel our energies to investigating that problem. With some luck, my team and I find some interesting approaches to solve that problem. Those normally are the seeds to invention, which then propagate to various insights and combinations of solutions.

How did Qatar University support you as an inventor?

This has been a productive journey for us in creating what seems to be an invention factory, with consistent invention productivity and demonstrators year by year. This will not be possible without the support of QU. The ecosystem has been designed to support creative scientific and technical endeavors. For this, I am grateful to Qatar University.

Management of Minor Medical Conditions in Qatar: An Assessment of Self-perceived Competencies and Predictors

Ahmed Makhlouf, Master of Science in Clinical Pharmacy and Practice,
Supervisor: Dr. Kazeem Yusuff, Associate Professor of Clinical Pharmacy and Pharmacy Practice,
Co-supervisor: Prof. Mohamed Izham Ibrahim, Professor of Social and Administrative Pharmacy,
College of Pharmacy - Qatar University

The State of Qatar has invested heavily in re-imagining public healthcare delivery in Qatar over the past decade with specific focus on enhancing the quality of primary healthcare. A major pillar of Qatar's unrelenting focus in changing the paradigm for the delivery of primary healthcare is the Qatar National Health Strategy (QNHS) 2018-2022, which specified an integrated approach for the provision of a functional patient-centered primary care that is closer to home, and meet patients' needs. The QNHS 2018-2022 identified community pharmacists as one of the key healthcare professionals whose active participation is crucial to expanding access to functional primary care services including the effective management of minor ailments. Minor ailments are uncomplicated medical conditions that are commonly encountered in hospitals and community pharmacies, and have become a major source of clinical and financial burden especially in primary, tertiary and emergency care settings. However, the use of an integrated collaborative delivery model that cedes the task of managing minor ailments to other primary healthcare professionals such as community pharmacists has been shown to reduce the burdens associated with minor ailments. The reported benefits include efficient use of healthcare resources as physicians are able to focus on serious medical conditions, reduction in patient load and waiting time, and increased patient satisfaction.

From left: The co-supervisor, Prof. Mohamed Ibrahim, the Master's student Ahmed Makhlouf, and Master's thesis supervisor Dr. Kazem Yousef.

However, studies focused on comprehensive assessment of the competency of community pharmacists to manage minor ailments are scanty. This is an essential first step because the ability to assume a responsibility is substantially dependent on self-perceived competence to execute the tasks associated with that responsibility successfully. This notion is consistent with Albert Bandura's social cognitive theory that describes the relationship between the successful completion of an assigned task and perceived self-efficacy. Indeed, empirical evidence has shown that higher the self-perceived competency, more confident an individual feels about executing an assigned task. Therefore, a baseline assessment of community pharmacists' self-perceived competency to manage commonly encountered minor ailments in Qatar, and identify the predictors of their competency level was conducted to determine their readiness to key into the integrated primary healthcare model of the QNHS.

The study was the focus of an MSc thesis submitted to Qatar University by Mr. Ahmed Makhlouf (MSc Pharmacy Graduate) under the supervision of Dr Kazeem Yusuff (Associate Professor of Clinical Pharmacy and Pharmacy Practice) and Dr Mohamed Izham Ibrahim (Professor of Social and Administrative Pharmacy), and was funded by Qatar National Research Fund (QNRF). The MSc project was a two-phase cross-sectional assessment of the self-perceived competency of community pharmacists working in independent and chain pharmacies to manage common minor ailments in Qatar. In addition, the factors that may enhance or impede community pharmacists' capacity to manage common minor ailments effectively and safely in Qatar were also investigated.

Key findings of the study revealed that out of the 14 minor ailments commonly encountered in Qatar, community pharmacists' self-perceived competency was highest for constipation and colds/catarrh. The competency elements with the highest median scores were; the ability to recommend over-the-counter medicines, and the ability to provide instructions to guide its use, while the ability to differentiate minor ailments from other serious diseases was the lowest. Female community pharmacists (OR = 2.39, 95%CI: 1.34–4.25, p= 0.003) and working for chain pharmacies (OR = 2.54, 95%CI: 1.30–4.96, p= 0.006) were the significant predictors of higher self-perceived competency. Customers' trust, physicians' support, and the strategic focus of the QNHS 2018–2022 on community pharmacists to expand access to functional healthcare services at the primary care level were the major enabling factors identified; while inadequate private counselling space in community pharmacies was a key self-perceived barrier.

The study has provided important insights crucial to developing an appropriate institutional framework that will guide the ceding of the task of managing minor ailments to community pharmacists in Qatar. This is likely to ensure that such a policy change is fit-for-purpose, meets societal needs, enhances effective service delivery, ensures better value for money spent and achieves positive outcomes in Qatar.

Furthermore, the study findings will be helpful in identifying appropriate interventions that could improve the competency of community pharmacists to take over the task of managing minor ailments in Qatar and contribute to the achievement of one of the major goals of the Qatar National Health Strategy 2018-2022.

Legal Personality of Companies (Joint Venture): A Comparative Study in Qatari Law

Maha Mansour Al-Thani
PhD in Private Law, College of Law - Qatar University

This research is significant as it explores the fact that commercial transactions are originally conducted between natural persons whenever they have legal capacity. However, economic progress has led to the emergence of legal entities in which a number of people participate to achieve a specific economic goal. Positive and negative implications shall be solely directed at this entity, without its constituent persons, entailing rights and liabilities upon the entity, and accordingly requiring it to be financially independent of its natural persons.

Consequently, such entity shall be similar to a natural person, however distinct in terms of human characteristics, while endowed with its own legal characteristics. As such, it shall be considered a juristic person that is different from a natural person, paving the way for corporates to be established accordingly.

Hence, various countries have incorporated companies based on the said concept, carefully studied such companies and enacted laws that regulated them. Consequently, the recognition of the existence of such entities between natural persons or between natural and juristic persons takes the form of commercial or civil companies as established by law.

It is also conceivable that some commercial companies, while retaining their legal personality in accordance with the law, will join to form an alliance, coalition or union to achieve a particular economic objective. The economic community has recently produced this type of legal entity, which is known as Joint Venture.

The research shows the issue related to discrepancy among the Qatari Civil Code, and comparative Arab and model laws, concerned with the regulation of companies, with regard to definition of the legal personality of the company. The law stipulates only the legal personality of civil and commercial companies, and fails to do the same for Joint Venture. Hence, the judiciary is striving to fill the legislative gap, particularly with regard to Joint Venture. However, the law did not specify only the legal personality of civil and commercial companies, leaving this type of companies.

Since the legal personality of Joint Venture raises many problems that have so far remained a matter of controversy with the judiciary and has not been clarified by jurisprudence, this study is a serious attempt to solve these extremely accurate and far reaching problems, which can be summarized as follows:

First: Develop a concept for a joint venture by explaining its formation, purpose of formation, the extent to which it is recognized by law, and its governing rules.

Second: The extent to which a joint venture's legal personality is proven, whether with regard to the company claiming against a third party or vice versa and what is the Qatari judiciary's stand on Joint Venture?

Undoubtedly, the researcher shall develop a method to follow according to the nature of the research, which the researcher is preparing. This study is based on an integrative approach that combines a number of approaches, including a deductive approach, through which the researcher aims to explore laws related to the subject of defining the company and the extent to which Qatari law recognizes its acquisition of a legal personality, in addition to the appropriateness of these laws with regard to solving problems faced by Joint Ventures. The researcher also expands the interpretation and analysis of some texts, draws conclusions and expresses opinions on some controversial issues, which need explanation. Additionally, the researcher uses a comparative approach that helps in presenting the stand of the comparative judiciary, which has addressed laws that stipulate Joint Venture, such as Qatari, Lebanese, Egyptian, Syrian, Algerian, Jordanian, and Emirati civil laws, the Unified Arab Law, Bahraini and Yemeni Laws and the Unified Law of the GCC States of the Gulf.

At the end of the study, the researcher has come up with the following conclusions:

First: Qatari law and the laws subject to this study provide for no specific definition of a Joint Venture. Accordingly, the researcher defined the Joint Venture as "a contract between two or more companies to implement a specific project in order to achieve a mutually beneficial economic goal by sharing the profit or loss that may arise from this project".

Second: Qatari law and the laws subject to this study do not stipulate special provisions on Joint Venture. However, contract and general provisions of the company are referred to in accordance with the general rules.

Third: Qatari law and the laws subject to this study have not expressly stipulated the right of a Joint Venture to acquire a legal personality. Qatari and comparative judiciary have rather recognized the right of that venture to acquire a legal personality as a moral, juristic or legal person immediately upon the conclusion of its incorporation contract.

Fourth: Qatari law and the laws subject to this study have not clarified the extent to which the legal personality of this type of venture is invoked. General rules of the venture and Qatari judicial principles and comparison have provided for the claiming of a third party regarding the existence of such personality of a Joint Venture before publication is fulfilled according to the law. In return, they stipulate that a Joint Venture cannot prove its personality before publication procedures are completed. They have also permitted third parties to file claims against a Joint Venture or one of its constituent companies for debts owed by them, as they are commercial debtors and shall be jointly liable for payment of all the debts.

Fifth: Qatari judiciary has not settled on a single principle regarding the recognition of this type of company as a legal personality, it rather adopts three main opinions. The first opinion does not recognize the legal personality of a Joint Venture, only its constituent companies. The second opinion recognizes that personality of a Joint Venture without its constituent companies. The last opinion recognizes the legal personality of a Joint Venture and its constituent companies.

Finally, the researcher implores the legislator and judiciary to take into consideration the below recommendations while implementing the Civil Law provision:

First: When the legislator re-drafts Article No. 513 of the Civil Code, he should expand the definition of the company so that it is easier to interpret and can be applied to any company that may be created by economic development in future. The definition set by the Algerian legislator in Article (416) of the Civil Code, stipulating that a company is a contract by which two or several persons undertake to contribute assets in kind or money to achieve a mutually beneficial economic goal, share profits and bear losses incurring from such enterprise, can be borrowed to that effect.

Second: Qatari judiciary should adhere to one principle regarding the recognition of the legal personality of Joint Venture. It is proposed to adopt the third opinion, which recognizes that personality for Joint Venture and their constituent companies, as it ensures a clear position for these companies before stakeholders. In addition, it ensures that their provisions, capacity upon transactions and litigation, and the extent to which these companies are invoked when claiming the rights arising from the obligations assigned to them are all properly regulated.

The researcher recommends that the Qatari Court of Cassation should adopt this opinion and establish judicial principles accordingly, in order to resolve the dispute related to determining that legal personality, prevent conflicting judgments in single court circuits, stabilize transactions and create a safe economic environment governed by public and private law.

COVID-19 and Vaccine Diplomacy, A New Currency of International Diplomacy: **India and the GCC**

Thomas Bonnie James,
Lakshmi Venugopal Menon,
PhD Candidates at the Gulf Studies Program, Gulf Studies Center, Qatar University

Introduction

The COVID-19 vaccine has become a new currency of international diplomacy. Countries with the knowledge and production capacity have identified the vaccine as a soft power tool that can secure diplomatic support, or thaw frosty bilateral ties. Russia, China, and India are pioneering in this realization.

Vaccine diplomacy maybe understood via the larger theoretical category of medical diplomacy, a expression that was devised by Peter Bourne in 1978, special assistant to the president for health issues in the Carter administration. Bourne contended that health and medicine can perform a significant character "as a means for bettering international relations" as "certain humanitarian issues, especially health, can be the basis for establishing a dialogue and bridging diplomatic barriers because they transcend traditional and more volatile and emotional concerns".

Hotez defined vaccine diplomacy as "almost any aspect of global health diplomacy that relies on the use or delivery of vaccines and encompasses the important work of the Gavi, the Vaccine Alliance, as well as elements of the WHO, the Gates Foundation, and other important international organizations".

The onset of the COVID-19 pandemic has created an opportunity for vaccine diplomacy to function on a global scale. It may also be understood from the perspective of the soft-power paradigm. Thomas Bonnie James and Lakshmi Menon, enrolled in the Gulf Studies PhD program of the Gulf Studies Center at Qatar University, conducted a research study to understand the vaccine diplomacy between India and the Gulf Cooperation Council countries.

India's Attempt at Vaccine Diplomacy

India, the world's third-largest producer of pharmaceuticals, launched the 'Vaccine Maitri' (Vaccine Friendship) initiative in January 2021. A critical diplomatic effort to supply made-in-India vaccines to low-income and developing countries universally. India has been verbal about its assurance to assist global recovery efforts and was one of the first nations to supply food, medicines, and essential supplies to countries in South Asia, Africa, and the Indo-Pacific. At the United Nations General Assembly in September 2020, Indian Prime Minister Narendra Modi expressed commitment to ensure that India's vaccine production and delivery capacity is available to "humanity" as it contends the virus. On 16 January 2021, India began

PhD students at the Gulf Studies Center: Thomas Bonnie James and Lakshmi Venugopal Menon.

rolling out its domestic COVID-19 vaccine, both the indigenously developed inoculation from Bharat Biotech International Ltd. and Serum's Covishield. The latter is "the Indian version of the replication-deficient adenoviral vector vaccine" developed by AstraZeneca and Oxford University.

During the World Economic Forum, India expressed readiness and intent to export Indian-produced vaccines. On 22 January, the country began exporting vaccines to six neighboring countries –Nepal, Bangladesh, Bhutan, Maldives, Myanmar, and Seychelles. In late January, India began commercial shipments of the vaccines to Brazil, Morocco, Saudi Arabia, and South Africa. Compared to their counterparts, Indian-made vaccines are considered cost-effective and do not require to be stored and transported at subzero temperatures.

As of 9 May, India has provided 66.3 million vaccine doses to 95 countries through various modalities, including grants, aid, and gifts. India's vaccine diplomacy arrived at a time of growing apprehensions over 'vaccine nationalism', and the increasing inequity in vaccine supply.

India has decided to share its existing vaccine supplies, whereas many nations have opted for the nationalist choice of hindering exports. Additionally, India has offered 1.1 billion vaccine doses to the WHO's COVAX program to dispense COVID-19 vaccines to economically weaker nations. Meanwhile, in the scramble for Coronavirus vaccines, several nations are approaching India to ensure accessibility and availability apertures.

The GCC Link

In this study, the MENA countries can be categorized based on their position and agency in the emerging vaccine diplomacy field, and its interaction with previous political trends. First, leaders attempting regional vaccine diplomacy – the UAE, Israel, Morocco, and Turkey. Second, nations with less expertise – Egypt, Saudi Arabia, Iran, Jordan, Tunisia, and Algeria. Last, states that have been unsuccessful in launching effective vaccination campaigns due to structural issues, political instability, and financial shortfalls – Syria, Yemen, Sudan, Libya, and Iraq. This is crucial in understanding the vaccine diplomacy scramble by Russia, China, India, and the European Union in the region.

The GCC is a unique migratory destination for Indians, and correspondingly India is a vital country for human resources to the region. As of 2018, there were 8.9 million Indian migrants in the Gulf. 3.31 million were in the UAE, 2.27 million in Saudi Arabia, 1.16 million in Kuwait, 1.2 million in Oman, 0.4 million in Bahrain, and

A photo showing the vaccines distribution among countries.

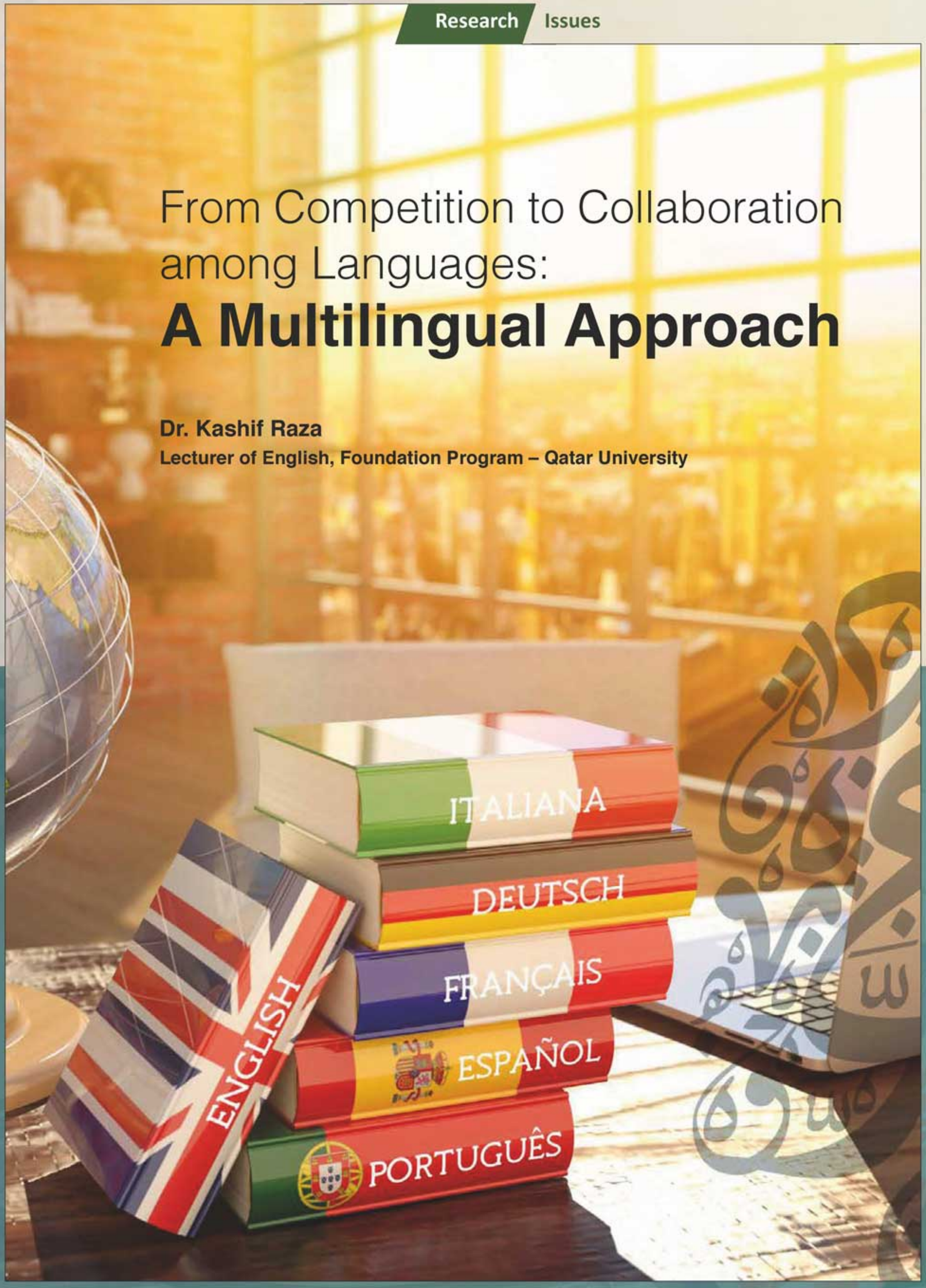
0.7 million in Qatar. India also shares close economic, historical, and cultural ties with the region.

Approximately 8.4 percent of India's vaccine export has been directed to the GCC. As of 5 May 2021, India has exported a total of 5.1 million vaccine doses to the GCC countries. Saudi Arabia has received the lion's share (4.5 million doses) – 88 percent of the total Indian vaccines received by the GCC, an indicator of strong bilateral ties between the two countries. UAE and Kuwait received 0.2 million doses each. Meanwhile, Bahrain and Oman received 0.1 million doses each. Bahrain's Prime Minister and Crown Prince Salman bin Hamad Al Khalifa thanked PM Modi: "…and our friends in India for working with us to secure the delivery of the vaccine" through a Twitter post.

The argument that New Delhi's vaccine diplomacy has worked in the GCC is plausible. India has recently overcome the second wave of the pandemic. The second wave was highly proliferous and a triple-mutant COVID-19 variant which crippled the government and its systems. Amidst the crisis, the GCC is rushing to provide emergency aid to the country. The Saudi government has sent 80 metric tons of liquid oxygen. Qatar has sent approximately 300 tons of medical supplies from around the world to support COVID-19 relief efforts. Qatar Airways is committed to delivering aid supplies to India free of charge. The United Arab Emirates has sent a consignment of COVID-19 relief material, including 157 ventilators, 480 BiPAPs, and other medical supplies to India. Bahrain has shipped 40 MT of liquid oxygen. Kuwait has provided 282 oxygen cylinders, 60 oxygen concentrators to India. Every GCC state, apart from Oman, has already sent immediate aid to India. This may suggest that India's attempt at vaccine diplomacy has been successful to a certain extent amongst the GCC states.

From Competition to Collaboration among Languages: **A Multilingual Approach**

Dr. Kashif Raza
Lecturer of English, Foundation Program – Qatar University



Dr. Kashif Raza

Discussions related to policy enactment where English Language Teaching (ELT) or Teaching English to Speakers of Other Languages (TESOL) and multilingualism are viewed as collaborative endeavors are emerging. Scholars, researchers and language teachers are arguing for creating classroom environments where target languages such as English are developed in collaboration with local languages like Arabic, French, Punjabi, and Urdu. At theoretical level, such shift in language collaboration will require contesting monolingual ideologies that support the use of single, mostly dominant, language(s) as medium of instruction in the classroom and refuse to recognize the significance of other languages for academic and non-academic purposes. At practical level, examples need to be provided to showcase how English is, and can be, developed while welcoming, celebrating, and utilizing students' heritage languages such as Arabic for equity, inclusivity and social justice in educational spaces.

Three scholars from the Gulf context that are arguing for a shift in language education to promote collaboration between English (as a target language) and Arabic (as students' heritage and local language) are Kashif Raza, Lecturer in English at Qatar University, Qatar, Christine Coombe, Associate Professor at Higher College of Technology, UAE, and Dudley Reynolds, Senior Associate Dean for Education at Carnegie Mellon University in Qatar. Their work focuses on ELT and multilingualism, and argues for utilizing students' skills, knowledge, and expertise developed in Arabic to enhance English language skills where students are able to bring their prior learning in Arabic to English language classrooms, use it for further academic development, and connect the content learnt in English to topics and issues outside the classroom.

An example of their recent work in this regard is a co-edited volume **"Policy Development in TESOL and Multilingualism: Past, Present and the Way Forward"** that aims to serve as a platform for discussions related to policy enactment where TESOL and multilingualism are viewed as collaborative endeavors. It includes 21 chapters that are divided into three main sections based upon their focus. The first section of the book provides critical examinations of previous initiatives and accomplishments in the area of language policy development, especially with regard to how efforts were made to recognize and embrace linguistic diversity. It provides a detailed discussion on what has been done in terms of developing language policies that strengthen the notion of coexistence between TESOL and multilingualism. The second section describes projects and initiatives currently being worked upon to expand and strengthen the field of TESOL while providing space for local and indigenous languages to develop. Policy development initiatives at school, state, region and organizational (e.g., TESOL International Association Summit, 2017) levels feature prominently in this section. The last part of the

book highlights policy development areas that need special consideration to develop TESOL not only as a unique field, which is different from general education and/or language acquisition, but also one that builds on and contributes to multilingualism. This section includes proposals and discussions that can be used to shape TESOL as an advanced area of knowledge where issues related to ELT in different levels, contexts, and settings are dealt with through continous policy development, proper implementation, and periodic revisions.

Teachers, researchers, policymakers, and multilingual learners can benefit from this work in many ways. Below are some key takeaways from this edited volume.

Takeaways for teachers:

- Multilingualism is a reality and monolingual ideologies can be a threat for multilingual students.
- Multiple languages can develop at the same time.
- English can exist and develop with other languages brought by the students and the teachers to schools.
- When teaching English, other languages can be integrated into the curriculum, assessment, and communication to welcome, support and utilize students' linguistic repertoire.
- When teaching other languages, English can be used as a resource, without letting it dominate the development of other languages.

Takeaways for researchers:

- TESOL should not be perceived as a monolingual endeavor.
- Policies that position TESOL as an instance of multilingual education are emerging.
- Need to provide practical examples of how English is working or can work with other languages.
- This book advances TESOL International Association's call for redesigning English language education programs with priority given to embracing linguistic diversity as an asset, improving intercultural dialogues, embedding educational technologies, increasing information about the role of English as a lingua franca, and engaging in reflective practices as TESOL professionals to revise policies.
- The book covers what has been done, what is being done and what needs to be done to pave the way for TESOL and multilingualism to co-exist and co-develop in an equilibrium.

Takeaways for policymakers:

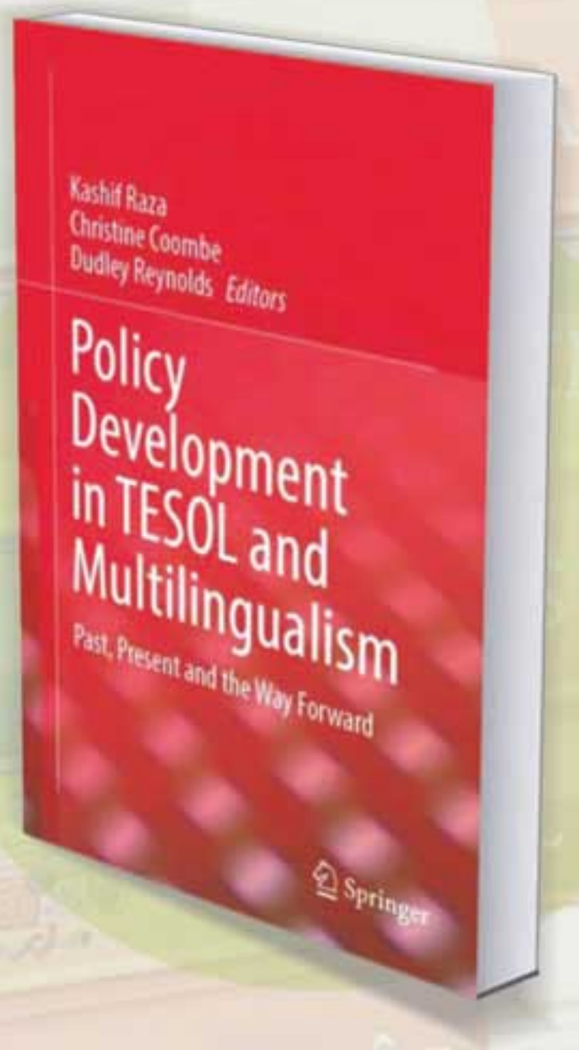
- This book works as a resource for those interested in designing educational systems that recognize and support the linguistic and cultural resources that students bring to their classrooms.
- Local teaching practices, beliefs and contexts should be considered when designing and implementing a language policy in a specific context.
- The chapters in the book show that it is possible to teach English in ways that continue to build literacy and competency in other languages while modeling and scaffolding multilingual communication.
- Policy is only as useful as the willingness and ability to implement it.

Takeaways for multilingual learners:

- Multilingual repertoires can be used as resources and assets in English language classrooms.
- Prior knowledge and language skills are of value.
- English is a language, just like other languages spoken at home and in society.
- Learners can develop English language skills by utilizing other languages as resources and vice-versa.

The book is on the link:

https://link.springer.com/book/10.1007/978-981-16-3603-5



Public Views of Qatar Labor Law Changes

Dr. Buthaina Al-Khulaifi, Senior Research Assistant (PhD Candidate)
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Introduction

In Qatar and the rest of the GCC (Gulf Cooperation Council) countries, expatriate workers have always been an important constitute of the labor market. With the announcement that Qatar would be hosting the FIFA 2022 World Cup, the country has witnessed not only a substantial increase in the number of foreign workers, but also an intense international scrutiny about its labor law system and its treatment of expatriate workers. Reforming the labor law has always been one of Qatar's 2030 National Vision goals, to ensure social and economic justice for all foreign workers. In 2012, the Qatari government formed a committee to study potential reforms to its labor law system, and by December 2016[1], Qatar implemented a new policy to replace the Sponsorship Law of 2009. This was followed by several legislative changes including the Decision No. 95 of 2019, Law No. (18) of 2020, and Law No. (17) of 2020, which show Qatar's genuine commitment in reforming its labor laws.

Labor law reforms received mixed reviews from multiple international organizations. These organizations argued that the new policy is similar to the previous labor law, lacking flexibility and constraining workers' freedoms. Nevertheless, as changes to the law are implemented, it is important that policy makers are aware of such reviews so that they can act from an informed perspective. The Social and Economic Survey Research Institute (SESRI) implemented a QNRF funded study to collect feedback from Qatari citizens, residents (high and low-income expatriate workers) and business owners about the new elements in the labor reforms. The recently introduced changes to the Labor Law are expected to raise the overall quality of life and economic outlook for both citizens and resident expatriates of Qatar. The results of the study would offer impartial knowledge base enabling policy makers to improve pre-existing intervention strategies, and develop new methods for tackling migration-related issues.

Survey Features

A total of 2,760 interviews were conducted by telephone using CATI (Computer-Assisted Telephone Interviewing) from September 2020 to January 2021. The sample included 857 Qataris, 1,012 higher-income expats, and 891 lower-income expats, aged 18 years or older[2].

