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QATAR UNIVERSITY

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Digital Technology

Health

Society

Resource Sustainability

Energy

Qatar University:

Launching the Strategic Research Priorities 2025 - 2030

- Inauguration of the MRI Unit
- Developing Humanities and Social Sciences at Qatar University
- Why Do Some People Age Faster Than Others?
- Special Coverage: Graduate Studies Awards

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Editorial

Prof. Aiman Erbad,

Vice President for Research and Graduate Studies, Qatar University

Distinguished Readers,

I am delighted to welcome you to this new issue of the Qatar University (QU) Research Magazine, a knowledge platform that reflects the University's creative research activity and highlights achievements that show the commitment to supporting scientific research and innovation, in colleges and research centers, through various initiatives and activities.

In this issue, we celebrate significant achievements, most notably the launch of the Strategic Research Priorities for 2025-2030. These priorities embodies QU's role as a key player in the national scientific research system by directing research efforts towards priorities that align with the goals of the Qatar National Vision 2030 in its four dimensions: human, social, economic, and environmental development.

The issue features the opening of the QU's MRI unit. We are also pleased to highlight the hosting of the first Gulf-wide "Three-Minute Thesis (3MT)" competition, a testament to QU's advanced position in the regional research and education landscape.

In addition, the issue highlights qualitative steps taken to launch advanced research grants aimed at developing the humanities and social sciences by exploring vital topics that are fundamental pillars of society, such as national identity, the family, and other local societal challenges. We also document the University's contribution to the national innovation system through the "Manara Innovation" platform.

We are closely following pioneering work in advanced healthcare and technology fields, and new horizons towards inventions with a tangible societal impact, such as the "Waleef" project, supporting smart driving, and natural plant extracts to combat agricultural pests.

We also highlight outstanding student contributions that demonstrate advanced awareness of environmental, legal, and health issues, including an article answering the question, "Can artificial intelligence be held legally accountable?" We also raise research issues on accelerated aging, the future of the Arabic language, and the environmental impact of plasticizers in water sources.

In line with scientific momentum, this issue's articles contribute to exploring the potential of plant resources for developing environmentally friendly alternatives, the environmental and economic benefits of smart polyurethane-based coatings, and their contribution to environmental sustainability. In addition, stories from researchers and students enrich academic knowledge and dialogue.

Finally, the Magazine concludes with a special coverage highlighting the Graduate Studies Office awards, which serve as an incentive for students to exert greater effort and creativity in the fields of research, education, and academic achievement.

I thank everyone who contributed to the production of this distinguished issue, including researchers, academics, students, and others. I hope that readers will find in its pages rich and inspiring scientific material that reflects QU's vision and mission as a solid and innovative national and scientific compass.

Qatar University Research Magazine is a publication issued by the Research & Graduate Studies Sector at 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: ECO.RGS@qu.edu.qa

The data and opinions appearing in the QU Research Magazine herein are the sole responsibility of the authors and do not necessarily reflect the opinions of the Research and Graduate Secror.

Driving Innovation: QU Outlines "Strategic Research Priorities 2025-2030"

Qatar University (QU) is preparing to launch strategic research priorities for the period 2025–2030, which embody the University's ambitious vision of being a leading national institution in academic and research excellence with a distinguished global reputation. It reflects the University's firm commitment to producing and disseminating knowledge that serves society and achieves sustainable development at both national and regional levels.

These priorities come within the framework of Qatar University's strategy, which aims to strengthen its role as a central hub in the national scientific research system by directing research efforts toward national priorities that align with the goals of Qatar National Vision 2030 as per its four objectives: human, social, economic, and environmental development. These goals are distinguished by establishing an integrated governance framework that ensures the optimal investment of research resources and directs them toward achieving a tangible impact in various vital sectors.

QU has adopted a comprehensive methodology to update and review its research priorities for the period (2021–2025). This methodology was based on the Third National Development Strategy, which focuses on the sectors of health, energy, digital transformation, environment, and education. Extensive studies were also conducted to align priorities with global research trends, as indicated by the 2024 Scopus database. In addition, the strategies of the relevant ministries were integrated into the study, with a focus on five strategic pillars that correspond to national needs and the challenges of sustainable development: health, energy, digital technology, resource sustainability, and societal development.

The Five Research Priority Pillars for 2025–2030 include:

1. Health

Research efforts in this pillar focus on developing innovative solutions in regenerative medicine and stem cell research, digital health and telemedicine, and artificial intelligence in healthcare, in addition to precision and personalized medicine based on genetic characteristics. This pillar also includes public health systems and epidemiology, with a focus on disease prevention and vaccine development.

Through this pillar, QU seeks to enhance the quality of healthcare and improve patient outcomes while addressing the ethical and security challenges associated with modern technologies.

2. Energy

Energy is considered a strategic pillar for supporting economic diversification and achieving environmental sustainability. Research focuses on enhancing the sustainability of oil and gas production, developing alternatives to renewable and clean energy, improving energy efficiency, and reducing carbon emissions. Efforts also include designing smart energy management systems and creating national policies that promote the transition toward a diversified and sustainable economy, while building a national research base capable of competing globally.

3. Digital Technology

The University is committed to supporting innovation in the fields of artificial intelligence, cybersecurity, high-performance computing, and big data analytics. This pillar aims to accelerate digital transformation in government and industrial sectors, support technological innovation, and develop advanced digital infrastructures that respect ethical and societal values, with a focus on enabling the digital economy and creating productive job opportunities.

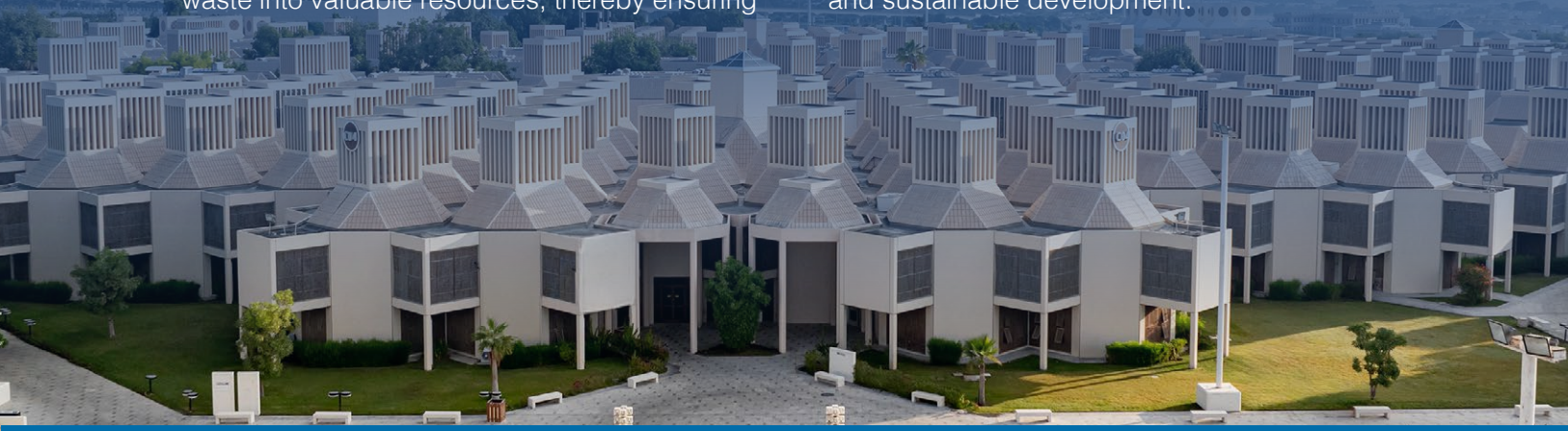
4. Resource Sustainability

This pillar reflects the University's commitment to protecting the environment and promoting the circular economy. Research encompasses biodiversity conservation, water and food security, sustainable construction development, and the management of smart infrastructure. It also seeks to develop innovative agricultural technologies, support recycling, and transform waste into valuable resources, thereby ensuring the sustainability of natural resources and achieving balanced environmental and economic development.

5. Society

This pillar focuses on building a cohesive and secure society that supports human and economic development. Research encompasses promoting digitalization and digital inclusion, advancing education, skills, and capacity building, supporting entrepreneurship and economic diversification, strengthening women's roles in society, and enhancing family cohesion. The pillar also addresses issues of national security and public safety, consolidates national identity and promotes active citizenship, and enhances Qatar's role in regional and global peace and stability.

Qatar University's strategic research priorities are integrated with internally and externally funded projects, as well as graduate programs. Internal grants align funding programs with approved research priorities, using specific and measurable performance indicators. Colleges and research centers play a pivotal role in achieving this integration through strategic planning, which enables them to meet the objectives of research priorities and ensure an effective contribution to national development. The University also emphasizes the importance of strategic partnerships with academic and industrial institutions locally and internationally. It encourages multidisciplinary research that serves more than one research field due to its broad impact and added value to the research ecosystem. Through this integrated approach, the University continues to solidify its position as a beacon of scientific research, anticipating future horizons and contributing to the development of a knowledge-based society, while supporting national ambitions for achieving comprehensive and sustainable development.



From left: Dr. Saeed Al-Meer, Prof. Aiman Erbad, and Prof. Ibrahim Al-Kaabi.

Ten Years of Leadership and Achievement:

Inauguration of Small Animal MRI Unit at the Laboratory Animal Research Center

On Monday, February 3, 2025, the Laboratory Animal Research Centre (LARC) at Qatar University (QU) held a celebration to mark ten years of leadership and achievement in the field of animal research to coincide with the inauguration of the Magnetic Resonance Imaging (MRI) Unit. The establishment of this unit is considered a major local and regional achievement towards enhancing the capabilities of the LARC and QU to enable researchers to conduct innovative research in various scientific fields. The unit was inaugurated by Prof. Aiman Erbad, Vice President of Research and Graduate Studies, in the presence of Dr. Ibrahim Al Kaabi, Vice President for Academic Affairs, Prof. Asmaa Ali Al Thani, Vice President for Health and Medical Sciences, Dr. Mohammed Ahmedna, Assistant Vice President for Health and Medical Sciences, Dr. Saeed Almeer, former Director of Research Support (Grants and Contracts), Dr. Hamda Al Naemi, Founder and Director of the LARC, and a number of the Center's staff members. The ceremony aimed to highlight the LARC's most significant achievements over the past decade.

Prof. Aiman Erbad, Vice President of Research and Graduate Studies, said in the opening ceremony speech: "Despite the recent establishment of the LARC, it has made outstanding achievements and provided valuable opportunities for researchers and students in research, education, training and awareness of the use of laboratory animal research to study various types of human diseases. LARC is

a national platform for developing scientific research in the biological, medical, and pharmaceutical fields, supporting researchers in all educational and research institutions. It can absorb increasing numbers of researchers and provide the best research platforms in animal research."

On this occasion, Dr. Hamda Al Naemi, Founder and Director of the Laboratory Animal Research Center, gave a presentation highlighting the excellence of the LARC in its pioneering role at both the local and regional levels. She emphasized its innovative design and operating methods, which adhere to international standards in this field, thereby ensuring sustainability and research quality. She noted that the LARC houses, under one roof, a Specific Pathogen-Free (SPF) rodent vivarium, diagnostic laboratories, and cell culture and research labs. Additionally, the LARC includes a live imaging unit equipped with the latest instruments and technologies available in animal research. Dr. Al Naemi also explained that the LARC provides support to researchers from both inside and outside the University through research partnerships and service contracts. Furthermore, she highlighted the center's effective role in developing distinguished professional and research talent, many of whom have secured prestigious positions in local and international job markets.

This was followed by a presentation made by Dr. Muralitharan Konar, Manager of Research Projects at the LARC, on MRI technology and the recent and future innovations that can be achieved using this device in various fields of science, including physical, biological, pharmaceutical, and pre-clinical sciences.

The ceremony's program included three panel discussions that focused on presenting examples of research projects conducted at the LARC through the participation of some researchers from inside and outside Qatar University, and talking about the use of animal models in their research achievements.

LARC is a platform that helps bridge the gap between different disciplines, supports multidisciplinary research, and paves the way for progress and innovation in basic, biological, biomedical, and pharmaceutical sciences. The Center continues to provide humane animal care, conduct animal research, deliver consultancy, and offer training and support to the academic staff, researchers, and postgraduate students at the national level. LARC is characterized by a system of close animal monitoring and humane and veterinary care programs provided by professionally licensed staff.

Qatar University Hosts a Special Academic Event

The First Gulf Edition of the Three-Minute Thesis (3MT) Competition

On 28 November 2024, a landmark day in the history of scientific research in the Gulf region, Qatar University hosted the first GCC edition of the 3MT (Three Minute Thesis) Competition. 3MT is an academic event that aims to enable postgraduate students to present their scientific research in a simplified and engaging manner in just three minutes. This initiative came to enhance students' scientific communication skills and enable them to communicate their research ideas without academic complexity, thus contributing to building an effective bridge between scientific research and society. The competition is expected to become an annual event, serving as a regional platform that contributes to supporting scientific innovation and enhancing academic communication.

Importance of the Competition

The 3MT Competition was first launched at the University of Queensland in Australia in 2008 and spread globally to become an academic event organized by hundreds of universities around the world. Qatar University has organized the national edition of the competition since 2019, but the 2024 edition was particularly significant as it marked the first time the event was held at the Gulf Cooperation Council (GCC) level. This milestone reflects the University's strong commitment to advancing scientific research and fostering academic innovation across the region.

The competition provides students with the opportunity to develop presentation and communication skills, and contributes to the dissemination of scientific research

in simplified and attractive ways. Consequently, it has a greater impact on society and motivates researchers to present their ideas in more compelling and persuasive ways. This edition witnessed the participation of several leading Gulf universities, including: Qatar University (Organizer), King Abdulaziz University, King Abdullah University of Science and Technology, Khalifa University, the American University of Sharjah, Kuwait University, Sultan Qaboos University, University of Bahrain, and Qatar Finance and Business Academy - Northumbria University.

Mechanism of the Competition

Each participant is given just 3 minutes to present their research, using only a single slide and without any additional effects. The judging panel evaluates the participants based on several criteria, most notably:

- The clarity and understandability of the research.
- The impact and persuasiveness of the presentation.
- The competitor's ability to communicate with the audience and communicate his/her idea effectively.

Results of the Competition

The participants fiercely competed, and the winners were as follows:

First place: Manal Sabah Abboud
Master of Science in Molecular Biology
Kuwait University - State of Kuwait

Second place: Egan Ozakuga
Master of Science in Finance
The American University of Sharjah - United Arab Emirates

Third place: Azza bint Hamad Al Aysariya
Master of Science in Nursing - Midwifery
Sultan Qaboos University - Sultanate of Oman

Audience Choice Award: Shahad Mohammed Al-Khair
Master of Science in Environmental Science
Qatar University - State of Qatar

Qatar University's organization of the first GCC edition of the competition is an important step towards enabling young researchers to communicate their research in an impactful way, which contributes to strengthening the Arabian Gulf's scientific presence in the international academic arena.

The competition also provides a platform to build vital presentation and communication skills that have become a necessity in today's world of scientific research.

For more details about the competition and upcoming editions, visit Qatar University's official website.

College of Education Excellence Awards in Research, Teaching and Community Service

Prof. Ahmed Mohammed Megreya

Associate Dean for Research and Postgraduate Studies at the College of Education, Qatar University

As part of the endeavors of the College of Education that seek to foster excellence, innovation, and creativity, the College has launched a range of awards that aim to honor outstanding educational scholars in research, teaching, and community service. These awards include the following:

(1) Distinguished Educational Researcher.

(2) Distinguished Research Group.

(3) Excellence in Teaching.

(4) Excellence in Service.

The Distinguished Educational Researcher Award supports the mission of the College of Education at Qatar University to provide a motivating environment for researchers to conduct research and improve the quantity and quality of its outcomes to contribute to enhancing the College's regional and international rankings. This award is granted on a competitive basis to academic members who excel in educational research, aiming to enhance the quantity and quality of educational research, including substantial theoretical and field applications locally, regionally, and globally. The winner of the Distinguished Researcher Award receives a certificate of appreciation and QAR 10,000. The evaluation criteria include the following:

1. Research publications in peer-reviewed scientific journals.
2. Peer-reviewed scientific books or book chapters.
3. Internal and external research grants.
4. Research quality indicators such as Citation Impact and H-Index.
5. Demonstrating a leading role in building research collaborations regionally and internationally.

The Distinguished Research Group Award was established as part of the College of Education's strategy to promote effective collaboration among faculty members within or across fields, and to contribute to enhancing the ranking of the College of Education at Qatar University in educational research regionally and globally. This award is presented on a competitive basis to the best research group to encourage researchers to work together and make innovative and high-quality contributions in the fields of educational research. The winners of the Distinguished Research Group Award receive a certificate of appreciation and QAR 20,000 to be distributed equally among the members of the research group. The evaluation criteria include the following:

1. Research submitted for publication and its quality: The research group should have high-quality and scientifically valuable research published/submitted in peer-reviewed scientific journals with high impact factors. This research must enrich the theoretical field and educational practice with effective insights and provide innovative educational solutions to current educational challenges.
2. Research grants: The research group provides

evidence of having received (or at least applied for) internal or external research grants.

3. Sharing research findings: The research group provides evidence of sharing the research findings with the stakeholders through workshops, presentations, or scientific conferences. This plays a vital role in promoting knowledge exchange and encouraging collaboration between CED researchers and other academic institutions.
4. Relevance of the research effort to societal educational challenges: The efforts of the research group must be closely linked to addressing current societal educational challenges, thereby contributing to developing innovative and effective solutions to improve the educational process and meet the needs of society.

The idea of the Teaching Excellence Award also emerged within the framework of the mission of the College of Education at Qatar University. It aimed at ensuring the quality of teaching in higher education and improving educational practices to achieve excellence in teaching and learning outcomes. The winner of this Teaching Excellence Award receives a certificate of appreciation and QAR 10,000.
The evaluation criteria include the submission of a teaching portfolio, which should include the following elements:

1. Teaching philosophy: The applicant must present his/her teaching philosophy in no more than one page.
2. Excellence in teaching and learning and achieving graduate attributes: The applicant must provide evidence of the extent to which the courses taught fulfil the areas of excellence in teaching and learning and the attributes of graduates.
3. Quality and variety of the teaching methods: The applicant must demonstrate the effective use of a variety of teaching methods in a manner that achieves the learning objectives of each course.
4. Developing and improving the courses: The applicant must showcase a remarkable effort in developing a course, enriching it to ensure the competitiveness of graduates in the labor market, and must update the content of the course by using the latest educational and technological sources, of books and scientific articles.
5. Use of technology in teaching and learning: The applicant must demonstrate an effective use of technology in teaching and learning

Group photo of the winners of the Excellence Awards in Research, Teaching, and Community Service during the Annual Research Forum of the College of Education.

that contributes to the achievement of learning outcomes.

6. Quality and variety of assessment methods: The applicant should demonstrate the adoption of constructive and varied assessment methods to ensure the achievement of the learning outcomes of each course.
7. Assessment of learning: The applicant should provide a detailed description of how he/she support students to enhance their strengths and develop their skills or identify and improve their weaknesses.
8. Collaboration: The applicant should demonstrate co-operation with colleagues through discussion and active participation concerning the strategies of teaching the scientific material, experimenting with electronic applications or new educational programs, and providing sources that enrich the scientific material.
9. Student Assessment: The applicant should attach the student assessment results for the courses of the last three semesters, and provide statistics on the number of students who received different grades (from A to F) in these courses.

Finally, Community Service Excellence Award was established in line with the College of Education's mission to further activate the College's pioneering role in designing, implementing, and evaluating educational programs and projects that enhance the quality of academic, professional, and community aspects in Qatar, and to motivate the faculty members to actively participate in providing high-quality educational service programs and projects. The winner of the Community Service Excellence Award obtains a certificate and QAR 10,000. The evaluation criteria include participation in high-quality community service programs and projects, a provision of realistic solutions, and sustainable, positive impact. Applicants for this Award should submit a file containing evidence of their outstanding contributions to the following:

At the State level:

1. Service or consultancy projects for governmental or private educational institutions.
2. Chairmanship or active memberships in committees of governmental or private institutions.

At the University level:

1. Service or consultancy projects at the University level, which contribute to the development of higher education outcomes at Qatar University.
2. Chairmanship or active membership in committees at the University level.

At the College level:

1. Service or consultancy projects at the College level that contribute to the development of higher education outcomes at Qatar University.
2. Chairmanship or active membership in committees at the College level.

At the level of the department or center:

1. Service or consultancy projects at the department/center level that contribute to the development of higher education outcomes at Qatar University.
2. Chairmanship or active membership in committees at the department/center level.

During the College of Education's annual research forum, which is a prominent platform celebrating the achievements of these distinguished individuals, the winners of the Excellence Awards in Research, Teaching, and Community Service were honored. The Distinguished Educational Researcher Award was won by Dr. Youmen Shaaban (Research Associate at the Educational Research Center). The Distinguished Research Group Award was granted to Dr. Ali Al-Odat (Associate Professor in the Department of Psychological Sciences) and his colleagues in the Special Education Research Group (Prof. Maha Al-Hindawi, Prof. Qais Al-Miqdad, Prof. Osama Al-Batayneh, and Dr. Nawaf Al-Zayoud). The Teaching Excellence Award was granted to Dr. Adel Abu Al-Rous (Associate Professor in the Department of Educational Sciences). The Community and University Service Excellence Award went to Dr. Saba Mansour Qadhi (Dean of General Studies).

The College of Sharia develops “Research Profile” to build Research

Identity for High-Quality Output

Prof. Nour El-Din Al-Khademi
Department of Al-Fiqh and Usul Al-Fiqh, College of Sharia

The College of Sharia at Qatar University has developed a document titled "Research Profile" to serve as a reference framework for carrying out research, so that research performance can achieve the objectives of the strategic plan and research priorities. This document has yielded several notable outcomes, which we will present after defining the concept.

The Research Profile at the College of Sharia, Qatar University is defined as "the set of distinguishing characteristics of the College in the field of scientific research," with its three frameworks as follows:

- Reference Framework: represented in the theoretical principles and the governing value system.
- Methodological Framework: represented in methodological foundations and quality standards.
- Organizational Framework: represented in judging criteria and research priorities.

The Research Profile is the result of the College's strategic initiatives and dedicated efforts in response to significant challenges and the diagnostic assessment of the current situation. This assessment revealed that much of the research is overly specialized, lacks interdisciplinary collaboration, and is often disconnected from real-world needs. It also indicated that several major areas within Sharia sciences remain overlooked and have not received adequate attention, highlighting the necessity for researchers to address them.