1 Kovessy, "Qatar Officials Propose Changes to Kafāla System", Doha News, 14 May 2014.

2 The study used QAR4,000 as a cut-off point to distinguish between higher income expatriates who earn 4,000 QAR or more and lower-income expatriates who earn less than QAR4,000.

Results

Familiarity with the Changes in Labor Law

First, respondents were asked about their level of familiarity with the Labor Law changes introduced since 2016. These new laws include the Interior Minister Decision No. 95 of 2019 that stipulated the removal of exit permit for all expatriates as well as Law No. (18) of 2020 that allows expatriates to change jobs without obtaining a 'no objection certificate' (NOC). Moreover, Law No. (17) of 2020 was passed to determine a national minimum wage for workers and domestic workers(3). The results revealed that Qatari nationals (43%), higher-income expats (27%), and lower-income expats (32%) are not very familiar with these changes (See Figure 1). This indicates a lack of awareness among respondents about the changes in the labor law.

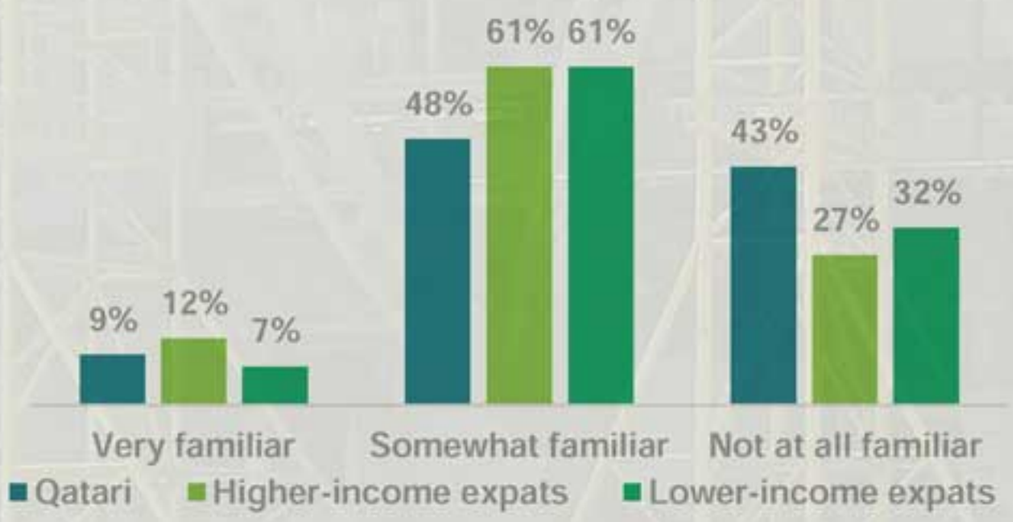

Figure 1. Familiarity with Qatar Labor Law changes.

Dependency on the Employer

When the respondents were asked whether or not the amendments of the labor law made expatriate workers more or less dependent on their employer, the majority thought that the new changes would make foreign workers less dependent on their employers (70%, 73% and 54%, respectively). It is essential to note that more than three quarters of those who were more familiar with these changes believed that employees would be less dependent on their employer. Fewer respondents believed that "the changes will totally eliminate dependency on the employer" (See Figure 2).

3 According to Law No. 17 of 2020, on Setting the Minimum Wage for Workers and Domestic Workers sets the minimum wage for all private sector workers, including domestic workers, at QAR1,000 per month as a basic wage, as well as QAR500 per month allocated by the employer for accommodation expenses and QAR300 per month for food, unless the employer already provides adequate food or accommodation for the employee or domestic worker.

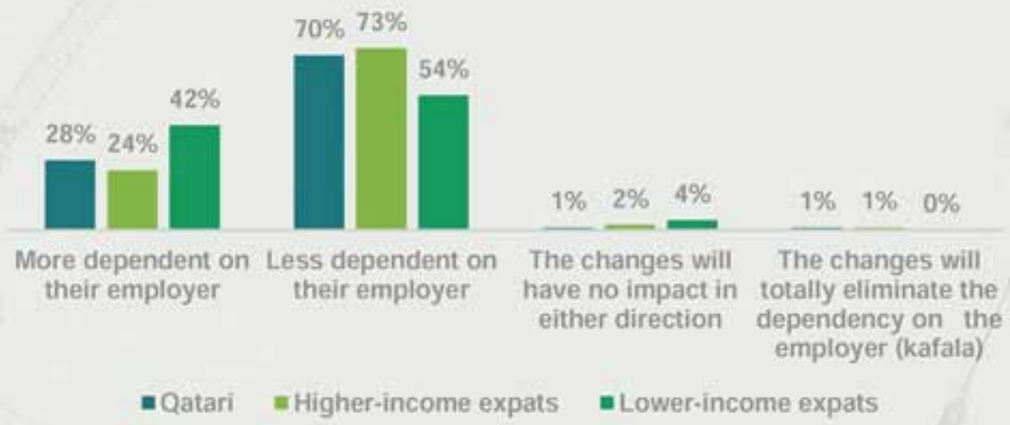

Figure 2. The impact of new changes on the workers' dependency on their employer.

Views on Minimum Wage

Respondents were also asked about worker's minimum wage and whether it should be increased, reduced, or kept the same. The results indicate significant differences between Qatari nationals and expatriates. As shown in (Figure 3), slightly more than three-quarters of higher-income (78%) and lower-income (77%) expatriates supported increasing the current monthly minimum wage, while more than half of Qatari respondents preferred to keep it the same (58%). When asked about how much the minimum wage should be, Qataris mentioned lower minimum wage (a mean of QAR1,529) compared to expatriates (a mean of QAR2,224 among higher-income and QAR1,639 among lower-income expats). This result is not surprising as the minimum wage represents a revenue for expatriate workers, whereas for Qataris it is a cost they bear as employers of expatriates.

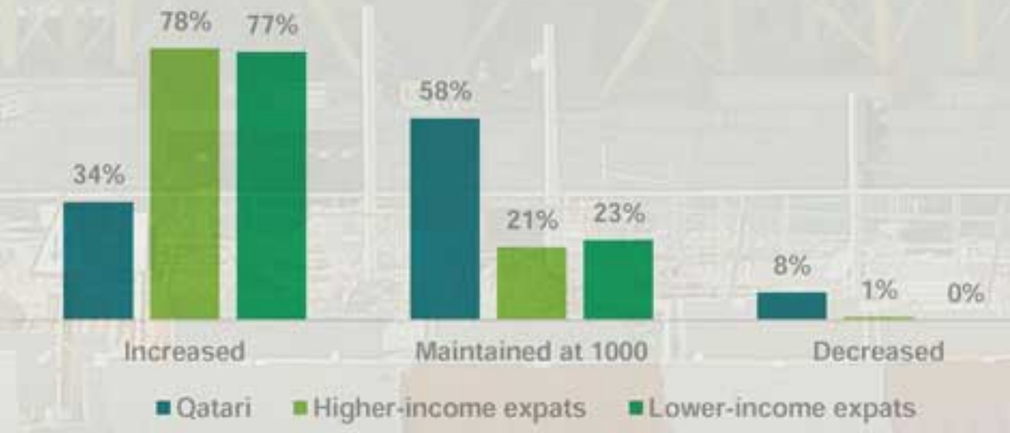

Figure 3. All respondents' perceptions of the minimum wage in Qatar.

Impact of Labor Law Changes on Quality of Life and Workers' Conditions

Respondents and business owners were asked a series of questions gauging the possible impact these legislative changes could have on the quality of life and workers' conditions. Qatari respondents reported that the new Labor Law changes have made their lives "much worse" or "somewhat worse" (20%) compared to both expatriate subgroups (3% higher-income and 2% lower-income expats). This could presumably be due to the fact that Qatari citizens are also more likely to be business owners and employers and hence view the legislative changes as primarily serving to protect expatriate workers, reduce employers' power and increase their cost.

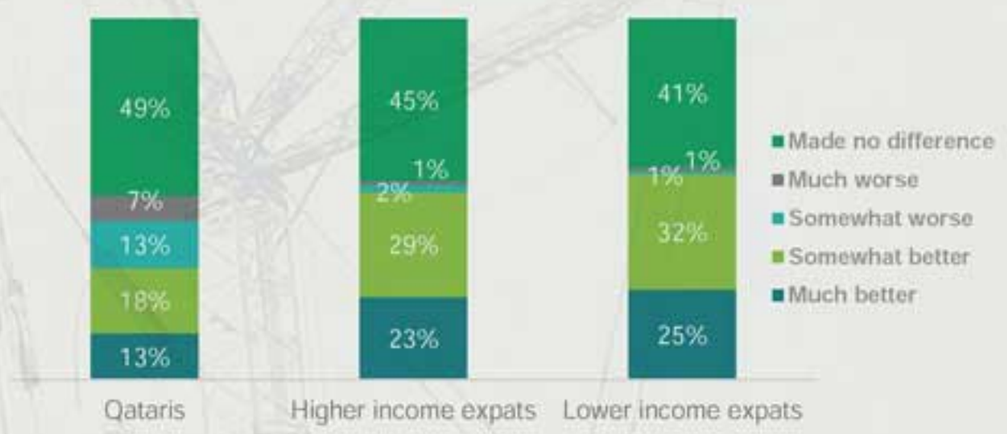

Figure 4. Overall, how the new Labor Law changes impacted the lives of workers.

Table 1: Impact of labor law changes on living conditions of foreign workers and Impact on workers' rights[4]

	Qataris	Higher income expats	Lower income expats
Improve the living conditions of foreign workers in Qatar	91%	93%	94%
Have a negative impact on the living conditions of foreign workers in Qatar	33%	22%	17%
Improve the protection of workers' rights in Qatar	91%	96%	93%

The results revealed that the majority of respondents, from all subgroups, had positive views with regard to the impact of the new labor laws on workers' living conditions and rights, as shown in Table 1. This indicates that there is a general agreement that these laws indeed help improve workers' conditions and preserve their rights, which is one of the ultimate goals behind such reforms.

Discussion

At first glance, many might regard these reforms as only benefiting the workers, while in fact these legislative changes were carefully drafted to achieve the ultimate goal of building a more sustainable economic setting, in which both employers' and employees' rights are protected. The study indicates low level of awareness about labor law reforms. This hinders the effective implementation of these changes. In order to maximize the benefits for both workers and employers, it is essential to raise awareness among Qatari nationals and expatriates for their better understanding of these changes. This, in turn would preserve Qatar's image in the international arena and foster an attractive investment environment, ultimately strengthening Qatar's future economic outlook.

4 Table1 shows the combined proportion of respondents who either "strongly" or "somewhat" agreed with each of the statements.

Innovative Application for the Mitigation of Airborne Pathogens Including SARS-CoV-2

Dr. Nahla Omer Eltai
Researcher, Infectious Diseases, Biomedical Research Center (BRC) - Qatar University

Research on the transmission of respiratory diseases, such as tuberculosis, aspergillosis, and recently Coronavirus disease 2019 (COVID-19) pandemic caused by (SARS-CoV-2) virus threatened the lives of millions, causing hundreds of thousands of deaths around the globe, and resulting in a worrying global health crisis. It also highlighted the airborne transmission's crucial role in infection.

An airborne disease can spread when infected people cough, sneeze, or talk, ejecting the pathogens into the air. These pathogens can swing in the air, becoming contagious (Figure 1), and as they travel in the air, it is hard to arrest their spread. Given that, especially after the COVID-19 pandemic, which was carefully documented to have an airborne transmission pathway, it has become imperative to mitigate airborne diseases.

Figure 1. The team is trying to establish a safe distance of transmission of airborne pathogens.

In a joint investigation crossing the area between microbiology and engineering, Dr. Nahla Omer Eltai led the microbiology research at Biomedical Research Center (BRC), Qatar University (QU), collaborated in this innovative project with Professor Saud Ghani from Mechanical Engineering, QU. This was joined by a research team from the BRC including, Professor Asmaa Al-Thani (Director of BRC), Dr. Hadi Yassine (Section Head of Research, BRC), Dr. Hashim Alhssain (Research Assistant, RA), Mr. Mutassim Salih (RA), Ms. Hana Abdelrahman (RA), and a research group from Hamad Medical Corporation (HMC) led by Dr. Abdullah Al Ansari (Chief Medical Officer) and Dr. Jameela Al Ajmi (Executive Director Infection Control). The research team developed and assessed the effectiveness of a novel device for the successful eradication of indoor pathogen transmission, including SARS-CoV-2. This project was formulated in 2020 by an emergency response grant from QU. After a fruitful first phase, similar research contour will continue during the consequent two years with the recently awarded prestigious H3P- High-Potential Projects Program.

Current research has well-documented droplet and airborne transmission of infectious respiratory diseases, including COVID -19. Henceforth, there is an urgent need to innovate solutions to efficiently and cost-effectively address airborne transmission diseases. Thus, providing a safe environment in healthcare facilities and at domestic places.

Heating, Ventilation, and Air Conditioning (HVAC) designed for healthcare facilities and domestic buildings utilize filtration as the primary mitigation method against airborne pathogens. High-efficiency particulate air filters (HEPA) of different grades are the current industry standard. Nevertheless, HEPA filters must be used with other air cleaning methods as they present a high-pressure drop to the airflow and consume fan power. Over time, filters' mechanical seals can be damaged, and air can easily bypass the filter allowing untreated air into protected spaces. In addition, HEPA filters are expensive and need to be frequently changed every six months. Here a new device presented for air cleaning wasdeveloped and evaluated for its efficiency by the Faculty of Engineering and BRC. The device uses Electrically Activated Water (EAW), which could be integrated into current HVAC systems, used to condition the indoor environment in healthcare facilities and domestic buildings. The air-cleaning efficiency of the developed prototype was assessed using SARS-CoV-2, Newcastle Disease Virus, *Escherichia coli (E. coli)*, and Aspergillus spp. At the laboratory level, preliminary lab air cleaning analysis carried out at QU-BRC demonstrated the efficiency of the novel prototype. The technology showed its efficacy at the health facility level as well.

The application is novel, marketable, and will have a global impact on the hospitals' infection control strategies by providing a safe environment for workers, patients, and visitors in healthcare facilities by alleviating dangerous pathogens. These pathogens, especially SARS-CoV-2, might continue to emerge in different ways and mutations. Individuals will probably have to continue vaccinating and taking measures for years. Therefore, this device is exceptionally suitable to help protect from such viruses and other emerging infectious agents.

In this study, a modified integrated air cooling portable unit was developed to accommodate the EAW-wicking system and the HEPA filter (Figure 2) that can be used to mitigate airborne diseases initiated by bacteria, viruses, and fungus. A known amount of *E. coli*, *Aspergillus spp.*, Newcastle

virus, were nebulized for 16 min in a contained space using an automatic compressor nebulizer. The efficacy of the HEPA filter, the prototype, and a combination of the developed prototype and HEPA filters were compared and assessed through different techniques. These include collecting and counting bacteria during the simulated nebulization period of continuous dispersion in the presence of the devices mentioned above, respectively.

Furthermore, in an additional experiment, the contained space was nebulized with a similar load of bacteria (5 mL of 0.5 McFarland standard), then cleaned for different times ranging between 0.5 and 10 min via the three devices separately. After each cleaning period, the bacteria were quantified by sampling into nutrient agar plates consuming Cascade Impactor. Newcastle disease virus was collected by SKC button aerosol sampler; then, viral load reduction was assessed through TCID50/ml and RT- qPCR, while the antifungal effect was evaluated by the inhibition of fungus growth.

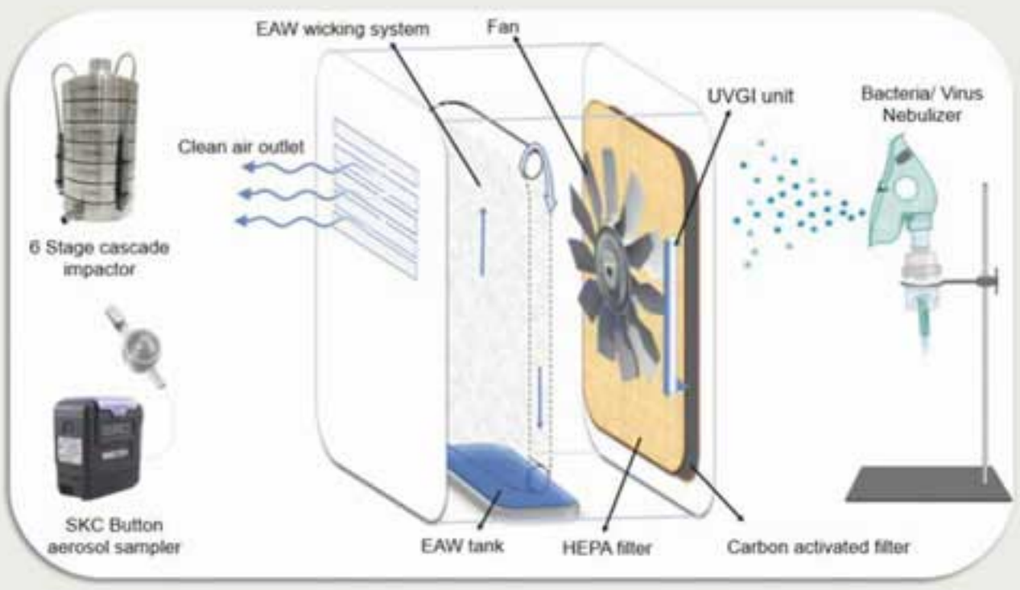

Figure 2. Schematic presentation of the modified cooling portable unit to accommodate the EAW wicking system and the HEPA filter. EAW: Electrically activated water; HEPA: High-efficiency particulate air filter; UVGI: Ultraviolet germicidal irradiation; 6-stage cascade impactor for bacteria collection; SKC button aerosol sampler for virus collection.

Suspensions of the SARS-CoV-2 virus were prepared in the BSL-3 facility by propagating the virus on Vero cells. Vero cells were seeded in 24 wells plate at a density of $3x10^5$ in Dulbecco's Modified Eagle Medium for 24h at 37oC and 5% CO2. On the next day for cell infection, four different panels, including negative control, EAW, positive control (SARS-CoV-2), and treated virus (EAW-SARS-CoV-2), were prepared in sixtuplicate. On infection, the media was removed, and100 µl of each panel was inoculated onto each well and incubated for one hour. Subsequently, the inoculum was removed, and new media was added to each well. The cells were observed daily for CPE, and 50 µl of the media were collected every day from each panel and stored at -80oC for further RT-qPCR analysis. Contrary to the treated virus, CPE was significantly spotted on the cells infected with SARS-CoV-19 (Figure 3).

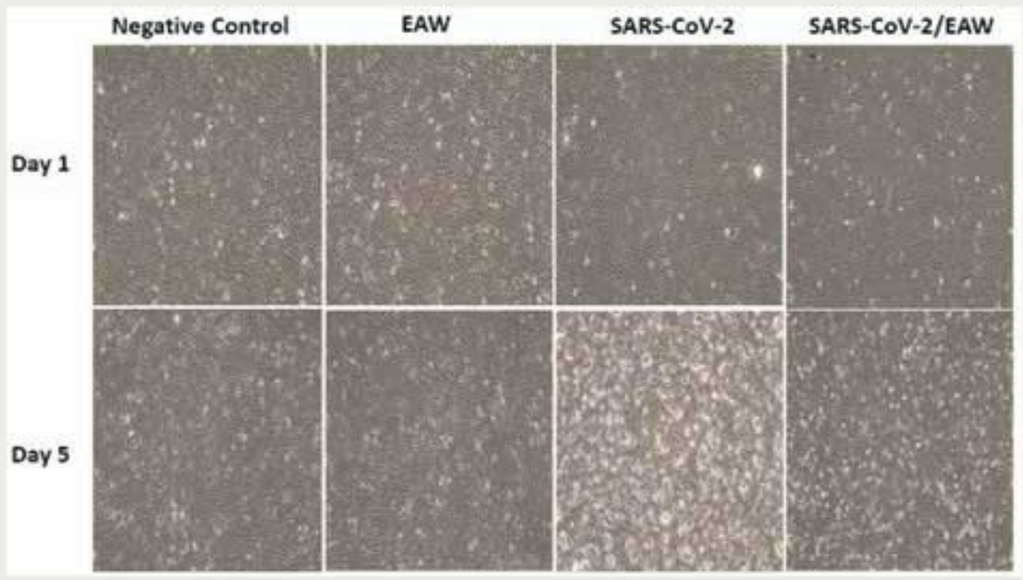

Figure 3. This figure illustrates the effect of EAW on the SARS-CoV-2 virus under an inverted microscope. No CPE was spotted on the treated SARS-CoV-2 contrary to the non-treated virus.

The developed prototype displayed a significant reduction of bacteria, viruses, and fungus in the contained laboratory environment and exhibited a 99.3% reduction in collected bacteria after 30 secs. of the purifying period. EAW inhibits the growth of Aspergillus spp. after 4 minutes of direct contact. The cycle threshold (CT) values of the SARS-CoV-2 treated with EAW remain constant over five consecutive days, while the non-treated virus showed a continuous drop of CT value. Correspondingly, the titers (TCID50/ml) of the NDV were decreased significantly by more than 4 logs after passing through the novel prototype device compared to the control collected without passing through any device, besides significantly reduced bacteria and fungus (more than 80%) in an appropriately simulated environment at HMC and Al-Rayan Stadium (Figure 4).

To conclude, BRC and the Faculty of Engineering collaborated to produce the qualified commercial prototype at the TRL8 level by the end of this study. The application is novel, marketable, and will have a global impact on hospitals' infection control strategies and other public indoor environments.

Figure 4. The prototype (TRL6) demonstration in simulated environments (A) Al Rayyan Stadium (B) Hamad General Hospital.

The Campaign on Twitter for the Boycott of French Products:

A Social Network Analysis

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This study aims to explore different aspects of the recent campaign to boycott French products on Twitter. The exploration focused on defining the nature of the digital network formed, determining its shape, type, the groups involved, and to understand the reasons on why it topped among the most trending hashtags. Moreover, the study set out to discover different dimensions of the campaign, by analyzing the contents of the tweets. Hopefully, the study will lay a proper ground for an in-depth analysis of this form of digital protests. Understanding and probing the phenomenon of boycott campaigns through social networking sites will not be possible without adequately and extensively unfolding the emerging network therefrom, revealing hidden implications, and answering questions such as: When did it start? Who is driving the campaign? From where? How? In addition, what are their strategies and demands?

This study particularly focuses on answering the following questions:

1. What are the characteristics of the social network formed on Twitter around the boycott of French products, at broad, and at the Macro and Micro levels?
2. What are the campaign's motives, demands, and themes discussed?
3. What are the reasons for the campaign's daily hashtag trending in most Arab countries?

The study used the social network analysis, which is a mixed and multidisciplinary approach applied to reveal the structure of relationships between social entities, as well as the impact of those structures on other social phenomena. The method is further used to investigate the pattern of social relationships between key actors (users), and provides a visual and mathematical analysis of human relationships; we used NodeXL software, which collected data about "French Products Boycott" between (December 17, 2020) and (January 4, 2021) and analyzed it. During that period, (108813) edges were collected, with (21298) nodes. Additionally, the French boycott campaign network was visualized, to determine its type, the most influential users, top hashtags, links, and words.

Dr. Asma Malkawi

The study also used MAXQDA software to analyze qualitative data and reveal the campaign's motives, demands of campaigners, and the topics discussed in the tweets. To do that (40,393) tweets were collected, filtered, bringing the number to (7107), then a random sample of (1000) tweets was selected for content and thematic analysis. Key themes were extracted according to the six stages of coding developed by Brown and Clark (2013).

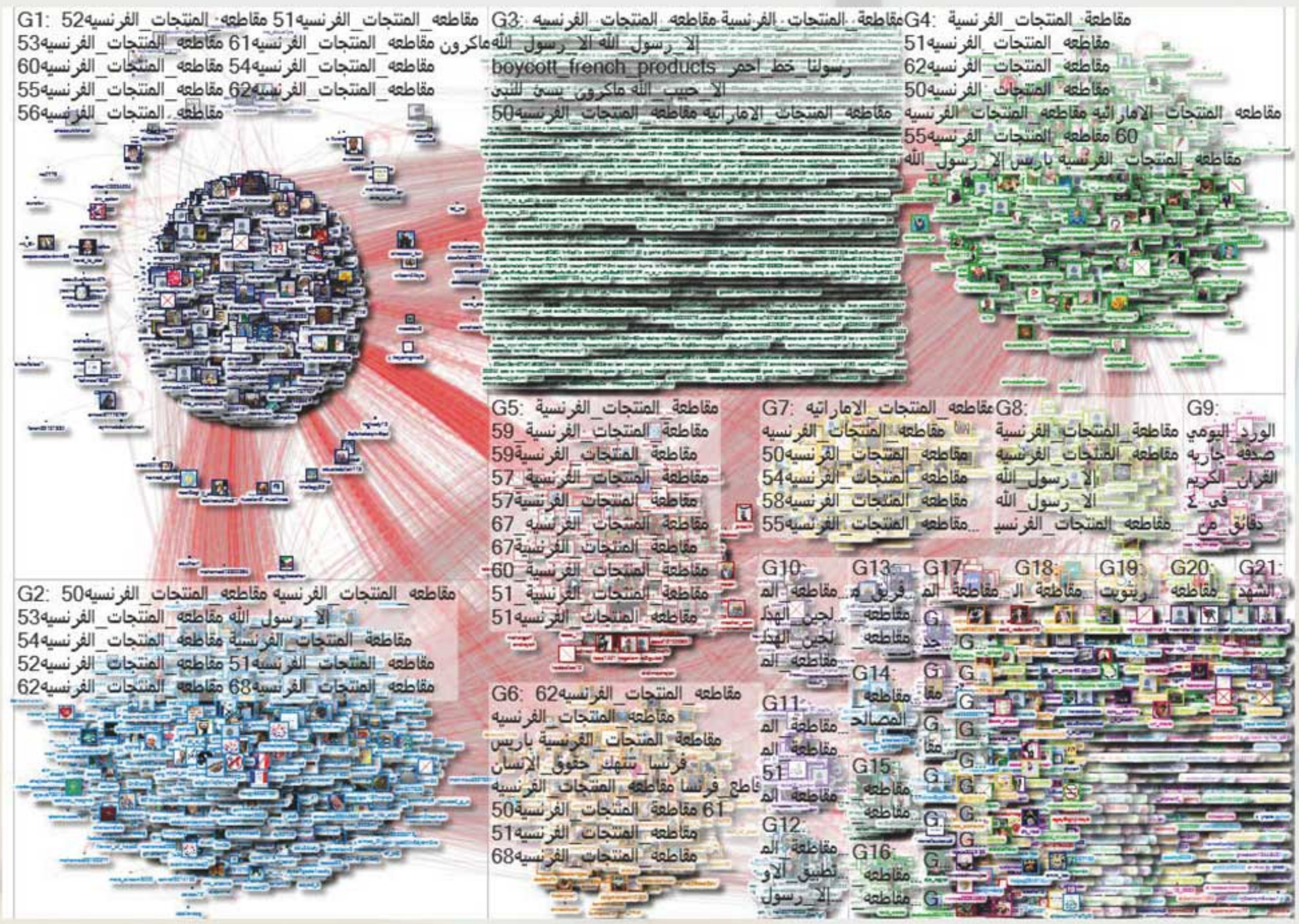

Figure 1. Twitters' network on the "boycott of French products" from October 17, 2020 to January 4, 2021.

Findings and Discussion

The findings showed huge participation (nearly hundreds of thousands) in the campaign to boycott French products. A strong community network was formed among participants, who discussed different topics, were not divided, and no polarizations or fundamental differences existed between them concerning the main topic. This indicates two factors given by Friedman (2015) on the types of boycott campaigns. The first is that the campaign has achieved success in its expressive status, while the second is that its instrumental status concerned with achieving down to earth results with an economic impact. The second factor requires a separate study to verify the impact of the campaign on actual consumer behavior in Arab countries at least.

Findings also showed that religious, economic and political dimensions were heavily present in the boycott tweets, and further highlighted the dominance of the religious dimension in the boycott motives, as expected, given that the abuse is basically religious. On the other hand, the economic dimension is more prominent in tweets that focused on achieving immediate and short-term results. These results were to inflict significant losses on French companies and economy as means of force and pressure to sway the French government's policies against the offensive cartoons. The political dimension represented a level of awareness of interests, goals, positions and equilibria surrounding the boycott campaign. The religious dimension controlling an economic campaign may not be taken lightly, since an individual's economic behavior is directly affected by religious beliefs. The latter leads to stereotyping of economic activity of individuals and society, and eventually turning stances into political ones, as in the French case.

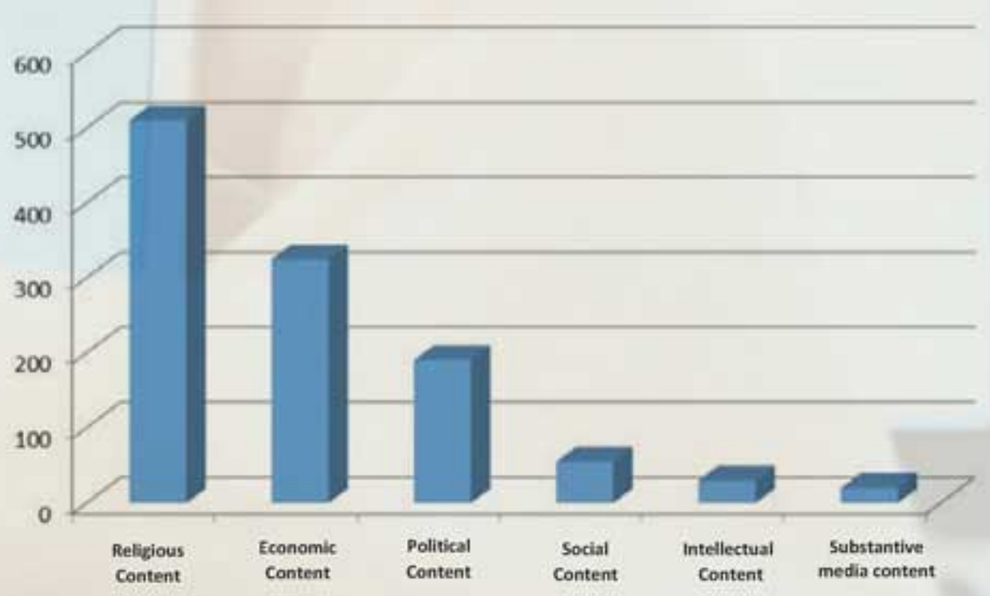

Figure 2. Content type in boycott posts Source: Created by researchers based on Twitter data.

The study revealed that the majority of participants in the campaign live in Arab countries. Findings also indicate an active role of religious leaders, even the activists have alerted that their campaign is far from ideological trends and any kind of political party

Background: Recalling history of offences	Blaspheming Prophet Muhammad (pbuh) - history of colonialism- Muslim provocation - Racism - Islamophobia - double standards
Motives: Muster Strengths	National Unity - Love for the prophet - Religious Texts
Reaction: Targeting collective consciousness	Boycotting as a life-approach - Raise awareness on French products and alternatives - Advocacy for Continuity
Targets: Using economic tools as a political stand	Undermining French economy - Pressure to topple Macron - Call for France to retract and law intervention
Campaign reactions	Disregarding some of Arab Governments - European support - Elite absence
Other contexts and circumstances	Normalization - Corona Virus

Figure 3: Topics shared by activists in the network.

organizations. Despite the importance of religious leaders in influencing consumers' behavior, yet the absence of leaders specialized in law, politics, economics, and sociology may undermine the campaign and its expected outcome, since it's goal is to push for laws that prevent offending religions in general, and leaving an economic impact that follows a political action. Absence of leaders specialized in these fields to direct the campaign in a conscious scientific manner, may make it disappear after a while. Yet, the long-term impact of the campaign heavily relies on the level of collective awareness, thinking, and consumption behavior.

The campaign's themes reflected a narrative with historical roots dating back to the brutality of Western and French colonial history in particular. This is in addition to a series of continuous and recurring events, including the repeated French provocation of Muslims, growth of Islamophobia, racism, and double standards of French politics. These aspects formed indelibly embedded memories that cannot be forgotten from Arab people's minds. Insulting the Prophet, peace and blessings be upon him, is not a separate issue here, but rather an extension to that history.

The campaign themes targeted collective awareness and actions that should be taken by boycotting French products in order to weaken the French economy and bring down French President Emmanuel Macron. Additional campaign themes were the reaction of different parties, whether individual or international, Arab or European, with close or distant relations. This narrative revolves around the complex position of French secularism on Islam as a religion that cannot be tamed with the French vision.

The study was published in Lubab Journal for Strategic and Media Studies, May 10, 2021 issue. The journal is a referred and indexed periodical issued by Al Jazeera Center for Studies. In its editorial, the journal praised the study, the scientific techniques used in it, and the methodological approach it described as innovative in analyzing the content of the campaign to boycott French products on Twitter.

Sustainable Residential Roads: **Towards Safer Environment for Pedestrians**

Dr. Qinaat Hussain, Research Associate
Dr. Wael Alhajyaseen, Research Associate Professor
College of Engineering – Qatar University

From left: Dr. Qinaat Hussain, Dr. Wael Alhajyaseen.

Problem Statement

Despite tremendous national efforts to improve traffic safety in the State of Qatar, pedestrians still constitute around one-third of the annual road traffic fatalities. What is alarming is that the pedestrian proportion in road traffic deaths is increasing in Qatar. Figure 1 illustrates the recent statistics of pedestrian fatalities in the State of Qatar as obtained from the Qatar National Traffic Safety Committee. As can be seen from the figure, the proportion of pedestrian fatalities in 2020 still accounts for around 34% of the overall fatalities coming from the road traffic crashes compared to 29.1% in 2015. The issue of pedestrian safety is not unique for Qatar but it is an international dilemma in majority of the countries. The World Health Organization (2018) reported that in most countries, around one third of the annual road traffic fatalities are pedestrians.

Generally, pedestrian safety is a critical issue in residential areas where high presence of pedestrians especially children and elderly, is observed. In such conditions, there is a need for frequent crossing facilities that are usually located either at intersections (commonly un-signalized) or at midblock. In general, pedestrians approaching these crosswalks have priority over vehicles to cross. However, as commonly observed in Qatar, drivers usually do not stop or yield to pedestrian but rather compete for the right of way. On the other hand, the unavailability of sufficient crossing facilities in residential areas may lead to irregular and risky pedestrian crossing behaviors (Jay walk). In both cases, pedestrians are not receiving sufficient nor safe crossing opportunities, which may induce high safety risks. Thus, it is essential to develop operational strategies equipped with countermeasures that encourage drivers to yield for pedestrians, which will contribute to safer road environment in residential areas.

Proposed Solution

In this study, the impact of different innovative crosswalk treatments on driving behavior on roads in residential areas is investigated using the advanced driving simulator facility located at Qatar Transportation and Traffic Safety Center in the College of Engineering, Qatar University.

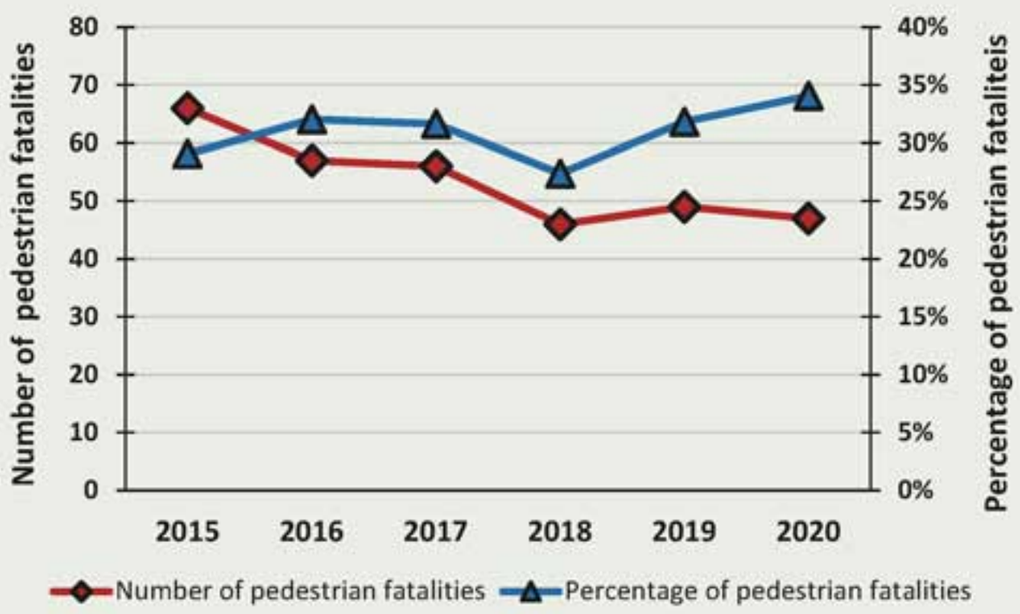

Figure 1. Number/percentage of pedestrian crashes in Qatar from 2015 to 2020.

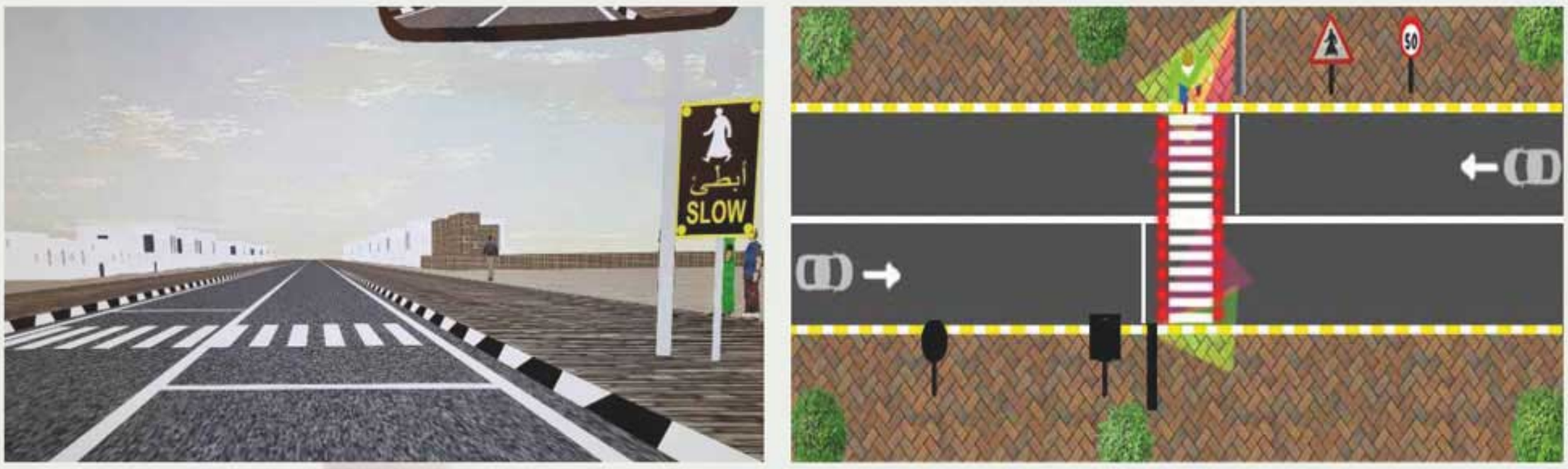

Figure 2. Detection-based strategies – LED (left side), VMS (right side).

Figure 3. Pavement markings – Zigzag markings (left side), Road narrowing markings (right side).

Figure 4. Physical Road Narrowing.

Different types of countermeasures can be used to stimulate drivers to reduce their speeds such as physical measures, surface treatments (e.g., road markings) and ITS-based solutions. In this study, five different treatments were tested. These treatments included two ITS-based solutions (LED pavement lights and Variable Message Sign (VMS) as shown in Figure 2), two different road markings (Zigzag markings and Road Narrowing markings as shown in Figure 3) and a physical road narrowing treatment (see Figure 4). Each treatment scenario was tested with a yield/stop controlled marked crosswalk located in a residential area (speed limit of 50 kph) for two different situations. In one situation, a pedestrian was present at the crosswalk, while in the second situation there was no pedestrian at the crosswalk. To conduct the experiment, 61 volunteers possessing a valid Qatari driving license were invited to participate in the study. The collected data from the participants was analyzed for drivers' yielding rates and driving speeds in all the treatment scenarios.

Regarding the yielding rates, the results showed that the VMS, road narrowing markings and physical road narrowing were very effective in motivating drivers to yield for pedestrians (see Figure 5). The highest yielding rates (> 98.2%) were observed in these three treatment scenarios. Meanwhile, the untreated control scenario showed the lowest yielding rate where 16.4% of the drivers failed to yield to the pedestrian.

Regarding speed analysis, the percentages of speed reduction in the treatment scenarios are presented in Figure 6. In the situation where a pedestrian was present at the crosswalk, all the treatments were effective in motivating drivers to reduce their traveling speeds, especially VMS, road narrowing markings, and physical road narrowing treatments.

Moreover, when there was no pedestrian at the crosswalk, the physical road narrowing scenario outperformed the other scenarios by motivating the drivers to keep their traveling speeds lower by 25% compared to the untreated scenario. This indicates the benefit of modifying the layout of the road physically, which could force drivers to reduce their speeds while approaching the crosswalks. In real world, it is common to install speed meters, such as humps and bumps, to enforce drivers to reduce their speed. However, such treatments cause significant damage to the vehicle on the long term while inducing more air and noise pollution.

Based on the previous discussions, it is recommended to apply physical road narrowing as a potentially effective and low-cost treatment to improve pedestrian safety in residential areas. In locations where physical road narrowing is not feasible, road narrowing markings are recommended, since they showed efficiency in improving the yielding rates while motivating drivers to reduce their speeds.

Figure 5. Percentage of drivers that yielded for the pedestrian in each scenario.

Figure 6. Percentage of speed reduction in each scenario compared to the control scenario.

Security Functionality and Performance of 5G Wireless Networks

Prof. Ma Maode
Research Professor, KINDI Centre for Computing Research, College of Engineering – Qatar University

Recently, the Fifth Generation (5G) wireless network became a major carrier for wireless communications that supports the Internet of everything (IoE) and large-scale heterogeneous connections. Nowadays, 5G wireless networks have been deployed in many countries such as Qatar, where 5G commercial services are available to end-users. 5G wireless networks present some promising new features including support to diversified terminals and huge number of user equipment (UEs), ultra-high density of deployment, coexistence of multiple wireless communication technologies and device-to-device (D2D) direct communications. Since the introduction of new techniques and new features with 5G wireless networks creates several new security challenges, which may not exist in the previous generations of wireless networks, it is critical to design new security functionality to protect the operation of 5G wireless networks.

The Third Generation Partnership Project (3GPP) has produced the Technical Specification TS 23.501 R16 to specify various functions of 5G wireless network with corresponding security mechanisms. Some other pioneering research works have enhanced the security mechanisms specified by the 3GPP. However, all of the works have overlooked the performance of the 5G wireless networks. A 5G wireless network is a real-time system, which needs quick responses even though a security mechanism is equipped. In this work, our aim is to achieve a compromise between the security functionality and the performance of the 5G wireless networks. A series of proposed solutions targets at providing security protection with high efficiency in three kinds of network scenarios including access control, D2D communication and handover process. All the solutions have been derived by using BAN logic to demonstrate their logic correctness, and formally verified by using Scyther Tool to present their security capacities. They have also been evaluated by extensive simulations to show their efficient performance.

The secure solution for access control: When a user joins a 5G wireless network, the access control function works to verify the user's legality to prevent any attacks to the system. The Secure Blockchain-based Authentication and Key Agreement for 5G networks (5GSBA) works on the architecture of the 5G wireless network specified by 3GPP as shown in (Figure 1).

A blockchain is employed as a distributed database to equip the 5GSBA scheme with decentralized authentication functionality. The 5GSBA scheme

Prof. Ma Maode

has its outstanding feature to prevent single-point-of-failure and distributed Denial of Service (DDoS) attacks. Besides, device anonymity is ensured by mandating the encryption of device identities. The proposed protocol is superior to the authentication and key agreement (AKA) scheme specified by the 3GPP standard in terms of perfect key forward secrecy (KFS), device anonymity, mutual authentication, and key agreement. It also holds the ability to resist linkability attacks, replay attacks, and most importantly, the DoS and DDoS attacks.

The secure solution for D2D communication: A D2D communication is referred to the direct communication between two users without traversing a base station, gNodeB (gNB), or core network. Since there is no involvement of the gNB, the D2D communication is more vulnerable to different types of malicious attacks compared to the gNB supported communication. The Lightweight Traceable D2D Authentication and Key Agreement (LTAKA) protocol works to provide authentication and key agreement function for the D2D communication as shown in (Figure 2).

The LTAKA scheme uses randomly generated authentication code to guarantee the authorships of the key exchange messages and facilitate secure key exchange. The outstanding feature of

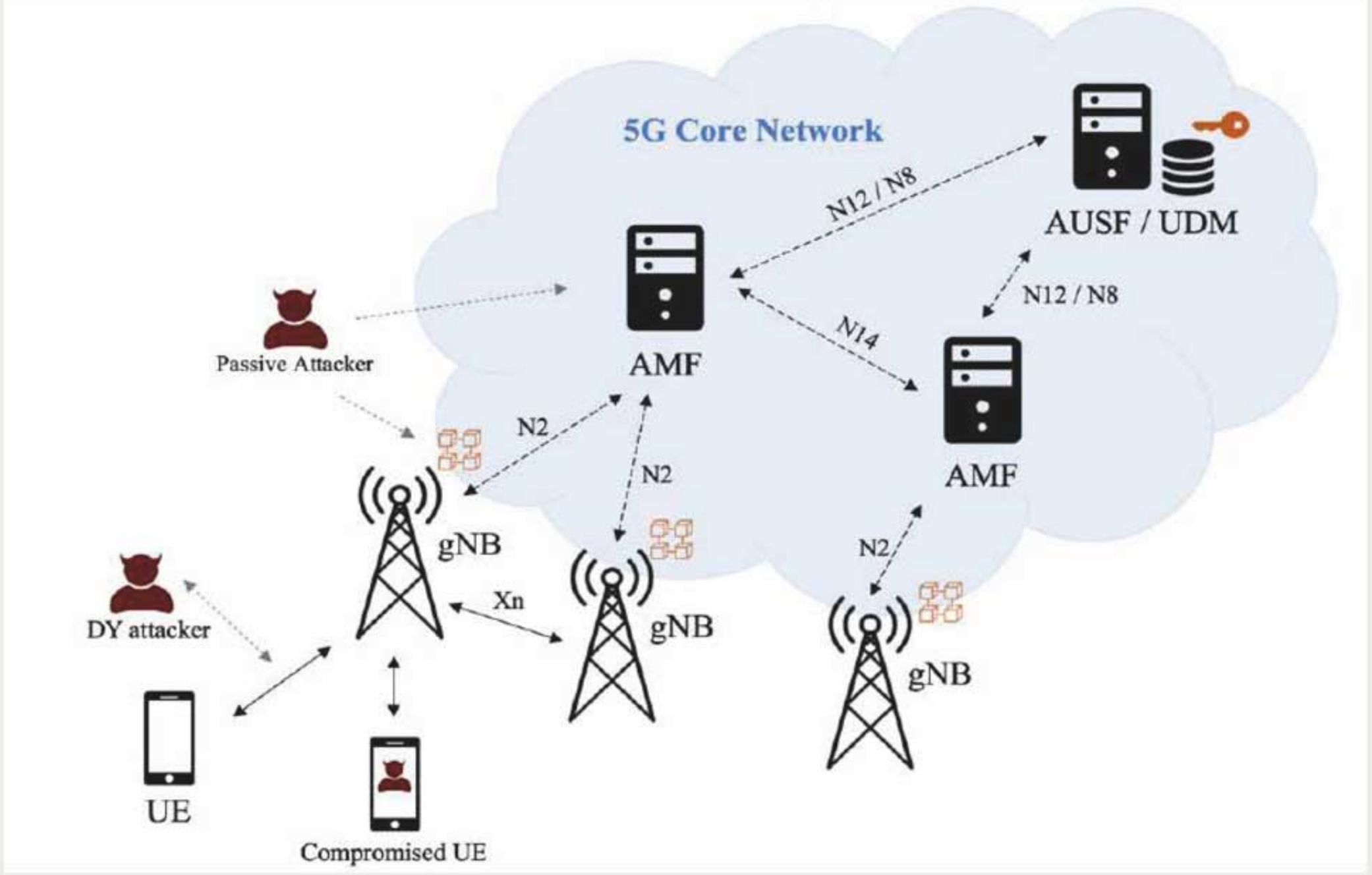

Figure 1. Architecture of 5G Wireless Networks by 3GPP.

the LTAKA scheme is that it provides traceability support to network operators to equip them with the ability to deprive the access rights of any malicious users. By the traceability support, the D2D communication in the 5G wireless networks could be protected from free-riding attacks and some other common malicious attacks. The LTAKA scheme is computationally lightweight,

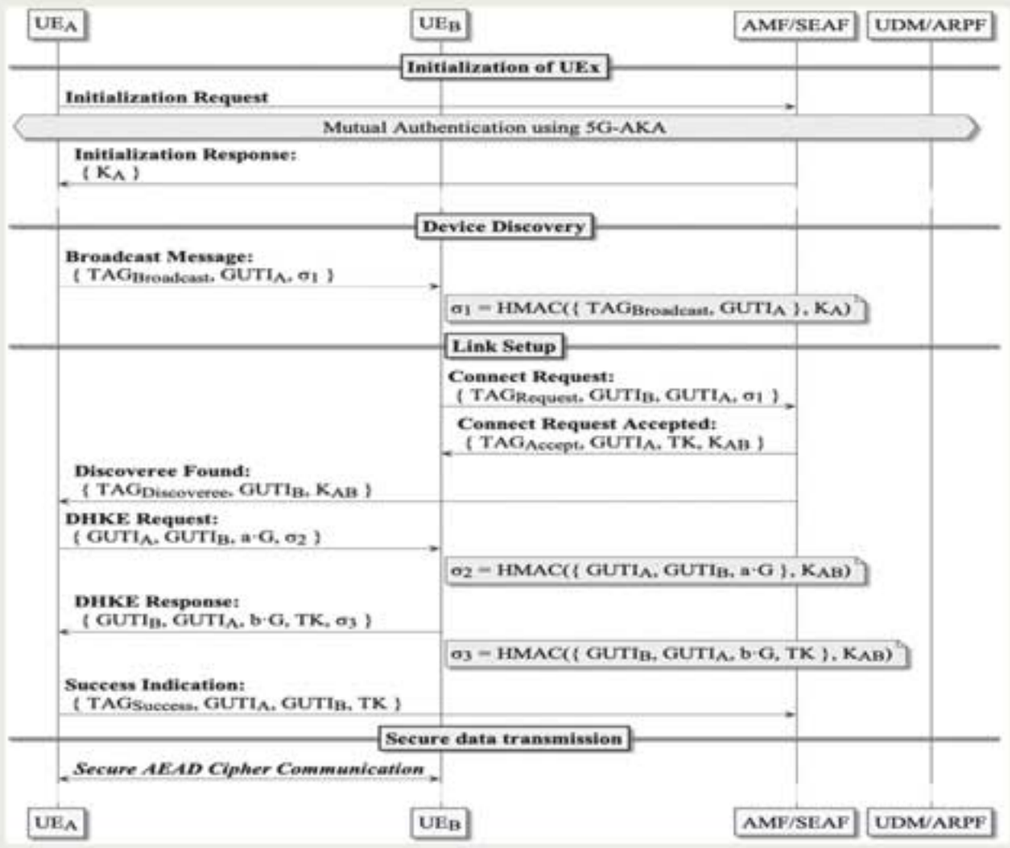

Figure 2. Information Exchange by LTAKA Scheme

which is another advantage to make it preferable to all resource-constrained 5G devices such as connected sensors, 5G Internet of Things (IoT) devices, and low-end mobile phones.

The secure solution for handovers: A handover is the process for a mobile user to change his/her communication with the gNB in the current cell to another gNB in a new cell when the mobile user is in movement. In this process, network access needs to be refreshed with an authentication of the mobile user. The Lightweight and Secure Handover Authentication Scheme (LSHA) uses the Chinese remainder theory to achieve efficient and secure handovers while holding various security attributes including identity verification, mutual authentication, KFS, and resistance to a variety of malicious attacks. The LSHA scheme introduces a neighborhood graph to present the cells in the neighborhood of the serving gNB (s-gNB), by which the identification of the target gNB for handover can be limited to the neighboring gNBs of the s-gNB in order to shorten the handover authentication latency. The LSHA scheme shows a relatively low computational overhead and energy consumption, which makes it preferable to the UEs in high-speed moving scenarios, such as high-speed trains.

Corrosion of Carbon Steel Pipelines in Sour Medias

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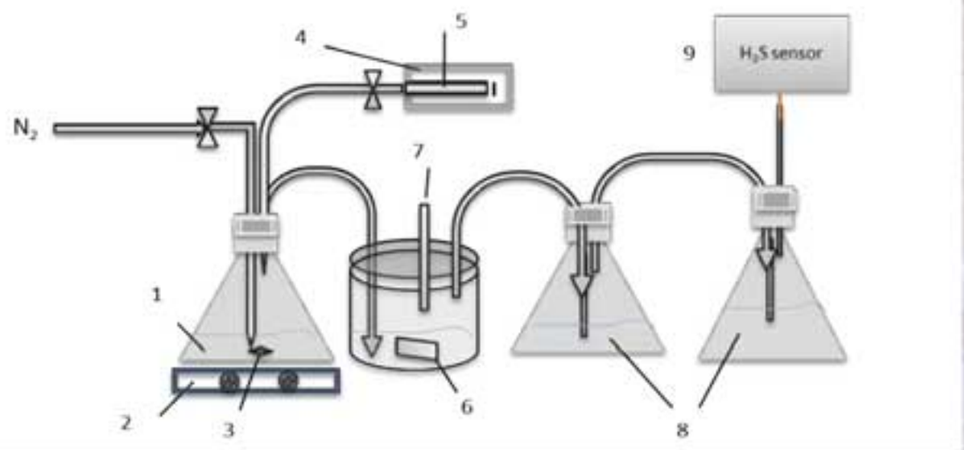
Corrosion is a destructive attack on a metallic material caused by an electrochemical reaction with its surroundings. Any aqueous environment can initiate as well as promote the corrosion process for many metals and alloys. This initiation happens under various complex conditions, especially in oil and gas pipelines and processing systems. The corrosion promoters in oil and gas media that are responsible for the degradation of C-steel are typically carbon dioxide (CO_2), hydrogen sulfide (H_2S), in addition to the aqueous environments that have various inorganic salts such as chlorides.

C-steels are essential in the petroleum industry due to their mechanical properties that easily handle high pressures and elevated temperatures. The corrosion of iron-based materials due to hydrogen sulfide (H_2S) and/or CO_2 is a complex phenomenon that implies a general and localized attack. The combination of the sweet and sour corrosive gases (CO_2 and H_2S) in water leads to most corrosion issues in oil and gas production and transportation facilities. The internal corrosion within the C-steel pipelines, in the presence of CO_2 and H_2S, was first recognized in the 1940s and has been investigated since then. CO_2 corrosion of carbon steel has taken much attention, and its mechanisms are well defined. While many authors have investigated the interface of H_2S with C- steels, the understanding of the effect of H_2S on C- steel corrosion is still limited because of the different interactions of H_2S with carbon steel, which results in the formation of different phases of iron sulfides.

Extra attention has been paid to the mixed corrosion of carbon dioxide/hydrogen sulfide (CO_2/H_2S) aqueous system due to the harsh environments when discovering new wells of oil and gas that often contain H_2S. Nevertheless, slight improvement has been made in outlining the corrosion mechanisms involved. Understanding, estimating, and controlling H_2S corrosion is one of the core challenges for oil and gas production, transportation, and processing. The extent of corrosion is mainly affected by numerous factors, e.g., temperature, pH, partial pressures of CO_2 and H_2S, and flow conditions. Hence, there is a need to predict corrosion rates under the conditions above and, thus, save time and reduce the cost of unpredicted failures. Several studies have been performed in the literature; but, none was able to decide sharply how to control the formation of sulfide protective scales, which will reduce the tons of corosion inhibitors used in such infrastructure.



1 Sodium sulfide solution; 2 Stirring hot plate; 3 Stirrer bar; 4 Syringe pump; 5 Syringe filled with Diluted HNO_3 solution; 6 Iron sample; 7 pH meter; 8 H_2S scrubbers; 9 H_2S sensor.

Figure 1. Experiment setup and schematic drawing.

Being successful in controlling the formation of protective sulfides under high pressures and elevated temperatures will be a breakthrough that can diminish the internal corrosion of oil and gas pipelines which represents 20% of the pipeline's failure due to internal corrosion. It is worthy to mention that the internal corrosion issue of pipelines is increasing as the reservoirs are aging due to the increase in the water cut and H_2S levels. As the state of Qatar is one of the largest oil and gas producers in the world that relies on pipelines for transportation (Dolphin line to UAE and Pearl Line to Ras Laffan, Qatar), it is crucial to study the corrosion of the material of the C-steel pipeline in sour media under different operational conditions. This target can be achieved by understanding the electrochemistry behind this corrosion problem, sulfide formation and dissolution mechanisms, and the kinetics of corrosion under the different operational conditions. The presented work herein is precisely targeting these parameters. Qatar Shell funded the project, and it is a collaboration between the company, Qatar University, and Imperial College London.