Among the key outcomes of this Research Profile were the following:

A. The Founding Approach to research projects, which is considered a constitution for the College's research and its major research projects. This approach was adopted during a workshop held from 1–3 February 2022, which brought together experts from across the Islamic world. The workshop was dedicated to discussing the implementation of the College's Research Unit strategic plan. This workshop resulted in the adoption of the idea of the approach with its axis and its epistemological and methodological guidelines. Discussions then followed (from February 2020 to June 2022) to end up approving the first version of the approach, accompanied by its appendices (including the original scientific papers of the mentioned workshop, research profile document, and an overview of the first research project, "Family between Multiple Islamic, National and International References").

B. Twenty-two (22) major research projects. The Research Project represents a broad research track that includes multiple axis and issues. A project is performed by an individual or in partnership, within the framework of postgraduate research, promotional research, events, journals, etc.

C. Actual commencement of postgraduate and academic staff research within the first research project, as mentioned above. Some research has already been completed, while others are currently in progress.

D. Initiating the implementation of the second research project titled "Thematic Interpretation of the Prophetic Sunnah" and the third research project titled "Comprehension of Civilization and Urbanization" by developing the framing papers, defining the list of priority topics, and directing researchers to them.

Among the notable outcomes and tangible fruits of the Research Profile are the following:

a. Strengthening the University and community environment to support scientific research and researchers, in alignment with the spirit of the Research Profile. This includes fostering partnerships, promoting community engagement, and building bridges with relevant institutions such as educational bodies, the family sector, judiciary, legal institutions, arts, and medicine. This was particularly evident in the operations of the aforementioned family project.

b. Contributing to the development of academic curricula by leveraging research performance within the College's research strategy, in light of its research profile, foundational approach, and other projects related to these curricula.

c. Contributing to the promotion of students' research performance and the development of their research skills under the policy of research and other kind of support by training in dealing with authentic and ancient scientific texts, and holding specialized and focused scientific courses, some of which are related to one of the research projects, such as the project "New Dimensions in the Objectives of Sharia (Maqasid al-Sharia)." To date, six courses on Maqasid have been introduced, along with additional courses in the sciences of Hadith, Fiqh, Aqeedah, and related fields.

The Research Profile and its branches aim to enhance research, teaching, and administrative performance; strengthen partnerships both within and beyond the University; build bridges to address local, national, and global issues; and position the College as a leading reference among peer institutions. The College's leading reference position can be taken by achieving academic accreditation and meeting the requirements of quality, legal, and historical responsibility among people and before the Almighty. Allah says: "Then we made you successors in the land after them so that we may observe how you will do" [The Noble Qur'an, Surah Yunus 10:14].

Developing Humanities and Social Sciences at Qatar University:

Advanced Research Grants Addressing Local Societal Challenges

Qatar University (QU) has announced the launch of advanced research grants for developing humanities and social sciences through research that addresses local societal challenges. QU's Humanities and Social Sciences Research Grants program aims to support research teams in vital areas of interest to Qatar, including important topics representing key pillars such as identity and family, under which many topics could be listed, such as financial literacy, women, heritage, education, and economic and environmental sustainability. The program also includes collaboration with experts from other fields such as science, engineering, and health.

QU funds these internal grants. The online application process began in January/February 2025, with the deadline for submitting research proposals and winning summer grants in March 2025, followed by the award announcement phase in April of the same year.

Promoting academic publishing in social sciences is one of the main pillars of this program since it aims to support knowledge and develop policies through the publication of academic papers and books that can be published by Qatar University Press. In addition, specialized workshops are organized to bring researchers together with local and international institutions, and open the door for them to exchange ideas and research methodologies. It is expected that these workshops will contribute to the production of a joint book on relevant subtopics.

The program is based on developing researchers' skills through training on research ethics and ethical review standards, as well as specialized workshops on data collection, such as questionnaire design and sampling strategies. The program also provides training on analyzing data by using statistical tools and data science. Moreover, academic mentoring opportunities are offered through a network of experts to support new researchers and enhance their research capabilities.

The program also aims to build a strong community of researchers at Qatar University by organizing events that bring the academic staff and students together to share ideas and foster collaboration. These events include the annual QUHSS Forum, which will be a key platform for presenting collaborative research and exchanging insights among scholars and researchers. Discussion panels on research findings are also organized to share outcomes and enhance collaboration among researchers.

The program is available to the academic staff and researchers in humanities and social sciences, with the possibility of involving undergraduate and postgraduate students. Priority will be given to teams including Qatari academic staff or those collaborating with local institutions. The expected outcomes of this program include submitting proposals to the QUHSS forum to share research findings, participating in workshops to build researchers' skills, organizing community events to disseminate research findings, as well as publishing outcomes in prestigious scientific platforms and contributing to relevant awareness-raising campaigns.

The program also includes a range of incentives, such as research exchange trip opportunities to foster academic collaboration and expand research networks, and summer research grant support to develop researchers' skills and contribute to the writing and publication of research.

These trips and grants shall require letters of invitation from recognized academic institutions.

In this regard, Professor Aiman Erbad, Vice President of Research and Graduate Studies at Qatar University, highlighted that Qatar University seeks to develop humanities and social sciences due to their great importance in forming cultural and societal awareness and their role in developing the cognitive and creative capabilities of researchers and students. These grants aimed to support research related to families and Qatari identity as the main pillars, along with subtopics such as heritage, education, environmental sustainability, and other issues of interest to the Qatari society. This reflects the strong relationship between the University and society and the University's active contribution to meeting the needs and aspirations of the community. He also congratulated the winners, wishing them continued success.

Among the winning titles of this research grant in the field of family studies is: "Exploring the Context of Communication in Mental Health Field and Health-Seeking Behavior in Qatari Families: The Influence of Socio-Cultural and Socio-Demographic Factors," by Dr. Shaikha Al-Kuwari, Assistant Professor at the Department of Social Sciences. She expressed her pride in winning, saying: "My research team and I are thrilled to have been awarded the Social Sciences and Humanities Grant from Qatar University. This grant is an important opportunity to support research that aims to strengthen and develop social sciences and humanities. Our project focuses on studying family communication styles and patterns related to mental health and their impact on healthcare-seeking behaviors. This study will contribute to providing a cultural framework that can contribute to the design of effective culturally-based interventions, policies, and programs to reduce the stigma associated with mental health in the Qatari society. The research team is a multidisciplinary one as it includes experts from various disciplines, including social sciences, education, and medical and health sciences."

Dr. Turki Obaid Al-Marri, Assistant Professor at the Department of Fiqh and Usul Al-Fiqh at the College of Sharia and Islamic Studies, was also awarded this grant for his research titled: "Implications of Economic Transformations on the Qatari Family: A Socio-Legal Analysis in the Light of Islamic Sharia." On this occasion, he said: "Winning the Social Sciences and Humanities Grant is not only a scientific recognition, but also a boost of hope and a message of confidence in the importance of research to understand the transformations that are ravaging our societies. Our research project explores the effects of economic transformations on the stability of the Qatari family, attempting to identify the most significant legal and social challenges posed by these transformations, and seeking to address these challenges from the perspective of Islamic Sharia in light of its established provisions and considered objectives, to formulate a comprehensive vision that preserves the Qatari family's equilibrium and stability. I thank the grantor for this support, and I hope that this research will contribute to achieving a clear scientific vision and proposing effective solutions that contribute to achieving the stability of the Qatari family."

Concerning identity-related research, Dr. Hamad Al-Ghadeed, Assistant Professor at the Department of History, was among the winners of the research grant for his research titled: "Qatari Identity in the Time of Transformations: Towards a Sustainable Strategy to Preserve Values and Culture." He said about the project: "This project is an important opportunity to study and analyze the national identity in Qatar and the impact of globalization on it, contributing to developing a deeper understanding of these transformations and strengthening national belonging amid rapid cultural and social changes. I hope that the findings of the research will support decision makers and academic institutions to develop policies that preserve the balance between authenticity and modernity in the Qatari society."

The research support also included other studies in the field of identity, including the research of Dr. Amna Abdulla Sadiq, Assistant Professor at the Department of Gulf Studies, titled: "Social Determinants and Factors Shaping Qatari Identity from the Perspective of Qatari Youth." She stated: "I am delighted with the support provided by Qatar University for research in social sciences and humanities. The introduction of this grant represents an important turning point in supporting these efforts and providing more opportunities for interested researchers. The trust Qatar University places in young researchers is just a reflection of the long-term vision of this academic institution. The research grants offered are an opportunity for researchers to join multidisciplinary research groups. They also help master young researchers' skills in a nurturing academic environment."

She added: "As for the grant, I submitted an interdisciplinary research project that aims to study identity trends among Qatari youth, in an endeavor to understand the values that drive our youth today. Through this research project, we seek to enrich the scientific content on this topic in addition to providing a comprehensive and scientific picture to the executive and legislative institutions in the country that are interested in this field. The project supports the University's research priorities concerning social sciences and humanities and copes with Qatar National Vision 2030."

In the same context, another study by Dr. Esraa Ahmad Al-Muftah, Assistant Professor at the Department of Educational Sciences, was supported by the research grant. Her research is titled: "Ways to Promote Environmental Citizenship in Education: Towards the Sustainability of Environmental Knowledge across Generations." On this occasion, she stated: "I would like to thank Qatar University for supporting young researchers in social sciences and humanities. I am grateful that my project was selected during this session. It aims to document Qatar's rich oral heritage related to topography and nature, and use this documentation as a material to enrich educational programs, so that citizens can graduate with a strong, sustainable identity. The project relies on multidisciplinary research between the College of Education and the College of Arts and Sciences, promoting the integration of knowledge between the fields of social, natural, and educational sciences with the ultimate objective of providing new approaches to understanding the relationship between environment and identity in the Qatari context."

Qatar University Research 2020-2024:

Powering National Vision through Scholarly Excellence

Research Planning and Development Department, Qatar University

I. Introduction

Over the last decades, Qatar University (QU) has firmly established itself as a cornerstone of research excellence and innovation in the State of Qatar. Guided by the Qatar National Vision (QNV) 2030 and the University's mission of advancing knowledge and serving society, QU has made remarkable strides in enhancing scholarly output, fostering international collaborations, improving research quality, and contributing to societal development.

According to Scopus/SciVal data, QU's cumulative scholarly output has steadily increased over the past decade, reflecting a strategic focus on emerging research areas aligned with national and global priorities. Significant increases in publication activity were observed in 2018 and again in 2023, highlighting sustained momentum and growing research capacity. This upward trajectory makes it timely to assess QU's recent progress in research performance.

This article provides a comprehensive overview of QU's research achievements during the 2020–2024 period, based on Scopus/SciVal data compiled as of March 2025. It highlights major institutional accomplishments, evolving scholarly trends, and strategic developments that have positioned QU at the forefront of academic research both nationally and regionally.

II. Scholarly Output: Enhancing Research Quality and Impact

The COVID-19 pandemic posed unprecedented challenges to the global academic and research landscape in 2020. Yet, amidst these disruptions, QU demonstrated remarkable resilience and a sustained commitment to scholarly excellence. Notable increases in research productivity were observed particularly in 2018 and 2023, driven by several factors, including intensified research on COVID-19, alignment with national strategic research priorities, enhanced international collaboration, capacity building, improved research infrastructure, the launch of new graduate programs, and the growing influence of open access publishing-especially through initiatives supported by the Qatar National Library.

Reflecting this momentum, the CAGR of scholarly output was 23.49% during the 2018-2021 period, with a projected CAGR of 29.18% from 2023 to 2026.

Sustained Growth in Research Productivity: Annual scholarly output rose steadily from over 2,500 publications in 2020 to more than 3,200 by 2024, averaging around 2,950 publications per year. Between 2020 and 2024, QU researchers produced approximately 14,800 peer-reviewed documents indexed in Scopus, with an annual growth rate of 4.83%.

The majority of scholarly outputs during this period were peer-reviewed journal articles (71.6%), followed by review articles (12.3%), conference papers (8.3%), and book chapters (3.8%). Editorials accounted for 1.5%, while other formats represented less than 2.5% of the total output. This diverse and expanding output reflects a deepening research culture across QU's colleges, research centers, and graduate programs.

Advancing Research Quality and Impact: While the volume of research output is significant, QU has strategically prioritized enhancing the quality and impact of its scholarly contributions. A clear shift towards publishing in high-impact journals has defined QU's recent research trajectory. Between 2020 and 2024, 64.6% of QU's publications appeared in Q1 journals (top 25% globally), and 23.0% in Q2 journals (26–50%), reflecting a strong commitment to scholarly excellence, which is represented in Figure 1. Only 12.5% of publications fell within Q3 and Q4 categories, underscoring the institution's deliberate focus on quality.

Further affirming this strategic direction, 32.4% of QU's scholarly output during this period was published in the top 10% of journals globally by CiteScore, while 19.2% of the publications ranked among the top 10% most cited worldwide, highlighting the University's growing international reputation for impactful research.

During 2020-2024, publications from QU significantly exceeded global citation benchmarks, with more than 281,000 citations as of March 2025—an average of 56,000 citations per year and 19.1 citations per publication. These figures underscore both the relevance and influence of QU's research output to the global needs. Open access publishing played a pivotal role in enhancing this visibility. During the same period, 57.8% of QU's publications were openly accessible, contributing to 66.6% of the total citations received. This demonstrates the

University's commitment to making its research widely available and internationally recognized, supporting both knowledge dissemination and community engagement.

A key indicator of QU's research impact is the Field-Weighted Citation Impact (FWCI), which compares citation performance against global standards. QU achieved an average FWCI of 2.08 over the five years, with a notable increase from 1.8 in 2021 to 2.6 in 2024, representing a 44.4% improvement. This substantial rise illustrates the growing relevance, influence, and recognition of QU's research at both the national and international levels.

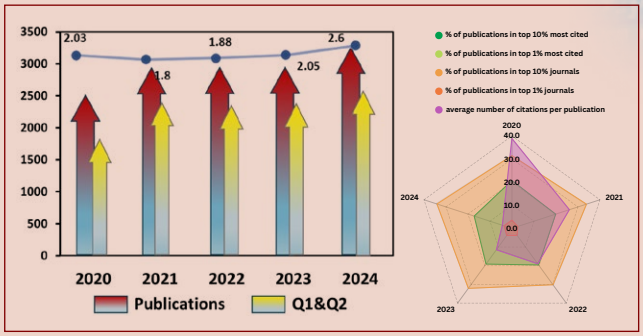


Figure 1: Bar chart showing total publications with Q1 and Q2 journal counts; Radar chart displaying the percentage of publications in the top 1%, top 10% most cited globally, and those published in top-tier journals.

Regional and Global Standing: When benchmarked against leading Arab and global institutions (listed in the QS ranking), QU has demonstrated outstanding performance, particularly within the region. QU achieved the highest share of publications in Q1 & Q2 journals (87.6%) among the top five Arab universities, reflecting a strategic focus on publishing in high-impact journals. In addition, the FWCI of QU publications exceeded the average FWCI of the world's top 10 universities. While the broader Arab region has shown steady improvements in research output and impact, QU's trajectory has distinctly outpaced many of its regional peers, establishing its leadership in the regional research landscape.

At the global level, QU researchers have garnered increasing recognition for their scholarly contributions. These recognitions affirm QU's commitment to fostering a competitive and globally visible academic community.

That said, comparisons with the world's top 10 universities highlight areas for continued growth. In particular, citations per faculty and the percentage of publications in the top 10% most cited journals remain key metrics for strategic enhancement. These insights will serve as a foundation for targeted initiatives aimed at elevating QU's international research profile and advancing its position in global academic rankings.

III. Alignment with Research Pillars and Priorities

QU's scholarly output from 2020 to 2024 exhibits a broad distribution across diverse disciplines, with a strong concentration in STEM and health-related fields. Based on Scopus-indexed publications, the most prominent subject areas include, Engineering (17%), Energy and Environmental Science (12%), Medicine (11%), Computer Science (11%), Chemistry and Materials Science (11%), Social Sciences and humanities (7%), and Biochemistry, Genetics, and Molecular Biology (6%). This disciplinary distribution reflects QU's alignment with national priorities such as healthcare innovation, sustainable development, and energy transformation, while also contributing to global scientific discourse.

QU has contributed significantly to the top 10% worldwide topic clusters by scholarly output, showing strength in applied and interdisciplinary domains. Several research areas at QU were also represented within the top 5% and 1% of worldwide topic clusters based on prominence percentile metric reflecting momentum, visibility, and relevance of research topics globally. These topic clusters include: nanomaterials for energy

storage and sensors, AI in healthcare and security, climate modeling and marine ecosystems, and COVID-19 diagnostics and public health policy. The research also demonstrates robust alignment with the United Nations Sustainable Development Goals (SDGs), particularly: SDG 3: Good Health and Well-Being (29.4%), SDG 7: Affordable and Clean Energy (15.6%), SDG 9: Industry, Innovation, and Infrastructure (8.7%), SDG 6: Clean Water and Sanitation (7.0%), SDG 13: Climate Action (6.4%), and SDG 11: Sustainable Cities and Communities (6.0%).

It is also worth noting that the overall research achievements were significantly supported by a diverse and robust network of funding bodies, both national and institutional. These funding sources played a pivotal role in facilitating high-impact projects across critical sectors aligned with QNV 2030 and global research priorities. The key funding source, Qatar Foundation, supports research through Qatar Research, Development, and Innovation Council's competitive research grants, innovation opportunities, and capacity-building programs. QU also has internal funding mechanisms to support the research and development. This integrated support structure has played a pivotal role in enhancing scholarly output, increasing citation impact, and ensuring alignment with the national development strategies.

IV. Research Collaboration and Partnerships

A defining trend in QU's research landscape from 2020 to 2024 has been the substantial growth in international research collaboration. During this period, 73.9% of QU's scholarly output was co-authored with researchers from global institutions, an indicator of the University's strong international research footprint and commitment to fostering diverse, cross-border academic engagement.

Key partnerships have been formed with 314 institutions across 99 countries, as well as collaborations with industry and government agencies within Qatar (Figure 2). These collaborations have not only enriched the scope and depth of research but also significantly enhanced the visibility, quality, and citation impact of QU's output. Notably, the University's international collaboration rate is significantly higher than that of many top global universities, highlighting QU's robust and expansive global research network.

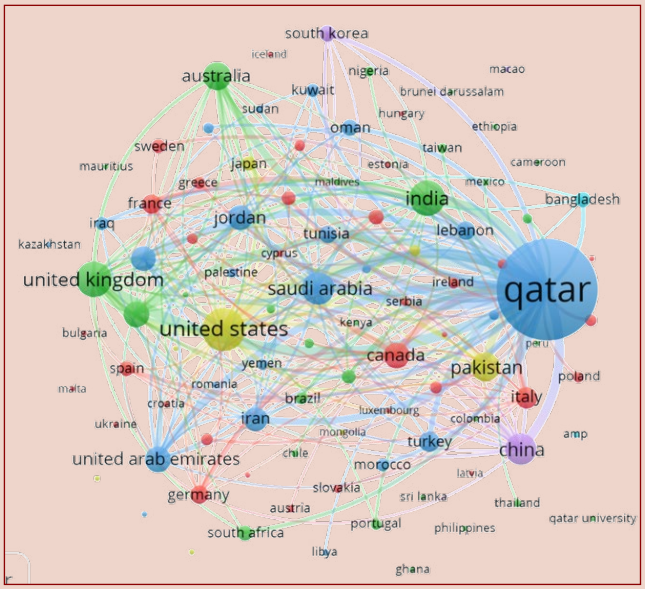


Figure 2: Research collaboration map generated using VOSviewer.

QU has also secured 78 patents from 2020 to 2024, demonstrating its commitment to translating research into real-world innovations. These patents reflect the University's strong focus on applied research and its contribution to Qatar's knowledge-based economy.

V. Conclusions: Advancing Research Excellence at Qatar University

QU is steadily advancing towards its goal of becoming a global leader in research excellence. Through a strategic focus on high-impact, high-quality publications and sustained growth in international collaboration, QU is positioning itself at the forefront of scientific discovery. The University's research output has demonstrated remarkable quality, with a significant percentage of publications appearing in top-tier journals. By fostering interdisciplinary collaboration across its research entities and leveraging its strong global research network, QU is not only contributing to national priorities but also shaping global scientific discourse. As QU continues to build on these foundations, the future of research at the University looks promising. With sustained investments in research infrastructure and capacity building, QU is poised to drive further innovation, contributing to the advancement of knowledge and societal progress.

Qatar University in “Manara for Innovation” Platform:

An Active Presence in the National Innovation Ecosystem

Qatar University (QU) has actively participated in the “Manara for Innovation” platform, launched by Qatar Research, Development and Innovation Council (QRDI) at Web Summit Qatar 2025, reaffirming its leading position in supporting innovation and the scientific research ecosystem in the country. This participation comes as part of the University’s ongoing efforts to enhance research collaboration and expand the horizons of innovation, in line with Qatar National Vision 2030 and the realization of a knowledge economy based on research and development.

“Manara for Innovation” is an advanced national digital platform that aims to facilitate access to the resources, capabilities, and infrastructure available in Qatar’s innovation and research ecosystem. The platform marks a qualitative evolution of Qatar Research, Development and Innovation Portal, providing an interactive environment that encourages collaboration between researchers and institutions, and opens up new avenues for scientific and technological opportunities.

Qatar University has been one of the leading institutions to engage with this platform, contributing to forming knowledge and collaborative partnerships with national entities such as the Ministry of Public Health, Qatar Museum, Hamad Bin Khalifa University, and others. This step marks an extension of the University’s pivotal role in research and development, through its academic staff and specialized research centers, which are known for their prestigious reputation regionally and internationally.

“Manara” platform offers two new features that promote interaction and support data-driven decisions. Firstly, the “Research, Development and Innovation Communities” section provides a collaborative space for the exchange of knowledge and expertise between researchers and professionals, thereby contributing to stimulating innovation in various fields. Secondly, the “Visions” section provides data-driven dashboards and analytical reports that support decision makers and guide them towards emerging research trends.

Engineer Omar Al Ansari, Secretary General of Qatar Research, Development and Innovation Council (QRDI), highlighted that the launch of this platform is a strategic step towards reinforcing Qatar’s status as a regional hub for innovation. Additionally, the participation in the Web Summit demonstrates the country’s commitment to building international partnerships and developing technology. Ms. Nujood Al-Jahni, Senior Director of Policy Planning and Evaluation, stated that the platform will continue its role in supporting communication among stakeholders and facilitating access to vital resources.