The open-circuit system utilized to elucidate the physical structure and the chemical composition of the created iron sulfide scale at different times and temperatures in aqueous sour media is shown in (Figure 1). The ionic species were measured by determining dissolved Fe^{2+} ions in solution using the inductively coupled plasma technique (ICP) and the local pH. Recognizing aliquots of the solution and the film structure as a function of time and temperatures were used to evaluate and understand the FeS formation mechanism. Interestingly, the findings of this work are such in considerably sour environments. We have revealed that when iron-based material comes into contact with water, the H_2S affects the carbon steel to produce corrosion products (sulfides mainly) under the right conditions (time, temperatures, and pH). In such a sour condition, corrosion kinetics are defined as two electrochemical processes: "solid-state" or "direct" corrosion reactions and aqueous phase corrosion reactions. The direct reduction reaction mechanism for H_2S/HS^- reduction has been shown

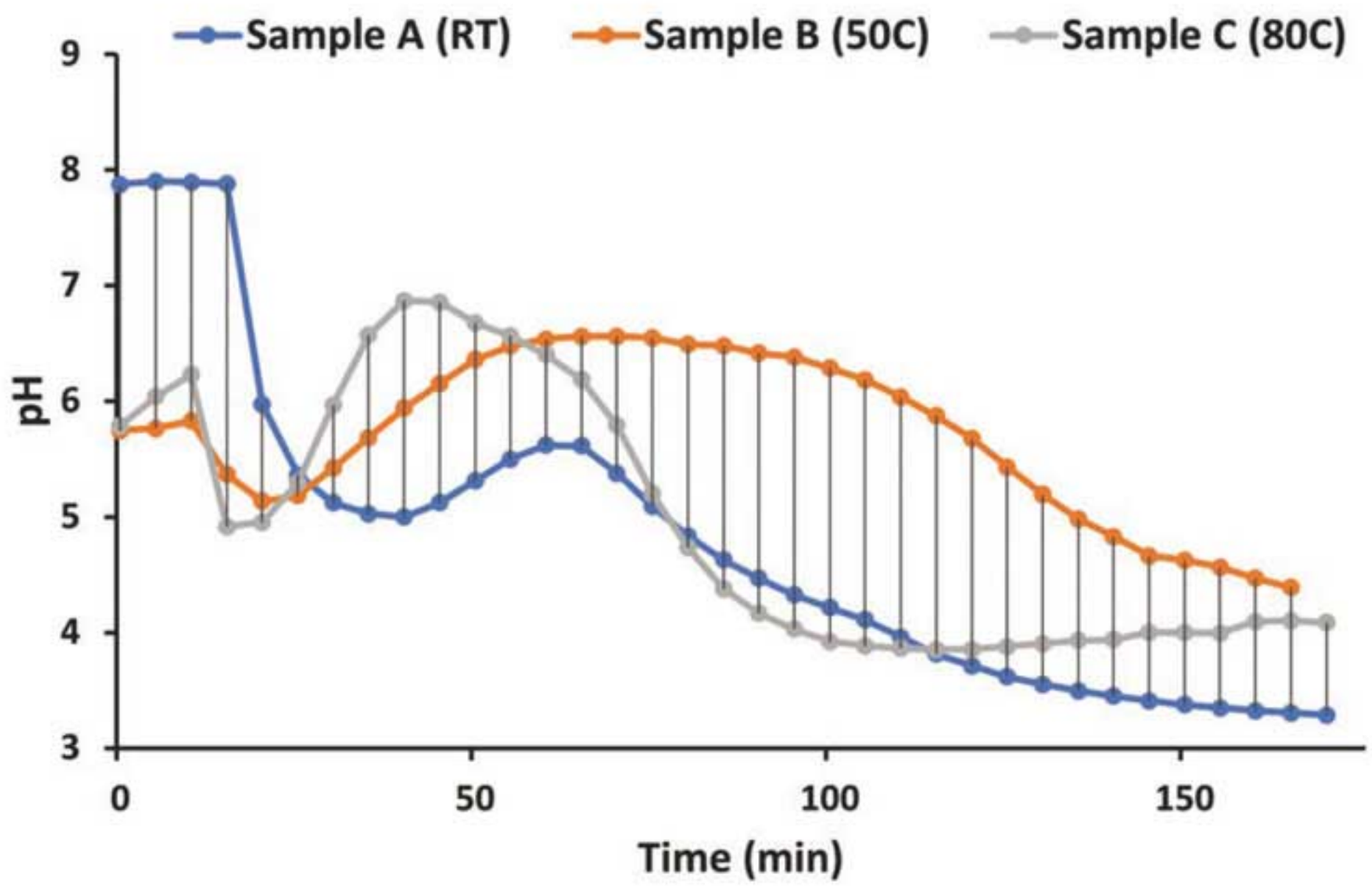


Figure 2. Solution pH changes with time at a different temperature: RT, 50 °C and 80 °C.

by the pH curves that were also influenced by temperature (Figure 2). Furthermore, the direct oxidation reaction of the iron-based material leads to the formation of Fe^{2+} in H_2S-containing corrosion environments, which ended up with the formation of a very thin initial layer of FeS corrosion products identified as mackinawite (stoichiometric FeS) at the early stages of corrosion, as demonstrated by this study. The aqueous phase corrosion reaction process is associated with the initially favored Fe dissolution process. This suggested that the morphologies typical of FeS; flowery structures; cotton balls; flat and dark areas with circular disks, sharp and porous with high regularity, were revealing high crystallinity forms. Likewise, the results of the Raman spectroscopy, despite their qualitative appeal, provided signs of the predominance of FeS in the specimens exposed to the sour medium. The predominance of FeS was expected as this iron sulfide phase is usually reported as the initial corrosion product formed on carbon steels in a sour system, as shown in (Figure 3). However, TEM images displayed a multiple-layer structure of an iron sulfide layer formed in H_2S corrosion. These layers may be formed and can be attributed to three main reactions. The first one is the direct chemical reaction of H_2S at the steel surface. The second is precipitation above that porous structure, and the last is an inner more dense layer that forms below these two layers due to the limitations of the dissolving Fe^{2+} diffusion from the metal/sulfide interface.

Acknowledgment

The author is thankful to her colleagues (Aboubakr M. Abdullah, Mary P. Ryan, Jiahui Qi, and Nicholas J. Laycock,) from the respective Institution of Qatar University, Imperial College London, and Qatar Shell Research and Technology Centre, who assisted directly or indirectly in this research work. The findings achieved herein are solely the responsibility of the author. This work was supported by Qatar Shell (QS), Shell Global Solutions, Advanced Interfacial Materials Science (AIMS), and Qatar University (QU) for the continuous financial support and technical guidance that led to this publication.

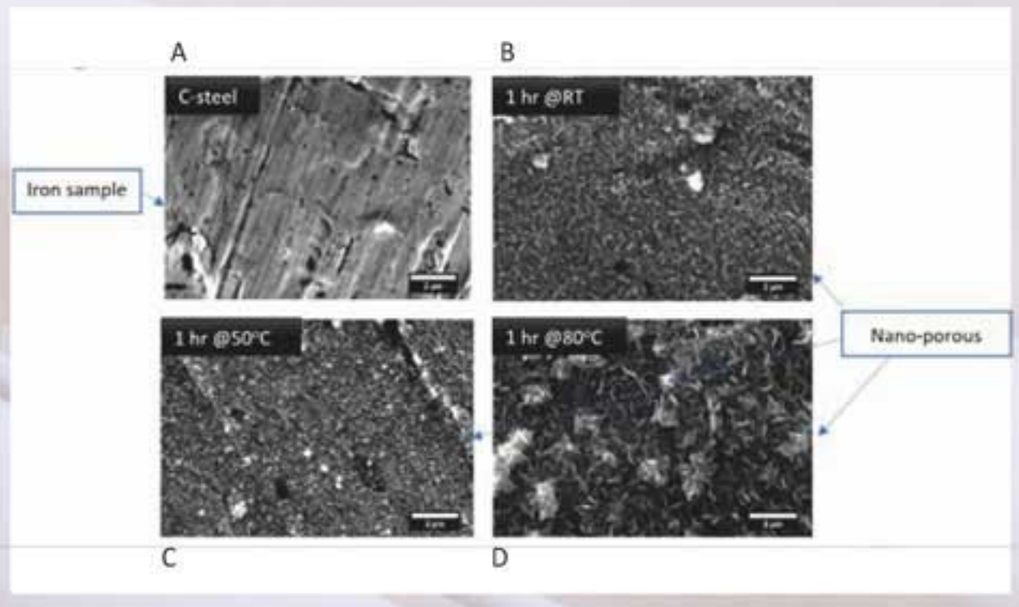


Figure 3. SEM imaging for (A) unreacted carbon steel, (B) FeS at 1hr-RT, (C) FeS at 1hr-50 °C (D) FeS at 1hr-80 °C.

Taxation in Qatar: An Abadi (Non-Finite) Vehicle for Economic Diversification

Dr. Maryam Abdulla Al-Asmakh

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A QU Representative in the Committee for Experts Affairs at the Ministry of Justice

In December 2018, Qatar introduced a new package of tax reforms that represent a major shift towards diversifying government revenue, as illustrated in (Figure1), and achieving the country's vision of becoming an advanced country by 2030. Tax reform in Qatar refers to the introduction of three regulations: [Corporate] Income Tax Law 24 of 2018 [hereinafter CITL]; Amiri Decree 77 of 2018, establishing the General Tax Authority (GTA) to implement all tax laws; and Excise Tax Law 25 of 2018, the first tax on consumption. Although this reform is over two years old, it represents an adventurous endeavor to modernize the Qatari economy. Having the world's third-largest natural gas reserves meant that the enormous profits from the sale of gas created plentiful government revenue, which, for as long as Qataris could remember, did not need to be supplemented with tax. However, the combined effect of a regional GCC crisis and a worldwide Covid-19 pandemic meant that Qatar could no longer rely on its finite and volatile gas wealth, which had, for so long, been the cornerstone of its economy.

Taxation, the paper argues, is the most effective diversification vehicle to offset the recent negative consequences on Qatar's public finances that have relied on gas revenue. Through the direct and indirect lenses, the paper creates an all-around-picture of taxation in Qatar taking into consideration the inseparability between tax reform and economic diversification.

Direct tax in Qatar holds three different systems, each with its own tax rules and enforcement bodies. At the same time, each of these direct systems complement one another in providing a novel source of government revenue to Qatar without disturbing the attractiveness of its economy to foreign investors. First, the mainland's governing tax law, CITL, intends to preserve Qatar's investment-friendly environment through exclusions and exemptions. Second, working closely with the mainland, as evidenced by having a harmonized general tax rate of 10% and a shared territorial nature, Qatar Financial Center (QFC) offers a specifically tailored taxing system to attract Foreign Direct Investment (FDI), not only in international banking, but most notably Islamic finance. Third, in creating its free (from tax) zones, Qatar has pursued efficiency through specialization. Its first free zone, the Qatar Science and Technology Park (QSTP) is designed entirely to promote and support scientific, applied and technological research. More recently, an airport free zone and a port free zone have been established to encourage specialization in industries dependent on airfreight and maritime transport, respectively.

Unlike direct taxation in Qatar that has been designed to serve the needs of Qatar's sophisticated three systems, indirect taxation system, consisting of customs duty and excise tax, has been shaped by the objective of creating an economic unity between the members of the Gulf Cooperation Council (GCC). Firstly, like other hydrocarbon-dependent countries, foreign (export and import) trade has become an essential driver of Qatar's economy. Thus, Qatar's Customs Duties Law 40 of 2002 advocates trade liberalization through the implementation of a Unified GCC Customs Tariff of a general duty rate of 5% for most goods and products. Secondly, Qatar's excise tax, as demonstrated in (Figure 2), has innovatively introduced the concept of taxation for the first time to Qataris by targeting harmful products instead of the wide range of goods that could have been taxed under Value Added Tax (VAT). Therefore, unlike any other tax, excise tax has three far-reaching implications for Qatar: (i) promoting a healthy lifestyle; (ii) linking taxation and democracy; and (iii) paving the way for the introduction of VAT.

Compared with existing direct and indirect taxes in Qatar, VAT (when introduced) would be a better way to collect tax than any other tax. Hosting the FIFA World Cup in December 2022 might accelerate the introduction of VAT to take advantage of the expected rise in the sale of goods and services around that time. Tax reform, whether through VAT and other new attractive greening taxes, such as a carbon tax, is the way forward for Qatar to strengthen its public finances and accelerate its independence from gas revenue.

These analyses and findings were published as a peer-reviewed article entitled "Taxation in Qatar – An Abadi (Non-Finite) Vehicle for Economic Diversification?" by the Scopus indexed journal, namely, Bulletin for International Taxation, Issue November 2020.

Figure 1. Why have Tax?

Source: Adapted from Qatar Tax Authority https://www.gta.gov.qa/en/why-have-tax.

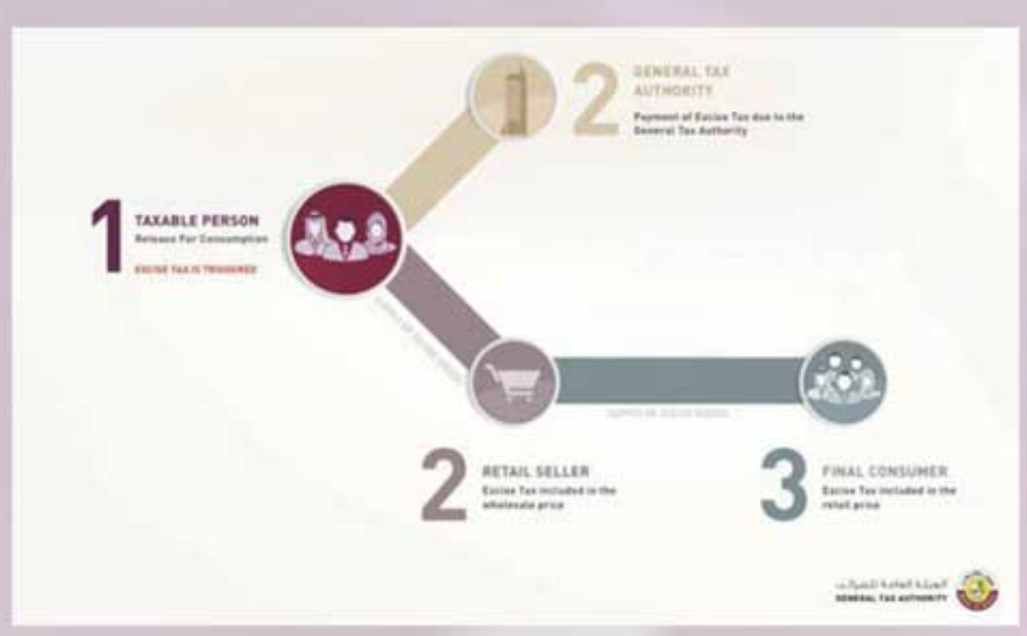


Figure 2. How Excise Tax Works.

Source: Adapted from Qatar Tax Authority https://www.gta.gov.qa/en/what-is-excise-tax.

How Much Fish Oil Supplementation is good for Bone Health Benefits?

Dr. Md Mizanur Rahman

Assistant Professor of Biological Sciences, College of Arts and Sciences - Qatar University

Age-associated bone loss is an eloquent and widespread, health and socioeconomic burden among a fast-growing-aging population. Studies reveal that around 50% of women over the age of 50, and 1 out of 4 men, will experience an osteoporotic bone fracture. Diminution in bone mineral density (BMD) and increased fracture risks are the major concerns of the aging process and imply toward the need of new and immediate prevention strategies. The underlying causes for the age-related increase in bone fractures are not clear yet; however, bone resorption seems to play a major role. Despite the unknown etiology of age-related bone loss, one prominent feature is a chronic inflammation reaction driven, in part, by increased pro-inflammatory cytokine expression that contributes to the pathogenesis of the disease. Bone resorption (mediated by osteoclasts) and bone formation (mediated by osteoblasts) are systematically regulated by the interaction of pro-inflammatory and anti-inflammatory cytokines and hormones. Thus, an imbalance in the secretion of these molecules is central to the pathology of osteoporosis.

Despite significant advances in the treatment of osteoporosis, undesirable side effects like cytotoxicity, strange fracture, necrosis of the jaw, etc., and the high cost of treatment may limit their application. Therefore, it is necessary to develop cost-effective alternatives with fewer undesirable side effects. Dietary therapy and/or lifestyle modifications represent an effective strategy to reduce bone loss. Increasing the intake of long-chain omega-3 polyunsaturated fatty acid (PUFA) may be one such strategy. The most important biologically active omega-3 PUFAs, eicosapentaenoic acid (EPA 20:5), and docosahexaenoic acid (DHA 22:6) are mainly derived from certain cold-water marine fishes or their oils. Omega-3 fatty acids are anti-inflammatory. Because of its health benefits, the use of omega-3 FA supplements is continuously rising worldwide, and 50%–90% EPA/DHA concentrated oils are now commercially available. Omega-3 along with omega-6 PUFAs are essential fatty acids for optimal health.

Dr. Md Mizanur Rahman

However, a lower ratio of omega-6/omega-3 fatty acids (FAs) is necessary for the prevention and management of chronic diseases. Evidence accumulated over the past 20 years has documented that anti-inflammatory omega-3 FAs, EPA, and DHA are beneficial for bone health. We have shown that omega-3 PUFA rich fish oil (FO) prevents bone loss in animal models of post-menopause, arthritis, and aging. FO and low omega-6/omega-3 fatty acids ratios have also been shown to promote bone formation in growing animals. Recently, a strong relationship between higher omega-3 FA intake, and improved bone turnover markers and BMD in humans has been reported. It was also demonstrated that a higher red blood cell (RBC) omega-3 PUFA was associated with lower fracture risk. On the contrary, a higher RBC omega-6/omega-3 ratio was associated with higher hip

How to choose a better fish oil? Always look for the purity and content of EPA and DHA per capsule. The more EPA and DHA in it, the better the fish oil. Fish oil without defined EPA and DHA quantity may be the worst one.

fracture in postmenopausal women. However, clinical studies have shown conflicting results for the efficacy of omega-3 PUFA in osteoporosis, which may have resulted from the varying doses, purity, proportion of EPA and DHA, etc. FO enriched with omega-3 FAs are now among the most popular dietary supplements used worldwide.

However, the question comes: are all the fish oils effective for bone health? To determine how much EPA and DHA should be there in the FO for getting bone health benefits, we undertook an animal study with different FO with various EPA and DHA content. This study aimed to determine the dose-dependent effect of a FO with high content of EPA and DHA (CFO: EPA, 46.5% and DHA 37.5%) against bone loss in C57BL/6 female mice during aging. Twelve-month-old mice were fed with 1% and 4% CFO and 4% omega-6 safflower oil (SFO) diets. We also included a group with a 4% regular-FO with low content EPA and DHA diet (RFO: EPA, 18% and DHA, 12%) and a group with a lab chow diet as a control for 12 months.

Bone mineral density (BMD) was analyzed by dual-energy x-ray absorptiometry (DXA) before and after the dietary intervention. At the end of dietary intervention, bone resorption markers in serum and inflammatory markers in the bone marrow and splenocytes and inflammatory signaling pathways in the bone marrow were analyzed. As compared to the 4% SFO group, 4% CFO group maintained higher BMD during aging, while 1% CFO group offered only a mild benefit on bone parameters. Interestingly, the 1% CFO-fed group exhibited slightly better BMD than that of the 4% RFO fed group. BMD loss protection by CFO was accompanied by reduced levels of the bone resorption marker, TRAP, and the osteoclast-stimulating factor, RANKL, without affecting the decoy-receptor of RANKL, osteoprotegerin (OPG). Further, CFO supplementation was associated with increased production of anti-inflammatory cytokines IL-10, and IFN-γ and a decreased production of pro-inflammatory cytokines, TNF-α, and IL-6, and the decreased activation of inflammatory signaling pathways, NF-κB, p38 MAPK, and JNK. Based on the findings of our study, we concluded that the supplementation of 4% CFO is very efficient in maintaining BMD in aging mice, whereas 1% CFO is only mildly beneficial. These findings indicate that the more EPA and DHA content in the FO, better the effect on bone health. In a separate study, we showed that DHA is more anti-inflammatory and anti-bone resorptive than EPA. Therefore, more DHA content in the FO might be more protective against inflammatory osteoporotic bone loss.

Currently, there is no universal recommendation on the amount of EPA and DHA intake for health benefits. However, based on current research data, about 3 grams of EPA+DHA a day might be optimal to achieve health benefits from omega 3 fatty acids consumption. In addition, we have to remember that optimal bone health requires a balance of omega 6s and omega 3s in a ratio of 4:1. So, we have to control our omega-6 fatty acid-rich vegetable oils consumption to maintain this ratio. The top sources of EPA and DHA are predominantly seafood, especially oily fish. However, daily dose of around 3 grams of EPA+DHA is not achievable by consuming fish. Rather, we may take FO with high content of EPA and DHA as a supplement in addition to consuming oily marine fish.

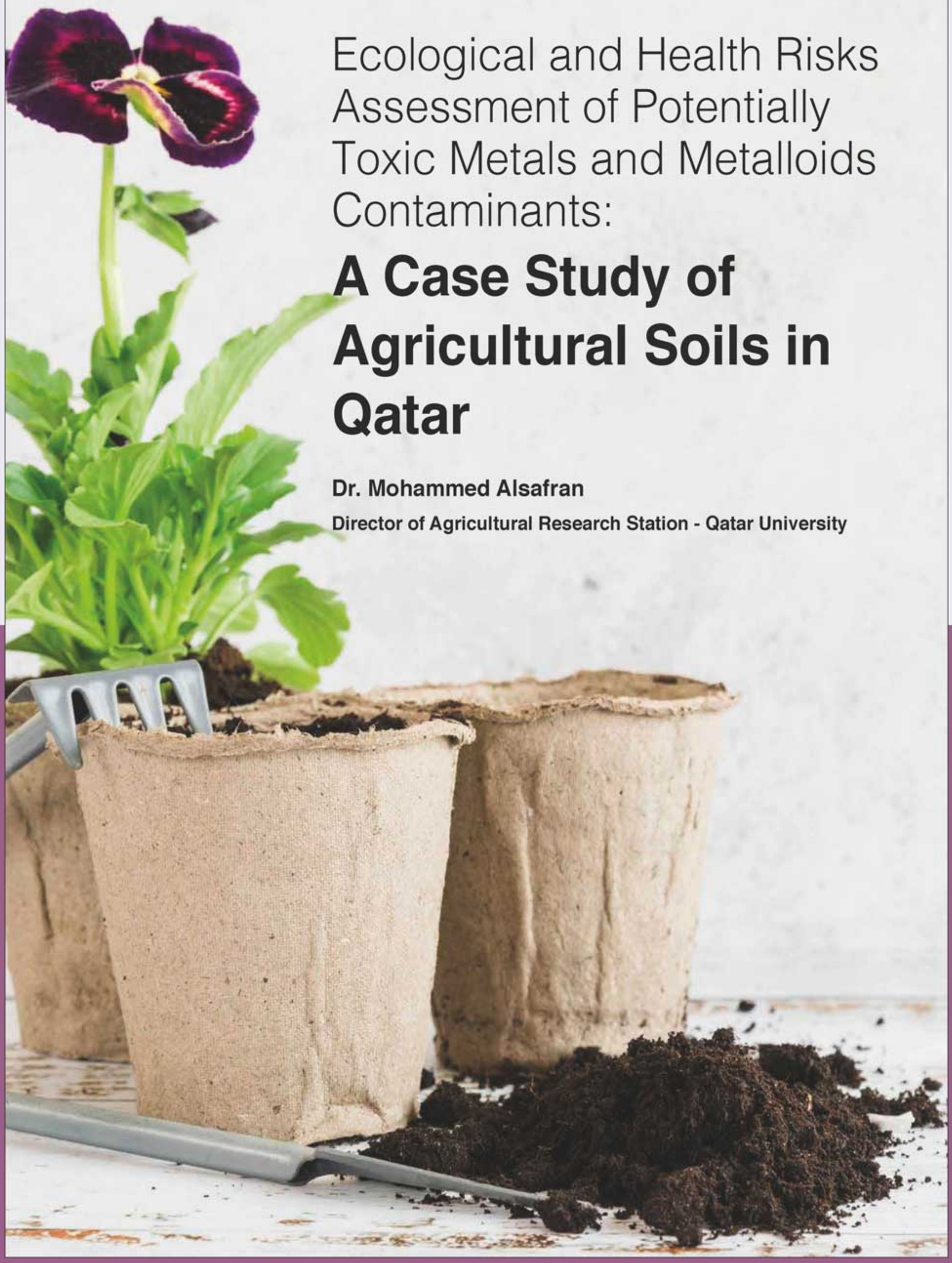
Finally, not all FO are the same. The content of EPA and DHA in it is the most important, in addition to its quality. We would recommend that supplementation of FO with maximum content of DHA and EPA starting at middle age may be beneficial for maintaining better bone health during aging.

Ecological and Health Risks Assessment of Potentially Toxic Metals and Metalloids Contaminants:

A Case Study of Agricultural Soils in Qatar

Dr. Mohammed Alsafran

Director of Agricultural Research Station - Qatar University



In recent years, Qatar witnessed exponential growth in human population, urbanization, and increased anthropogenic activities, including agriculture. Naturally, potential toxicants, including metals and metalloids, are a common occurrence in such environments. It is a known fact that at high concentrations, metal elements such as arsenic (As), chromium (Cr), and nickel (Ni) can be hazardous and may lead to various health problems in humans, including cancer. These elements may find their way into the human body by ingestion of contaminated food products, direct inhalation, or skin exposure. The importance of the results obtained in this research, coming at a time when Qatar is prioritizing national food security and safety, cannot be over-emphasized. It will help shape local agricultural production policies and inform the creation of legislation and pollution management strategies to protect the environment and human health. It will also support sustainable development based on the diversity of global climate, regional/country-specific determinants of policy formulation, and political will towards environmental sustainability for health.

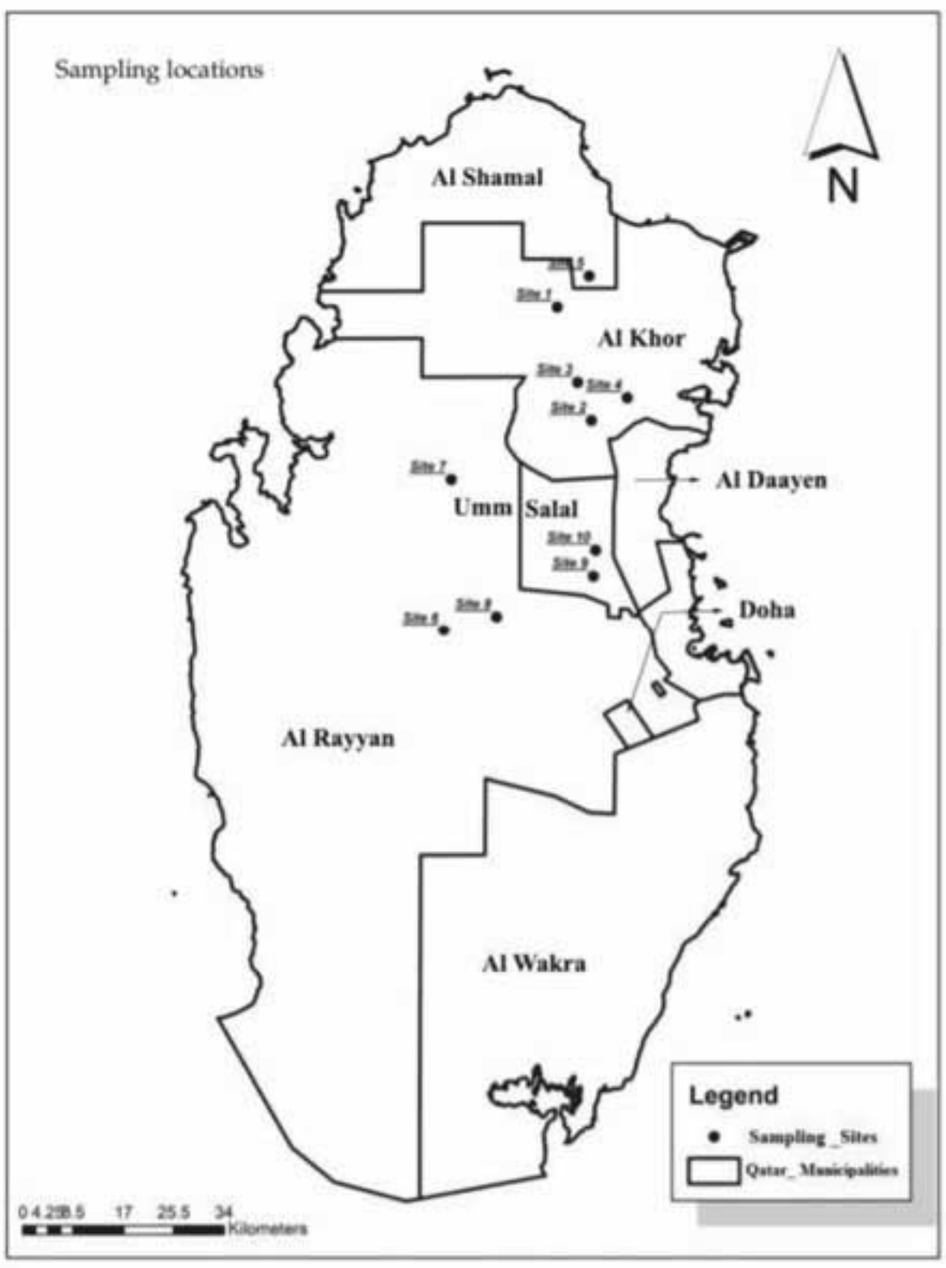


Figure 1. Sampling locations.

Researchers at QU Agricultural Research Station, led by the Director, Dr. Mohammed H. Alsafran published an article in a high impact factor international journal, Toxics, published by Multidisciplinary Digital Publishing Institute (MDPI) accessible via https://doi.org/10.3390/toxics9020035. The group's study evaluates Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Vanadium (V), and Zinc (Zn) contamination levels in Qatar agricultural soils and potential ecological and human health risks according to USEPA's standard methodologies. The research team members include Dr. Kamal Usman, Research Associate - Agricultural Research Station, Dr. Hareb Al Jabri, Manager of Innovation and Intellectual Property, Research and Graduate Studies Sector (VPRGS), Qatar University and Dr. Muhammad Rizwan, College of Resources and Environment, Huazhong Agricultural University, Wuhan, China.

Dr. Mohammed Alsafran mentioned that, in June 2017, Saudi Arabia, U.A.E., Bahrain, and Egypt, imposed a land, sea, and air blockade on Qatar. Since the economic sanction, there has been a massive increase in agricultural activities to boost local food production, cushion the blockade's effect, and ensure future food security and safety. The state has also introduced new enabling policies through public-private partnerships, infrastructural incentives, and increased research funding. The study aimed to characterize agricultural soil in selected cultivated areas in northern and central Qatar; evaluate the degree of Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Vanadium (V) and Zinc (Zn) pollution; assess potential ecological and human health risks (adults and children).

The sampling locations with a concentration of open, irrigated farms were chosen for this study. The sites chosen for this study are open irrigated farms spread across the northwestern and central parts of Qatar (Figure 1). From January to April 2020, 50 soil samples from 10 separate locations, all within 70 km of Doha city center, were gathered. From the chosen sites, cultivated produce included spinach, parsley, lettuce, silk, dill, coriander, onion, Rocca, mint, and vegetable silk.

Dr. Kamal Usman mentioned that the results presented in this study confirm that the Arsenic (As), Chromium (Cr) and Nickel (Ni) levels in studied soil samples are significantly higher than their corresponding background levels. A human health risks analysis shows that oral ingestion could be the principal exposure pathway in adults and children compared to dermal contact, mouth, and nose inhalation. Although both groups (adults and children) may be at risk when exposed to Arsenic (As), Chromium (Cr) and Nickel (Ni) contamination, children are more vulnerable and likely to develop cancer. The research team findings strongly support authorities' need to closely monitor potentially toxic elements in agricultural soils and farm produce. He added that reducing the bioavailability of such elements in soil and developing innovative

remediation technologies is needed to limit potential risks to human health. The concentration of these elements in vegetables harvested from the studied areas should be investigated, and more attention given to the health of children living in the surrounding regions.

The research team pointed out that, at high concentrations, elements such as Arsenic (As), Chromium (Cr) and Nickel (Ni) can be hazardous and may lead to various health problems in humans, including cancer.

Pollution levels and potential negative impacts on human and environmental health were determined using the United States Environmental Protection Agency (USEPA) standard methodologies. The research team concluded that the findings support the need for closer monitoring of potentially toxic metals and metalloids levels in Qatar's cultivated soils and farm produce. Reducing the elements' bioavailability in soil and developing innovative remediation technologies are needed to limit potential risks to human health.

Dr. Mohammed Alsafran mentioned that, further studies on Arsenic (As), Chromium (Cr) and Nickel (Ni) gastrointestinal bio accessibilities are required to fully understand the effects after long-term exposure and the cancer-causing potential of these elements over a lifetime. Future investigations will include a larger number of cultivated soils, larger samples, and primary leafy vegetables grown in the current studied areas. These will generate more data that is essential for adequately informing new policies and regulating the emerging agricultural sector.

From Left: Dr. Mohammed Alsafran, Dr. Kamal Usman

The following Figure (Figure 2) summarizes the ecological and health risks of the metals on adults and children:

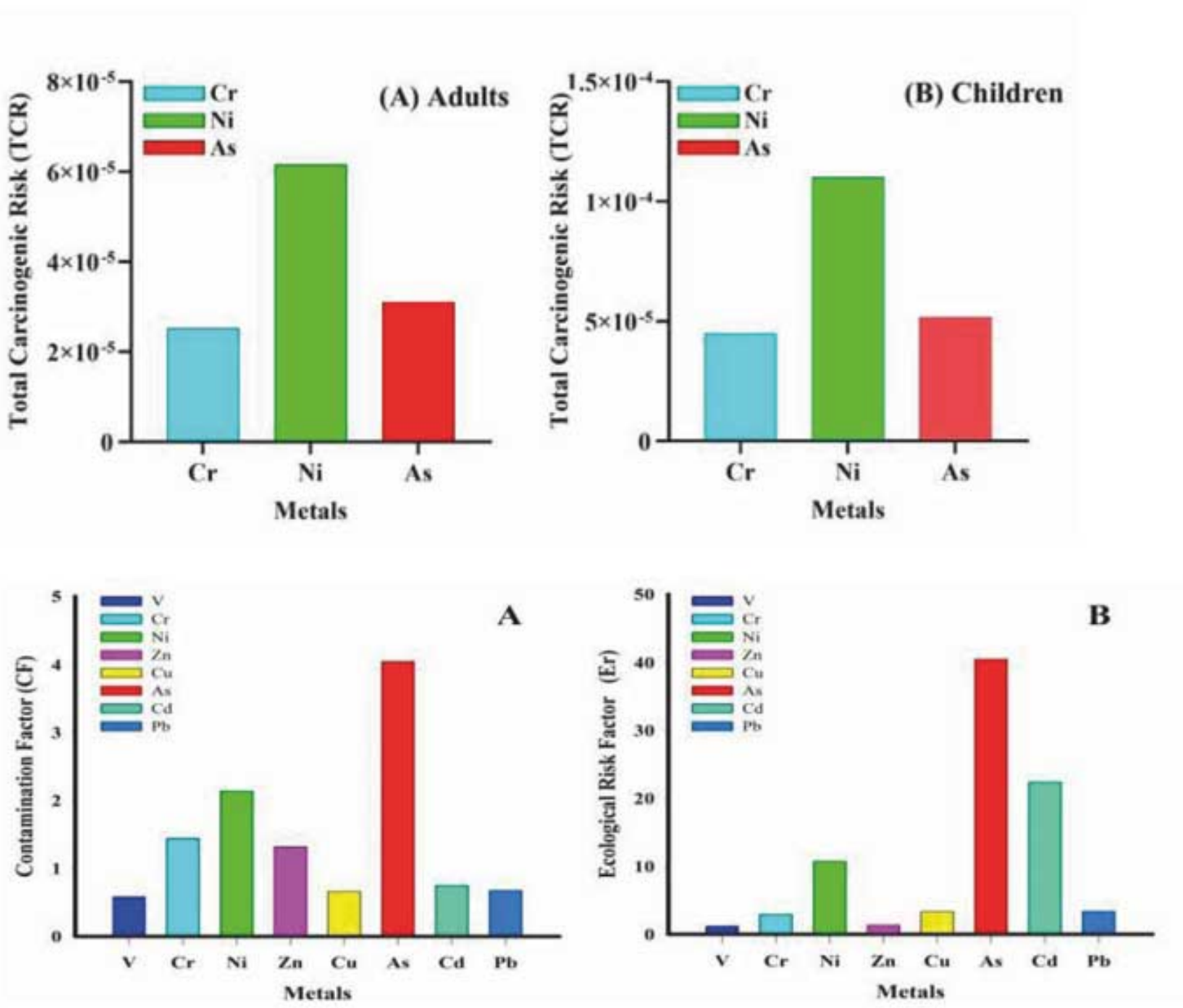


Figure 2. Ecological and Health Risks of metals on adults and children.

An Analytical Study of Industrial Designs and Models Law No. 10 of 2020 in the State of Qatar

Dr. Mohamed Salem Abouelfarag, Associate Professor of Private Law
Shaikha Al-Muraikhi, Teaching Assistant of Private Law
College of Law – Qatar University

In compliance with the Qatar National vision 2030, which emphasis economic development, the country issued a new Law on Industrial Designs and Models in 2020. This law determines the conditions and duration of protection, the eligible subject matter, and the application procedures in addition to other several matters. Although industrial designs are not newly protected in Qatar, the previous provisions regarding their protection were very limited in number. However, the new law encompasses 38 articles devoted to establishing a framework to protect industrial designs. This paper summarizes these new provisions.

Eligibility for Industrial Design protection

According to Law No. 10 of 2020, an industrial design denotes "any two-dimensional or three-dimensional composition of lines or colors that must give to any industrial or handicraft product a new and special appearance, and not merely for a functional or technical purpose." In addition, for an industrial design to be protected, a number of requirements must be fulfilled. The four conditions required for an industrial design to be protected are illustrated below in (Figure 1):

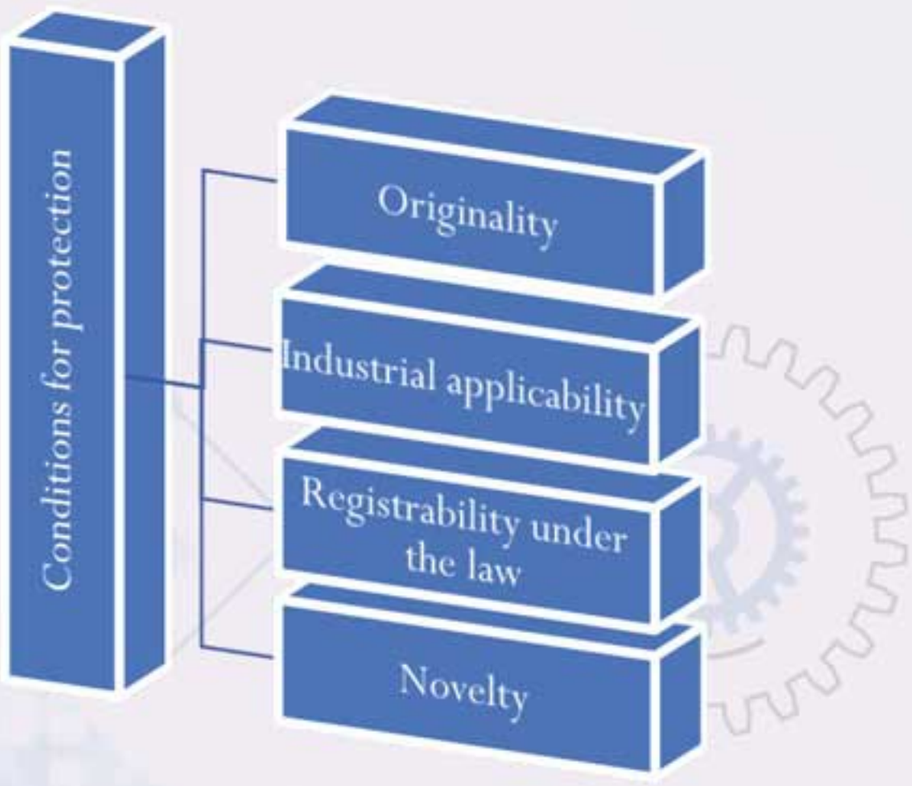


Figure 1. The four conditions for protection.

The features that distinguish a design from other products confer its "originality" and the key purpose in this regard is to grant protection to distinctive and not imitated designs. "Industrial applicability" refers to the fact that the design must have a valuable or practical application in any given industry. With respect to "registrability under the law", the design must be eligible for registration and must not offend public order or morality in any sense. The last condition is "novelty", which means that the design must be new. However, one should be cognizant that a disclosure within six months prior to filing an application are not considered disclosures that destroy the novelty requirement, if this is done in a national or international exhibition.

Application Process

The industrial design creator is to submit an application to the Office of Intellectual Property Rights in the Ministry of Commerce and Industry (the office), which then, scrutinizes the application and all the attached files to confirm that it fulfills all the stipulated legal conditions. Subsequently, the office informs the applicant with its reasoned decision within 30 days of filing the application. If, the office advises amendments to the application and the applicant fails to comply within 90 days, the office is entitled to reject the application.

Grounds for Refusal

The law explicitly excludes a number of designs from registration and thus from protection. These cases are as illustrated below in (Figure 2):

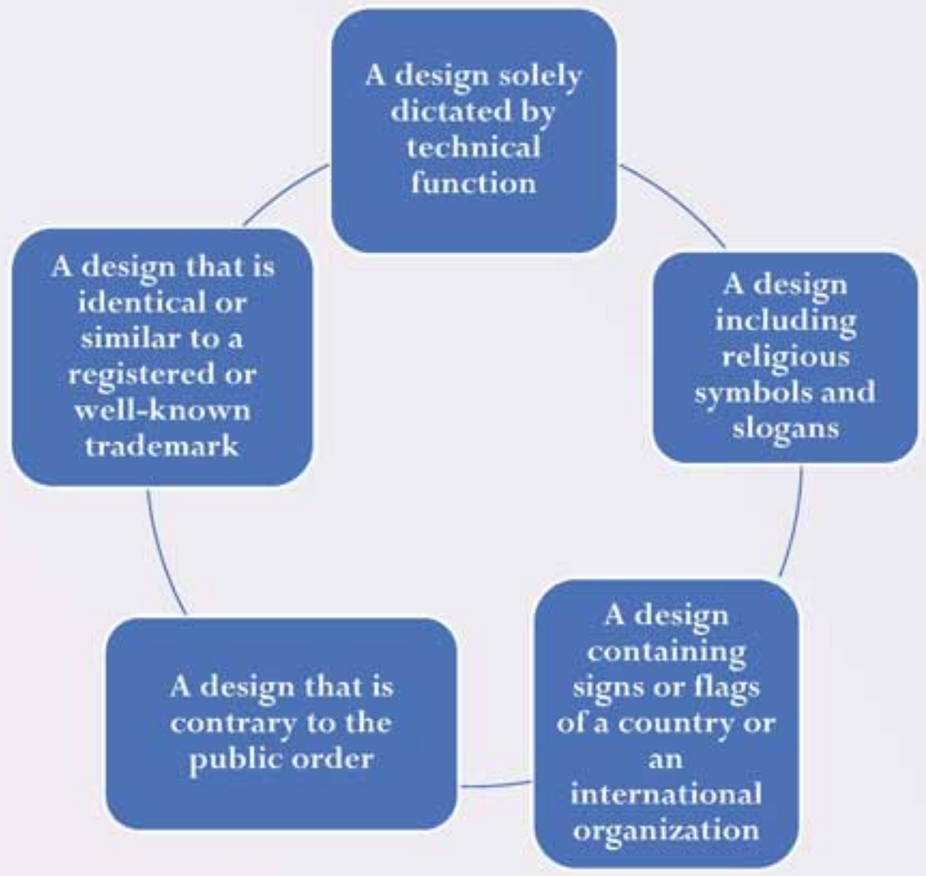


Figure 2. Grounds for Refusal.

According to the Agreement on Trade-Related Aspects of Intellectual Property Rights of the World Trade Organization (WTO), there are few exclusive rights granted to the industrial design owner. One of these rights is the right to exclude third parties from selling, importing, or making articles that embody or show a design that substantially imitates the protected design without the consent of the industrial design owner. Furthermore, industrial designs are protected for five years in Qatar. However, the term specified is renewable for two similar periods, meaning that industrial designs are protected for a maximum of 15 years in Qatar.

Conclusion

In conclusion, the enactment of Models Law No. 10 of 2020 contributes to the development of the national economy, which is one of the main pillars of the Qatar National Vision 2030. This new law encourages competition and stimulates innovation by providing the necessary legal protection for industrial designs and models, in addition to granting exclusive rights to their owners. Moreover, protecting industrial designs with a separate regime that defines the eligible subject matter for protection and conditions for registration segregates trademark law from industrial designs law. This prevents inventors and creators from using trade dress protection offered by trademark law to protect their industrial design in order to get a longer period of protection.

Critical Indices and Model of Uncertainty Perception for Regional Supply Chains: **Insights from a Delphi-based Study**

Dr. Abdellatef Majed Anouze

Associate Professor of Management, College of Business and Economics – Qatar University

Supply chains typically span different regions of the world and practitioners grapple on a global scale with perceived uncertainty. Perceptions of uncertainty stem from questions, such as:

What will my customers order?

How many products should we have in stock?

Will the supplier deliver the requested goods on time and according to the demanded specifications?

Such questions are indices (or measures) of perceived uncertainty that raise a myriad of supply chain management (SCM) challenges, and there is no panacea for confronting variability, volatility and vulnerability due to these questions. In light of these challenges, evaluations of supply chain uncertainty have a propensity to apply multi-criterion decision-making (MCDM) methods that inform option selection, assess the relative impact and adopt mitigation strategies. For regional supply chains "that conduct the majority of upstream and downstream activities in their home regions", SCM tends to reflect intra- and inter-regional strategies for economic development and environmental sustainability. Subsequently, uncertainty in this context depends on varied influences and specificities as perceived by regional SCM practitioners and prioritizations that shape SCM design decisions. However, an analysis of SCM research suggests a gap in knowledge on how regional SCM practitioners perceive uncertainty and on the critical indices of uncertainty for regional supply chains. This constitutes the research gap for this study, which was participated by each of Dr. Christopher M. Durugbo, from Arabian Gulf University at Bahrain, Dr. Zainab Al-Balushi, from Sultan Qaboos University at Oman, and Dr. Omar Amoudi, from National University of Science and Technology at Oman.

This paper aims to identify the critical indices of uncertainty for regional supply chains and analyze how SCM practitioners perceive uncertainty. Specifically,

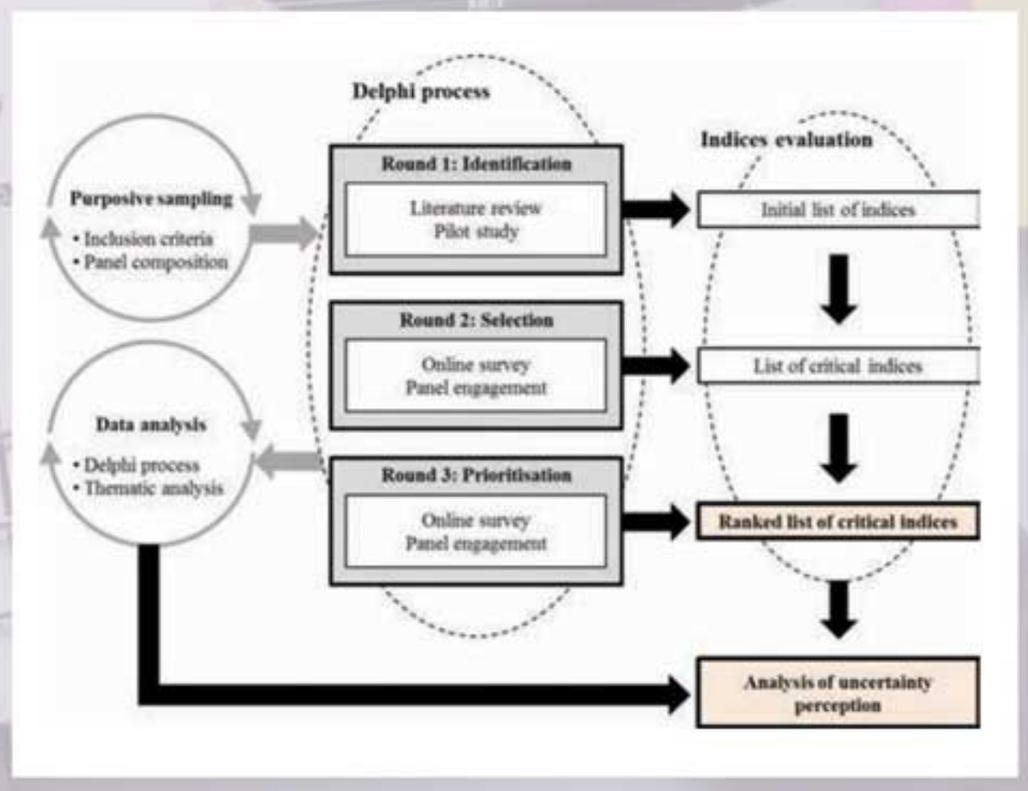


Figure 1. Flow chart for research methodology.

Dr. Abdellatef Majed Anouze

the research applies the widely used Delphi process in a study involving SCM practitioners from the Gulf Cooperation Council (GCC) region to advance research at the interface between SCM and operations strategy. Thus, the rationale of this research is that indices and theorizations relating to uncertainty perception may further enhance design decisions and strategy concerning the influences and specificities of SCM for regional supply chains.

In the area of managerial decision-making for supply chain uncertainty, researchers apply MCDM methods such as analytical hierarchical process and theory of constraint, data envelopment analysis, grey relational analysis, interpretive structural modelling and fuzzy techniques. However, Delphi offers an appropriate MCDM approach for this study because it uniquely supports an iterative process allowing participants to revise choices, allows anonymity for true opinions to emerge, and supports high conflict situations involving multiple decision makers. In addition, Delphi is suitable for addressing the main aim of this study because it supports group consensus in the identification (and prioritization) of issues and in the modelling of perceptions, such as supply chain uncertainty.

The Delphi process is widely used in SCM research to identify and prioritize research opportunities and for decision models. Previous areas of use include sustainable SCM, big data applications and understanding for SCM and SCM for flexibility and excellence. This study specifically applies an online version of the Delphi process (i.e. e-Delphi) for expert insights, anonymity and controlled feedback for the prioritization of issues. Because the Delphi process relies on multiple rounds of systematic enquiry to reach panel consensus, a key challenge for using the process is striking a balance in the number of rounds used to gather opinions. It is for this reason that two or three rounds of polling are typically used in Delphi-based SCM studies. Too many rounds may raise commitment issues with the panel and too few rounds

would produce underdeveloped conclusions. With this in mind, the article presents a three-stage Delphi-based study with SCM practitioners from the GCC region to confront the following research questions:

RQ1. What are the critical indices of regional supply chain uncertainty?

RQ2. How do regional SCM practitioners perceive uncertainty in supply chains?

This study is relevant to regional SCM practitioners and researchers in two main ways. First, as an uncertainty assessment that replicates and updates research on indices of supply chain uncertainty but from the perspective of developing countries and specifically the GCC region. This assessment is a useful competence in setting parameters for SCM tools such as supply chain audits that are conducted to appraise supply chain operations and collaborative readiness assessments that inform decisions to admit/omit supply chain partners. Second, as an uncertainty theorization that offers knowledge to inform the setting of performance objectives for supply chain strategies. As a critical metric for success, supply chain strategies provide an important basis of competition that trigger firms to amalgamate operations strategy with contemporary marketing and business policies such as user-generated content, co-creation and brand influencers. It is for this reason that knowledge from related studies of supply chain uncertainty has been applied in supply chain planning that leverages competitive business models and underscores relationship-building skills for SCM.

Research methods

The research applied thematic analysis after the Delphi process to methodically understand and identify patterns from the collected data. The intention was to analyze how SCM practitioners perceive uncertainty. The analysis involves deciphering and interpreting common themes of the ranked critical indices of supply chain uncertainty. The focus was on identifying factors shaping perception based on analyzing the sentences that describe the uncertainty e.g. 'rate of new product introduction' and 'replacing supplier of critical material'. Part of the analysis is also devoted to theorizing on the process for uncertainty perception and knowledge for this aspect of the analysis stems from observing the entire Delphi process. Figure 1 illustrates the applied method.

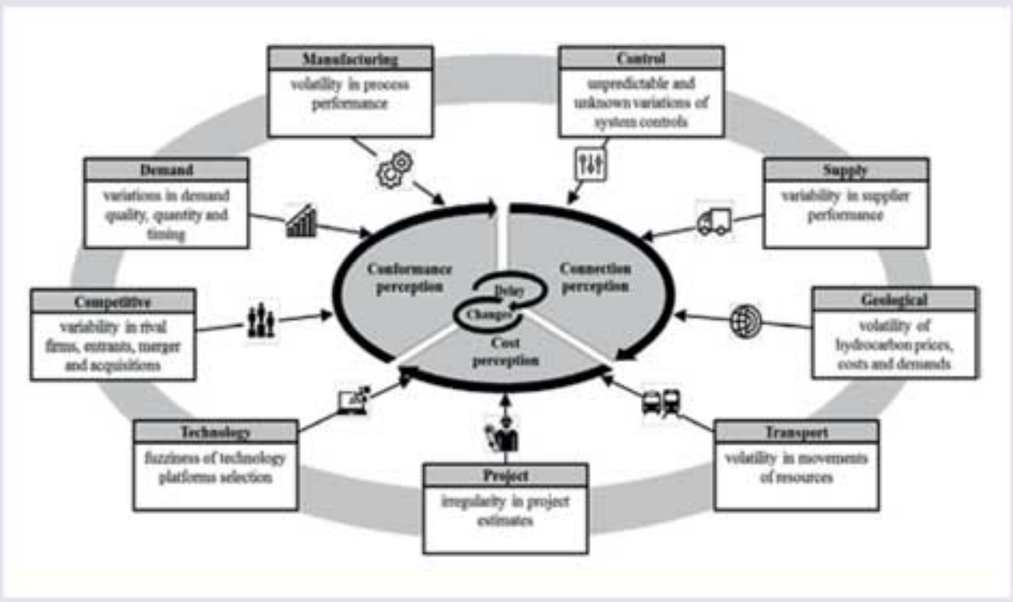


Figure 2. The three critical Cs (cost, conformance and connection) shaping uncertainty perception.

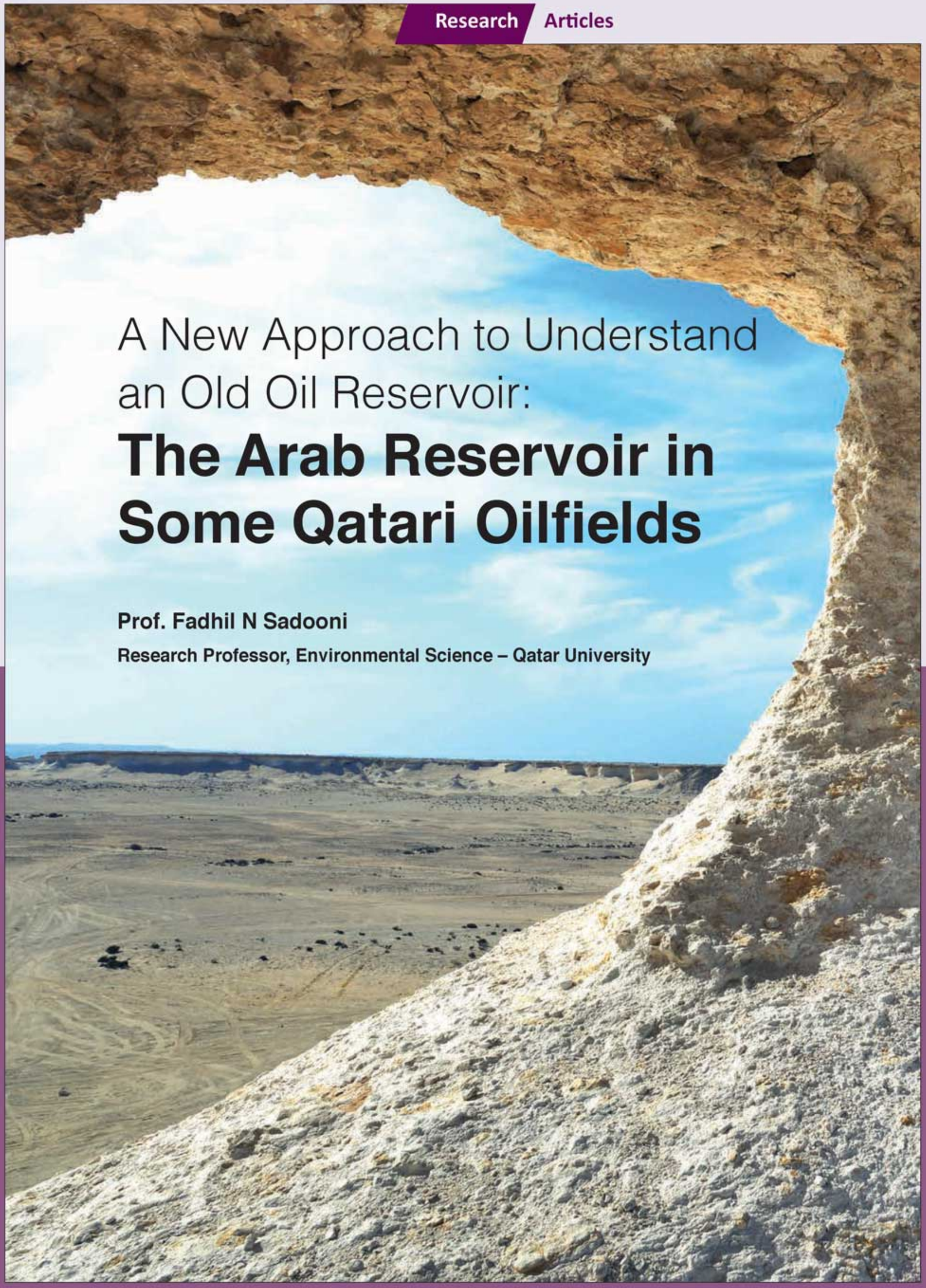
Main Results

In terms of the factors that shape perceptions, the analyzed critical indices reveal three critical C themes that underpin questions surrounding the critical indices of supply chain uncertainty. The three critical Cs are cost, context and customer, as shown by Figure 2.