Qatar University’s participation in this national platform represents a culmination of its rich research journey and a clear message of its deep belief in the role of innovation in serving society and elevating the country’s scientific and economic standing. Through this step, Qatar University continues its contribution to advancing development through meaningful partnerships and applied research that addresses national challenges and provides innovative solutions with a tangible impact.

Silent Killers:

The Impact of Anti-Personnel Mines and Advances in Detection and Clearance

An Innovative Study Wins First Place in the Research Poster Awards

Ahmed Helmy Abou Elezz, Research Assistant

Thoraya Al-Yafei, Manager of Technical Services/Facilities

Environmental Science Center – Qatar University

The devastating impact of landmines remains a major global concern, with recent statistics revealing 5,544 casualties in 2021 alone, including 1,696 children. Over the past fifty years, these silent killers have disproportionately affected civilian populations, with data showing that since 1999, civilians have constituted 85% of more than 7,000 casualties in 54 countries. Establishing the Mine Ban Treaty in 2009 was a landmark in international efforts to prohibit the development and transfer of these lethal weapons. However, within this legislative framework, the ongoing threat to civilian lives underscores the urgent need to improve methodologies for detecting and clearing anti-personnel landmines. Recent developments have highlighted the significant risks associated with this type of mine in the Arab region, particularly in northern Syria and the Gaza Strip.

The study reviewed the latest developments in possible technologies for landmine detection, including magnetic resonance technology, enhanced underground vibration detection, deep learning, dual-position sensors, and artificial intelligence, all of which improve the accuracy of mine detection and removal. It also addressed challenges such as non-metallic mines and environmental factors complicating the detection process.

Since 2005, armies have been using drones equipped with advanced technologies, such as basic infrared sensors, to locate mines, and this development continues to this day. Robert R. Vennell, from the Defense Technical Information Center, conducted a test program to disable munition components at very low temperatures. The process involved cooling three sets of munitions fuzes—the components located at the front of large-caliber munitions responsible for detonating the munition upon impact or according to its functioning method—using liquid nitrogen at -320 degrees Fahrenheit. The application of liquid nitrogen had a significant impact on the mechanical components of the fuzes and a minor effect on the sensitivity of the detonator.

Given the similarity in the functioning of fuzes and landmines, the current study proposed a new

method for securing and removing landmines that drift towards populated areas due to natural factors. This method involved integrating the use of drones equipped with advanced technologies for locating mines with liquid nitrogen rifles to neutralize surface mines by freezing their components (Figure 1). When the drone, equipped with the latest technologies, detects a mine, it sends a signal to the receiver. The operator then secures the mine by directly spraying liquid nitrogen onto it until it is completely neutralized.

Figure 1: Method for detecting and securing mines using liquid nitrogen.

Figure 1 shows the method for detecting and securing mines using liquid nitrogen, and the expected results indicate that these innovative methods can improve mine detection and removal, thereby reducing risks to civilians, especially children. This research also offers valuable insights, suggesting that the integration of advanced technologies can enhance the safety and effectiveness of mine clearance operations, benefiting future research and development efforts globally. Recently, this study won first place in the research poster awards related to the topics of the National Committee for the Prohibition of Weapons at the 2025 Annual Research Forum and Exhibition at Qatar University.

Thoraya Al-Yafei and Ahmed Helmy

An Innovative a Far-UVC

Light-based Respirator Mask Cartridge for Protection against Microorganisms

Prof. Sadok Sassi

Abdullah Elkawakjy, Student of Mechanical and Industrial Engineering, College of Engineering

Prof. Sadok Sassi, Professor of Mechanical Engineering, Department of Mechanical and Industrial Engineering, College of Engineering

Prof. Adel Gastli, Professor of Electrical Engineering, and Unit Head of Program Review and Assessment of Learning Outcomes, AVP for Academic Planning and Quality Assurance Office

Dr. Susu Zughaier, Associate Professor of Microbiology, College of Medicine, QU Health–Qatar University

Dr. Mahmoud Elgamal, Research Assistant, College of Medicine, QU Health–Qatar University

1. Introduction

The recent COVID-19 pandemic has created an urgent need for more effective respiratory protection against airborne diseases. This research project presents the development of an innovative, reusable respirator cartridge that integrates far-UVC LEDs to disinfect inhaled and exhaled airflows. Far-UVC has germicidal effects and is safe for human exposure. This novel approach represents an advancement over previous disposable masks and passive-filtration techniques.

2. Methodology

2.1. Proposed Design Concept

The central concept proposed involved disinfecting air containing airborne pathogens as they enter and exit the human respiratory system. The primary goal was to ensure the safety of uninfected individuals by preventing them from inhaling contaminated air and preventing infected individuals from transmitting pathogens in their exhaled breath. This can be achieved by implementing a respirator incorporating far-UVC light for disinfection.

The proposed design envisions a respirator with a specially equipped cartridge containing far-UVC light (Figure 1). Air entering the respirator passes through the cartridge and is exposed to UVC radiation for disinfection during inhalation and exhalation. This innovative approach provides a protective barrier that safeguards individuals from inhaling infectious agents and mitigates the risk of pathogen transmission via exhaled air.

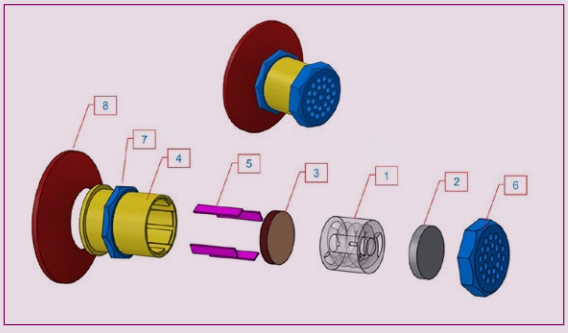


Figure 1: Exploded view of the proposed UV respirator cartridge.

2.2. Optimization of the Design

The efficacy of germicidal UV irradiation in disinfecting respirator cartridges relies on two key factors: UVC radiation intensity and duration of exposure. The exposure time should be maximized to achieve a high level of decontamination. Optimizing both UVC intensity, through proper selection of the UV light source, and sufficient exposure time will lead to the most effective disinfection, enabling the safe reuse of respirator cartridges.

Since most commercially available UV systems operate at the optimal germicidal wavelength, the exposure time, primarily determined by the design of the cartridge (length of the helical tube), is the key factor in optimizing disinfection efficacy. Increasing exposure time lengthens the airflow path inside the cartridge, allowing the air to remain in contact with UV radiation for an extended period. This can be achieved by adding baffles, turns, and labyrinthine passages within the cartridge's interior. However, extended air paths create significant pressure drops, making inhalation and exhalation more difficult.

2.3. Respirator Standards

To ensure safety and efficacy, the respirator's design must adhere to established performance standards. The National Institute for Occupational Safety and Health (NIOSH) provides the testing protocols and requirements for respiratory resistance. According to NIOSH's regulation 42 CFR Part 84, respirators must be tested at an airflow rate of 85 L/min (approx. 0.00142 m^3/s) to determine the maximum inhalation and exhalation resistance. The allowable limit is less than 70 mm of water pressure during inhalation and exhalation. Exceeding these resistance thresholds impedes airflow, making breathing through a respirator difficult and fatiguing. Compliance with NIOSH criteria helps guarantee that respirators do not impose unreasonable physiological burdens during their intended use.

2.4. Process of Optimizing the Design

An iterative process was undertaken to optimize the design of a respirator cartridge, maximizing disinfection efficacy while minimizing breathing resistance (pressure differences) and ergonomic impact on the user. Multiple concepts were evaluated using the following key parameters:

- Shape and length of the air path: A more extended, convoluted path increases the time of exposure to UV but also increases the size and breathing resistance.
- Cross-section of the air path: A larger cross-section reduces resistance but increases the cartridge's size. The shape affects exposure to UV radiation.

- Dimensions of the cartridge: Height and diameter affect the fit, the user's field of view, and the overall weight.
- Transparency of the material: Highly transparent materials improve UV transmission into the air's path. Transparency depends on the material used and the surface finish of the final product.
- Weight: Excess weight contributes to fatigue during prolonged use.
- Breathing resistance: The drop-in pressure across the cartridge must remain below 70 mm H_2O as per NIOSH's standards.

2.5. CFD Simulation

A numerical investigation using SolidWorks was conducted to assess the breathing resistance of several respirator cartridge designs through CFD simulations (Figure 2). The objective was to determine compliance with NIOSH's inhalation and exhalation resistance criterion, which is a drop-in pressure of less than 70 mm H_2O. The CFD models simulate the airflow and pressure fields inside the cartridge under normal breathing conditions. The tests measured the pressure differential across each cartridge prototype at an inlet airflow rate of 85 L/min (0.00142 m^3/s).

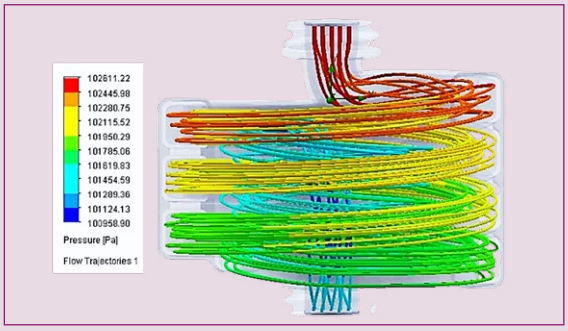


Figure 2: Results of the computational fluid dynamics simulation.

In summary, the selected design (Figure 3) uniformly addressed all critical objectives of optimization:

- It maximized the delivery of UV via a lengthy dual helix path.
- It complied with the standards for breathing resistance.
- Its compact and lightweight construction ensured its usability.
- The streamlined dimensions ensured the visibility and mobility of the user.

The integrated strengths of Design 6 made it the ideal candidate for final optimization and commercialization as a far-UVC respirator cartridge. Further design refinement will focus on finalizing the materials, printing parameters, and ergonomic factors, while preserving the superior performance.

The outcome will be an optimized cartridge that combines industry-leading disinfection efficacy with uncompromising user safety, comfort, and regulatory compliance. This will expand access to reusable respiratory protection, helping to safeguard frontline personnel against airborne pathogens.

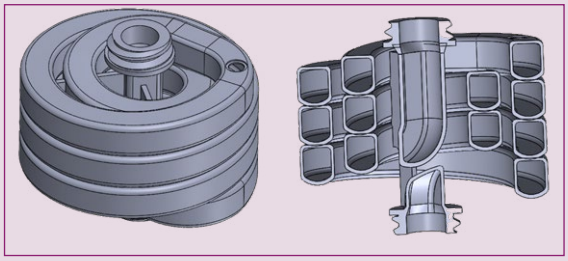


Figure 3: The final design of the cartridge with a section view showing the internal details.

3. Laboratory Experiments and Results

In a proof-of-concept experiment, we tested the effectiveness of a novel far-UVC 3D-printed cartridge mask. Four volunteers were asked to exhale three times while wearing the 3D-printed mask with the UVC lights off and then three times with the UVC lights on. The aerosolized oral bacteria in their exhaled breath were collected on bacterial agar plates before the subjects wore the mask. These samples were incubated at 37°C overnight. The next day, we assessed the number of viable bacterial colonies on the agar plates, comparing the results between the conditions with and without UVC. The data suggest that using far-UVC in the cartridge of respirator masks can reduce aerosolized bacteria. However, the study's limitation is that it could not capture the mask's effectiveness against aerosolized viruses. Future research to examine the efficacy against viruses using human cell culture methods is warranted.

4. Conclusion

In conclusion, the resulting modular cartridge assembly effectively delivers far-UVC disinfection, meets NIOSH's breathing resistance standards, and prioritizes user safety, comfort, and mobility. It also displayed promising bacterial inactivation, warranting further validation of its efficacy in eliminating viruses.

Thinking of Starting a Poultry Business?

Here's the Ultimate Digital Solution!

Dr. Kishor Kumar Sadasivuni
Research Assistant Professor, Center for Advanced Materials - Qatar University

Poultry farming is a key component of Qatar's food security strategy, yet farmers often face critical challenges, including disease outbreaks, nutritional imbalances, and breeding-management complexities. A team of researchers from Qatar University's Center for Advanced Materials—Ms. Mizaj Sha (PhD Student at QU), Mr. Jai Ramesh (Undergraduate student), Mr. Hanish Abdulla (Undergraduate student), Mr. Nihal Ashik (Undergraduate student), Dr. Muni Raj (Research Associate), and Dr. Kishor Kumar Sadasivuni—collaborated with Prof. Somaya Al-Maadeed from the College of Engineering to address this issue through developing The **PoultryPedia** Qatar application (**Figure 1**). Funded by the Qatar National Research Fund (Grant No. MME03-1226-210042), this cutting-edge mobile application provides real-time insights on disease prevention, nutrition, and farm management. PoultryPedia Qatar is designed to empower poultry farmers, veterinarians, and researchers by combining expert knowledge with digital technology to optimize productivity and promote healthier flocks. By bridging the gap between scientific research and practical application, this innovative tool is set to transform Qatar's poultry industry, reinforcing the nation's commitment to sustainable agriculture.

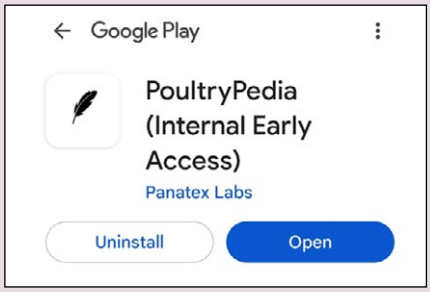


Figure 1: Google Play Store window of the PoultryPedia Qatar application.

A Smart Solution for Poultry Disease Management

Figure 2: PoultryPedia Qatar app showing its comprehensive disease database.

One of the biggest challenges in poultry farming is disease control. Viral, bacterial, and fungal infections can spread rapidly, causing significant economic losses and threatening the sustainability of farms. PoultryPedia Qatar includes a comprehensive disease database that offers in-depth information on the most common poultry diseases, their symptoms, potential causes, prevention measures, and treatment options (**Figure 2**). This feature allows farmers to identify symptoms early, take preventive measures, and respond quickly to outbreaks before they escalate. The database is continually updated with scientifically validated information, ensuring that users have access to the latest research and veterinary recommendations.

The application also provides real-time alerts and notifications about disease outbreaks in specific regions, helping farmers stay informed and take necessary precautions. By leveraging data analytics and user reports, PoultryPedia Qatar can track disease patterns and provide insights to mitigate risks. This proactive approach reduces poultry mortality rates and minimizes economic losses, contributing to a more resilient poultry industry in Qatar.

Optimized Nutrition and Feeding Strategies

Figure 3: PoultryPedia Qatar app showing the nutrition module with tailored feeding.

Proper nutrition is fundamental to poultry health, growth, and egg production. However, many farmers struggle to create balanced diets due to a lack of accurate information. PoultryPedia Qatar features an advanced nutrition module that provides customized feeding recommendations based on poultry breed, age, and growth stage (**Figure 3**). The application considers essential factors such as protein intake, vitamins, minerals, and energy requirements, ensuring that farmers can optimize their flocks' nutrition for maximum productivity.

Additionally, this mobile application suggests dietary adjustments during critical growth phases and environmental changes, such as extreme heat, which can affect poultry metabolism and feed efficiency. By following scientifically backed feeding protocols, farmers can enhance weight gain, improve egg production, and maintain healthier flocks, ultimately increasing profitability.

Comprehensive Farm Management Tools

Managing a poultry farm efficiently requires careful record-keeping and structured planning (**Figure 4**). PoultryPedia Qatar serves as a digital assistant, enabling farmers to maintain detailed records of their poultry stock, vaccination history, health status, and productivity trends. This application simplifies farm operations by providing integrated tools for flock monitoring, vaccination schedules, and production analysis. Users can track the number of birds, their growth progress, and health conditions, while automated reminders ensure that important vaccinations

are never missed, minimizing the risk of disease outbreaks. Additionally, it helps analyze egg production and meat yield trends, allowing farmers to make data-driven decisions that enhance farm efficiency. By streamlining these tasks, PoultryPedia Qatar reduces the manual workload and boosts overall farm efficiency and profitability.

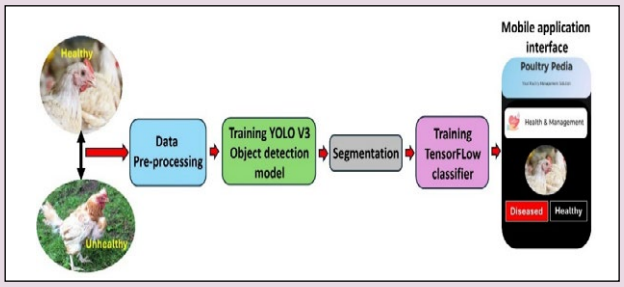


Figure 4: PoultryPedia Qatar app illustrating the process of managing poultry farm records.

Bridging the Gap Between Farmers and Experts

Another standout feature of PoultryPedia Qatar is its ability to connect farmers with poultry health experts and veterinarians. Often, small and medium-scale poultry farmers do not have direct access to professional veterinary services, which can lead to improper disease management and financial losses. The app's teleconsultation feature enables farmers to seek professional advice, share health reports, and receive expert recommendations without needing to travel. This feature is especially valuable in remote areas, where veterinary services may be limited. By providing instant access to expertise, PoultryPedia Qatar ensures that farmers receive timely interventions, improving poultry welfare and minimizing losses.

Interactive Learning and Sustainable Farming Practices

Figure 5: PoultryPedia Qatar app featuring educational modules on the farming practice guidelines database.

Education is a cornerstone of successful poultry farming. PoultryPedia Qatar enhances this by offering interactive learning modules on best farming practices, biosecurity measures, sustainable techniques, and modern breeding strategies. Farmers can access step-by-step guides, video tutorials, and research-based articles to implement scientific and sustainable poultry management methods effectively (**Figure 5)**. Beyond education, the application provides a comprehensive guide on profitable poultry marketing, helping farmers identify the best locations and platforms to sell their chickens and eggs within Qatar. Additionally, it includes essential healthcare resources, ensuring farmers have access to expert guidance on maintaining flock health.

Success Story in Digital Agriculture

PoultryPedia should be widely adopted by poultry farmers, industry professionals, and researchers across the country. Its impact has been transformative, providing users with data-driven insights, disease prevention strategies, and optimized farm management solutions. By combining research-backed knowledge with an intuitive interface, the application empowers farmers to improve poultry health, increase productivity, and enhance food security in Qatar. The success of PoultryPedia Qatar is a testament to Qatar University's commitment to technological innovation and agricultural sustainability. It showcases how digital tools can revolutionize traditional farming practices, making them more efficient, informed, and resilient. By utilizing smart solutions like PoultryPedia, Qatar is taking significant strides toward achieving self-sufficiency in poultry production while ensuring a sustainable future for the industry.

PoultryPedia Qatar stands as a shining example of how digital transformation can address real-world agricultural challenges, ensuring a brighter future for poultry farmers in Qatar and beyond. Looking ahead, PoultryPedia Qatar will integrate AI-powered features using camera technology, allowing farmers to diagnose poultry health issues in real time. Through integrating artificial intelligence, the application offers instant analysis, early disease detection, and tailored recommendations, revolutionizing poultry management in Qatar.

PoultryPedia Qatar is now available for all users and can be downloaded by scanning the QR code.

A Practical Approach to Strengthening Observational Studies:

Addressing Immortal Time Bias at QU CMED

Prof. Suhail Doi, Department Head of Population Medicine, College of Medicine – Qatar University

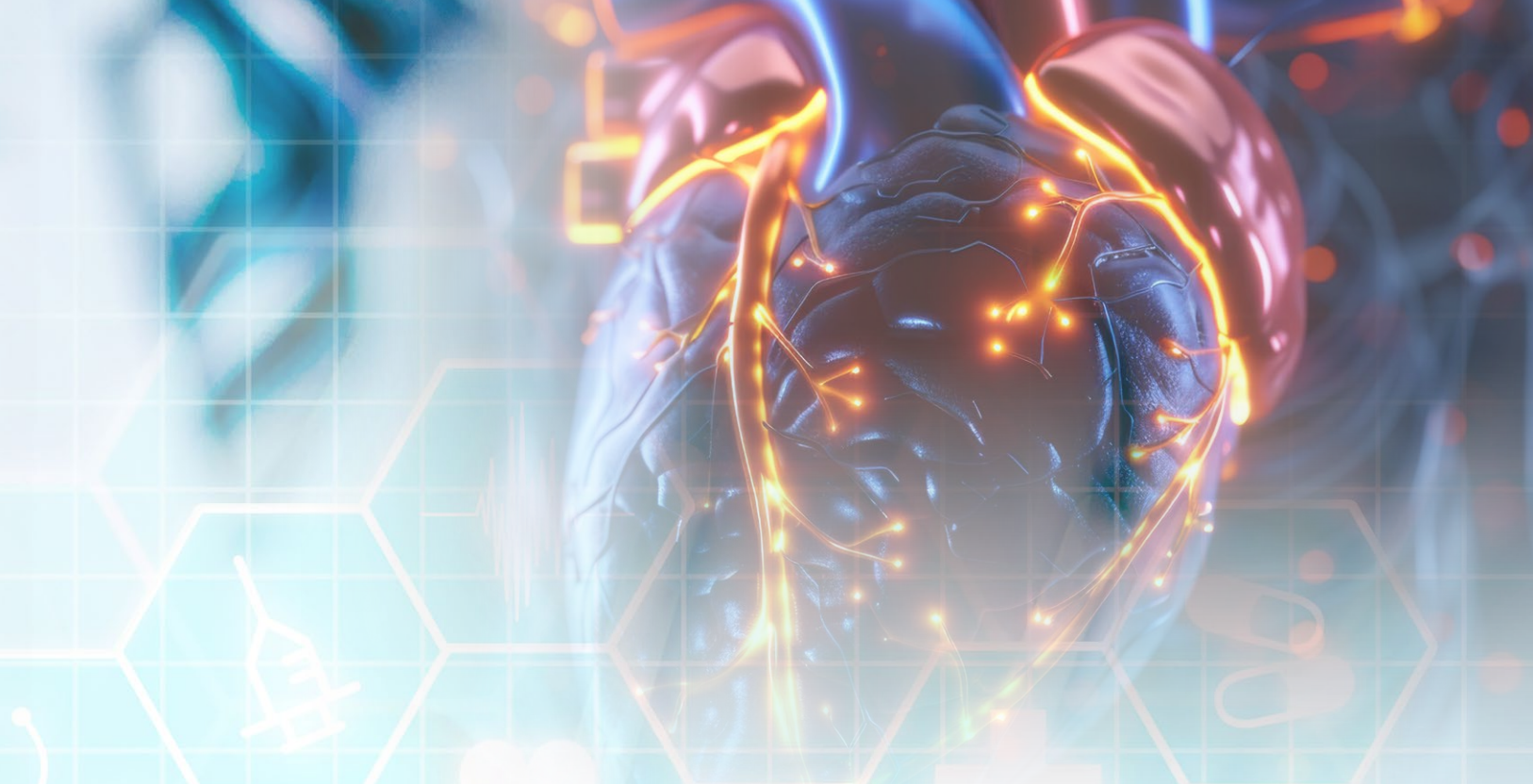
In medical research, randomized controlled trials (RCTs) are often considered the gold standard for evaluating treatment effectiveness. By randomly assigning participants to different groups, RCTs help ensure that any observed differences in outcomes can be attributed to the treatment itself. However, RCTs are not always feasible due to their high costs, time requirements, and ethical considerations. As a result, researchers frequently turn to observational studies, which are more accessible and reflective of real-world clinical practices. Despite their advantages, observational studies are prone to biases, one of the most notable being *immortal time bias*. This bias can distort results, leading to misleading conclusions. A team of researchers at QU CMED, led by Professor Suhail A. Doi and PhD scholar Jazeel Abdulmajeed, has developed a new method called the *Iterative Time Distribution Method (ITDM)*, which aims to address this issue and improve the reliability of observational studies.