Cost-related perceptions concern potential changes due to costs associates with projects, keeping up with technology, and unexpected orders or demands. In this context, perceived uncertainty relies on visible and reliable cost-effectiveness measures adopted within the supply chain. Confidence levels of SCM practitioners for costs also stem from credible and effective forecasts in estimates. These estimates may in turn influence degrees of uncertainty in virtuous (or vicious) circles concerning on-going and prospective expenditures for product development, production, service, and disposal of equipment. Cost controls become imperative for supply chain planning and regulations, and to curb regional and organizational expenditure within both public and private sectors whilst remaining competitive.

Conformance-related perceptions characterize changes and delays surrounding the fulfilment of customer requirements by supply chains in relation to materials, orders and quality. In this respect, perceived uncertainty hinges on confidence levels for high quality and timely delivery by supply chains. In supply chains, confidence levels underpin the orchestration that aids practitioners in enhancing operational performance. This leads to decisiveness for regional supply chains that are agile i.e. respond to short-term changes in demand or supply quickly and handle external disruptions smoothly; adaptable i.e. adjust their strategies, products, and technologies to meet structural shifts in markets; and aligned i.e. bring into line the interests of all partners– the so called 'Triple-A' supply chain paradigm.

Connection-related perceptions apply to changes in platforms, systems and applications concerning information use, updated technology and infrastructure availability. Here, the perceived uncertainty depends on accuracy, availability and transparency that facilitates resource use in information environments for supply chains. These environments dictate governance as regions face an optimization problem of maximizing their welfare while minimizing barriers to business environments for investors.



A New Approach to Understand an Old Oil Reservoir:

The Arab Reservoir in Some Qatari Oilfields

Prof. Fadhil N Sadooni

Research Professor, Environmental Science – Qatar University

Prof. Fadhil N Sadooni

The Arab Formation is the world's richest oil reservoir. It hosts the largest portion of the Saudi reserve and large parts of oil in Qatar and the United Arab Emirates. The location where the formation was described for first time is from the well Dammam 7, eastern Saudi Arabia. The formation is formed of alternation of limestone and anhydrite and has been divided into four members A, B, C, and D. Member D is the most important reservoir unit of the formation (Figure 1). Through regional correlation, the Arab reservoir has been identified in Dukhan Field, Qatar which was drilled in 1938 and then in other Qatari offshore fields such as Maydan Mahzam and the Id al-Shargi. Due to the high oil reserve in this formation, it was studied in detail in most of the Gulf countries using the prevalent technologies.

Advances in analytical power, high-resolution microscopy and new logging techniques, however, made it necessary to take a renewed approach at the rocks and oil content of this reservoir. The mission was carried out by a team from the Environmental Science Center, Qatar University headed by Professor Fadhil Sadooni, Professor Hamad Al-Saad Al-Kuwari and Dr. Wael Matter in collaboration with the Department of Petroleum Engineering, University of Houston in the USA. The project was funded by the National Priorities Research Program in Qatar Foundation in its 12th Cycle.

Understanding the porosity permeability system of this giant reservoir and the fluid distribution in it was a big challenge from the beginning. The presence of anhydrite interbeds with the limestone reservoirs made things more complicated. In order to understand these challenges, there was need for a new approach using geomechanics and artificial intelligence to understand the micro and nano porosity types, pore structure, connection and permeability conduits.

The first approach was to link the petrophysical properties of the reservoir with the different environments under which the rocks were deposited (Figure 2). Then there was a need to understand the impact of the diagenetic processes (the processes that affected the rocks after their deposition) on their reservoir properties.

A major problem was the shortage of core samples from the studied fields. The majority of the available samples were drilling cuttings. These corn-flake size samples are not good enough to achieve what is needed. A reverse engineering approach was used to overcome this issue, and detailed petrophysical analyses were carried out on the available cores, then these cores were broken down to the size of cuttings. Detailed measurements of the mechanical properties of the resultant cuttings were carried out. Using AI approach, these mechanical properties were correlated with the petrophysical properties of the original cores. A significant correlation has been achieved. If this fully works, then there will be less need for the rare and expensive coring in the future.

One of the aims of the project was to understand

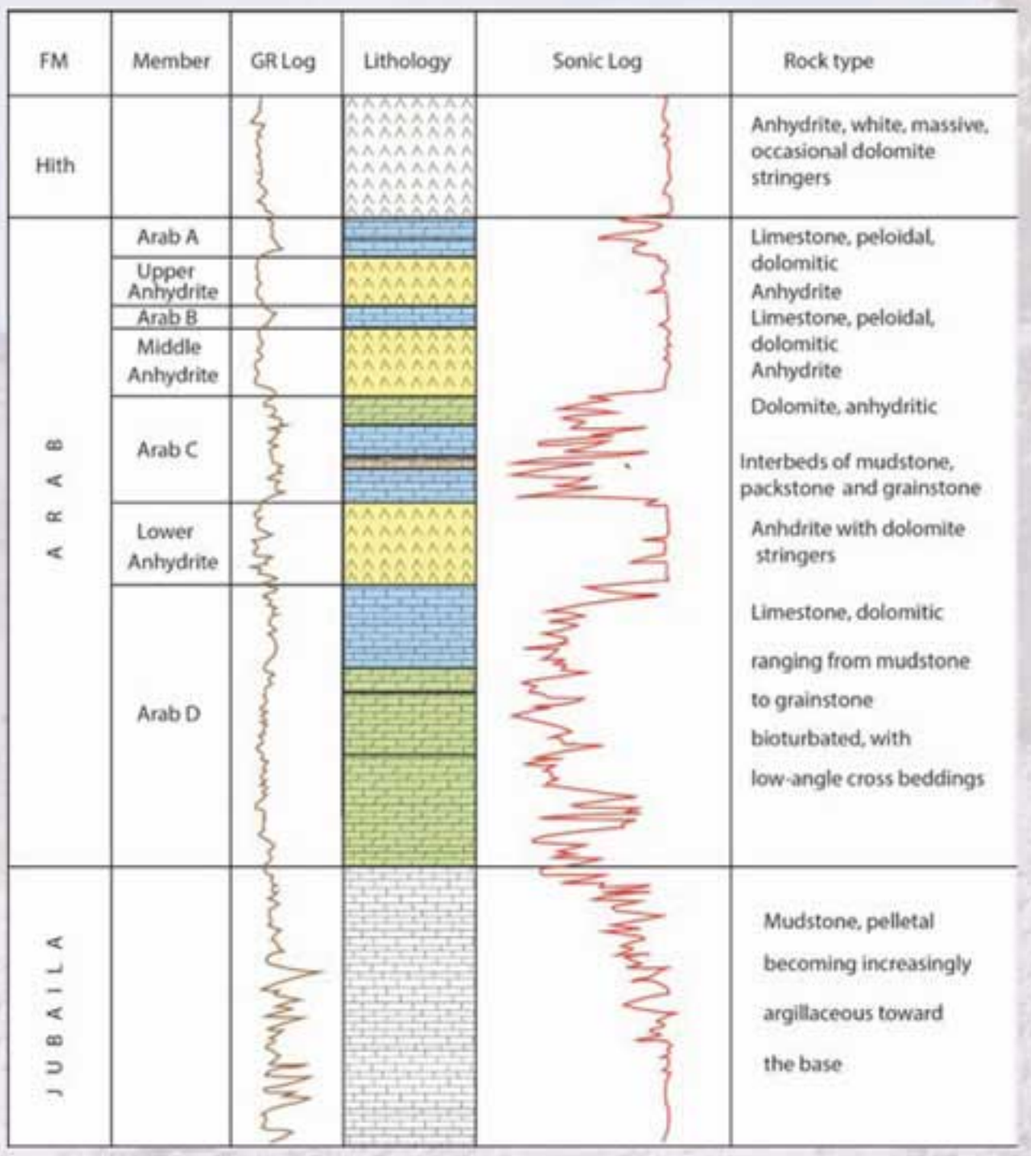


Figure 1. General vertical section through the Arab reservoir in Dukhan Oilfield showing the main lithologies and subdivisions.

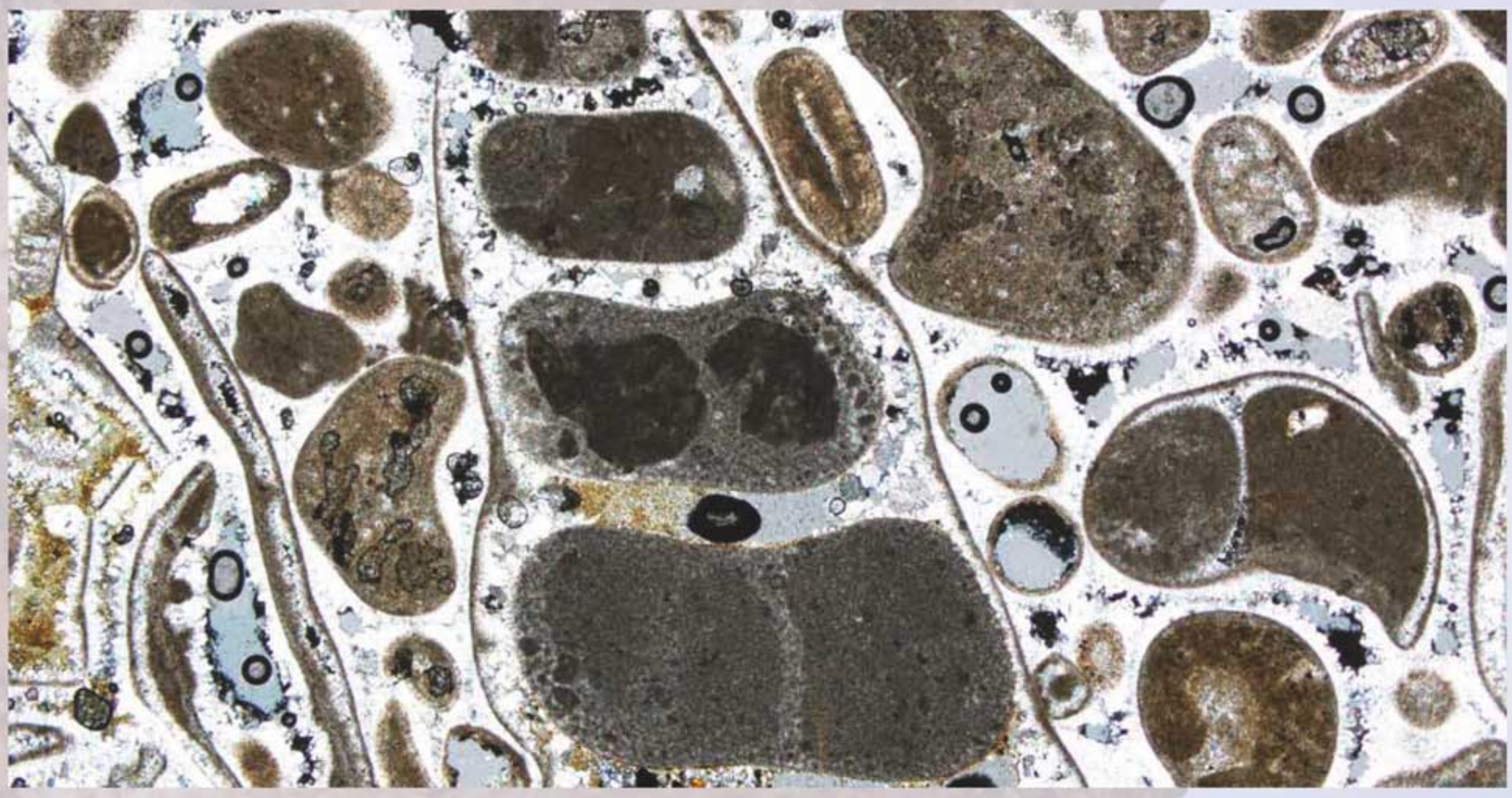


Figure 2. Photomicrograph under the polarized light of a petrographic microscope showing shell fragments as the main components of this rock from the Arab Formation. There are also some pores in the groundmass.

micro and nano porosity types of the studied reservoir. The detailed examination of the formation using Scanning Electronic Microscope (SEM) coupled with Edx and Light Emission Microscope (TEM) made it possible to look closer to these rocks and see how the structure of the nano grains and their packing influence the development of the larger macro pores. The heterogeneity of the studied rocks because they are formed of different minerals such as calcite $CaCO_3$, dolomite $CaMg(CO_3)_2$ and anhydrite $CaSO_4$ made things more complicated. The interface between these different minerals (having different crystal forms) created a considerable space between the grains forming new porosity types. Since these different minerals respond differently to the diagenetic processes, new geometries were created after dolomitization, dissolution and cementation.

Understanding the micro and nano porosity development in the studied reservoir added around 10% porosity in rocks that were considered not reservoirs according to the old studies (Figure 3). Such a figure is important for exploring new areas in the future.

Fracture is an important porosity and permeability parameter in the Arab reservoir. Fracture surfaces are usually rough and hence the hydraulic aperture of the fracture is different from its mechanical one. Studying the fracture roughness of the Arab reservoir allowed us to shed some light on the impact of the fracture roughness on the multiphase flow of fluids in the reservoir.

It is expected that the project will lead to the filing of a new patent for the technology of predicting petrophysical properties from cuttings as well as a software to manage this.

Although the Arab reservoir is an old reservoir, but it may have more pleasant surprises in store for the future. The new technologies will make this possible.

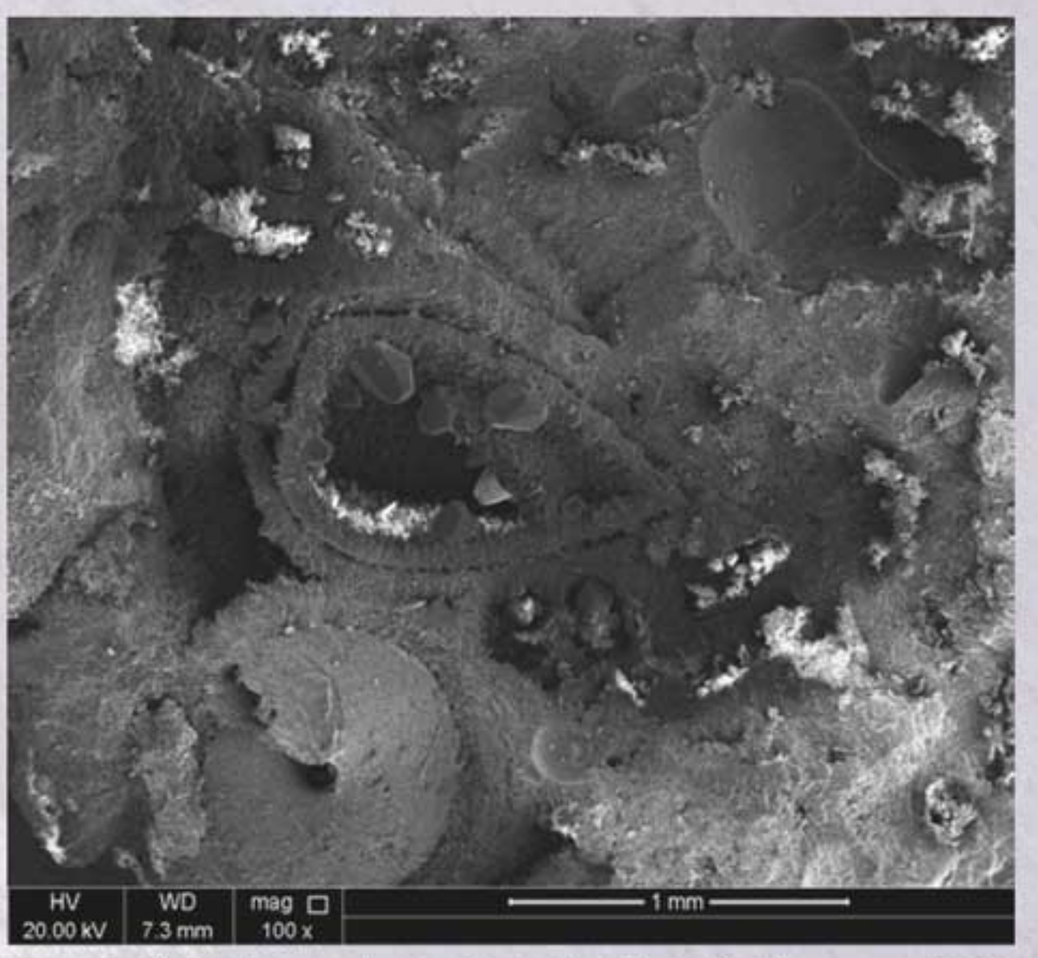


Figure 3. Close micrograph using Scanning Electronic Microscope (SEM) showing the development of nano porosity inside the shell fragments. Notice the growth of new calcite cement crystal inside the shell also.

Story of a Knowledge Platform:

مركز جامعة قطر
للعلمـــاء الشـــباب
Qatar University
Young Scientists Center

بعلم صواب علي وحق صايب

Qatar University's strategy targets achieving the QNV's pillar of Human Development, establishing an infrastructure and a world-class education system comparable to the most esteemed ones globally, and empowering Qatari students to face global challenges. The strategy pushes them to create and start initiatives in the future in order to be able to participate significantly in building an innovation-based economy. Thus, an idea was born to establish the QUYSC, a center that seeks to raise a new generation, harnessing productivity and creativity in their endeavors. For getting more information about the efforts of the QUYSC, we meet with Prof. Noora Jabor Al Thani, Director of the Center.

First, we know that the Center is an extension of Al-Bairaq Program, could you please introduce us to the history of Al-Bairaq Program since its establishment in 2010?

Al-Bairaq Program was launched in 2010 under the leadership of Prof. Noora Jabor Al-Thani. Its vision focuses on promoting the national capacities in STEM fields. The idea started with introducing students to scientific and research activities, aimed at catching their interest in these fields to seek scientific studies at the University, and promote the scientific research culture among Qatari students. These efforts are directly linked to human development and education quality, and aim at achieving QU's objectives and strategies relevant to the quality of education and scientific research. The program succeeded to attract 7286 participants in primary, preparatory and secondary schools, and lead to the participation of students in national and international events, in which they have achieved many awards. Consequently, Al-Bairaq Program won a compilation of Six Awards offered by esteemed institutions in the field of educational innovation, such as WISE 2015 Award and a collection of Reimagine Education Awards offered by QS world university rankings institution. These recognitions serve to raise the visibility of Qatari researches nationally and internationally.

How can you introduce the Center through its vision, mission, and main objective?

In 2020, QUYSC was established as a center for developing STEM skills and research, to serve at a larger scale and include greater number of students in its programs. Considering the fact that it is a hub for students of all levels of study and their portal to access Qatar University, the Center was supported by the University leadership. The Center is intended to be a nationally and internationally reputed institution serving the school's students, with the aim of contributing to the growth of their interests in STEM fields through organizing comprehensive educational and scientific programs designed to boost their knowledge. The Center is working in cooperation with all QU colleges and departments to attract and develop the talents and interests of students. The vision of the Center is reflected in applying the means and techniques of interactive learning to prepare the future scientists, researchers and highly expert leadership of the State.

Could you walk us through the departments and specializations currently available at the Center?

We have the "I am a Researcher Program" and "National Science Promotion Program", designed to develop the research-based knowledge, and offer scientific expertise in QU Labs. These programs are a unique opportunity to the students in the pre-university stage to participate in research, be acquainted with the research environment and learn significant skills in their undergraduate studies. Consequently, they plant the seeds of curiosity towards science and problem solving, and develop the perspectives of students in secondary school regarding the scientific specializations and their professional application in the future. These programs guarantee an exquisite opportunity to secondary school and bachelor students at QU to collectively work under the supervision of the faculty and high-qualified researchers.

The "Gateway to QU" program will enable the Qatari students to take a leap forward in understanding the criteria upon which they can choose their specializations at the college level. It aims at attracting the greater proportion of Qatari students to QU, and introduces them to all STEM colleges through setting up mock-ups of the profession under study reflection, its applications in real life and simulating its day-to-day activities, all in an effort to assure delivering qualified Qataris to the job market. The program also introduces students to the admission criteria and the entry exams that must be passed before enrollment, offering them the opportunity to make prior preparations.

Al-Bairaq Program includes several programs to inspire and develop the skills of all school students, as they are offered training workshops. The workshops aim to encourage them to seek for problem solving of factual issues, inspire their curiosity and passion for sciences at an early age, and motivate them to find empowerment from within and develop their skills in light of the objectives of QNV 2030.

What are the most significant research projects for the academic year 2021-2022?

Part of the QU Young Scientists Center activities.

Part of the QU Young Scientists Center activities.

There is a project dedicated to studying the local factors contributing to the main issues resulting in the lack or limited participation of students in STEM Research Experience Program. The study includes the undergraduate students in the State of Qatar. It aims to provide a throughout view of the anticipated positive effect of official and unofficial education programs in producing national talents.

In addition, there is another project revolving around the challenges that the Qatari society faces in the field of STEM education during the COVID-19 pandemic. This study is implemented to evaluate the relation between the various learning technologies, the education level of parents and the digital literacy eradication to assist children during their studies.

Moreover, a project covering the education models is underway to support the implementation of Research Experience Program in STEM fields dedicated to secondary schools and universities.

How does QUYSC support QU students?

The Center is distinguished for creating the opportunity and the adequate research environment to learn research expertise under the supervision of advanced labs researchers in the University. The students are involved in carrying out high quality research as they learn high-level scientific research skills and, consequently, how to apply such skills to find practical solutions to develop products. Gaining laboratory skills is part and parcel to the mission of the students of scientific specializations. Therefore, the program prepares them to undergo their first year of university studies and develop their ability to find solutions and innovate.

What are the research services offered by the Center to support the learning process and research program? What are the aspects of cooperation between the Center and industrial/ academic institutions in the State of Qatar?

Preparing students for the university stage by acquiring various skills, such as scientific research, problem solving and innovation, and intellectual judgment, is considered a corner stone service offered by the Center to support QU colleges. The Center succeeded in creating relations and cooperation with several institutions in the State of Qatar. It was further keen to establish partnerships with the Ministry of Education and High Education, Qatar Scout, and Qatar National Olympic Committee as well as major industrial partnerships that target offering better services to the students and provide necessary support to them.

Is there any type of cooperation between the Center and research institutions outside the State of Qatar?

In addition to major partnerships with UNESCO, the Center has partnerships and cooperation with international universities, such as: Stanford University, Rice University, South Georgia University, the Swiss Federal Institution for Technology, Tokyo Institute of Technology. Furthermore, the Center focuses on student projects on global platforms through participating in international research competitions in several countries, such as: Turkey, Malaysia, Canada, Korea, and the United States of America.

What are the research outputs of the Center and its future objectives?

The center is proud to offer its services and engage 7896students in the research experience, skills development and innovation programs, as they succeeded in innovating 2000 projects. The Center still aspires to move forward through strategies focusing on innovation, new technologies and educational strategies to integrate new students into the Center's programs. The Center witnessed a huge expansion in scientific and educational programs that target school students of all grades as well as university students. Moreover, the Center is launching new STEM programs in cooperation with various QU departments. These new programs will attract many students, and facilitate the Qatari students' enrollment at QU. We are also aspiring to gain the patent for products created by students and introduce them to the international market.

Interview with a Researcher:

Dr. Nasser Abdullah Al Nuaimi,

Associate Vice President for Research and Graduate Studies, Qatar University

The scientific disciplines at Qatar University are varied, and engineering overlaps with science and technology to open up new horizons for research projects, discoveries and innovations. In materials engineering, it comes to mind that instead of randomly searching for new materials, science can strengthen the properties and mechanisms of materials to suit the needs of local and global markets. In order to learn about the nature of advanced materials, and the areas of research within them, we are pleased to meet Dr. Nasser Abdullah Al-Nuaimi, Associate Vice President for Research and Graduate Studies, Qatar University.

Dr. Nasser Al-Nuaimi, would you kindly introduce yourself and your academic specialization?

I am Nasser bin Abdullah Al-Nuaimi, I graduated from the Civil Engineering Department at the College of Engineering, Qatar University in 1989. Following graduation, I was appointed as a teaching assistant in the department and obtained my master's degree in structural engineering from Oklahoma State University. Afterwards, I travelled to the US for my PhD in civil engineering, Structural discipline. I graduated from the University of Arizona in 2004, then joined the Civil Engineering Department, and became the head of the department in 2006. Later on, I assumed the office of director of the Center for Advanced Materials in 2016, and currently I am the University's Associate Vice President for Research and Graduate Studies. I got many projects funded by the Qatar National Research Fund (QNRF). My research interests are mainly focused on design and reinforcement of concrete structures, materials and durability in hot climates.

Could you tell us about your most prominent achievements in the field of civil engineering?

I believe civil engineering is a gateway to many achievements. For a teacher or a university professor, there are two main responsibilities: Academic teaching and advising, plus scientific research.

I have taught civil engineering for 15 years and mentored many students. Now, they hold leading positions in the State and I am very proud to see my students doing a great job in developing our nation and the world in general.

In terms of research, my main objective is to observe and study the deterioration of concrete and civil infrastructure in the Qatari environment. Then how to devise techniques of repairing, maintenance and rehabilitation to overcome the problems of deteriorating structures. We studied timeworn eroded structures and tried to find out the scientific reasons behind their deterioration. We introduced various remedial measures such as reinforcing concrete elements with galvanized steel wire mesh and polymers or reinforcement with carbon fibres. A study was conducted to monitor the durability and longevity of this technique, where we submerged more than sixty reinforced concrete bridges under seawater for three years, and then extracted and examined them every six months.

Throughout my term at the Department of Civil Engineering, I supervised the development of laboratories, equipment supply. This helped to conduct research activities in the department and contributed to obtaining academic accreditation.

We learned that you are an active researcher in the field of reinforced concrete and its durability in hot and harsh environments, what is the summary of your research in this field?

The conclusion of my research so far is that the Middle East has a very harsh climate for reinforced concrete structures that causes rapid corrosion and deterioration of concrete and other steel structures. We need to come up with innovative materials that can lead to robust infrastructure. For this purpose, we have developed two flexible concretes; the first is Ultra-High Performance Concrete (UHPC) with a strength of up to MPa160 (the standard Newton) and the second is Self-healing Bio-concrete, which is a concrete that can close cracks, if any, with nanotechnology in this field.

In usual circumstances, ordinary concrete of strength (30-40 Newton) is considered tough for those conditions, but in harsh environments such as the Gulf region, the need for concrete of superior strength has become a necessity. UHPC is more durable as it is tough, durable and has very low porosity to allow harmful agents such as chlorides, sulphates and CO2 to enter and permeate the body. Thus, the onset of corrosion on steel is delayed, which extends the life of the concrete infrastructure and reduces the need for repair and restoration.

On the other hand, Self-healing Bio-concrete is another new material developed in the laboratory using locally available materials, nanotechnology, and bacterial strains from the Qatari and non-Qatari environments. This advanced concrete is self-healing as it works to automatically heal cracks with nanotechnology.

Moreover, through our work, we also proved that Galvanized Steel with Epoxy Reinforced Polymer and Carbon Fibre with Epoxy are long-term reinforcing materials under harsh climatic conditions. The deterioration of reinforced concrete is complex. We cannot identify the cause of reinforced concrete deterioration or categorize the type of concrete and reinforcing materials that can be used to achieve a resilient infrastructure that provides sturdiness throughout the building lifetime.

What are the main challenges you faced as a researcher?