Understanding Immortal Time Bias

Immortal time bias arises when the follow-up periods in a study are not properly aligned between treatment groups. This misalignment can create an artificial advantage for the treated group, making it seem like they have better outcomes simply because they had a period during which they were not at risk for the outcome. For example, in a study on bariatric surgery, participants are only considered “exposed” after undergoing the procedure. The time before the surgery, when they are not yet at risk for adverse events, must be accounted for. If this pre-surgical time is ignored, the surgery group may appear healthier than they truly are, skewing the results.

The Iterative Time Distribution Method (ITDM)

To tackle this issue, Professor Suhail Doi and Jazeel Abdulmajeed have developed ITDM, a method designed to better align follow-up times



between treatment groups. ITDM builds on the existing *Prescription Time Distribution Method (PTDM)* but introduces an iterative process that repeatedly checks and adjusts the timing of exposure. This iterative approach ensures a more accurate alignment of follow-up periods, reducing the risk of immortal time bias and providing a clearer comparison between treatment groups.

Advantages of ITDM

Traditional methods like PTDM often rely on a single adjustment, which may not fully eliminate immortal time bias. In contrast, ITDM's iterative process allows for more precise alignment of follow-up times, minimizing residual bias and improving the accuracy of comparisons. This method is particularly valuable because it can be applied across a wide range of medical conditions and treatments, making it a versatile tool for researchers. By bringing observational data closer to the rigor of randomized trials, ITDM enhances the credibility of findings in fields where RCTs are difficult to conduct.

Bridging the Gap Between Observational Studies and RCTs

While ITDM cannot fully replicate the conditions of randomization, it offers a more robust approach than traditional single-step corrections. By iteratively realigning follow-up times, ITDM helps approximate one of the conditions of an RCT, where the only difference between groups should be the treatment itself. This makes large observational datasets more reliable and useful, particularly in fields like oncology and cardiovascular medicine, where timely RCTs may be challenging to implement.

Conclusion

This is an area of methodological research in epidemiology that has resulted in a new research method with the expectation that it will be utilized worldwide and in Qatar. Observational studies are essential in medical research, especially when RCTs are impractical. However, they are often hindered by biases like immortal time bias. The introduction of ITDM by Professor Suhail Doi and Jazeel Abdulmajeed represents a significant step forward in addressing this issue. By systematically redistributing person-time and aligning follow-up periods, ITDM improves the accuracy and reliability of observational data. While it does not solve all the limitations of observational research, ITDM provides a practical and effective tool for producing more credible evidence. As the demand for real-world data grows, methods like ITDM will play a crucial role in advancing medical research and improving patient outcomes.

Interview with an Inventor

Dr. Layla Jedea Al-Mansoori
Research Assistant Professor,
Biomedical Research Center – Qatar University

Intellectual property refers to creations of the human mind, including inventions, literary and artistic works, designs, symbols, names, and images used in commerce. An invention is an idea conceived by an inventor that provides a solution to a specific technical problem. A patent, on the other hand, is an exclusive right granted for an invention, allowing its owner to determine how—or whether—others may use it for a limited period. In exchange for this right, the patent holder provides the public with technical details of the invention through the published patent document. Herein, we meet Dr. Layla Jedea Al-Mansoori, Research Assistant Professor at the Biomedical Research Center at Qatar University, who holds multiple patents for her innovative work.

Dr. Layla Al-Mansoori, how would you present yourself to the readers of Research Magazine?

I am a passionate scientist and innovator dedicated to translating biomedical research into tangible health solutions. As a Research Assistant Professor at the Biomedical Research Center at Qatar University, my work is focused on bridging the gap between bench science and real-world medical applications, with a particular emphasis on innovation and intellectual property development.

Can you tell us about the patents you have obtained at Qatar University?

I have been fortunate to work on several multidisciplinary projects that have led to filings and the granting of patents. These include GATA3 inhibitors for the promotion of subcutaneous fat deposition, which is granted and published under the number US11976282B2. The other one, which was filled by the end of last year, is related to diabetes and machine learning strategies for understanding insulin resistance.

In your opinion, how can inventions make a difference in patients' lives or contribute to improving society?

Inventions are often the bridge between scientific discovery and tangible impact on human health. For example, our patented GATA3 inhibitors, which aim to enhance the body fat re-distribution by lowering visceral fat and promote subcutaneous fat deposition, have the potential to shift the way we address metabolic health and obesity-related disorders. Similarly, leveraging machine learning to understand insulin resistance brings us closer to personalized and predictive approaches in diabetes management. Such innovations can empower earlier diagnosis, more effective interventions, and better disease prevention strategies. Ultimately, they not only improve patient outcomes but also reduce long-term healthcare burdens on society.

What were the biggest challenges you faced during the development of your medical inventions, whether on a technical or research level?

Each project presented its own unique challenges. For the GATA3 inhibitor work, one of the primary hurdles was identifying selective and bioavailable compounds that could modulate gene expression without off-target effects—this required extensive molecular modeling and in vivo validation. On the other hand, with the diabetes and machine learning project, the challenge was integrating large-scale biomedical datasets in a meaningful way while ensuring that the predictive models remained clinically interpretable and reliable. Balancing technical rigor with translational relevance was a continuous process, but these challenges ultimately strengthened the innovation and its potential for real-world application.

Can you tell us about the support provided by the Innovation Office for inventors at Qatar University?

The Innovation Office at Qatar University has been instrumental in supporting inventors by offering guidance on patent filings, IP strategy, and commercialization pathways. They provide essential legal and technical expertise, as well as opportunities for collaboration with industry partners. This ecosystem encourages a vibrant culture of innovation and empowers researchers to pursue impactful discoveries.

From your perspective, how can the integration of academic research and practical application accelerate medical innovations?

Integrating research with real-world application ensures that discoveries are not only theoretical but also usable and relevant. When academia works closely with clinicians, industry, and policymakers, it accelerates the translation of ideas into market-ready solutions. This interdisciplinary collaboration shortens the time from lab to clinic and enhances the societal impact of academic efforts.

What advice do you have for students interested in entering the world of research and innovation?

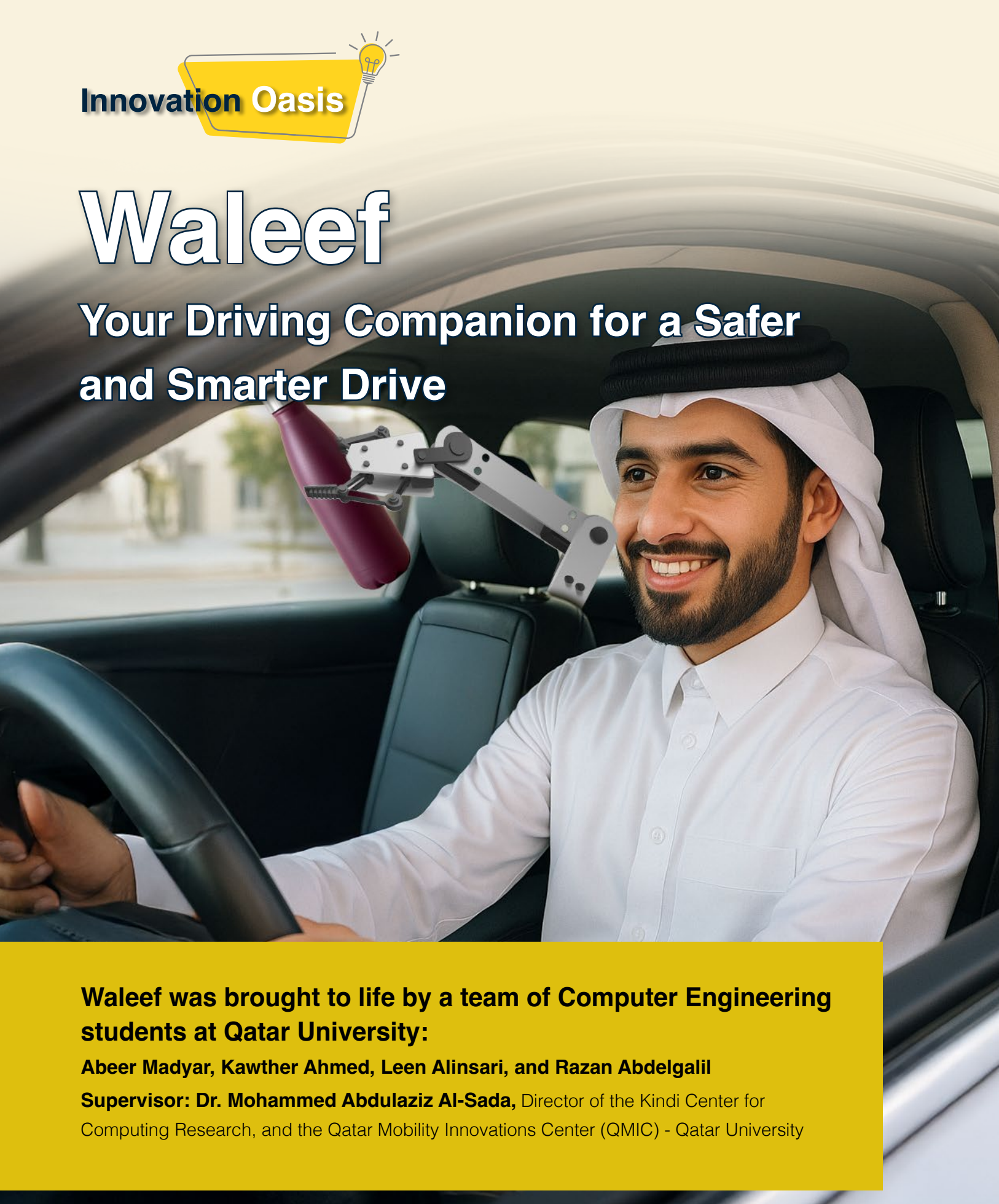
To dedicate their efforts sincerely in this noble path for the sake of Allah, and to remain curious and persistent. Innovation often begins with asking the right questions and being willing to explore the unknown. They should embrace interdisciplinary learning, seek guidance and mentorship, and not fear failure—it is often a stepping stone to success. Most importantly, they should align their research with a purpose that serves people, as real impact is the strongest driver of innovation.

What are your upcoming research goals, and how do you see the future of innovation in Qatar?

My upcoming research focuses on precision medicine and bioengineered therapeutic systems tailored to the needs of our population. I see great promise in Qatar's innovation landscape, with increased investment in research, growing institutional support, and an inspiring generation of young scientists. The future holds immense potential for Qatar to emerge as a regional leader in health innovation and biotechnology.

Waleef

Your Driving Companion for a Safer and Smarter Drive



Waleef was brought to life by a team of Computer Engineering students at Qatar University:

Abeer Madyar, Kawther Ahmed, Leen Alinsari, and Razan Abdelgalil

Supervisor: Dr. Mohammed Abdulaziz Al-Sada, Director of the Kindi Center for Computing Research, and the Qatar Mobility Innovations Center (QMIC) - Qatar University

In a world increasingly driven by technology, artificial intelligence (AI) and automation, the integration of intelligent systems into vehicles offers significant potential for improving safety and convenience. Waleef, developed by a research team at Qatar University, emerges as an innovation aimed at enhancing the driving experience and reducing distractions faced by drivers. The system assists both drivers and passengers by autonomously handling simple yet essential tasks while driving, such as retrieving objects or handling beverages, allowing the driver to focus on the road and enhancing the passenger's experience.

Project Motivation and Conceptualization

Waleef was conceptualized in response to a real-life scenario encountered by team member Razan Abdelgalil. During her commute from university, she needed to retrieve her medication stored in a bag placed on the backseat. Attempting to reach for the item while driving introduced a significant safety hazard, which sparked the question: *What if there was a way to access items in the car without endangering the driver?*

This question became the foundation for Waleef, an in-vehicle robotic assistant designed to enhance safety and convenience. Waleef retrieves objects, handles beverages, and even provides companionship during long drives. By automating these tasks from the driver and mitigating cognitive and physical distractions, it contributes to a safer, more focused driving experience.

How Waleef Works

Waleef is a compact robotic system integrated into your vehicle. It consists of three main components: (Figure 1)

1. **Robotic Arm**: A lightweight, multi-jointed arm that can reach and retrieve items from different parts of the car.
2. **Depth Camera**: An AI-powered camera that detects and locates objects within the vehicle.
3. **Voice Command Interface**: Drivers can interact with Waleef using simple voice commands, making the experience hands-free and seamless.

Example Use Case: When a user issues a command such as, "Waleef, grab my water bottle,"

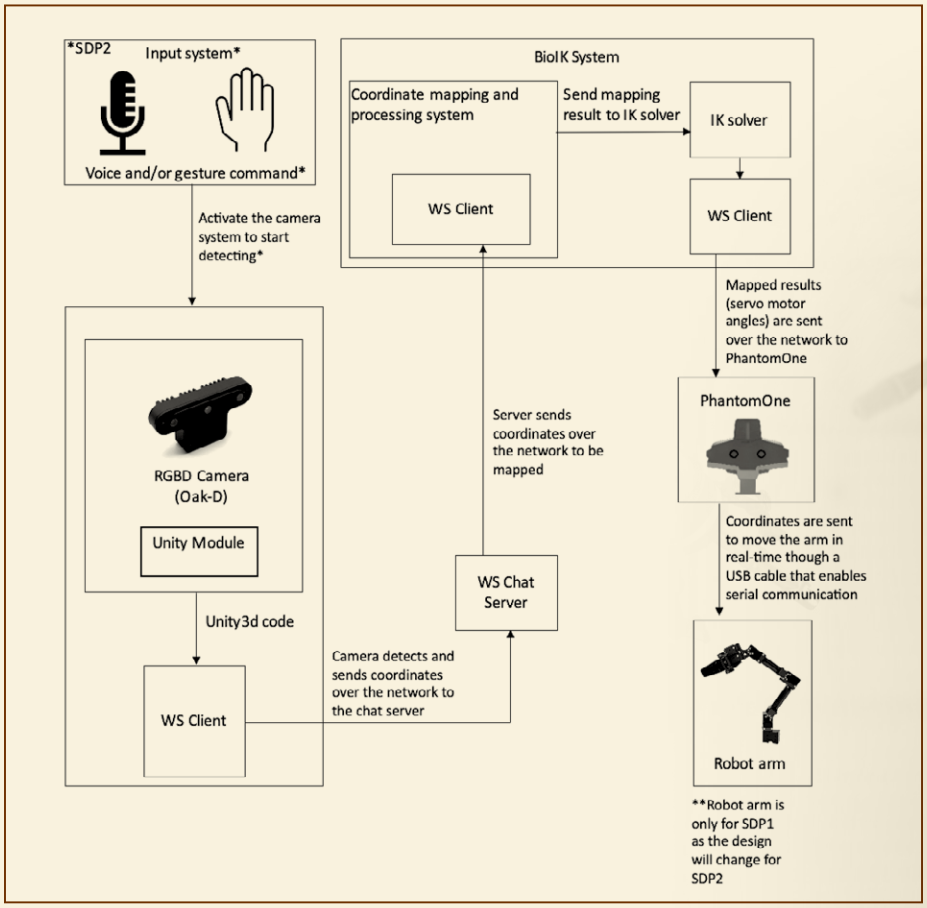


Figure 1: High-level architecture of Waleef system.

the system utilizes its depth camera to locate the target object, triggers the robotic arm to retrieve it, and delivers it to the user, all while ensuring that the driver remains visually and cognitively engaged with the road.

Waleef in Action

Waleef is an intuitive companion robotic appendage designed to enhance interactions during daily commutes for both drivers and passengers (Figure 2).

Why Waleef Matters

Safety Enhancement: By minimizing distractions, Waleef helps drivers stay focused, potentially reducing accidents caused by reaching for objects or handling beverages while driving.
User Convenience: The system automates frequent and repetitive in-vehicle tasks, such as retrieving items or holding beverages, thereby enhancing comfort and reducing task-related stress.

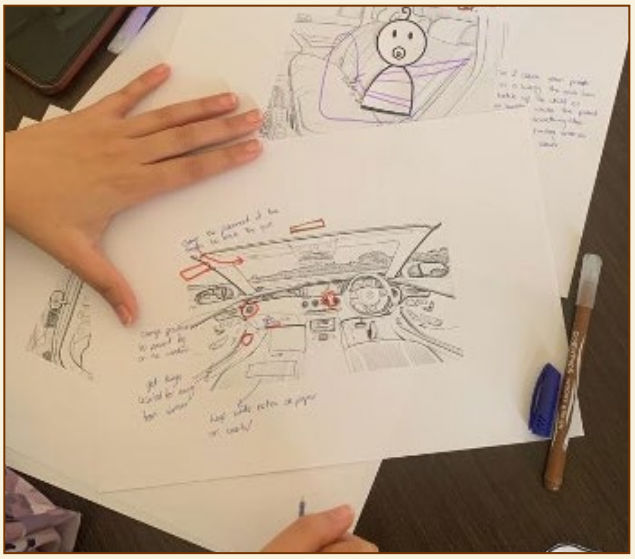
Technological Enhancement: Waleef represents a step towards the integration of smarter and more interactive vehicles that prioritize both safety and user experience. Setting a precedent for the development of human-centered automotive technologies.

What Users are Saying

The research team conducted two types of requirement analysis and testing to validate whether Waleef meets user needs and ensure its usability and relevance.

1. Focus Group

This research method involves a group of four to five participants who engage in discussions and provide feedback on a specific topic. The team conducted four different focus groups at Qatar University. The number of use cases extracted from the focus groups was 295, ranging from simple physical manipulation tasks to complicated AI-driven tasks.



Focus group

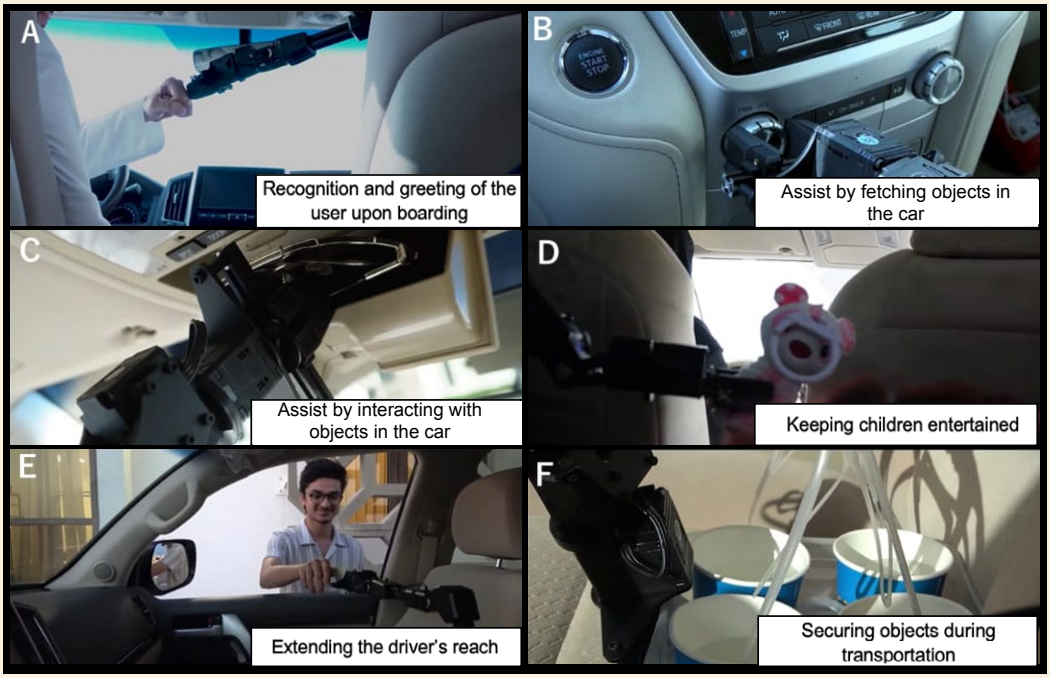


Figure 2: Daily Interactions with Waleef.

2. User Study

This research method involves observing and analyzing the targeted audience to understand their behavior, preferences, and opinions. The team conducted twelve different user studies at Qatar University. Participants evaluated Waleef's performance and contribution to a safer driving experience.

User study

The results and analysis for both evaluation methods demonstrated strong user satisfaction. Participants in the user study expressed satisfaction with the interaction and emphasized the system's effectiveness in minimizing distractions, noting that the system is easy to use and provides a safer driving experience.

The Future of Waleef

Due to the novelty of this project, the team created an illustration (Manga) to showcase their future life with Waleef, which was professionally illustrated by digital designer Ms. Noora Al-Subaey. The Manga envisions daily life with Waleef, portraying three main stories of how Waleef can interact with users, integrating within daily routines, supporting in-vehicle interactions, and creating new experiences. Figure 3 presents one of the stories.

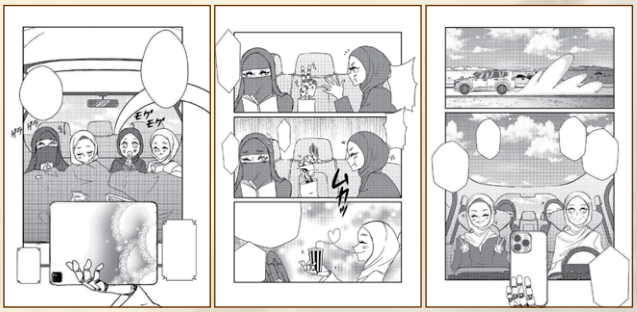
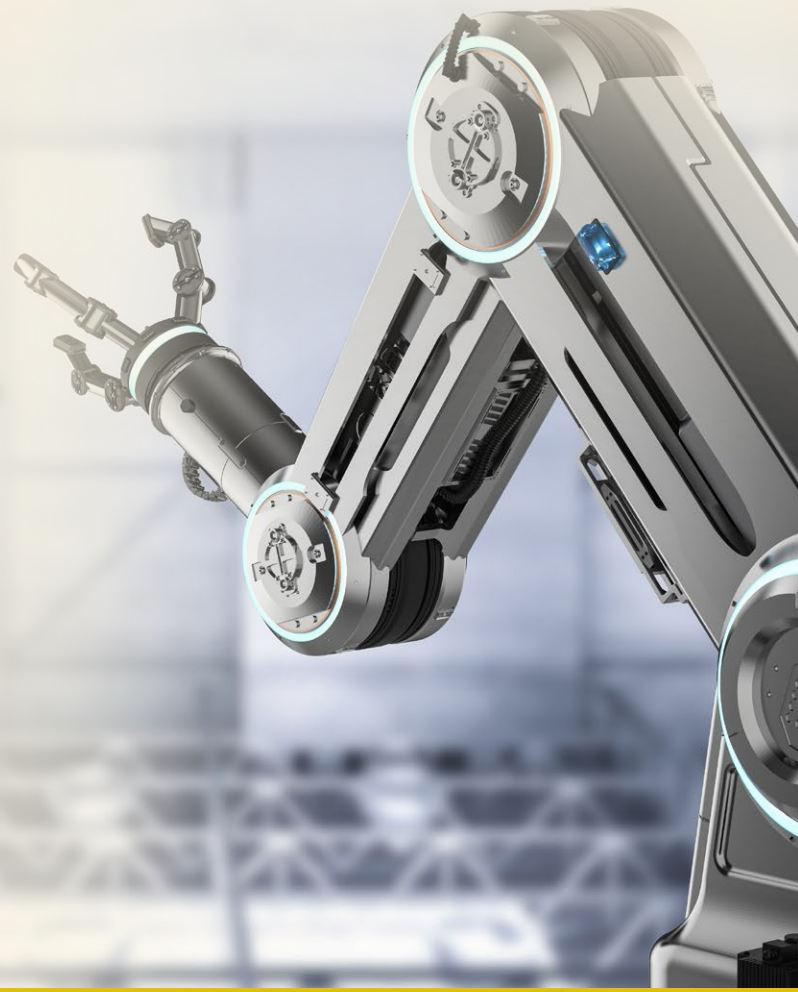


Figure 3: From left to right: manga pages 1, 2, and 3.

In the leftmost figure, a group of friends leaves for a journey, and Waleef snaps a selfie of the group before the excursion. The center figure shows Waleef engaging in a game of rock-paper-scissors with the passengers and entertaining them while on the way. Waleef also helps the driver by passing her a drink and assisting her in drinking so she can focus on the road. Lastly, in the rightmost figure, as friends reach their destination, Waleef grabs the tablet and plays their favorite show while they have snacks. The goal is to make Waleef an indispensable part of every vehicle, ensuring safer and more enjoyable journeys for everyone.

Conclusion

Waleef is more than just a robotic arm—it's a modern solution to the problem many drivers and passengers face daily. By addressing the challenges of distracted driving and enhancing in-vehicle convenience, Waleef paves the way for a future where technology and safety go hand in hand. So, the next time you're on the road, imagine having a helpful companion like Waleef by your side, making every drive smoother and safer.



Innovation Oasis

A New Eco-Friendly Innovation Enhances Food Security and Prevents Fungal Pests in Post-harvest Crops

Prosopis juliflora water-soluble leaf ethanolic (PJ-WS-LE) extract as a preventive coating for post-harvest fruits

Prosopis juliflora leaves

Prof. Mohammed Abu-Dieyeh, Professor of Biological Sciences
Dr. Iman Saleh, Lecturer of Biological Sciences
Department of Biological and Environmental Sciences, College of Arts and Sciences–Qatar University

Introduction

Food security is one of the major global challenges and a cornerstone of Qatar National Vision 2030. Although the agricultural industry is a growing sector in Qatar, about 90% of the fruits consumed in the country are imported. Many challenges hinder the cultivation of local fresh produce, including high summer temperatures and water scarcity. Postharvest diseases impact both locally produced fruits and vegetables, as well as imported ones, especially during storage. These diseases are primarily caused by fungal and bacterial pathogens, which can result in significant economic losses for both farmers and consumers.

Chemical pesticides and fungicides with their environmental pollution footprints are not a recommended option to extend fresh produces shelf life. Many countries around the world are setting a maximum residue limit (MRL) of chemicals on the skin of their fruits and vegetables. When pesticides are applied, only 0.1% of the applied amounts reach the target pests; the remaining (99.9%) are drifted to affect non-target populations and/or remain in the environment to cause biodiversity loss, water pollution, and soil contamination. Therefore, pesticides are reaching humans directly on their fresh produce and indirectly through the environment to cause various health problems. A successful replacement for chemical pesticides would be a product that effectively controls pre-existing spoilage causes, leaves residues that prevent subsequent infections, and inhibits the sporulation of existing spores, thereby reducing economic losses.

Prosopis juliflora (Mimosaceae), the focus of this study, is a short tree, native to Mexico, South America, and the Caribbean. It is an increasingly spreading invasive species in Asia, Austria, and other places around the world. Among the globally distributed plants, *P. juliflora* is considered one of the world's 100 most invasive species. *P. juliflora* is an invasive species in the state of Qatar, introduced in the 1950s as a soil stabilizer and for greening purposes. Mechanical irradiation of *P. juliflora* is costly and without effective control when it comes to the spread of seedlings of the plant. Nowadays, the idea of control through mass utilization is recommended. Using the leaves of this plant to prepare an extract that can serve as a bio-controller or natural anti-spoiling agents would help in utilizing the plant and would solve a major food security problem. This research would provide a solution to the worldwide agricultural problem.

Description of the Proposed Technology

The ethanolic extract from Prosopis juliflora leaves is prepared by incubating leaf powder in 70% ethanol at 45˚C with shaking at 50 cycles per minute for 48 hours. The supernatant contains all active phytochemicals, which are collected as a powdery or gummy material after the solvent has evaporated. The ethanolic crude extract is typically re-suspended in sterile distilled water to create stock solutions. Only the water-soluble portion is usually sterilized using a 0.2µm syringe filter for use in further in vitro and in vivo investigations.

Proof of Concept

In vitro analysis of PJ-WS-LE extract showed solid results on the efficacy of PJ-WS-LE extract against a wide range of pathogenic microorganisms. Antimicrobial tests showed total inhibition of *Botrytis cinerea*, *Alternaria alternata*, *Bacillus subtilis*, *Staphylococcus aureus,* and *Candida albicans* with minimum inhibitory concentrations (MICs) ranging between 0.125 and 1 mg/ml. The in vitro results were supported by fruit bioassay results during which PJ-WS-LE extract was explored as an alternative biological controller. Artificially inoculated tomato and mango samples were completely protected from the disease caused by fungi that were inhibited by the extract in the laboratory assays, including *B. cineraria* and *A. alternata*. Figure 1 shows the effectiveness of the extract in protecting mangoes from *A. alternata* (preventive treatment) and in curing *A. alternata* in mangoes (curative treatment). PJ-WS-LE extract embedded in edible coating has also been demonstrated as an effective coating material to maintain mangoes quality at low temperature for up to five weeks of storage. On the other hand, spraying cucumber samples with 8mg/ml of PJ-WS-LE extract extended cucumber shelf-life at 22°C by 77% (Figure 2) and maintained samples' acceptable quality for three weeks of storage at 8°C. PJ-WS-LE extract alone extended strawberries' shelf-life at 4°C by 2.32 folds and maintained the best storage quality parameters when embedded in 1% chitosan, which includes sensory characteristics, maintenance of firmness and total soluble solids levels, lower surrounding microbial count, lower percent weight loss, and maintaining total antioxidant levels. In citrus fruits, *Penicillium italicum*, one of the main citrus fruits spoiling agents, was 100% cured in lemons and prevented in oranges when fruits are treated with PJ-WS-LE extract. *Penicillium digitatum* infection was also controlled by the extract (Figure 3). PJ-WS-LE extract also showed success as a coating material to maintain lemons and oranges storage parameters at 4°C. The effectiveness of PJ-WS-LE extract against postharvest phytopathogens opens doors for the application of this natural product as a replacement for chemical pesticides and to manage the invasive plant via utilization.

From left: Dr. Atifa Ismail, Master's student Bushra Al-Janahi, Prof. Mohammed Abu-Dieyeh, Dr. Iman Saleh, and Master's student Amal Hadi.

Figure 1: Disease incidence in mango samples inoculated with *A. alternata*. All samples are 10 days old after treatment at 25 °C. (**a**) Preventive effect of PJ-WS-LE extract. (**b**) Curative effect of PJ-WS-LE extract. (**c**) Control samples inoculated with *A. alternata* and not treated with PJ-WS-LE extracts.

Figure 2: Cucumber samples of the shelf-life evaluation experiment. **(a)** The 30 fresh samples coated with 8 mg/ml PJ-WS-LE extract at 0-day post-treatment. **(b)** The remaining 20 control (non-treated) samples at 6 days post-treatment. **(c)** 20 of the PJ-WS-LE-treated samples at 6 days post-treatment.

The novel extraction method and the selection for a water-soluble end-product make future applications easier. Derived from an invasive tree that is widely available, the extract offers a low-cost solution for countries most in need of effective spoilage control for fresh produce. Time stability and heat stability were evaluated, and the extract maintained its antimicrobial effectiveness up to six months of the trial, and remains active upon exposure to high temperature up to 70°C. These results are very important for the future commercialization of the extract.

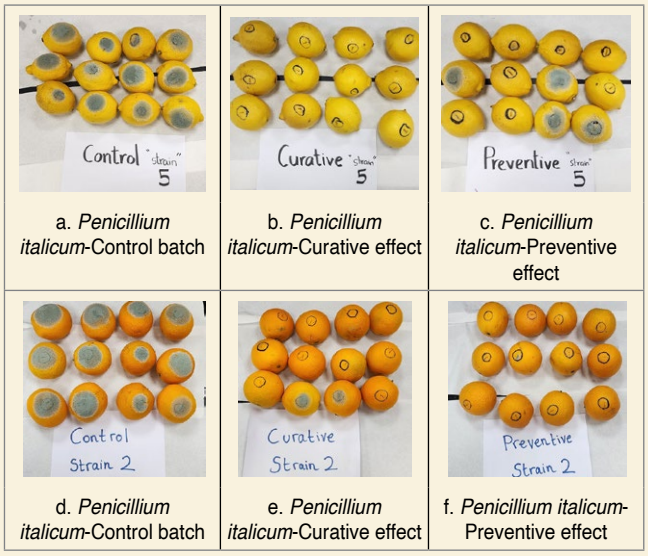
Novelty

As a naturally based antifungal agent, PJ-WS-LE extract is different than the currently used pesticides in the agricultural domain. Firstly, it is a novel solution, making it more effective as spoilage agents have not yet developed resistance to it. Additionally, it does not pose a threat to the environment or human health. Compared to other biological controllers described in the literature, the novelty of the PJ-WS-LE extract lies in the unique characteristics of the end product. It is water soluble, stable with time, and heat stable, which means that it can be easily applied in the form of a spray or embedded in any stabilizing packaging. It is also suitable for the hot weather of the Qatari environment. The extraction method is simple and not expensive. The tree is an invasive species, widely available in many countries, and it can be cultivated easily in places where it doesn't usually grow.

Development Roadmap and Requirements

PJ-WS-LE extract is ready to be taken to the next stage as an antifungal agricultural solution in the current development status for large-scale in-field trials. It can also be used as an antifungal storage coating material for large-scale storage preservation trials. The extract has a published patent application number 18/772,403 under the title "PROSOPIS JULIFLORA WATER-SOLUBLE LEAF ETHANOLIC (PJ-WS-LE) EXTRACT AS A PREVENTIVE COATING FOR POST-HARVEST FRUITS". Under the scope of the ARG01-0531-230424 project, further analysis would be conducted, which includes:

1. Fractionation of the crude extract using preparative HPLC to identify the active fraction.
2. Chemical identification of the active phytochemicals in the active fraction. The final structure of the active phytochemical(s) can be determined using Nuclear Magnetic Resonance (NMR).
3. Active fraction cytotoxicity evaluation will also add value to the end-product and would facilitate future commercialization.



a. *Penicillium italicum*-Control batch | b. *Penicillium italicum*-Curative effect | c. *Penicillium italicum*-Preventive effect

d. *Penicillium italicum*-Control batch | e. *Penicillium italicum*-Curative effect | f. *Penicillium italicum*-Preventive effect

Figure 3: Preventive and curative effect of PJ-WS-LE extract on *Penicillium italicum* artificially inoculated into lemon and orange samples.

Acknowledgments

The researchers would like to express their sincere gratitude to Qatar University, represented by the College of Arts and Sciences and the Department of Biological and Environmental Sciences, for providing all the necessary resources for the success of this research. Special thanks and appreciation are also extended to the Qatar Research, Development, and Innovation Council for their financial support of the research projects ARG01-0531-230424 and UREP29-146-4-004.

The researcher while isolating fungi from tomatoes.

Innovation Oasis

Inventor Business Card:

Dr. Khalid Abualsaud

Lecturer of Computer Engineering,
College of Engineering – Qatar University

Dr. Khalid Abualsaud, how would you present yourself to the readers of the Research Magazine?

I am an academic faculty member and researcher specializing in electronic health, with an interest in leveraging technology. My research is focused on developing cutting-edge technological solutions to enhance the quality and efficiency of healthcare delivery.

Throughout my research career, I have focused on connecting artificial intelligence to monitor chronic diseases, analyze and secure health data, and develop smartphone applications that empower patients to manage and track their health effectively. I collaborated on numerous research initiatives with the QNRF and leading medical institutions. My work has been published in reputable, peer-reviewed scientific journals, contributing to the growing knowledge in eHealth.

Can you share with us the patents registered under your name at Qatar University?

To view a list of patents, you can search through specialized platforms such as Google Patents, where most academic patents are registered. If you have any questions or need help, please feel free to contact. Here is the link to it: https://patents.google.com/?q=(abualsaud)&inventor=khalid&oq=khalid+abualsaud

What led you to focus on epidemics and diseases in your inventions despite your specialization in computer engineering?

Combining computer engineering with the medical field opens new horizons for saving lives and enhancing healthcare. The primary motivation behind my focus on epidemics and diseases in my inventions is the desire to use technology to serve humanity and improve the quality of life. Chronic diseases pose significant challenges to healthcare systems worldwide, and I believe technology can be a powerful tool to address these challenges.

What are the main challenges you faced while developing innovations in the healthcare field?

There are certain genuine challenges like:

- Sourcing materials and components for medical or technical devices can be a time-consuming process and may delay project progress.
- The medical data quality and sensitivity are subject to strict privacy standards, which makes accessing it challenging.
- Compliance with international and local health regulations and standards can be lengthy and complex.
- Understanding technical and medical requirements is essential.

Despite these challenges, developing innovations in the healthcare field is highly rewarding, as it has a significant positive impact on people's lives and health.

If you had the opportunity to develop an impactful invention in the field of sustainable public health, what idea would you work on?

I will work on developing a smart wearable device to continuously monitor biomarkers for chronic diseases (such as diabetes, high blood pressure, epilepsy, and respiratory issues). The device will automatically send data to the physician and provide users with personalized, real-time recommendations to improve disease management. Leveraging artificial intelligence, the device will predict potential complications early, reduce the need for frequent hospital visits, and help reduce overcrowding. This will promote sustainable healthcare and ease the burden on healthcare systems.

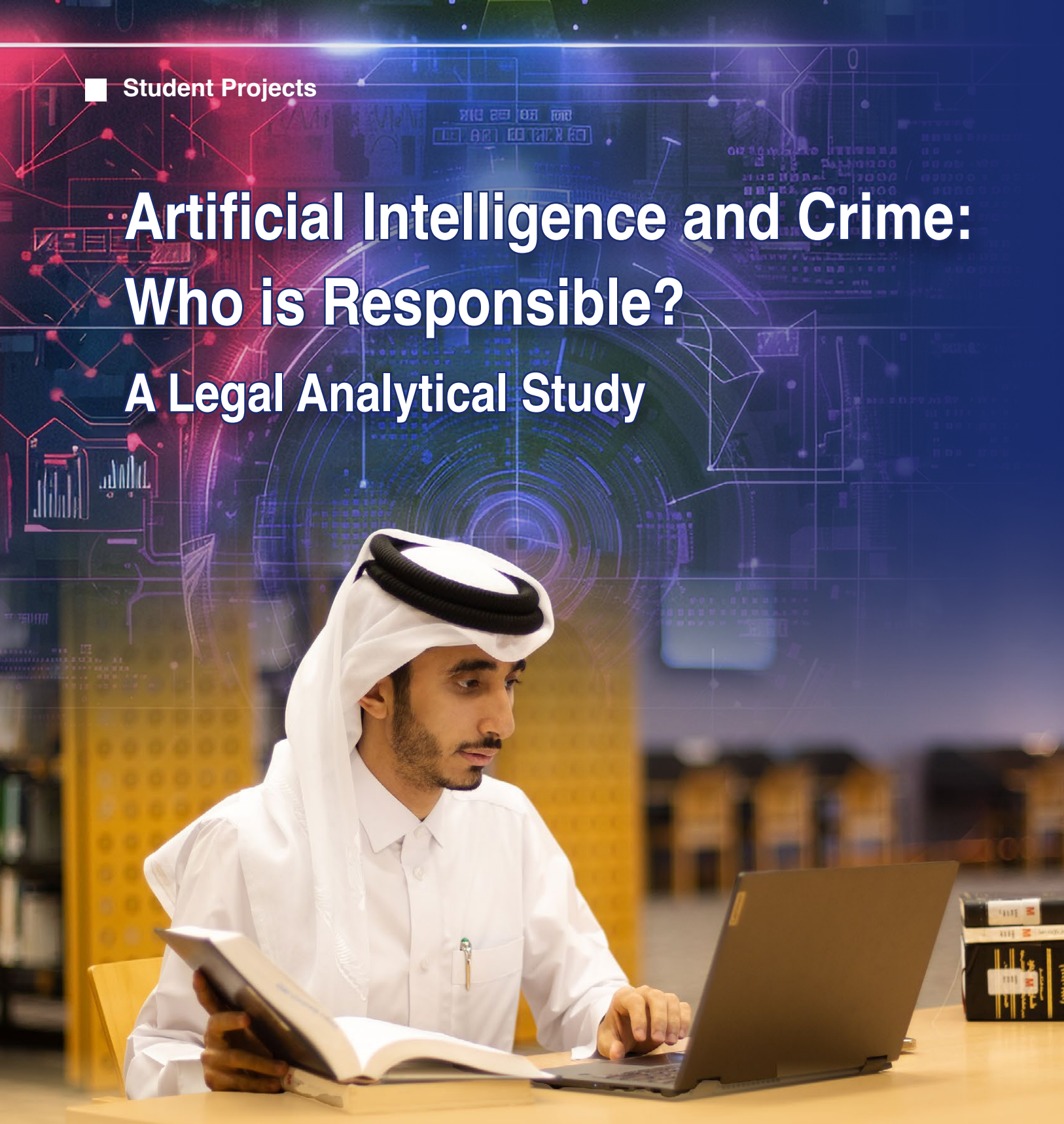
What advice would you give to Qatar University students interested in research and innovation?

That:

1. Choose a field of study that you are passionate about and excited to explore.
2. Stay updated by reading scientific papers, attending seminars, and participating in workshops.
3. Join research teams within or outside the University to increase and develop their horizons.
4. Connecting with experts, such as professors or experienced researchers, to seek advice or guidance.
5. Participate in scientific competitions and manage time effectively.

Artificial Intelligence and Crime: Who is Responsible?

A Legal Analytical Study



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Can Artificial Intelligence be Held Legally Liable?

Artificial intelligence (AI) has become an integral part of our lives, being widely used in industrial, medical, and technological fields. As AI continues to evolve, a crucial legal question arises, which this study attempts to answer: Can AI be held legally accountable for the harm or crimes it may cause, or does liability remain solely on programmers and users?

In this research, the researcher analyzed traditional criminal laws, which rely on awareness and free will in determining responsibility. However, AI's ability to make independent decisions introduces a new legal dilemma. Should AI be considered legally responsible, or is it merely a tool controlled by its users?

For this reason, this study examined the adequacy of general criminal liability principles in addressing crimes committed by AI and determining the legal entity responsible. The researcher also explored the possibility of granting AI legal personality and its impact on the evolution of criminal laws.

AI in the Legal Balance: An Independent Entity or a mere Tool?

AI technologies rely on deep learning and big data processing which allows them to analyze information and make decisions based on constantly updated inputs. However, the issue of free will and the ability to distinguish right from wrong remains highly debated. If AI systems learn from data and operate based on predefined algorithms. Does this make them legally accountable? or does liability rest solely on those who designed or used them?

Legal perspectives on this issue vary, and the researcher found that opinions in this study are divided into two main viewpoints:

1. The First View: Granting AI Legal Personality.

Proponents of this view argue that AI could evolve to a level of independence that allows it to bear responsibility for its actions. They draw on the legal concept of corporate personality, which grants rights and obligations to non-human entities. Just as corporations can sue and be sued, AI might, in the future, be granted limited legal personality, enabling it to be held legally accountable for certain actions.