The first of these challenges was the absence of a comprehensive vision for scientific research in Qatar. Scientific research was like isolated islands that did not interconnect to reach a specific goal. It stemmed from self-motivation not within a comprehensive framework. All of this was before the Qatar Vision 2030 was formulated. The vision made scientific research play a major role in achieving the aspirations and ambitions of the State of Qatar. Time was also a great challenge for me, as scientific research in concrete takes considerable time that may extend for many years, compared to some other disciplines. Commitment to professional ethics calls for several attempts to

successful experiments in research before publishing the findings in various scientific journals. We should not overlook a major challenge that existed until the beginning of this century, which was the difficulty of accessing the required information at that time, before the spread of the Internet on a large scale and digital transformation of libraries instead of keeping volumes of scientific journals year after year. In addition, I must mention that there was little communication between the different scientific schools, especially at the beginning of my career in terms of scarcity of conferences or joint projects between researchers inside and outside Qatar. The truth is that most of these challenges have been remedied in the last two decades at Qatar University and at the level of the State of Qatar as a whole in terms of the current comprehensive vision, increasing financial support for scientific research, as well as involvement of different scientific schools, developing scientific research, upgrading libraries, and achieving effective education in many disciplines.

How does advanced materials research contribute to achieving Qatar University's strategy and Qatar Vision 2030? Which sectors of the State yield the benefits?

If the sciences varied greatly at the beginning of the twentieth century, then materials sciences have consolidated sciences in recent times. Nowadays, you can hardly see a difference between the basic or applied sciences such as engineering, medical, environmental sciences, etc. The strategy of the State of Qatar is focused on promoting human-centred development, being the most valuable asset of any country. Four pillars comprise this strategy: human, social, economic and environmental development. Materials sciences interconnect with three pillars, particularly human development through the use of material science in education enhancement, learning programs in the country and the graduation of citizens armed with science and modern knowledge as well as economic development. Advanced materials science is the key gateway to a knowledge-based modern economy. Modern and advanced materials are used to preserve the environment and transform harmful materials into fortune, such as converting CO2 into useful chemicals or fuel, being one of the most significant branches of modern and advanced materials. Therefore, I say with conviction that studying materials science and engineering is an essential door to accomplish the revival of our beloved State of Qatar.

Qatar University is concerned with preparing future leaders. How would you describe your experiences with Qatar University students through your long academic experience?

My cumulative experience with Qatar University students shows that there has been development in

Dr. Nasser Al-Naimi during field studies.

the students' personality in terms of their interests and aspirations. The witnessed unwilling interest in scientific disciplines has diminished, and the basic and applied sciences, such as various engineering and medical sciences, have recently become attractive to interested students from our sons and daughters. This is an important matter for revival and continuity of the scientific research base in the State.

What are your research projects for the academic year 2021-2022?

My research is on manufacturing of regular and high-performance green concrete using locally available materials in Qatar, and studying its durability under the corrosive environment through the University's cooperative internal grants. Another research project is the technical trend in the field of concrete, which is the manufacturing of self-healing concrete as it automatically heals cracks with nanotechnology. We have succeeded in the first experimental stage and work is underway to develop the technology.

As a successful researcher and administrator, what is your advice to researchers who aspire to excel?

The support of Allah at first, and second; success in management is in two words "seriousness of work" and "giving others a chance to work and achieve." Management is considered a kind of art, but this art needs a foundation. The basis here is knowledge, not ignorance. As for research, my advice to my students and colleagues is to keep working regardless of the outcome, because even the wrong and unexpected results of the experiment will yield new information in the field of research that may provide guidance to the right path. Also, specialization is an essential and significant aspect in research. When you focus on studying a topic, after a relatively short period, you will be a specialist in a certain discipline rather than delving into various fields, because I believe in specialization in research and graduate studies.

Researcher Business Card:

Hamda Abu Jasoum
Research Assistant - Laboratory
Animal Research Center
Qatar University

جامعة قطر
QATAR UNIVERSITY

Could you introduce yourself, and tell us about your specialized work at Qatar University?

My name is Hamda Aboujassoum, Research Assistant at the Laboratory Animal Research Center (LARC). I started my career at QU (Qatar University) in 2008 after my graduation from the Biological and Environmental Sciences Department. I worked as a Senior Lab Technician in the Animal Lab at the same department. In 2013, I moved to work at the Laboratory Animal Research Center to join my current position.

Tell us about your most important practical and academic research achievements?

I got my MSc. degree in Environmental Sciences in 2013 from Qatar University. In 2016, I joined the PhD program at University College London (UCL) in the Division of Medicine and will defend my dissertation soon. My PhD research project is addressed as "healthy lifestyle intervention's effect in ameliorating obesity and its related comorbidities such as fatty liver." In this study, we successfully developed a diet-induced obesity (DIO) model in rats. This model is the first DIO model developed in Qatar and it is being used and followed by other studies.

What is the importance of "Biomedical Sciences" major in professional life?

Biological sciences encompass several disciplines such as physiological sciences, and biomedical sciences. Both are important disciplines in medical research field. This field helps the researcher in addressing most pressing health problems, generating new discoveries and treatments to improve human health.

Throughout your research experience, could you tell us how can the researcher achieve excellence?

Working on research is not easy, but it is not impossible. From my own experience, the main secret of being an excellent researcher is to have an interest in this field. In addition, the researcher must be patient, persistent and updated all the time with the recently published research.

What does belonging to Qatar University mean to you?

Qatar University is the place that built my academic personality as a student and researcher and developed my career skills as an employee.

Interview with a Graduate Student:

Dr. Suhaim Khalaf Al-Jasaiman

Ph.D. in Management, College of Business and Economics - Qatar University

Qatar University seeks to prepare distinguished graduates with comprehensive personalities and high competencies that enable them to face challenges in the labor market and contribute to building and leading the future of Qatar. The University also helps students achieve academic and administrative success in all State sectors, which already include active and distinguished pass outs from the University. In this issue, we interview Dr. Suhaim Khalaf Al-Jusaiman, the first Qatari graduate of the Business Administration PhD program from the College of Business and Economics at Qatar University.

Dr. Suhaim, could you please introduce yourself, and tell us about your academic journey?

Currently, I am the Director of Continuing & Professional Education Department and a faculty member at the College of the North Atlantic Qatar, which will soon be – God willing – Doha University of Science and Technology, and before joining the college, I worked for about fourteen years in the commercial and contracts sector in the field of oil and gas, where I was the Senior Marketing and Operations Manager. I would like to highlight some aspects of my educational career, thanks to God, in the academic year 2001/2002 I was one of the top ten students in Qatar in the secondary school, and was honored by His Highness Sheikh Hamad bin Khalifa Al-Thani, may God bless him. After that, I joined Qatar University in 2003 and was first in the batch of the bachelor program to graduate with a double major (management/ marketing) from the College of Business and Economics. Then, in 2008, I attended Liverpool University in the UK and completed my master's degree in business administration, and my thesis focused on a comparative study of organizational politics in Qatar. Then, in 2016, I enrolled in the first batch of the PhD program (Management) at Qatar University, and I was thankful to be the first Qatari graduate of the program, where the doctoral thesis highlighted the strategic management and achieving sustainability in supply chains.

What motivated you to choose to study PhD in the Business Administration Program at the College of Business and Economics?

After finishing my bachelor's and master's degrees, I was eagerly waiting for the PhD program to be launched at the College of Business and Economics at Qatar University. It happened in 2016 fall, and thank God, I had the honor of getting accepted in the first batch of the program, myself and eight other students. My master's and doctoral thesis were motivated by ambition and passion for science.

Many researchers in the College of Business and Economics study supply chains. What are its most important aspects that researchers are concerned with? Why does this topic receive so much attention?

One of the most important aspects for researchers is how to achieve sustainable supply chain model, where the supply chain is regulated by manpower, raw materials, technology, products, services, customers, etc. Sustainability is mainly regulated by economic, community and environmental aspects. Therefore, research and sustainability of supply chains is an important topic for Qatar, which in turn supports the sustainability of the industrial sector and projects of all kinds.

Your research focused on the concept of sustainability, how will this serve the industrial sector in the country?

Sustainability and sustainable development focus on the balance between calculating needs, our need to use technology economically, and the need to protect our environment. There is no doubt that sustainability contributes in improving the indicators of the state's economic growth, increasing the competitiveness of the national economy, directing economic resources, and attracting domestic and foreign investment towards new economic activities.

As the first Qatari graduate of the PhD program at the College of Business and Economics, faculty member and researcher at Qatar University, how do you describe Qatar University's research achievements? What did Dr. Suhaim add to the research achievements in business administration?

Qatar University has achieved remarkable and distinguished research achievements at the local and regional levels, and is one of the most powerful universities supporting scientific research in the region. Regarding my research achievements, with – god's support – and the PhD program management at the College of Business and Economics, I was able to publish four research papers in international journals, and the fifth research paper is under review. I think this is not an easy achievement, as it has taken a lot of effort, time, and perseverance to achieve it. The research I have published focuses on supply chains and their sustainability and adds a lot to the international research literature.

You mentioned that you published four research papers, so what obstacles did you face in getting

your papers accepted for publication? What is your advice for students and researchers in this regard?

Publishing in high-ranking international journals is a great achievement; however, it is not an easy job, as it takes a lot of effort and time. One of the obstacles that the researcher may confront is the request for review more than once by the journal, which requires many details and accuracy. This may take months, a year, or even more. Therefore, I advise our students, specifically postgraduate students, to start working on publishing their research in scientific journals from the first year of study; so that they can publish as many research papers as possible when they graduate.

What are the future objectives of Dr. Suhaim? What is his ambition in the world of entrepreneurship?

I have a great ambition to continue publishing in high-ranking international journals in order to enrich research in the field of my specialization, as well as contribute to the fame of Qatar in the field of scientific research. As for my ambition in the world of entrepreneurship, I have been working in commerce since I was 15 years old with the support of my mother, God bless her, and my future ambition in this field is to establish an industrial technology project of a sustainable nature to serve the beloved State of Qatar and the region.

Throughout your experience, how can Qatar University attract more students?

I believe that Qatari society today has become more aware and mature. Therefore, exerting more efforts to increase community awareness on the importance of education and postgraduate studies in building society will further attract more students. We are all sure that science is one of the most important pillars of building a successful society.

How do you evaluate what Qatar University offers to students in general and to postgraduate students in particular to produce distinguished graduates for the labor market?

From my postgraduate experiences in master's and doctoral degrees at prestigious universities in United Kingdom, I believe that Qatar University's programs have very high academic standards and quality. From my personal experience, I assure everyone that the quality of postgraduate programs at Qatar University is stronger and better than many prestigious international universities.

College of Business and Economics at Qatar University.

Graduate Student Business Card:

Ali Abdulmunem Noman

Master in Arabic Language and Literature
College of Arts and Sciences - Qatar University

جامعة قطر
QATAR UNIVERSITY

How do you introduce yourself to the University community?

My name is Ali Abdulmunem Nouman, a graduate student, specifically in the master's program in Arabic language and literature. A lover of science and research, I joined the masters program in the fall of 2018, and I am happy with this enrollment, although it was a challenge for me; because of my many connections outside the University between a job, family and other social activities. However, praise be to Allah, I have overcome that challenge and approached the end, and I ask Allah to facilitate completion as He did in joining.

What motivated you to choose the language track in the Arabic Language and Literature MA Program?

The Arabic language was and still one of my biggest interests since I was studying at a preparatory school. I was interested in Arabic grammar, reading texts, writing topics, grammatical issues and correcting common mistakes. Undoubtedly, one's inclinations and interests are one of the biggest motives in his decisions and choices.

In addition, the reason of my decision to join Master of Linguistics and not Literature is that I feel more interested in Linguistics than Literature. However, the decision was not easy.

Which aspects of the Arabic language will your MA thesis cover?

My thesis will cover a modern linguistic study of a range of remembrances and supplication texts through a blog) from one of the remembrances and supplication books (as before choosing the topic I set criteria for choosing the field of study). I wanted my study to be in a field where Sharia intersects with the Arabic language, and for it to be a collection of traditional texts studied with a modern approach.

Research experiences tone the skills of students. From your experience, what is your advice for students at Qatar University?

My advice to them is that they should take advantage of their time in their university years, and to give research enough attention and time. They should not only worry about submitting it on deadlines to obtain the degree rather, let their interest in mastering the research step by step from defining the title through the research problem and its hypothesis to reaching the results. Also, they should not make their only goal to graduate, but rather work hard to be scholars in their specialized fields.

Could you tell us about your ambition and future goals?

I aspire to have international research contributions in the field of language, and to be a member of the language academia, as well as to develop educational communication platforms to attract those interested in the Arabic language and its studies.

Interview with an Author: Professor Abdul Hameed Al-Ansari on his recent published book by QU Press:

"Shura and its Impact on Democracy"

"Humanity has known various regimes throughout its long history, and eventually reached the best form of governance "Democracy", which in essence means group self-ruling. Democracy has become the basis of modern regimes adopted by countries, and paved their way as a source of development and progression, since it makes way for wide discussions on diverse opinions to reach the soundest judgments across several domains."…from "Shura and its Impact on Democracy".

An extra light is shed on this interview with the book's author: Dr. Abdul Hamid Al-Ansari, former Dean of College of Sharia and Islamic Studies, Qatar University.

Prof. Abdul Hamid Al-Ansari, how would you introduce yourself to the University community?

I introduce myself as an academic, and have been a professor and lecturer for a quarter-century. I assumed the office of Dean of the College of Sharia and Islamic Studies for two terms (1990-1994) and (2000-2004). I also worked to establish a Law Department that later developed into a College. Through my membership in the Technical Office for University Development and since the early inception of Qatar University, I contributed to its development, mainly restructuring the University's internal bylaws and regulations as well as the transition to the current campus. Additionally, I engaged in scientific research and produced 16 books among other many researches. I have made contribution towards serving my community in issues of reform, human rights, women and children, renewal of religious understanding, dialogue and tolerance. Furthermore, I participated in legislation development through public lectures, local seminars and external conferences. Currently, I write weekly columns in Qatari and Gulf newspapers, in addition to media meetings and interviews. In recognition of this perseverance, my University honoured me and granted me the honorary title of (part-time professor).

Before discussing your book, what do you think is the role of Qatar University in developing researchers' skills and enabling them to write and author books?

I may not be familiar with all the dimensions and aspects of this role, and perhaps those who supervise this matter are better enabled to answer, but as a university researcher, I see that Qatar University has a prominent role in motivating researchers and developing their research skills through various practical methods. These methods are mainly allocating the necessary funds for scientific research, organizing research skills development courses, and lecturing among other methods.

We learned that this is the fourth edition of the book, could you brief us on the question addressed concerning the principles of Shura and Democracy?

The essence of Shura and democracy conforms on the right of participation of citizens in public affairs and the future of their countries, choosing their rulers, holding their governments accountable for their actions, and that citizens enjoys their rights and freedoms, including personal, honour, and property safety. These are necessities that fall within the ultimate purpose of Islam. Yet, the difference between Shura and democracy lies in the people's authority. In Shura, this authority is restricted by the boundaries and religious constants, while in democracy, this authority is much broader, though it is also restricted by the constitution.

Could you brief us on your position on women's membership in the Shura Council and the Presidency of the State?

This is a controversial issue in Islamic jurisprudence. I have put thorough, objective examination into the matter and embraced the opinion that membership and presidency are permissible for women on religious, rational and pragmatic pretexts. The woman is a human being honoured by her Creator like the man, and the rule in Islam is equality between genders, save explicit texts such as inheritance, which are bound by principle of justice.

What prompted you to write this comparative study?

(Shura and Democracy) is the subject of my PhD thesis for Al-Azhar Al-Sharif, where it was discussed and approved in 1980 (first degree with honours) as a comparative study. What prompted me was that overwhelmed innate longing rooted in my soul, since my childhood, that I owe to my parents, may God have mercy on them, to strive for justice, and seek justice for the oppressed, marginalized, weak, and the dispossessed. Hence, in this study, I sought to dismantle (5) pivotal issues that dominate the religious and political mentality in Islamic political thought, by employing tools and mechanisms of critical analysis, and came to the following understanding:

First: Public Shura is obligatory and it is a right for all citizens, educated and uneducated alike. Shura is not exclusive to the elite, or the aristocracy, senior scholars, dignitaries, luminaries, people of expertise and specialists, as is prevalent in the Islamic heritage.

Second: Shura is binding: meaning that the opinion of the majority of the people of Shura (51%) is a preponderant opinion that the government adheres to.

Third: The rule of majority on which contemporary democracies are based is a well-known rule in Islamic jurisprudence and applied in Islamic political thought, in contrast to those who allege that Islam is devoid from the principle of majority.

Fourth: Women are among the people of Shura, and it is their right to be a member of the Shura Council. Contrary opinions saying that Shura Council is a

A memorial photo of Prof. Abdul Hameed Al-Ansari (second on the right) with the teaching staff at the College of Law in 2005.

general guardianship forbidden for women should be discarded and is refuted in a special chapter in the book.

Fifth: Arab people are qualified for public political participation, unlike those who argue that they are not qualified because they lack political awareness and maturity, follow their whims and are ill-advised on choices.

What do you recommend to interested researchers and students in jurisprudence studies related to Shura and democracy?

I advise them to give themselves enough time to delve into comparative legal jurisprudence studies. Science and knowledge are ever developing and above every man of knowledge, there is someone more knowledgeable. Today, new studies have dealt with these topics with a contemporary critical view. I recommend them to focus on the critical approach, as these studies form your research aptitude. I also advise them to avoid any rush in writing before the idea is mature.

What are the motives behind your choice to publish your book in an academic publishing house such as Qatar University Press?

First: I am very proud of Qatar University, my prestigious University, being one of its members, and who does not wish his book be published at the level of Qatar University?

Second: Because it has professors, reviewers, copyeditors and a highly skilled production team. I was fortunate to have my book published; it is the dream of any author. With regard to my book in particular, it was of a special nature that required great attention for revision, scrutiny. It is an encyclopaedic knowledge of traditional sources of jurisprudence, doctrine, hadith, biography, history, and contemporary Islamic studies, other than dozens of constitutional references and political systems, in addition to periodicals, magazines and newspapers, which formed footnotes that occupied half of the book.

Third: Supervising the printing and publishing of such a book was a strenuous process. However, Qatar University Press was able to print and publish the book in a joyful, record time, artistic form, in line with the Shura Council elections.

In fact, I am thankful, appreciative and grateful to the efforts made. I am grateful to all members of this achievement who took responsibility and performed it faithfully. I especially thank the President of the University, Dr. Hassan bin Rashid Al-Dirham, and Prof. Maryam Al-Ali Al-Maadeed, Vice President for Research and Graduate Studies, as well as my brother, Prof. Talal Abdullah Al-Emadi, Director of Qatar University Press.

QU Launches Annual Research Forum and Exhibition 2021 under the Theme "Building Resilience at Universities: Role of Innovation and Entrepreneurship"

The Annual Research Forum and Exhibition (QUARFE) is one of the most prominent events at Qatar University. It gathers research achievements as well as distinguished researchers and students every year. It also attracts many researchers inside and outside Qatar University, in addition to partners and decision-makers. Activities of the 2021 forum started on October 20 in the Research Complex building with live streaming via WebEx. A number of ministers and senior state officials, and HE Dr. Hassan bin Rashid Al-Dirham, President of Qatar University, his deputies and those interested in scientific research affairs attended the event. The Forum was organized by the Office of Vice-President for Research and Graduate studies, under the theme "Building Resilience at Universities: Role of Innovation and Entrepreneurship," as flexibility is closely linked with creativity and innovation, and because it is essential for adapting to changes and a key to effective solutions of problems and challenges.

Part of the attendees of the Qatar University Annual Research Forum and Exhibition 2021, during the opening speech of HE Mr. Ahmad bin Mohammed Al-Sayed, Minister of State and Chairman of the Board of Directors of the Free Zones Authority.

QUARFE aims to highlight QU's approach in addressing issues and challenges facing the society. This approach relies on research, which is based on active and vibrant partnership with industry and various stakeholders, including institutions and research centers. QU aims to achieve research-driven learning, discovery and entrepreneurship through this approach. The forum also helps QU researchers and students to take advantage of the opportunities provided by respective partners. It highlights QU's significant and award-winning research progress that promotes the University's vision and supports Qatar's research priorities and goals of the Qatar National Vision 2030.

The theme of the Forum is in line with Qatar National Vision 2030 related to economic and social development projects of the State. Building resilience plays a special role in QU educational and research strategic plans, which adopts theoretical and practical policies and programs that help in preparing graduates to adapt and keep pace with conscious changes and innovating successful solutions to meet the needs and requirements of the society.

QU Press published the Forum Proceedings booklet, which included speeches from distinguished guests. In his speech, HE Dr. Hassan bin Rashid Al-Dirham stated that the pandemic was an affliction that tested QU's flexibility. It was an opportunity to reduce dependence on traditional working methods, use modern technology in developing adaptive skills, virtual academic and administrative performance, continue implementing plans and projects as well as provision of services, and finally maintain health and safety of University employees and students.

The opening session of the Forum included a statement from HE Mr. Ahmed bin Mohammed Al Sayed, Minister of State and Chairman of the Board of Directors of the Qatar Free Zones Authority, in which he praised Qatar University's research development and its high rank in the list of world's best universities. The keynote speech of the Forum was given by HE Dr. Abdulla Al-Subaie, Minister of Municipality and Environment and Managing Director and CEO of Qatar Rail, who expressed his delight to participate in such a crucial Forum organized annually by Qatar University, appreciating scientific and research development witnessed by the University as a result of the efforts of its management, faculty members, employees and students. He also stressed

Honoring the winning students of the National Competition 3MT (three-minute thesis) 2021.

Honoring researchers with the Qatar University Award for Research Excellence.

the importance of flexibility in implementing projects through the experience of Qatar Rail, which plays a vital role in the country's efforts to create a diversified, sustainable economy, complete mega projects, while dealing with relevant challenges.

Prof. Mariam Al-Maadeed, QU Vice President for Research and Graduate Studies, gave an overview of Research and Graduate Studies activities at Qatar University, and welcomed guests and participants of the Forum. She stated that QU research and graduate studies sector is paying increasing attention to the issue of resilience and innovation in research and education, in order to enhance capabilities of the emergency and current needs, preparedness and to anticipate the future and surprises in light of the lessons learned from the pandemic.

Dr. Al-Maadeed indicated that, in this context, QU launched a plan for basic and transformational research priorities in line with the State's National Development Strategy. "We periodically review programs and policies to help localize technology, meet requirements of innovators, support patents, develop grants, financing, marketing, internal and external partnerships, and other practices that support the contribution of research centers and researchers to building the economy of knowledge and sustainability," she said. Dr. Mariam stressed that QU continues to expand and update its graduate programs and provide students with opportunities and qualifications so that they would graduate as successful cadres fit for the labor market and capable of innovating in investment and entrepreneurship.

As part of the Forum's program, winners of Research Excellence and QU Innovation Awards were honored, and after the speech of Mr. Todd Creeger, President of ConocoPhillips Qatar, the sponsor of the National 3MT Competition 2021, winners were honored as well.

The Forum included a research exhibition in which QU colleges and research centers participated. Additionally, 250 research posters were virtually displayed. Awards ceremony and three panel discussions with the participation of faculty members and researchers, distinguished representatives from government entities, and international partners were also part of the Forum events. These panel discussions focused on the Forum's theme as follows:

First Panel Discussion: "Role of Universities in Transforming Society: Challenges and Practices." It focused on the role of the University in developing social and human sciences that are pivotal for transforming society. In the meantime, identity, traditions, and customs of the Qatari society, Arab culture, and Islamic values must be preserved. Discussions focused on significant planning areas that are necessary for developing strategies for societal transformation.

Second Panel Discussion: "Towards the Implementation of Sustainable Development Goals (SDGs)." The University should play a leading role, preparing the students to contribute to a sustainable future for all. The panel was a great opportunity to shed light on the recently launched Academic Network for Development Dialogue (ANDD). UNESCO, UN Economic and Social Commission for Western Asia (ESCWA), and the Academic Council on the United Nations System (ACUNS) participated in the discussion.

Third Panel Discussion: "Knowledge-based, Innovation and Entrepreneurship Driven Research and Teaching." The panel was about the fact that QU has built an enabling strategy to lead the University to excellence in education and research. This strategy stresses the role of innovation and entrepreneurship in facing challenges and adapting to changes and disruptions.

At the end of the Forum, awards were distributed to the participating researchers in the following categories: Visual Presentation Challenge Awards, Research Poster Awards, Best Graduate Studies Research Awards, in addition to Excellence Awards in Master's Thesis and Doctoral Thesis, and finally, QU winners of the National Three Minute Thesis (3MT) Competition were honored.

Part of the QU President tour and the Ministers in the Research Exhibition on the sidelines of QU Forum.

ANDD Students participate in QU's Summer Research Internship 2021 Program

QU Summer Research Internship is a program for undergraduate and graduate students that provides training in research methods, characterization techniques, application processes, and technical writing. Below mentioned are the ten research centers that organized the Summer Research Internship 2021 in 29 subjects, and a total of 194 students attended the internship:

Central Laboratories Unit (CLU), Laboratory Animals Research Center (LARC), Center for Advanced Materials (CAM), Environmental Sciences Center (ESC), Social & Economic Survey Research Institute (SESRI), Biomedical Research Center (BRC), Young Scientists Center (YSC), Ibn Khaldon Center for Humanities and Social Sciences, Gas Processing Center (GPC), National Center for Education Development (NCED). The program was conducted online from 6 June to 4 July 2021 with the below objectives:

- Training QU students in research methods, techniques and enhancing their research skills.
- Building human capacity in areas of research to make a positive impact on society and the economy.
- Engaging more students in research projects and grants.
- Preparing students for the following stages of their research career.

Supporting research centers to attract young researchers to join as researchers for the first time, the students from the member universities of ANDD (Academic Network for Development Dialogue) also participated in the Summer Research Internship 2021. The ANDD was established to create synergy and strengthen the cooperation and dialogue between the United Nations (UN) and Academia. It acts as a think tank in the region to influence UN's work and the global dialogue on policy options to support the Sustainable Development Goals. ANDD is a source of partnership between universities and educational institutions regionally

Virtual event honoring the students participating in the summer research-training program.

and worldwide with the United Nations Economic and Social Commission for Western Asia (ESCWA) supported by the Academic Council on the United Nations System (ACUNS) and Qatar University (QU). The network aims to support knowledge exchange between the UN and the Academia in the Arab region. It focuses on dialogue, facilitate collaboration between two schools of thought (the academic and non-academic), and cooperate in sharing knowledge.

In the Summer Research Internship 2021, 47 students from 14 ANDD member universities submitted the registration form, of which 23 were selected and 18 completed the internship. Moreover, they received the completion certificate.

The ANDD member universities that participated in the QU summer Internship 2021 are:

Four universities from Lebanon: American University of Beirut, Beirut Arab University, Saint Joseph University, UNESCWA. Four universities from Morocco: Mohamed V University, University Cadi Ayyad, University Sidi Mohamed ben Abdellah, Al Akhawayn University, and two universities from Malaysia: International Islamic University Malaysia and Universiti Teknologi Petronas, In addition, Mogadishu University from Somalia, Al QUDs University from Palestine and University of Jordan from Jordan, and finally the Doha Institute from Qatar.

QU Hosts the First National competition in Qatar:
Three-Minute Thesis (3MT) 2021

A group picture of the winning students in the competition with Prof. Mariam Al-Maadeed, the VP for Research and Graduate Studies, Chair of the Competition's Sponsor (ConocoPhillips Qatar), and the Competition Jury.

Qatar University celebrated its phenomenal growth and diversity in graduate education on Saturday October 9, 2021, at the first-ever National 3MT Competition. The 3MT (three-minute thesis) competition was founded by University of Queensland in 2008, and QU has held the 3MT on its campus since 2015.

Understanding the invaluable student learning experiences gained through events such as this and recognizing 3MT as a great opportunity to strengthen collaborations among universities, QU was keen to lead the extension of the competition locally and regionally. In late 2019, QU began approaching all higher education institutions in Qatar offering thesis-based graduate programs to support the organization of 3MTs on their campuses and to invite their participation in the national competition. The response was remarkable leading to several universities organizing their first 3MTs in 2020.

Although the national competition was originally scheduled for April 2020, the event was postponed due to the COVID-19 pandemic; however, Qatar University was finally able to physically welcome participants and attendees from seven universities to its campus this past weekend. Seventeen finalists representing Qatar University, Texas A&M at Qatar, Virginia Commonwealth University, School of the Arts, Qatar, University of Calgary, Qatar, Doha Institute for Graduate Studies, Hamad bin Khalifa University, and Al Rayyan International University College presented the significance of their theses in three minutes to a panel of distinguished judges and a general audience of nearly 500 attendees at the hybrid event.