2. The Second View: The Impossibility of Holding AI Liable.

Opponents argue that AI lacks awareness and free will, both of which are essential for establishing criminal liability. Since the law considers the perpetrator's intent and awareness of legal violations, AI, which operates solely on pre-programmed algorithms, cannot be held criminally responsible. According to this perspective, criminal liability should remain within the human domain, including manufacturers, programmers, users, or even external actors such as hackers who exploit these systems.

Qatari Legislation: Is the Law Prepared for this Challenge?

The researcher reviewed different legal frameworks and found that Qatari criminal law, like most traditional legal systems, attributes liability to individuals and recognized legal entities. However, liability can still be assigned to different parties when a crime is committed using AI, such as:

- Manufacturers and Programmers: If programming errors or negligence in AI system development leads to a crime.
- Users: If AI is deliberately used as a tool to commit a crime, such as employing a robot to carry out theft.
- External Actors: Hackers who exploit vulnerabilities in AI systems to conduct cybercrimes.

AI-Related Crimes: Real-World Cases Raising Legal Concerns

In this research study, the researcher examined several real-world incidents that have sparked legal debates about AI liability, including:

- The Killer Robot in Japan (1981): An industrial robot in a motorcycle factory identified an employee as a "threat" and pushed him into a machine, causing his death. The robot was

not held accountable, but the manufacturing company faced legal consequences.

- Attack on an Engineer at a Tesla Factory (2021): An engineer suffered serious injuries after being attacked by an industrial robot. Tesla was required to pay compensation, but the robot itself bore no direct responsibility.
- Drones and Digital Crimes: Criminal organizations have used autonomous drones for illegal operations, raising questions about whether these systems can be classified as "actors" in crimes.

Research Findings

Through this study, the researcher reached several key findings:

1. There is no comprehensive legal framework for holding AI criminally liable, as traditional criminal laws rely on intent and awareness, both of which AI lacks.
2. Liability is currently assigned to human actors such as manufacturers, programmers, and users, as AI is not yet considered an independent legal entity.
3. International legislation varies on AI-related liability, with some countries recognizing AI's civil liability, while criminal liability remains unacknowledged.
4. A new legal model could be developed to grant AI limited legal personality in civil cases while keeping criminal liability within the scope of individuals responsible for its development or operation.

Recommendations

Based on the legal analysis conducted in this research, the researcher proposes the following key recommendations:

- Establishing an international legal framework to regulate AI use and combat AI-related digital crimes, particularly given their cross-border nature.
- Mandating AI manufacturers to set clear liability standards for catastrophic programming errors and define responsible parties for any damages caused by these systems.
- Creating an international regulatory body to monitor AI advancements and establish legal and ethical standards to ensure its safe and responsible use.

This study has demonstrated that AI holds great potential but presents unprecedented legal challenges. Taking proactive steps to establish clear and flexible legal frameworks will ensure that societies can maximize the benefits of AI while minimizing potential legal and social risks.

From left: Ameen Aljawadi and Ahmed Alkubaisi.

Tech-Powered Community Engagement in Health Crisis Management

Ahmed Alkubaisi, Bachelor's in Social Work, College of Arts and Sciences - Qatar University

Ameen Aljawadi, 4th Year Student, College of Dental Medicine - Qatar University

Supervisor: **Dr. Wael Abdallah,** Box Hill College - Kuwait

Health crises pose significant challenges worldwide, demanding proactive strategies to enhance preparedness, response, and recovery. This research, presented at the prestigious Entrepreneurship for Sustainability and Impact (ESI) conference, explored the role of digital technologies in facilitating community engagement for effective health crisis management. Through leveraging social media analytics, crowdsourcing, crowdsensing, and other technologies, the study presented a conceptual model illustrating how technology can empower communities and inform policymaking across various stages of health crisis management.

Leveraging Technology to Harness Community Engagement

Community engagement is crucial in health crisis management, as local populations are both the first responders and the most affected. Governments and institutions can harness digital technologies to collect real-time data, enhance situational awareness, and facilitate swift decision-making. This research identified three critical phases where technology can have a significant impact:

1. Preparedness Stage: Proactive Measures for Crisis Mitigation

Predicting potential outbreaks and enhancing healthcare system readiness are crucial in minimizing crisis impact. This study separated the preparedness stage into:

- **Deliberate Preparedness:** refers to a group of organized actions taken well ahead of time, before the instigation of a crisis, to eliminate response and recovery inhibitors. The method we use to consolidate this stage is through implementing highly reliable organizational approaches, which include resilience cultivation and mindful leadership. Resilience cultivation aims to upgrade people's adaptability to unpredictable events by elevating their skills through training sessions, simulations, learning by doing, and the usage of personal protective equipment, scenario planning, and backup systems. On the other hand, mindful leadership refers to opening the communication environment and reducing the perceived distance between divergent actors, including citizens and decision-makers.
- **Immediate Preparedness:** refers to proactive actions taken to prevent minor issues from escalating. This phase operates in the aftermath of a crisis to manage discrete outbreaks or halt the continuity of pandemic waves. In this phase, a new confirmed case is considered a minor issue that must be detected and addressed to prevent the progression of the pandemic.

2. Response Stage: Real-Time Crisis Management

The response phase requires swift action, and technology-driven community engagement that play a crucial role by providing vital support through:

- **Social Media Sentiment & Spatio-Temporal Analysis:** within the umbrella of "citizens' centered data analysis," both sentiment and spatio-temporal analysis can be used to study and identify outbreak patterns by analyzing citizens' tweets—leveraging time, location, and sentiment analysis of the text of the tweets to enhance early detection and inform targeted containment measures. An example consolidating this idea includes a novel real-time flu and cancer surveillance system that uses spatial, temporal, and text mining on X's (Twitter previously) data.
- **Crowdsourcing Platforms:** Aggregating citizen-reported symptoms and epidemiological data for informed decision-making. This can be done via several open crowdsourcing technologies.
- **Crowdsensing Technologies:** engage the community in a subtler way, which, through various physiological factors, can detect disorders. These technologies provide decision makers with information that is objective and reliable, thereby guiding the process of smart decision-making that is backed by evidence. These technologies can be demonstrated through mobile and wearable devices to detect physiological indicators of infection, enabling real-time monitoring and intervention.

3. Recovery Stage: Enhancing Community Resilience

Post-crisis recovery involves addressing social and economic disruptions while rebuilding trust. Technology supports this phase by:

- **Vaccine Sentiment Analysis:** Assessing public perceptions and hesitations to tailor awareness campaigns.
- **Digital Social Support Networks:** Facilitating mutual aid and psychological resilience through online platforms.

- **Policy Refinement through Big Data:** Analyzing engagement trends to develop long-term health strategies.

The Impact of this Research

This research filled a gap in the existing body of knowledge as it examined the role of technology-mediated community engagement in health crisis management along its three separate stages: preparedness, response, and recovery. This was achieved by integrating distinct theoretical frameworks from the literature into a single conceptual model, as shown in **Figure 1,** showcasing the individual strategies that could be adopted at each stage.

Additionally, the research demonstrated the potential employability of digital technologies in harnessing big data driven by citizens in tackling health crises. For instance, citizen-centered data analysis could be utilized in exploring the geographical distribution of diseases as well as performing citizens' sentiment analysis amid the crisis. In sum, implementing such a conceptual model transforms health systems by fostering proactive management of health crises.

Conclusion

As digital technologies continue to evolve, their role in enhancing community engagement and crisis response becomes more pronounced. By integrating real-time data analytics, participatory governance, and technological innovations, a more proactive and resilient approach to health crisis management can be established.

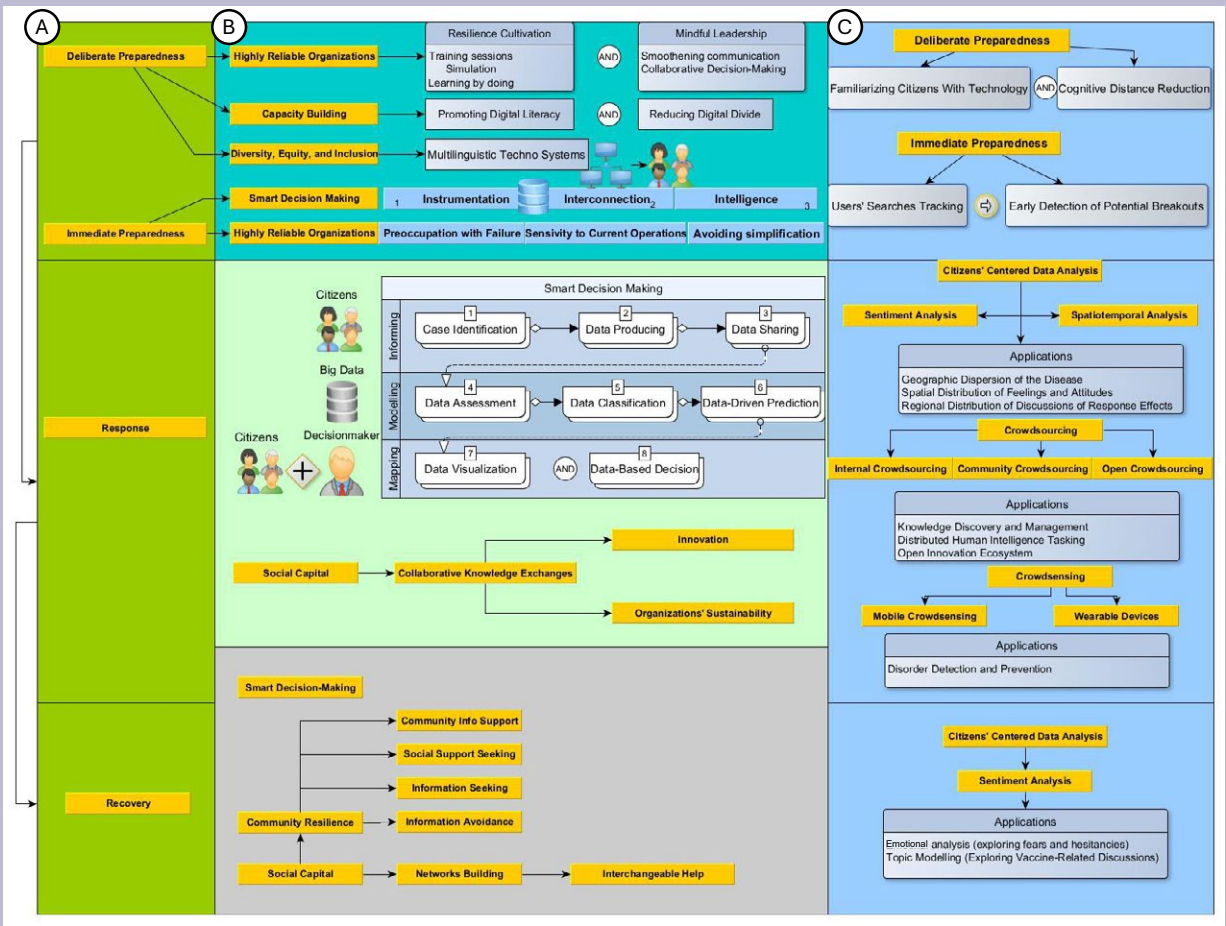

Figure 1: The first column represents the crisis lifecycle stage. The second column represents the approaches applied to the stage. The third column represents the technologies and their applications.

To view the research, please scan the QR code:

The Role of Juniperus Communis Essential Oil in Novel Nanofiber Bandages and Antimicrobial Resistance

Mohannad Natheef Abu Haweeleh, 6th Year Medical Student,
Supervisor: **Dr. Susu Zughaier,** Associate Professor of Microbiology,
College of Medicine – Qatar University

Infectious diseases remain a significant cause of morbidity and mortality worldwide, particularly in low- and middle-income countries. The increasing resistance to antimicrobial drugs poses a growing challenge to the treatment of these infections. The World Health Organization (WHO) has identified antimicrobial resistance (AMR) as one of the top ten global public health threats. AMR is associated with high mortality rates, increased healthcare costs, and reduced treatment efficacy, primarily due to the misuse and overuse of antimicrobial drugs. The crisis is particularly concerning in nosocomial infections caused by the ESKAPE pathogens: *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter cloacae*. As antimicrobial therapies become increasingly ineffective, the urgency to develop alternative treatments has intensified.

The alarming rise in AMR has revived the search for plant-derived antimicrobial therapies. Essential oils (EOs) extracted from various plants have long been recognized for their antimicrobial and antibiofilm properties, contributing to symptom alleviation and bacterial growth inhibition. In addition to their antimicrobial effects, EOs have been successfully used to treat conditions such as chronic pain, pediculosis in children, and postoperative nausea in cancer patients. Biofilm formation on medical devices such as catheters, ventilators, and contact lenses presents a significant challenge in clinical settings, further complicating the treatment of infections. Given the rising resistance of bacterial biofilms to conventional antimicrobials, natural therapeutic agents capable of eradicating biofilm-forming pathogens have become necessary.

A pioneering research titled “Antibacterial and Antibiofilm Activity of Novel Nanofiber Bandages Formulated with *Juniperus communis* Essential Oil Targeting Antibiotic-Resistant Bacterial Strains” was conducted to investigate the potential of *Juniperus communis* essential oil (JEO)-infused nanofiber bandages in combating AMR. This research, conducted by Mohannad Abu Haweeleh and colleagues under the supervision of Dr. Susu Zughaier, Associate Professor of Microbiology and Immunology at Qatar University, was presented at the American College of Surgeons’ Clinical Congress in Boston, where it secured second place in the Basic Science category.

The research focused on developing polycaprolactone (PCL) nanofiber bandages infused with JEO to assess their antibacterial, antibiofilm, and immune-modulating properties against ESKAPE pathogens. The research involved collaboration with Dr. MD Anwarul Hasan, Associate Professor of Mechanical and Industrial Engineering at Qatar University, for nanofiber formulation and with Dr. Nahla Eltai, Research Associate at the Biomedical Research Center, for bacterial testing.

The *Juniperus communis* plant is widely distributed across Europe, Asia, and North America and possesses various medicinal properties, including diuretic, anti-inflammatory, antiseptic, antioxidant, and hypoglycemic effects. Different parts of the plant have demonstrated efficacy against various diseases. Studies have shown that methanolic extracts from *J. communis* exhibit dose-dependent analgesic effects, while its EO has demonstrated effectiveness in water disinfection against *Mycobacterium* species. Given its antimicrobial properties, JEO holds potential for integration into nonwoven polymer nanofibers for use in treating surgical site infections (SSIs) and skin ulcers.

The antibacterial efficacy of JEO was tested using bacterial growth curves, microtiter dilution assays, and agar diffusion methods. Additionally, its antibiofilm activity was evaluated through biofilm formation assays in 96-well plates, followed by staining and quantification using crystal violet assays. The findings revealed that JEO exhibited significant antibacterial and antibiofilm activities against ESKAPE pathogens. Growth curve analyses showed dose-dependent inhibition of bacterial proliferation, while bactericidal assays confirmed the oil's ability to eliminate bacterial colonies. The antibiofilm assays demonstrated a substantial reduction in biofilm formation in the presence of JEO, highlighting its potential to prevent infections related to medical devices. The research also investigated the anti-inflammatory effects of JEO on human monocyte (THP-1) and murine macrophage (RAW 264.7) cell lines. The results indicated that JEO modulated immune responses by reducing pro-inflammatory cytokine release, suggesting its potential role in mitigating excessive inflammation in infected wounds.

To enhance the clinical applicability of JEO, PCL-based nanofiber membranes were developed with varying concentrations of the EO (2%, 4%, 6%, and 8%). The antibacterial efficacy of these membranes was evaluated using bacterial inhibition zone assays and broth-based viability assessments. The results confirmed that nanofiber membranes infused with higher concentrations of JEO exhibited stronger antibacterial effects, effectively inhibiting bacterial growth and reducing biofilm formation. To further validate the potential of JEO-infused nanofiber bandages, bacterial strains were cultured in the presence of the membranes, and their viability was assessed at multiple time points. The results consistently demonstrated a reduction in bacterial colony-forming units, indicating sustained antimicrobial activity over time **(Figure 1).** These findings support the potential use of JEO-infused nanofibers in clinical settings for preventing and treating infections caused by antibiotic-resistant bacteria.

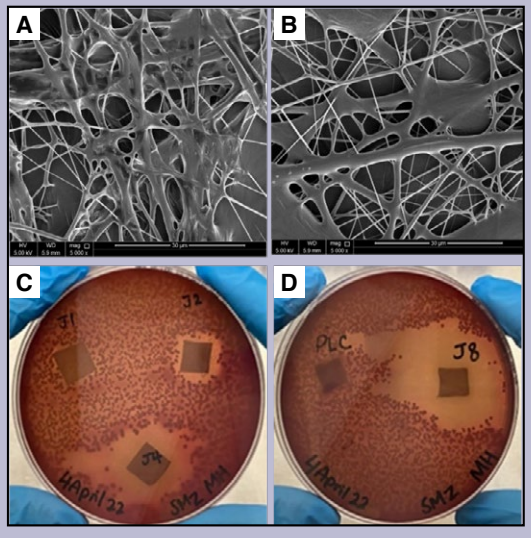

Figure 1: Scanning electron microscope (SEM) images demonstrate that incorporation of 8% Juniper essential oil (JEO) does not affect the morphology or porosity of polycaprolactone (PCL) nanofibers. **A)** PCL nanofibers without Juniper EO. **B)** PCL nanofibers with 8% Juniper EO. The antibacterial activity against methicillin-resistant Staphylococcus aureus (MRSA) was evaluated using sheep blood agar for bacterial growth, with zones of inhibition measured for nanofibers containing varying concentrations of Juniper EO (0%, 1%, 2%, 4%, and 8%). **C)** Inhibition zones for PCL nanofibers with 1%, 2%, and 4% Juniper EO. **D)** Inhibition zones for PCL nanofibers with 0% (control) and 8% Juniper EO.

AMR is an escalating public health concern, necessitating the urgent development of alternative therapeutic strategies. Research on JEO-infused nanofiber bandages highlights the potential of plant-based antimicrobials in addressing this challenge. By integrating the natural antimicrobial properties of JEO with advanced nanofiber technology, this innovative approach presents a promising strategy for managing antibiotic-resistant infections. Given the growing impact of AMR on global healthcare, plant-based antimicrobial solutions offer a viable alternative. This research underscores the potential of JEO-infused nanofiber bandages in preventing hospital-acquired infections and reducing reliance on conventional antibiotics. Future research should focus on optimizing JEO-infused nanofiber formulations, assessing their long-term stability, and conducting in vivo studies to evaluate their clinical efficacy.

The success of this research highlights the critical role of interdisciplinary collaboration in addressing AMR. Equipping future physicians with expertise in antimicrobial stewardship and translational research is essential for developing effective strategies to combat this global challenge. This research study aligns with Qatar's national priorities for biomedical innovation, emphasizing the pivotal role of physician-researchers in driving advancements in global healthcare solutions. The research is currently under review in the Chinese Herbal Medicines Journal, published by Elsevier.

Mohannad Abu Haweeleh (center) achieved second place at the American College of Surgeons Clinical Congress 2023.

Why Do Some People Age Faster Than Others?

Here's The Secret That Might Change Your Perspective on Time

Prof. Abdrabo Soliman

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Abstract

Biological, environmental, and social causes all play a role in the aging process that most people go through. However, these causes interact with other factors, collectively contributing to physical and psychological decline. This article will explore these dynamics through the lens of the distinction between chronological aging—measured in years—and biological aging, which is shaped by physical changes and cognitive-functional interactions. It will focus particularly on the role of telomeres (the ends of DNA strands, which serve as markers of cellular activity) and mitochondria in determining the rate of cellular deterioration. The article will also address the question: To what extent do these genetic factors—compared to environmental influences and lifestyle patterns—contribute to either accelerating or slowing down the aging process?

Prof. Abdrabo Soliman

Introduction

Aging, or senescence, is an inevitable part of the human life cycle, though its pattern varies among individuals. Some elderly maintain psychometric functions and vital signs, while others experience declines in physical and mental abilities, affecting quality of life. This disparity raises questions about the causes of variation in aging.

There is a scientific need to investigate aging determinants systematically, especially in an era of complexity and interconnection. Multiple factors influence aging measurement: psychological, genetic, social, and cultural. The scientific community must distinguish genetically fixed from environmentally variable factors to develop strategies supporting elderly lives.

Cognitive Determinants of Aging

Psychological, social, and cultural factors influence chronological and cognitive aging, requiring multifactorial analysis. Blake's (1999) research shows how societal changes reshape aging attitudes. Aging has two dimensions: chronological age (time from birth) and biological age (genetic function, physical health, emotional stability). Aging theories vary: demographic theories analyze population structure; programmed aging theories propose hormonal lifespan mechanisms; damage accumulation theories, including the "wear and tear" model, attribute aging to genetic and biological dysfunction. Mitochondrial dysfunction research has influenced contemporary aging scholarship, transforming traditional frameworks. Figure 1 illustrates the variations in brain activity between youth and old age, presented through four distinct imaging perspectives.

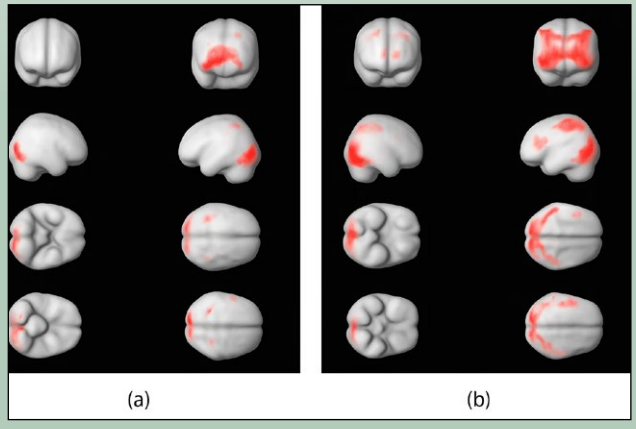

Figure 1: Differences in Brain Activity Related to Aging: Image (a) shows a brain with reduced neural activity, while image (b) shows increased neural activity in multiple areas. These differences indicate the impact of aging on cognitive decline and neural functions.

Recent research has shown a clear convergence among these theories, revealing that aging is a multifaceted phenomenon influenced by a variety of genetic, environmental, and cultural factors. This overlap in knowledge indicates that no two individuals age at the same rate, much like fingerprints or personality traits.