H.E. Dr. Ibrahim bin Saleh bin Khalifa Al Naimi, Undersecretary of the Ministry of Education and Higher Education opened the national finals by highlighting the increase in higher education institutions in Qatar in recent years, particularly in

Part of the 3MT competition attendees.

the private sector, which provides more opportunities for students in Qatar to pursue higher education.

Qatar University President, H.E. Dr. Hassan Al Derham, praised The National 3MT Competition, as another good step on the path to strengthening collaboration among higher education institutions in Qatar and for encouraging talents and building capabilities. He said, "its returns are not limited to the prizes awarded to winners, but rather a bridge between contestants and the audience and their move towards the labor market as strong researchers and scholars who are ready for the challenge of leading the progress and prosperity of the society."

In addition, Mr. Todd Creeger, President of event sponsor, ConocoPhillips Qatar, reiterated that the National 3MT Competition is a monumental event celebrating graduate education in Qatar and the remarkable research efforts of some of the country's finest scholars. It is our honor and privilege to support this unique event because we fully understand the important role research plays in advancing society and the invaluable contribution of Qatar's graduate students.

National 3MT judges, Dr. Khalid Al-Ali, Acting Assistant Undersecretary for Higher Education Affairs in the Ministry of Education and Higher Education, Dr. Samer Adham, Manager, Global Water Sustainability Center, ConocoPhillips - Qatar, Dr. Buthaina Al Ansari, Strategic Planning and Human Development Expert, Emad Al Khaja, CEO of Injaz Qatar and Mohamed Al Jefairi, Consultant in Innovation Management, were tasked with the challenge of selecting the top three finalists from among the competitors.

Taking first place and a cash prize of QAR15,000 was Sara Amani from the doctoral program in Interdisciplinary Engineering at Texas A&M, Qatar.

3MT® THREE MINUTE THESIS
FOUNDED BY THE UNIVERSITY OF QUEENSLAND

In her winning presentation, Sara spoke about her research, investigating the appeal of Engineering profession among women in Qatar and the importance of addressing women's concerns about the workplace to realize the Qatar National Vision (QNV 2030). Qatar University's Nour Hisham Al-Ziftawi from College of Pharmacy took second place and a cash prize of QAR10,000 for presenting her research comparing the safety, effectiveness, and affordability of two breast cancer treatment medications. Third place and a prize of QAR7,000 was awarded to Muhammad Danyal Imam of the Master of Science program in Chemical Engineering at Texas A&M, Qatar for presenting his research on photocatalysis and the development of green hydrogen as an alternative fuel. Additionally, the audience-voted People's Choice Award was presented to Amani Allouh of the Curriculum and Instruction program at Qatar University's College of Education for presenting her research on teacher self-efficacy during emergency online teaching in government schools in Qatar.

In her address to the competition winners and other national finalists, Professor Mariam Al-Maadeed, Vice President of Research and Graduate Studies at Qatar University, said, "You are all role models for the quality of graduate research in Qatar, and you have proudly represented your universities today". Professor Mariam went on to thank the participating universities for supporting the efforts of finalists as they prepared for the national stage and, once again, extended an invitation to participate at next year's competition.

Office of Graduate Studies:

Engaging Activities in Support of Graduate Students

1- Graduate Studies Orientation

Student Affairs at the Office of Graduate Studies is regularly holding an event for newly admitted students in each semester. The event focuses on the most important postgraduate policies related to study load, dropping classes, fees for dropping courses, academic probation, academic dismissal and the process to apply for appeal. During the event, students got to know the Graduate Studies Office, its members and the services provided by each department within the office, which includes 1) student affairs, 2) academic affairs, and 3) academic support for students. The event is usually held one day before the commencement of classes every semester, and this semester, it was on 14 August 2021. For more information, watch our event video here:

https://www.youtube.com/watch?v=PYZAVMI-TA3U

2- Graduate with Excellence

This event was held for the first time this year on September 7, 2021 with the aim of educating all graduate students on how to achieve the goal of graduating with excellence. The focus of the event was on several topics of interest to students who are in their final year, such as the importance of publishing in journals with high rating, the process of making their theses and dissertations available at QU library, obtaining the approval of the IRB (Research Ethics and Integrity), which is responsible for approving research that involves the study of living tissues, samples, or animals, as well as authorizing the questionnaires to be used to collect information for a particular study. The event also clarified the requirements of applying for graduate student awards. These awards include best thesis/ dissertation, best scientific research. It also explained the criteria for achieving research excellence, which will be honored at the graduation ceremony. This event was held virtually, and can be viewed through the following link:

https://youtu.be/3n6fFYlnnFE

3- Open day

On September 13, 14 & 15 of this year, the Office of Graduate Studies held an open day for graduate programs, targeting students who wish to complete their graduate studies, whether from inside or outside the university. Assistant deans for research and graduate studies and the heads of departments from each college were invited to attend the event in the auditorium in the Research Complex. College representatives talked about the programs currently offered in their colleges and programs that will be offered in the future. In addition, there were also representatives from Admission Department and International Students Department, focusing on admission process, conditions and the criteria

for selecting students. In addition, some students who have been accepted in graduate programs recently were invited to talk about their admission experience and how they prepared for it. The event was broadcasted live on Youtube. You can watch the video here:

Day 1: https://www.youtube.com/watch?v=YfNVb3Jjzrw&ab_channel=QatarUniversityResearch

Day 2: https://www.youtube.com/watch?v=oiZMXc7Tu80

Day 3: https://www.youtube.com/watch?v=VKYlQddNmy4

4 - Graduate Assistantship ... Development for Innovation

"Graduate Assistantship" for post-graduate students in Qatar University is an important activity in which students can participate during their study in the University. In addition to the financial benefits, it offers students an opportunity to be more acquainted with the research practices and communicate directly with the professors experienced in their field of study. Thus, students can deepen and increase their knowledge in the chosen field.

Unified Graduate bylaw was approved in May 2018 and was implemented in the fall of the same year. It is set to open positions in each college considering its needs and the evaluations of applicants to fill the position.

In 2021, these positions were created to support the research activities in QU and deepen the students' specialization concept through assigning tasks relevant to their field of study/thesis. The positions were crafted and chosen according to research proposals of the post-graduate university faculty.

Benefits of Updated GA Version:

1. Encouraging and training outstanding students to continue their research work as a career, in an effort to apply QU research strategies aiming at fulfilling the State's need of researchers.
2. Increasing research productivity and innovation in all the research centers and colleges of QU (Researchers – Academics).
3. Contributing to enhancing QU ranking through promoting high quality research productivity.
4. Increasing and enhancing the quality of post-graduate students' research, especially PhD Students, and ensuring that these research papers, theses and dissertations are compatible with the research priorities of the University.

To this end, a set of criteria were established to select research proposals and candidates.

Research Proposal Selection Criteria:

1. The supervisor must be a full-time faculty member (whether in a college or research center) and has the status of "post-graduate studies faculty member" from the Office of Graduate Studies.
2. The supervisor must have a proven track record of papers published in scientific journals, as well as experience in leading research teams and scholarship management.
3. Research proposal must be compatible with the research priorities in QU.
4. Only one research proposal shall be approved for each (faculty member/ researcher).
5. Research proposals including international cooperation (mutual supervision) and industrial cooperation (industrial PhD) shall have priority in selection.
6. A Faculty member who does not have an internal scholarship shall have priority in selection.

Student Selection Criteria:

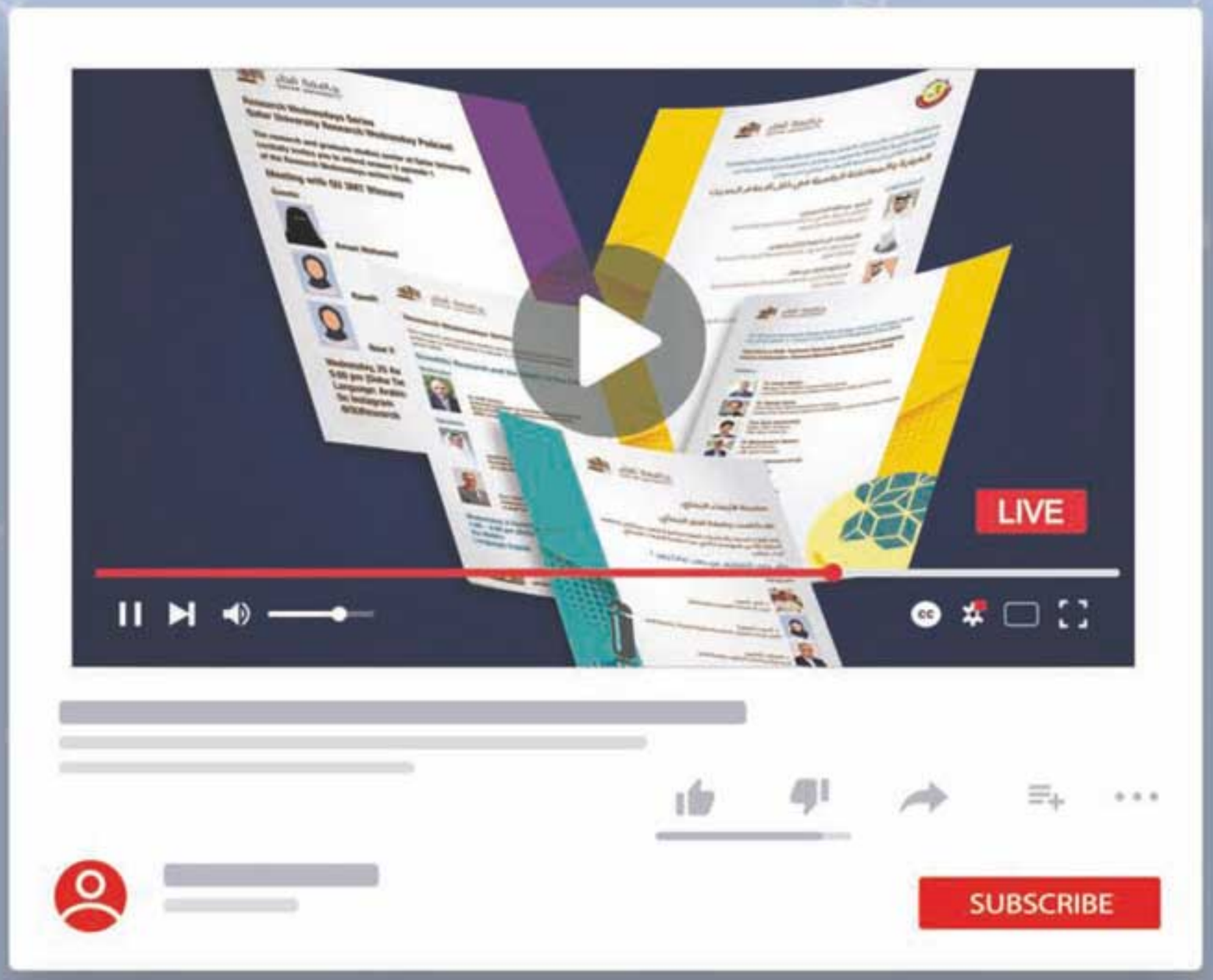
1. The candidate must have a bachelor/ master's degree with a GPA of no less than 3.2 out of 4.
2. PhD candidates must have a list of publications of their master's Degree research.
3. Candidates must fulfill the academic program requirements.
4. Candidates who have GSRA scholarship or other scholarships are not eligible to apply to this position.

It is worth noting that all students, especially those working as Graduate Research Assistants, must register their theses in Tadees, a program that registers all thesis stages starting from the research proposal, conducting all necessary audit/ review, and provision of final approval thereon by the supervisor. During the six steps of the program, the thesis must be approved by the dean, assistant dean for post-graduate studies and research, program coordinator and the supervisor. These approvals, if granted, will give academic value to the thesis.

5 - TADESS (Thesis and Dissertation Electronic Support System) Training Sessions

TADESS is a program that follows up with graduate students during their thesis/dissertation stage. The use of this program starts from the preparation of the proposal until the thesis defense and approval. The program includes the participation of various members from the student's college, including the supervisor, program coordinator and assistant dean for research and graduate studies. It also includes the participation from the Office of Graduate Studies, including the assistant dean for student affairs, and admins from the graduate studies team who supervise the external examiner communication process, and supervise the compliance of the formatting standards for theses/dissertations. During the sessions, there was a live presentation about TADESS Program and implementation of its various stages. Questions from the representatives of each college were answered, and their opinions and comments were taken into consideration to help improve the program in the future.

Research Wednesday Series: **Second Season**



Qatar University Research
For WebEx

QU Research
Live Instagram

QU Research
Podcast

Second season research seminars of the Research Wednesday Series started at QU on 25 August 2021. Research WednesdaySeries is a series of biweekly research seminars organized by the Office of the Vice President for Research and Graduate Studies on Wednesday. They highlight published scientific research, human and social research, inventions and innovations, local and global issues. They also discuss research achievements, student's research and activities at QU and the outcome of the research grants. These seminars will take place on three main online platforms: WebEx, Instagram, and Podcast.

From left: The session's moderator, Mr. Saleh Al-Nuaimi, Ms. Hind Al-Ibrahim, and Dr. Nayef Nahar Al-Shamari, during the second season's fifth session of the Research Wednesday Series.

The episodes discuss topics in a simple scientific manner, aimed to show excellence and diversity in scientific research, and actively participate in keeping up with current research issues. This will contribute to achieving QU's vision and mission in research excellence and knowledge contribution.

Researchers from QU's colleges and research centers as well as a selected group of researchers in all research and educational institutions within Qatar and abroad participate in the seminars. These participations contribute to strengthening relations and enhancing cooperation and partnership between QU and the State institutions. They also create an environment of communication between the researcher or inventor and the public to clarify the importance of research to the society and how to optimize their utilization.

In the first episode of Season 2, via Live Instagram, the Research and Graduate Studies Sector honored the winners of National 3MT Competition. The episode was allocated to meet the QU winners, including Rawdha Ali Al Hammadi, Amani Mohammed Al-Louh, and Nour Hisham Al-Ziftawi.

The second episode was held via Webex platform. It was titled "Scientific Research and, the COVID-19 Vax Debate," and it was moderated by Dr. Hadi Yassin, Associate Professor of Infectious Diseases and Section Head of Research at QU-BRC. The episode hosted Sheikh Dr. Mohammed Bin Hamad Al-Thani, Director of Public Health Department at the MOPH, and Dr. Laith Abu Raddad, Professor of Infectious Diseases Epidemiology at Weill Cornell Medicine – Qatar.

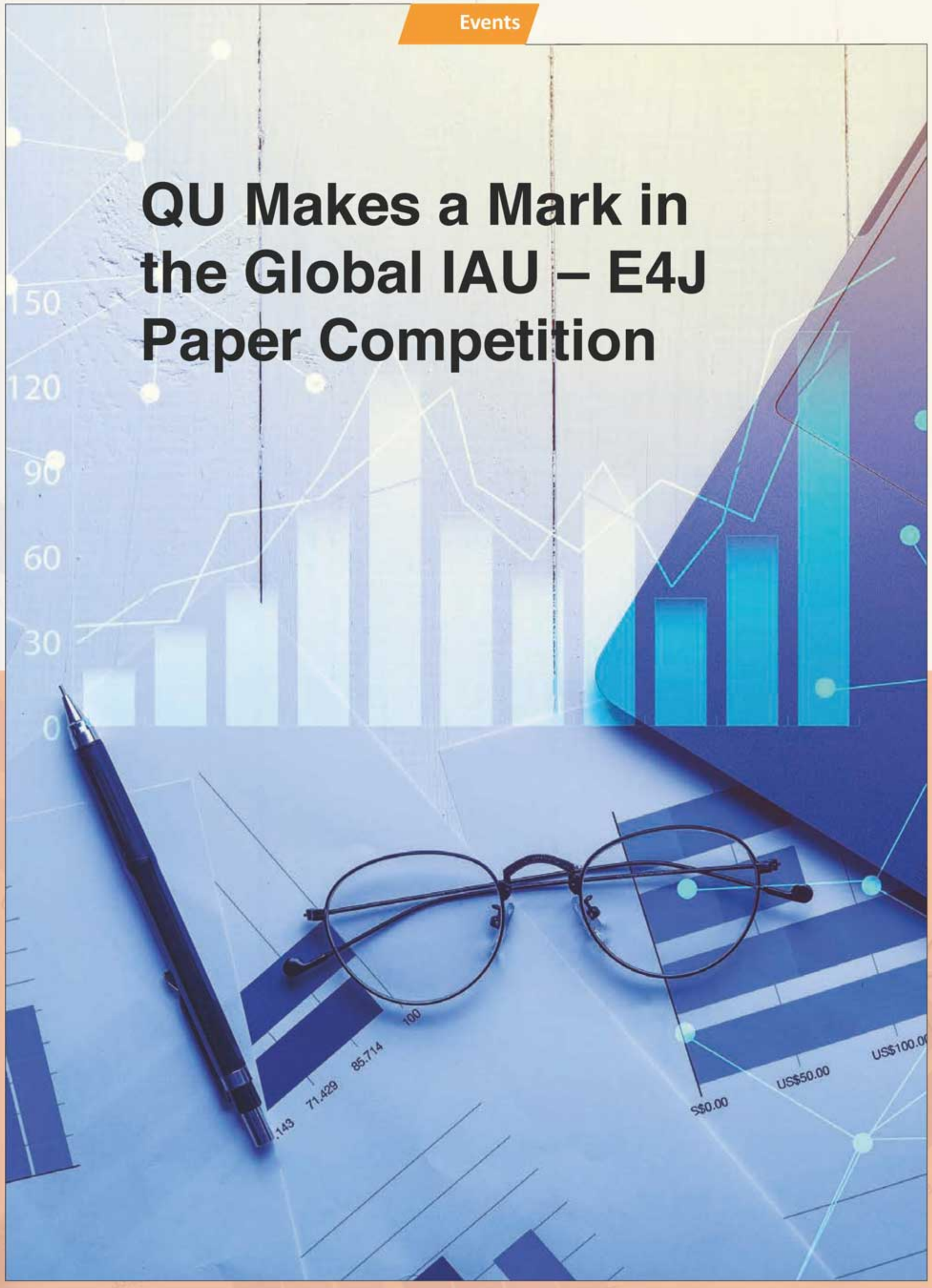
The third episode was titled "Studying Remotely: What Would Be Next?" and held via QU Podcast. It discussed distance education as essential solutions that many states have used during the COVID-19 pandemic. The episode also discussed distance education experience, its advantages, affected groups, and other relevant aspects. The episode hosted Dr. Ahmed Al-Oun, Dean of QU Graduate Studies, Dr. Asmaa Al-Attiyah, Head of Psychological Sciences Department – QU College of Education, and Dr. Mahjoub Al-Zweiri, Director of Gulf Studies Center at QU. It was moderated by Dr. Shaker Ayadi, Lecturer in Mass Communication Department at the QU College of Arts and Sciences.

The fourth episode was titled "Innovation in Water Treatment Technology & Importance of Academic Industry Collaboration: Advanced Membranes Fabrication Case Study." It was held via Webex platform. The episode hosted Dr. Samer Adham, Manager Global Water Sustainability Center, ConocoPhillips Qatar and Adjunct Professor, CAM, Qatar University; and Dr. Alamgir Karim, Dow Chair and Welch Foundation Professor, Director of the International Polymer and Soft Matter Center at the University of Houston. A number of the Center for Advanced Material's researchers at QU participated in the episode, including Prof. Syed Javaid Zaidi, QAFAC Chair Professor, CAM, QU; Dr. Mohamed Hassan, Assistant Professor, CAM, QU; and Dr. Maryam Mohammad Al-Ejji, Assistant Professor, CAM, QU. It was moderated by Dr. Aboubakr M. Abdullah, Hydro/Qatalum Chair Professor, CAM, QU.

The fifth episode was titled "Digital Identity and Citizenship in Modern Media," held via Webex platform. The episode hosted Dr. Nayef Nahar Al Shamari, Director of Ibn Khaldon Center for Humanities & Social Sciences at QU; and Ms. Hind Al-Ibrahim, Lecturer of TV and Digital Journalism at the Department of Mass Communication at QU. Additionally, Mr. Abdullah Al-Kubaisi, Acting Secretary-General of Qatar National Commission for Education, Culture and Science; and Dr. Kaltham Al-Ghanim, Director of Social & Economic Survey Research Institute at QU, participated in the episode remotely. It was moderated by Mr. Saleh Al-Nuaimi, Senior Engagement and Communication Specialist in Research and Graduate Studies Sector at QU.

The episodes of the Research Wednesday Series will continue to cover key research achievements at QU. To watch full episodes, you can visit Research Wednesday Series website in Research and Graduate Studies Sector at QU.

QU Makes a Mark in the Global IAU – E4J Paper Competition



Qatar University was part of the peer review and paper submission for the United Nations Office on Drugs and Crime (UNODC) and the International Association of Universities (IAU), IAU – E4J Paper Competition for Young Researchers: Higher Education engages with SDG 16: Peace, Justice and Strong Institutions, within the framework of the Education for Justice (E4J) initiative. Dr. Talal Abdulla Al-Emadi, QU Press Director, represented QU in the experts evaluation committee and Dr. Imad Ibrahim, Research Assistant Professor at QU College of Law, Center for Law and Development presented a paper which was among the 13 papers selected in the competition. Dr. Imad's research paper is entitled: "The importance of International Corruption Law and International Environmental Law to achieve SDG16: An analysis of Global Instruments Addressing Environmental Corruption." The outcome of this collaboration is an Open Access publication of 12 outstanding and unique research papers from young scholars around the globe which can be accessed via this link: https://www.iau-aiu.net/Higher-Education-engages-with-SDG-16-Peace-Justice-and-Strong-Institutions-1298.

A recorded virtual launch event for publication and announcement of the selected authors, involving discussion on important topics related to SDG16, Higher Education, and beyond took place on November 23 and can be accessed on the following link: https://youtu.be/7CNW51vvOUk.

Commenting on the importance of the event, HE QU President Dr. Hassan Rashid Al-Derham, said, "Qatar University attaches great value to such events and initiatives that aim at enhancing peoples' standard of living and the overall socio-economic development of those in need. Our participation in SDG16 is a commitment to working for unravelling the benefits of SDGs through the use of higher education by making QU as a platform of expression for such steps to global development."

Prof. Mariam Al-Ali Al-Maadeed, Vice President for Research and Graduate Studies at QU also gave her views on the event, she said, "Research gives us the ability to create a better understanding and helps us lay solid foundations of emerging scientific concepts, which in turn motivates us to work for the betterment of humanity. Perhaps, this is the purpose of pursuing the initiative of SDG 16, that we are able to play our role for the collective human good. Qatar University's role in pursuing such an endeavor will always generate positive outcomes and help in conveying to the world how higher education and particularly research can fasten our journey in achieving SDG objectives."

Dr. Imad Ibrahim

Dr. Talal Abdullah Al-Emadi

Dr. Talal Abdullah Al-Emadi, QU Press Founding Director and Oil and Gas Law Professor, and a member evaluation experts committee said, "Qatar University has done a lot in pursuit of publications that advocate for the role of higher education in enhancing Sustainable Development Goals. This particular event has provided an opportunity for us to share our views and evaluate some outstanding contributions from the youth towards the SDG 16 initiative, e.g. how higher education can create the atmosphere for realizing these goals for the betterment of the world and hence a better global future. In view of the same, QU Press intends to publish more research-based studies on the concept of Sustainable Development to help ensuring commitment to this global initiative."

Along with the honor of having his research paper selected, Dr. Imad Ibrahim commented, that, "SDG 16, which is focused on peace, justice and strong institutions, is seen as one of the most important goals adopted by the international community. Goal 16 includes several targets and indicators, including corruption prevention, which is extremely difficult to address. This is mainly because of the absence of rule of law or institutional corruption, which is why, this research collaboration, was extremely needed to address this interplay."

It is worth noting that the "Education for Justice" initiative was envisaged in the Doha Declaration Global Program during the 13th United Nations Congress on Crime Prevention and Criminal Justice 2015, funded by the State of Qatar. The Education for Justice (E4J) initiative seeks to prevent crime and promote a culture of lawfulness through educational activities designed for primary, secondary, and tertiary levels.

QU and QRail Conduct Disruptive Technology Applications Workshop

Dr. Abdelaziz Bouras delivering the project presentation at the workshop with Qatar Rail.

Qatar University (QU) and Qatar Rail (QRail) held the Disruptive Technology Applications Workshop (DTAW) on 22 November 2021, under the QNRF Supply Ledger NPRP11S-1227-170135 project, at QRail headquarters. The workshop was a hybrid and gathered many executives from reputed organizations as well as IT academics from renowned universities. The workshop focused on the impact of Blockchain, Artificial Intelligence, Fintech, Cybersecurity and other Disruptive Technologies on industry and business sectors.

Dr. Khalid Kamal Naji, Dean of the College of Engineering at QU, greeted the participants and expressed his contentment to see QU and QRail investigating together the evolution of such technologies for the industry. The workshop had the privilege of the presence of HE Dr. Abdulla Bin Abdulaziz Turki Al Subaie, Minister of Municipality MD & CEO of Qatar Rail who delivered the opening speech, highlighting the potential impact that disruptive technologies have on current and future mega-projects and supply chains.

In this context, Dr. Abdelaziz Bouras, Leader of the QNRF Supply Ledger project and Acting Director of QU's Office of Research Support, emphasized during his keynote the importance of real collaboration between academia and industry that gives students the opportunity of being trained well based on real case scenarios and prepare them to march forward towards Industry 4.0.

Additionally, the workshop included a technical panel discussion that was broadcasted as a live event to the virtual audience.

During the panel discussion, Mr. Basil Ayass, Education & Healthcare Lead at Google Cloud, stated that digital transformation is touching all sectors in reimagining businesses and organizations' culture. Dr. Guillaume Alinier, Director of Research at Hamad Medical Corporation highlighted from his side some challenges facing the implementation of new technologies in healthcare sector and clearly stated that those technologies are contributing to help decision-making.

Mr. Mansour Al-Mahmoud, Head of Business Products at Qatar Energy quantified multiple projects that are using disruptive technologies such as inspection oil plants with drones and intelligent oil fields. In addition, Eng. Ahmed AL Ansari, Technical Office Manager of Ashghal Public Works Authority, underlined during his intervention the improvement and efficiency as advantages as a result of using disruptive technologies such as Building Information Modeling (BIM) as well as the impact of such technologies on the AEC sector.

Dr. Lotfi Belkhir, Chair of eco-entrepreneurship at McMaster Univeristy in Ontario/Canada, stated that higher education institutions must align their research and objectives with economic imperatives, and encourage their students and researchers to participate in the creation of start-ups in the Disruptive Technology sector. Dr. Ibrahim Khalil, Researcher at RMIT University in Melbourne/Australia talked about the impact of Blockchains and Smart Contracts on the current applications and how computer science departments in the world are incorporating such topics into their curricula.

Moderators Dr. Belaid Aouni, Associate Dean for Research and Graduate Studies, College of Business and Economics at Qatar University, and Dr. Abdelaziz Bouras concluded the panel discussion by answering some selected questions queried by the audience and hoped to conduct other stakeholders' panels in order to keep in progress a fruitful discussion between the academia and industry.

QU Supply Ledger team took the opportunity to thank QNRF for its continuous funding and support.

For more details on NPRP Supply Ledger:

https://www.supplyledger.qa/

Supply Ledger Project

Biomedical Research Center (BRC) Organizes Workshop on "Viral Genomics and Bioinformatics"

The continuous emergence of new viruses such as the recent SARS-CoV-2, along with the ongoing evolution of new viral strains, raises the alarm about the importance of preparedness, planning, and building knowledge to ensure effective responses to emerging infectious diseases. In Qatar, where 1.5 million visitors are expected to enter the country during the coming FIFA World Cup 2022, in addition to the heavy influx of foreign labor, it becomes even more challenging to monitor and control the spread of viruses. Currently, one of the critical arms of the global response to understand and tackle emerging viruses is viral genome sequencing. In fact, genomic sequencing enabled the world to rapidly identify SARS-CoV-2 and develop suitable diagnostic markers and vaccines. In light of that, the Virology Unit in the Biomedical Research Center (BRC) at Qatar University organized a workshop on "Viral Genomics and Bioinformatics." The workshop, which was held from Oct 31 to Nov 4 2021, was organized by Dr. Hebah AlKhatib from Qatar University, with the support of Qatar Genome Program, and the sponsorship of Qatar Scientific Company. The training consisted of a series of lectures and hand-on sessions, to provide the participants with basic knowledge on viral genome sequencing and data analysis.

Part of the workshop at the BRC Center.

Workshop outcomes:

1. Participants gained basic knowledge on viral genome sequencing techniques, platforms, and data analysis.
2. Participants were able to analyze large sequencing datasets using graphical user interface (GUI) programs as well as command-line tools.
3. The workshop provided an environment for exchanging ideas and developing future collaborative projects between different stakeholders interested in virology research in Qatar, especially the trainees who represented different institutions and stakeholders in Qatar.