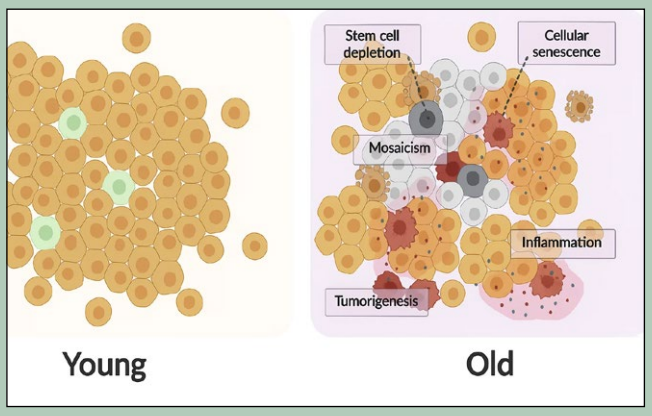

Figure 2: Cellular Changes Between Youth and Aging: The image on the left shows healthy cellular tissue in young individuals, while the image on the right highlights the effects of aging, such as stem cell depletion, cellular senescence, inflammation, and genetic (mosaic) changes that may lead to tumors.

Biological and Environmental Determinants of Aging

Aging manifests through several key indicators: wrinkles, reduced physical capacity, prolonged recovery periods, and bone deterioration. While lifestyle variations exist among individuals, certain factors consistently accelerate the aging process, including smoking, inadequate nutrition, and sedentary behavior.

Normal aging involves predictable cognitive changes, whereas severe memory impairments typically signal pathological conditions such as dementia. This distinction has prompted researchers to investigate methods for slowing or potentially reversing age-related decline.

Genetic factors significantly influence both the rate and characteristics of aging. Specific genes contribute to longevity, while others predispose individuals to age-related diseases. This genetic component explains why families with exceptional longevity often share heritable traits that promote healthy aging. Figures (2) and (3) provide detailed illustrations of cellular changes and telomere function, respectively.

Current research focuses on developing senolytic therapies—treatments designed to eliminate senescent cells. These interventions, currently in animal testing phases, show promise for delaying age-related diseases and enhancing overall health outcomes.

Environmental factors include the effects of diet, physical activity, and exposure to pollution in stimulating signs of aging. Fruits, vegetables, and anti-inflammatory compounds—such as omega-3 fatty acids—are among the factors that protect cells from damage and slow down aging. Accordingly, physical activity is one of the most effective physical methods to combat signs of aging, as it promotes cardiovascular health, strengthens muscles and bones, improves cognitive performance, and reduces stress.

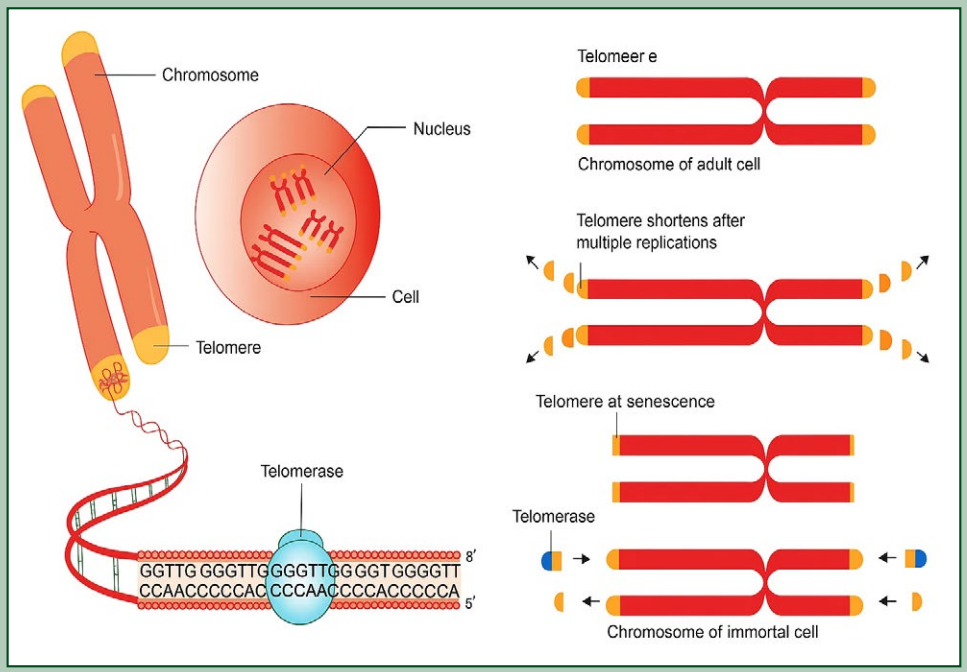

Figure 3: Illustrates the structure of telomeres at the ends of chromosomes and the role of the enzyme telomerase in extending the lifespan of cells and preventing their deterioration.

Type and Its Impact on Aging

Research on population aging shows notable differences between men and women in senescence indicators and expressions, shaped by both biological and societal elements. Population statistics indicate that women typically live longer than men but show increased vulnerability to conditions like osteoporosis and Alzheimer's disease. In contrast, men have higher risks of developing heart disease and other age-related illnesses. Brain alterations linked to aging, which are referenced in diagrams (e.g., Figure 4), might illustrate and help explain the biological basis of these sex-specific health issues, contributing to a clearer understanding of why diseases affect them differently.

Alongside these biological factors, societal influences, studied within population sociology and through qualitative population data, significantly impact how people age. Manifestations of aging vary greatly among different ethnic groups, shaped by diverse cultural frameworks and attitudes toward older adults. Some cultures emphasize and protect seniors' rights, while others may not afford similar recognition or support. This variation underscores the urgent need for the scientific community to develop a comprehensive health plan that integrates cultural, societal, and psychological factors to effectively address the complex and multifaceted nature of aging across diverse populations.

Socioeconomic status clearly influences the aging process; individuals with higher education and income tend to age more slowly, while those in lower economic situations often face chronic stress, poor nutrition, and limited healthcare access, which speed up their biological aging. Therefore, addressing these disparities is crucial for promoting healthy aging across all segments of society. Psychological factors also contribute to faster aging through mental health issues and chronic stress, which increase cortisol levels and cause damage to cells and tissues. To reduce this effect, stress management techniques like meditation, building social connections, and providing psychological and social support are recommended.

Conclusion:

Through this presentation, which explained the determinants of aging and discussed its manifestations, it becomes clear that genetic factors alone do not determine aging. Rather, there are other, more complex factors at play in an ever-changing and increasingly complex world. Nevertheless, other questions remain under investigation, such as the extent to which biotechnology can slow aging and other global inquiries awaiting scientific answers in the coming days, particularly regarding targeted treatments like senolytics. Ultimately, aging cannot be avoided, but we can influence its course through conscious choices that support physical and mental health. Thus, the concept of aging transforms from an inevitable pathological stage into an opportunity for a longer life built on solid scientific foundations and sustainable health strategies.

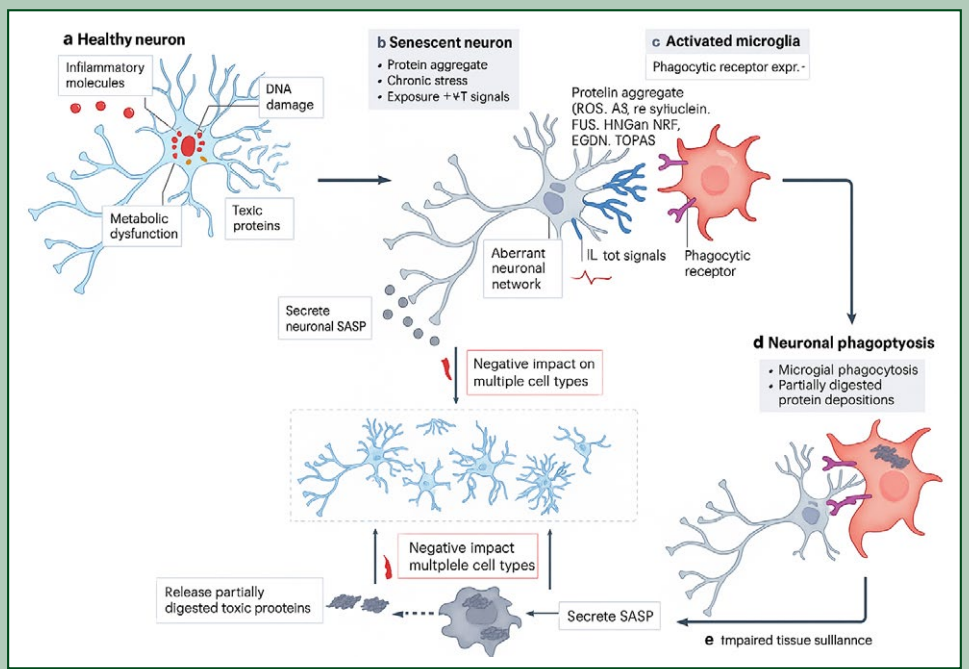

Figure 4: Illustrates the progression from healthy neurons to various stages of neurodegeneration and cellular interactions within the brain.

SESRI Consumption Values and Behaviour Survey in Qatar:

Key Insights from the Study

Prof. Arokiasamy Perianayagam

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The Social and Economic Survey Research Institute (SESRI) at Qatar University conducted a pioneering study titled “Consumption Values and Behavior Survey in Qatar.” The primary aim of this study was to collect comprehensive data on consumption values, choices, spending preferences, sustainable consumption behavior, financial vulnerabilities, income, savings, and economic well-being. This data is crucial for social and economic development processes and for monitoring global targets, including the Sustainable Development Goals (SDGs) in Qatar.

The study explores socio-cultural, psychological, and economic factors influencing consumption values and behavior. Unlike traditional Household Consumption Expenditure Surveys (HCESs), this study explores broader questions about how individuals allocate financial resources between essential and non-essential consumption. The study employed multidimensional measurement scales in behavioral economics and surveyed a diverse group of households, including 983 Qatari and 1,043 expatriate households, totaling 2,026 interviews. The survey findings offered groundbreaking insights into household consumption values and behavior, sustainable consumption practices, income and consumption patterns, financial resilience, and vulnerabilities. The study also examined how economic and social factors influence consumer decisions.

Some Key Insights from the Study are:

- The study revealed a growing awareness of sustainable consumption practices. However, hedonistic values remain strong, particularly among high-income Qataris (Figure 1).
- Between 46% and 49% of expatriates, compared to 29% of Qataris, reported actively trying to reduce excess consumption to protect environmental resources for future generations.
- The majority of study participants (70%) reported consistently making an effort to reduce the misuse of goods and services. Approximately 65% of respondents stated that they are mindful of food prices at restaurants, while 49% actively try to avoid overconsumption of goods and services (Figure 1).
- Regarding self-perceived spending preferences, nearly half (48%) of respondents never considered themselves extravagant.
- The level of education significantly influenced how people view consumption, particularly shaping attitudes toward extravagant purchases. Gender differences revealed that men are more likely than women to disapprove of non-essential spending and luxurious lifestyles.
- A strong positive correlation existed between education, income, and financial stability. Furthermore, household income level itself was strongly correlated with perceived economic well-being (Figure 2).
- Consumption inequality among Qatari citizens was measured at a Gini index of 0.49 (p90/p10 = 9), which is much higher than that among expatriates (Table 1). The incidence of debt is 56% and 26% for Qataris and expatriates, respectively, with emergencies being the single largest reason for loans.

The study revealed a complex interplay between satisfying personal needs and seeking social status and prestige. Residents value their consumption both for personal satisfaction and as a marker of social status. Conspicuous consumption remained part of Qatar's social dynamics and an important driver of consumption. However, the study findings also revealed there was a growing awareness and potential for sustainable practices. The study findings indicated significant social variations based on education, family size, and gender. Furthermore, the level of consumption inequality was high (Table 1). The study provided substantial evidence of residents' current financial well-being confirming their economic optimism and financial resilience (Figure 2). Qatar's residents have several reasons for economic optimism and financial resilience as they approach 2025.

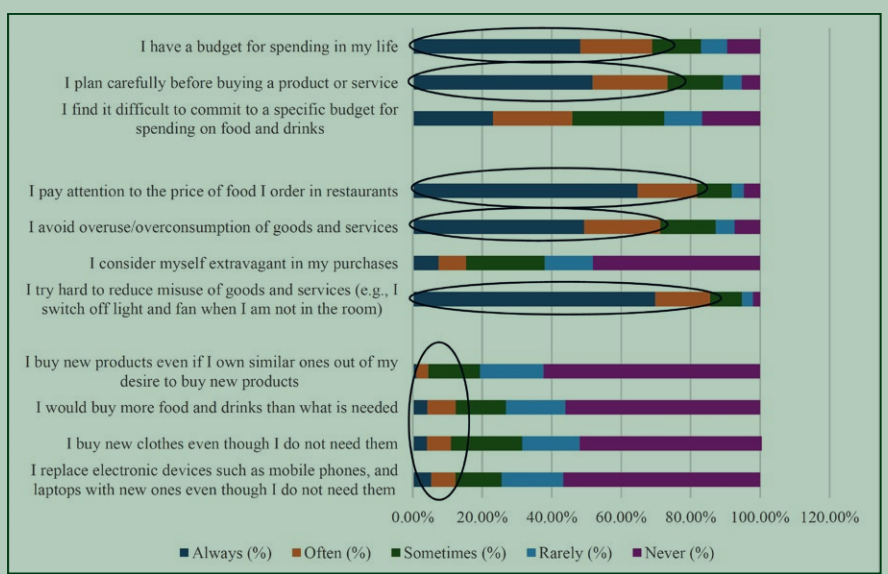

Figure 1: Distribution of Sustainable Consumption Behavior and Budget Planning Practices.

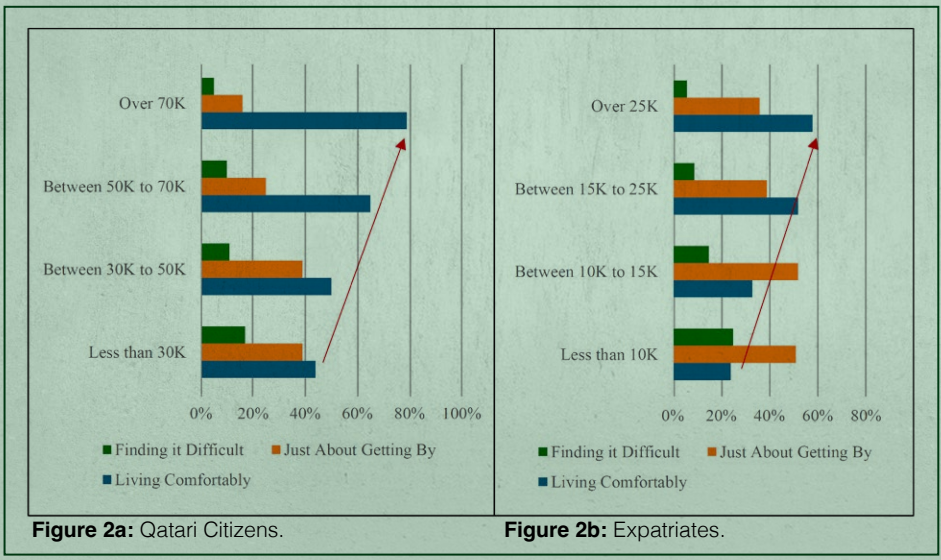

Figure 2a: Qatari Citizens.

Figure 2b: Expatriates.

Figure 2: Current Financial Wellbeing by Monthly Income Levels.

Table 1: Consumption inequalities: Gini Coefficient and the Percentile ratios for distribution of Total Per Capita Monthly Expenditure of Qataris & Expats.

	p90/ p10	p90/ p50	p10/ p50	p75/ p25	p75/ p50	p25/ p50	Gini Coefficient
Qataris	9	3	0.4	3	2	1	0.49
Expatriates	4	2	0.5	2	1	1	0.33

Dissemination Workshop

SESRI organized a dissemination workshop on Thursday, 30 January, at the Auditorium, Library Building, Qatar University, to share the findings of the study with academia, researchers, policymakers, and stakeholders. The first technical session of the workshop included a comprehensive presentation of the study's findings by SESRI researchers. Professor Arokiasamy Briyanayagam, Lead Principal Investigator at SESRI, presented the study overview and key insights, while Dr. Rashid Memon examined income and consumption patterns and disparities. Ms. Noor Khalid Al Thani discussed consumer values and sustainable practices. The session concluded with Mr. Fahad Al-Boinin's insights on economic well-being and financial resilience.

Panel discussion on policy implications and stakeholder engagement

The second session featured an interactive panel discussion focused on the impact of public policies on consumption behavior and sustainable practices. The panelists agreed that this is a pioneering survey in Qatar, offering comprehensive and valuable data that can be used to develop evidence-based policies, contributing to a more sustainable and prosperous economic future. The panel discussion was moderated by **Professor Ahmed Khalifa,** College of Business and Economics, with the following distinguished panelists:

Prue Morris, Managing Director, Qatar Financial Centre Regulatory Authority, Qatar.

Dr. Alanoud Al-Maadid, Head of the Department of Economics, Qatar University, Qatar.

Professor Hamdi Bennasr, College of Business and Economics, Qatar University, Qatar.

The discussions focused on the following themes/ questions:

- **Theme 1:** Awareness and adaptation of sustainable consumption behavior and practices. Are Qatar's residents ready to embrace sustainable consumption practices, or do hedonistic values still dominate?
- **Theme 2:** How can household budget planning and sustainable consumption practices be aligned with national goals? How can financial institutions play a more active role in promoting sustainable consumption and budget planning?
- **Theme 3:** How can social protection policies be navigated in the context of income and consumption inequalities, as well as disparities across education levels?

- **Theme 4:** What strategies can be employed to engage policymakers, considering residents' economic optimism and financial resilience?

Discussion Summary

Public consumption in Qatar is estimated at 17% of GDP, revealing a trend of overconsumption at the expense of savings. To address this, strategies like behavioral economics—leveraging Qur'an-inspired "nudges" to influence consumer choices—can promote sustainable consumption. Additional approaches include financial literacy programs, emergency savings initiatives, financial strategies, and green funding options.

Despite the cultural influence of social status-driven spending, there is a growing awareness of sustainable practices. However, balancing ecological awareness with status-driven spending poses a challenge for policymakers. To address this, education and awareness initiatives, legislative changes, and financial incentives are needed to promote sustainable consumption practices without compromising social standing or financial goals.

The importance of household budgeting for financial stability and sustainability needs to be recognized.

Financial institutions can support sustainable practices by offering ethical investments, financial literacy, and green financial products. Additionally, addressing income and consumption disparities through social protection laws and financial inclusion programs remains crucial to ensure fair opportunities for all households. Overall, these strategies can foster a more sustainable and robust economic welfare in Qatar.

Panel discussion on policy implications and stakeholder engagement.
From left to right: Ms. Prue Morris, Dr. Alanoud Al-Maadid, Professor Hamdi Bennasr, Professor Ahmed Khalifa

Is Arabic Under Threat in the Arabian Gulf?

Prof. Rizwan Ahmad, Professor of Linguistics

Shaikha Al-AHemaidi, Student of the Department of English Literature and Linguistics

Department of English Literature and Linguistics, College of Arts and Sciences – Qatar University

Is Arabic under threat in the Gulf Cooperation Council (GCC) countries of Qatar, Kuwait, Saudi Arabia, Oman, Bahrain, and the UAE where the number of non-nationals exceeds the nationals? Do non-Arabs living in the GCC pose a threat to the Arabic language and Arab identity? These questions have been the subject of debates not only in the media but also academic conferences and seminars. In this article, we examine this critical issue objectively.

Demographic changes after the Discovery of Oil in GCC

The GCC countries have experienced an influx of migrant workers over the past decades following the discovery of oil and gas. The massive economic and social projects undertaken by the GCC governments have further created labor needs that the local population cannot fulfill leading to reliance on foreign workers. In the GCC, non-nationals outnumber the nationals making up 52% of the total population. In Qatar, the percentage of non-nationals is even more pronounced reaching up to 95% of the workforce. While migration into the GCC has brought many benefits to the region, it has also raised concerns that the Arabic language and Arab identity are in danger.

Fear of Decline of Arabic

In popular discussions, the decline of the Arabic language is generally attributed to two factors. First, it is argued that the presence of a non-Arab migrant population not only poses a threat to the structure of the Arabic language but also endangers the Arab identity of the youth. Al-Farajani, a scholar and a columnist, argued, in an article published on Aljazeera in 2008, that the presence of Asians had negative consequences, the most important of which is *ifsād al-lughah al-'Arabīyyah,* 'corruption of the Arabic language.'

In 2013, King Abdullah bin Abdulaziz Center for Language Planning and Policies, based in Saudi Arabia, organized a conference to develop strategies to strengthen the Arabic language and identity. Dr. Lateefah Al-Najjar, professor of Arabic language in the UAE University, presented

a paper on the effects of Asian labor on the Arabic language in which she argued that maids and drivers affect the language of children. She recommended that the Asian labor be replaced with Arabs and that being fluent in Arabic must be a condition of employment in the GCC.

A second source of anxiety comes from the presence of English-medium schools and colleges in the region. In a report published in 2019 on the UN Arabic Language Day celebrated on December 18, it was argued that the English language was a threat to Arabic in the GCC in the same way as French endangers Arabic in in North Africa. According to a report published in the Economist, in 2022, the youth in the GCC use English more than Arabic. Some scholarly studies have also argued that English-medium schools in the GCC are a threat to Arabic. A similar fear of the decline of Arabic in the entire Arab World was the theme of a Pan-Arab conference entitled "The Arabic language is in danger: We are all partners in protecting it" held in the UAE in 2013 indicating that the purported decline of Arabic is not limited to the GCC.

Language Policy Changes in the GCC

The presence of a large non-Arab population has also created challenges for communication between Arabs and non-Arabs. The governments of Qatar and UAE have started to use migrant languages in dealing with issues related to the workforce. At the same time, the concerns about the decline of the Arabic language have led the countries in the region, especially Qatar and UAE, to take measures to protect it. In the UAE, the Cabinet passed Resolution Number 21/2 in 2008 whereby all government departments were required to use the Arabic language in all their official communications. In 2015, the Department of Economic Development of Dubai in the UAE issued violation tickets to restaurants for not having their menus in Arabic. Similarly, in 2019, Qatar passed the Law on Protection of the Arabic Language which strengthens the use of Arabic.

Language Decline as Proxy for Social and Political Crisis

A major shortcoming of the aforementioned reports, studies, and conferences is that no empirical evidence was provided to support the purported decline of Arabic. There is no evidence that the Arabic language spoken by the young people in the GCC shows the linguistic influences of their maids and drivers. They may have acquired some words, phrases, and sentences to communicate with them, which only suggests that their linguistic repertoire has become enriched. Many maids and drivers learn to communicate in broken pidgin Arabic. There is a need for systematic research to understand the linguistic effects of maids and drivers on the language of the host society.

Moreover, the discourse of the decline of Arabic is not limited to the GCC but it covers the entire Arab World as was the theme of the 2013 conference in the UAE. Yasir Suleiman, a sociolinguist who has researched Arabic language and identity, describes the situation as language anxiety, meaning that it is less about the language and more about the social tensions besetting the Arabs as a nation. One major external factor that contributes to anxiety is the presence of English in educational institutions. Another is the demographic changes that the GCC countries have witnessed whereby non-nationals form a significant part of the Gulf population. Suleiman contends that discussions about the decline of Arabic serve as a stand-in for broader social tensions, where defending the Arabic language equates to defending the Arab social and moral order.

Despite concerns about linguistic anxiety, a significant shift has emerged in the linguistic landscape of the GCC: for the first time in history, Arabs are becoming bilingual in both their dialect and English. Before the advent of international schools and universities, Arabs from the region would seek higher education in other Arab countries such as Egypt and Syria, where Arabic was the medium of instruction. Their level of education would be displayed in their knowledge and use of Standard Arabic. By contrast, many GCC students today graduate from English-medium schools and international universities within GCC or abroad with a better command of English than Standard Arabic, especially in discussing professional issues. This may give rise to the anxiety that English is encroaching upon the Arabic space. However, research shows that bilingual people can command two languages equally proficiently and use each in its appropriate context.

More research is needed to understand the pattern of usage at home and professional places. Census data, similar to the bilingual Quebec in Canada, could shed light on what language(s) people use in different social domains such as home, workplace, social gatherings, etc. before we can conclusively conclude anything about the status of Arabic in the GCC.

The article previously appeared on Language on the Move Blog.

Dr. Azza Naija explaining to her research team.

Are Plastic Additives in Our Water a Hidden Danger?

Dr. Azza Naija,

Research Associate, Biomedical Research Center–Qatar University

Qatar's National Vision focuses on protecting natural resources, preserving aquatic ecosystems, and promoting the efficient use of water resources. However, pollution remains a global challenge, with plastic waste contributing significantly to long-term pollution. More than 300 million tons of plastic are produced annually, with at least 14 million tons ending up in the oceans. Among the most concerning plastic pollutants are plasticizers—chemicals added to plastics to make them more flexible and durable. These substances are widespread in many products, including food packaging, medical devices, household dust, vinyl flooring, toys, and even drinking water. Their presence raises serious concerns about their harmful effects on human health, such as obesity, diabetes, asthma, hormonal imbalances, fertility problems, and the potential risk of cancer.

Dr. Azza Al-Naiji, Research Associate at the Biomedical Research Center at Qatar University, has focused her research on the field of environmental toxicology. She was awarded an Academic Research Grant (ARG) in its first cycle for a project on the environmental impact of plasticizers in water sources. Her master's and doctoral research was dedicated to assessing the effects of environmental pollution—particularly cadmium and mercury—on fish species. She currently leads a team of four research assistants and 12 students under various grants, including the Undergraduate Student Grant, all working in the field of environmental toxicology. Their work focuses on studying the effects of plasticizers on Zebrafish **(Figure 1)** and understanding their implications for human health and aquatic ecosystems.

Figure 1: Zebrafish

In Qatar, the supply of water relies primarily on seawater desalination; however, plasticizers can pass through filtration systems due to their small particle size. In addition, these pollutants can enter water sources

through industrial activities, wastewater discharge, and the degradation of plastic infrastructure.

To study their impact, the research team used zebrafish, an ideal biological model due to its high genetic similarity to humans **(Figure 2).** The study revealed the presence of plasticizers in treated wastewater at concentrations of up to 1.17 µg/L, and in tap water at concentrations of up to 1.03 µg/L—levels exceeding the safe limits for human consumption. Experiments showed that even low levels of plasticizers could cause cardiac deformities and blood flow disturbances in zebrafish embryos, indicating potential risks to human health. The team is currently expanding the research to explore the effects of these pollutants on brain development and neurological functions, which may have far-reaching implications for human health.

Figure 2: Experimental design for Zebrafish exposure to plasticizer-containing water.

The presence of plasticizers in water sources raises significant concerns regarding public health and environmental safety. Based on these alarming findings, researchers are collaborating with relevant stakeholders to improve water quality standards. The team also seeks to work with government bodies and policymakers to propose new guidelines that ensure effective monitoring and regulation of these harmful chemicals. It is essential for citizens to understand how their daily interactions with plastic products can contribute to exposure to these substances and what measures they can take to minimize the risks. Encouraging the use of alternative materials and enhancing waste management strategies can help reduce plastic pollution at its source. Through research, innovation, and collaboration, sustainable solutions can be achieved for a healthier future.

Addressing water pollution caused by plasticizers is a crucial step in protecting public health and preserving water resources in Qatar. This research serves as a call to collective action among scientists, policymakers, and the community to tackle one of the most pressing environmental issues. The deeper our understanding of the effects of plasticizers and the ways they enter the environment, the greater our ability to develop long-term solutions. Environmental toxicology is a field that directly impacts human health, and it is the responsibility of scientists to explore solutions that will safeguard both ecosystems and communities.

To address this issue, we are also developing advanced filtration membranes to more efficiently remove plasticizers from water. These membranes, known as “low-fouling membranes,” offer several advantages over conventional filters, as they are designed to trap plasticizer particles while allowing clean water to pass through, ensuring high efficiency and low energy consumption. Researchers are subjecting these membranes to extensive testing under various aquatic conditions to evaluate their long-term performance. Once optimized, these systems can be integrated into large-scale water treatment plants, improving drinking water quality in Qatar and around the world. Tackling plastic pollution requires a collective effort from scientists, policymakers, industries, and communities. Investments in research and sustainable technologies will contribute to the development of more efficient filtration methods, the manufacturing of safer plastic alternatives, and the enhancement of waste management policies. Countries that rely on desalination, such as Qatar, must take proactive steps to ensure the removal of emerging contaminants like plasticizers from water treatment processes.

In addition to research and development, the impact of this work extends to industrial applications and sustainable development. Through collaboration with institutions such as the Ministry of Municipality and Environment, Ashghal, and the private sector, the team aims to develop innovative solutions that align with Qatar’s environmental goals. The findings also contribute to scientific advancement through the publication of research in peer-reviewed journals and presentations at international conferences. By fostering interdisciplinary collaboration, the team hopes to bridge the gap between academic research and real-world applications, thereby enhancing water safety and protecting the environment.

Furthermore, the research project is committed to enhancing education and student engagement, with Qatar University placing great emphasis on preparing the next generation of researchers. This project provides opportunities for undergraduate and graduate students to participate in advanced research in environmental toxicology. Students from fields such as chemistry, biology, and engineering are involved in laboratory work, data analysis, and field studies, gaining hands-on experience in assessing water quality and developing filtration technologies. This multidisciplinary approach aims to strengthen Qatar’s research capacity and empower students to contribute to sustainable solutions for environmental challenges.

Examining the Relationship between Pre-sport Mega-event Programming and Physical Activity Participation

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Introduction

Sports mega-events like the FIFA World Cup and the Olympic Games have become integral tools for fostering social and economic development. In recent years, there has been a growing recognition of their role in addressing public health concerns, particularly through promoting physical activity. Qatar, a country committed to diversifying its socio-economic landscape, leveraged its hosting of the 2022 FIFA World Cup to design pre-event programs that encouraged community participation in physical activities. This study investigated whether interest in the World Cup and planned engagement in pre-event programs positively influenced physical activity levels among Qatar residents, both in the short and long term.

Background and Objectives

Engagement Theory formed the foundation of the study, highlighting that meaningful participation stems from a blend of behavioral, emotional, and cognitive involvement. This framework allowed us to analyze how engagement in structured activities influences physical activity. The study was conducted eight months before the World Cup to examine if interest in the 2022 World Cup and planned engagement in the pre-Qatar World Cup programming influenced current and future informal and formal physical activity.

Key Findings

Engagement vs. Interest

While interest in the World Cup was widespread among participants, it did not translate into significant increases in physical activity. This indicated that interest alone was not enough to drive behavioral change; rather, participation in pre-event programs played a crucial role. Programs like Qatar's National Sports Day and the 365 Days Active initiative provided structured opportunities for residents to engage in physical activities, fulfilling their intrinsic needs for competence, autonomy, and relatedness.

Distinction Between Formal and Informal Activities

Engagement in pre-event programs showed a stronger correlation with formal physical activities. This indicated that structured initiatives, such as community sports events, are more effective in encouraging sustained participation. Informal activities, while beneficial, may require different engagement strategies to achieve similar levels of impact.

Long-Term Implications

Participants who actively engaged in pre-event programs were more likely to express intentions to continue physical activities in the future. This finding underscored the potential for such programs to create enduring health benefits, contributing to Qatar's broader vision of a healthier, more active society.

Practical Implications

For Policymakers and Event Organizers

The findings highlight the need for strategic pre-event planning that extends beyond the event itself. Key recommendations include:

- ***Targeted Engagement:*** Programs should be designed to accommodate diverse demographic groups, providing activities that are both inclusive and culturally meaningful.
- ***Infrastructure Development:*** Investments in sports facilities, such as the Aspire Zone, create lasting opportunities for community engagement.
- ***Multi-Sector Collaboration:*** Collaborations across health, sports, education, and urban planning sectors can amplify the impact of these initiatives.

For Public Health

By promoting physical activity, pre-event programs can reduce healthcare costs and improve social well-being. For instance, Qatar's Sports for All program demonstrated how inclusive initiatives could enhance public health outcomes while fostering social cohesion.

Challenges and Limitations

The study acknowledged certain limitations. First, it focused exclusively on residents in Qatar, limiting its generalizability to other host countries or events. Additionally, the reliance on self-reported data introduces the potential for bias. Future research should consider longitudinal approaches to assess both pre- and post-event impacts more comprehensively.

Conclusion

Qatar's strategic use of pre-event programming for the 2022 FIFA World Cup offers valuable lessons for future hosts of sports mega-events. By shifting the focus from mere spectatorship to active participation, such initiatives can leave a lasting legacy of improved public health and social cohesion. This study highlighted the critical role of engagement in driving these outcomes, reinforcing the importance of well-planned, community-centered programs.

For policymakers, event organizers, and researchers, the findings underscore a central tenet: *The true success of a sports mega-event lies not only in its immediate economic gains but also in its ability to inspire long-term, positive change within its host community.*

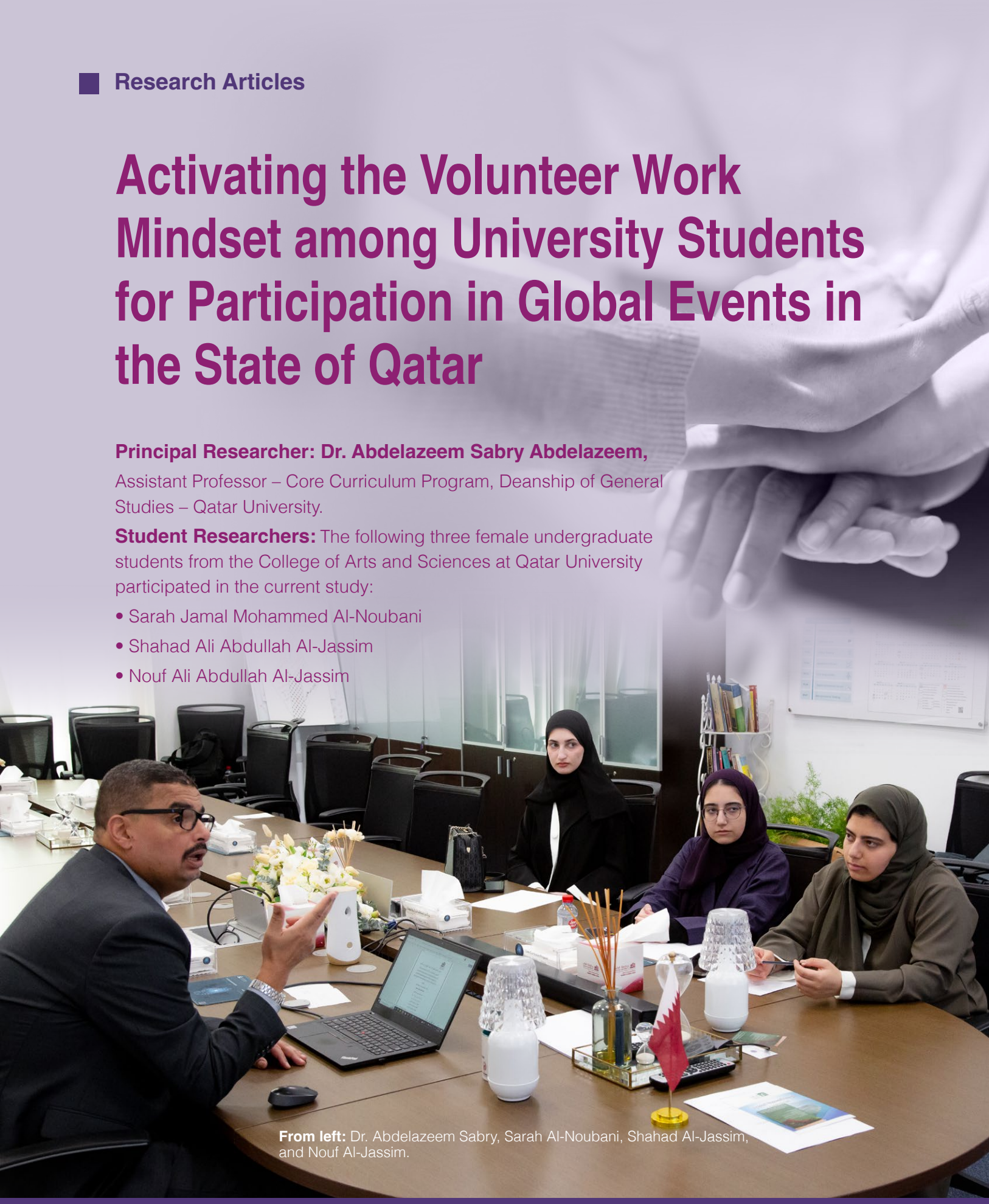
To view the article, please scan the QR code:

Activating the Volunteer Work Mindset among University Students for Participation in Global Events in the State of Qatar

Principal Researcher: Dr. Abdelazeem Sabry Abdelazeem,
Assistant Professor – Core Curriculum Program, Deanship of General Studies – Qatar University.

Student Researchers: The following three female undergraduate students from the College of Arts and Sciences at Qatar University participated in the current study:

- Sarah Jamal Mohammed Al-Noubani
- Shahad Ali Abdullah Al-Jassim
- Nouf Ali Abdullah Al-Jassim



From left: Dr. Abdelazeem Sabry, Sarah Al-Noubani, Shahad Al-Jassim, and Nouf Al-Jassim.

Introduction

University education is one of the most important means of confronting changes and challenges. It prepares individuals for a successful social life, enabling them to participate in decision-making and address the problems facing society effectively. The current era is marked by numerous complexities and challenges, making it essential to instil a mindset of volunteerism in the youth—an effort that cannot be postponed or delayed.

This was emphasised by the Qatari Ministry of Education and Higher Education in its strategy over the years, where its vision and mission incorporate the principle of community participation in the educational process to achieve high-quality education. The strategy also outlined in its summary that the primary goal of the State of Qatar is to establish a high-quality educational system that effectively contributes to society, reinforces the values of the Qatari community, and equips all learners with a diverse range of skills. In its intermediate outcomes—specifically in its first element—it stressed providing diverse learning opportunities that enable learners to enhance their abilities to contribute effectively to Qatari society. (Education and Higher Education, 2017).

Research Problem

The UN Report 2018 indicated that the Arab world has 8.9 million volunteers, which does not exceed 3% of the total population, while in the United Kingdom alone, the volunteer rate is about 30% of the population and 22% in New Zealand (UN Volunteers, 2018). Moreover, as the State of Qatar hosts numerous regional and global events across various economic, social, cultural, and sports fields, there is a continuous need for volunteers.

Research Objective

To prepare and propose a comprehensive, unified vision for the entire volunteer work system at Qatar University — including students, faculty, administration, and partners — and then implement organisational procedures for volunteer work within the University.

Significance of the Research

Its importance lies in that it may benefit each of the following:

- **Volunteer Stakeholders' work in Qatar:** It provides an effective means of managing volunteer work.
- **Students:** It contributes to the enhancement of the students' volunteering skills.
- **Teachers:** It assists the teachers in employing effective strategies to encourage either themselves or their students to participate in volunteer work.
- **The Administration:** It enables administrators to precisely define their roles in volunteer work.
- **Partners:** It helps civil society organisations understand their roles in volunteer work.

Research Procedures

The research was conducted as follows:

A. Review of the literature and previous studies related to volunteer work associated with the following elements:
   - Volunteer work theories.
   - University youth and volunteering.
   - Successful experiences.

B. Examining the reluctance of university students to participate in volunteering.

C. Preparing a questionnaire (developed by the researchers) to identify the reasons for this reluctance.

D. Presenting the questionnaire items to a group of experts.

E. Developing the proposed vision based on the preliminary results of the questionnaire.

F. Presenting the proposed vision to a group of experts to gather their opinions and modify it according to their recommendations.

G. Analysing and interpreting the data, extracting and explaining the results.

H. Reaching conclusions, recommendations, and proposals.

Expected Benefits of the Research Concerning Volunteer Work in the State of Qatar

This research is expected to help achieve learning outcomes that motivate students to serve their community in both scientific and practical ways. Additionally, it prepares students intellectually to embrace a culture of volunteering and to integrate it into their lives, ensuring they are ready to engage in any volunteer work required of them. This aligns with the Qatar National Vision 2030, which, under its human development dimension, states: "Developing and empowering the residents of the State of Qatar to build a thriving society" (Amiri Decision No. 44 of 2008).

Research Results and Interpretation

The research reached the following conclusions:

1. **Development of a Volunteer Work Philosophy:** The proposed vision adopted the following objectives:

- **Opportunities for Participation:** Providing opportunities for all students regardless of their financial or personal circumstances.
- **Flexibility:** Activating volunteer work by the conditions available to students.
- **Effectiveness:** Utilizing volunteer work in the best possible manner.
- **Innovation:** The necessity to present volunteer work innovatively and creatively.

2. **Description of the Competencies Required for Participants in the Educational Process Within the University to Activate the Volunteer Work Mindset:**

- **Students:** University students should have:
  - Time to engage in volunteer work both within and outside the University.
  - Sufficient information about volunteer work, its importance, and its objectives for themselves and their community.
  - Moral recognition upon completion of the volunteer work in which they participated.
  - The opportunity to choose among various volunteer activities.
- **Faculty:** University teachers should have:
  - An appreciative mindset towards students participating in volunteer work.
  - A willingness to participate in volunteer work themselves to motivate their students.
  - Continuous communication with volunteer students to encourage them and offer assistance.
  - Ongoing support for students with special needs who are engaged in volunteer work.
- **University Administration:** The University administration should have:
  - Continuous communication with students to clarify the importance of volunteer work for both the students and society.
  - Specific guidelines for University teachers explaining the role of the volunteer students and how to interact with them.
  - Provision of a suitable schedule for volunteer students that does not conflict with their academic schedule.
  - An email system to receive complaints when any issues arise during the student's volunteering.
  - A plan to establish a dedicated course on volunteer work to be considered mandatory rather than elective for first-year students at Qatar University.
- **Partners (Parents – Civil Society Organizations):** They should provide:
  - Material and logistical support in collaboration with the University to activate volunteer work within it.
  - An understanding of the nature of the University volunteer students and how to interact with them.
  - Continuous monitoring of the volunteer students and suggestions for improvement.
  - The establishment of a principle of community oversight for the volunteer work.

Research Recommendations

In light of the research findings, the researchers recommend the following:

- Integrate the concept of volunteer work, its objectives, and societal importance for students and the community into some mandatory courses for first-year students at Qatar University.
- Link volunteer work to students' interests, inclinations, and previous experiences to increase the number of volunteers engaged in various activities.
- Enhance coordination between the University and civil society organisations to train students in volunteer work before they begin their activities.
- Organize seminars at the University featuring commendable models of volunteering to motivate students to participate in such initiatives.

Research Proposals

The researchers propose the following future studies:

1. The role of public schools in promoting volunteer work among their students.
2. Evaluating the role of University youth in volunteer work during global events in the State of Qatar.
3. The role of foreign universities in promoting volunteer work within the State of Qatar.

This research was funded with an internal grant by Qatar University (Qust-2-CCP-2023-1516) and was presented at the 6th International Youth Forum held on March 4–5, 2024, titled: "Innovation for Community Development."

From Rust to Resilience: Smart and Innovative Corrosion Mitigation

From left: Dr. Abdul Shakoor, Sakeena Arshad, and Dr. Sehrish Habib.

Dr. Abdul Shakoor, Research Assistant Professor
Dr. Sehrish Habib, Post Doc Fellow
Sakeena Arshad, Research Assistant
Center for Advanced Materials - Qatar University

Corrosion remains one of the most challenging and costly issues faced by industries worldwide, from oil and gas to infrastructure. It not only threatens the structural integrity of critical assets but also results in significant financial losses due to repairs, maintenance, and unplanned downtime. Current methods of corrosion protection, while effective, often fall short of meeting the demands for long-term efficiency and intelligent monitoring capabilities. Thereby, "Smart Polymeric Coatings" is an innovative solution that blends advanced materials science with modern sensing technologies.

Smart Corrosion Protection: A New Era

Smart Polyurethane coatings represent a significant leap forward in corrosion management. These coatings integrate advanced functionalities such as self-sensing and self-healing to provide real-time monitoring and extended durability. The approach combines three cutting-edge features (Figure 1):

1. **Advanced Polymeric Materials**: High-performance polyurethane (PU) coatings designed for superior mechanical resistance and strong adhesion to steel.
2. **Smart Corrosion Monitoring**: Embedding self-sensing functionalities that emit chemical signals in response to environmental changes, enabling the remote detection of corrosion.
3. **Enhanced Protection**: Incorporating corrosion inhibitors stored in high-surface-area carriers to ensure long-lasting and effective protection.

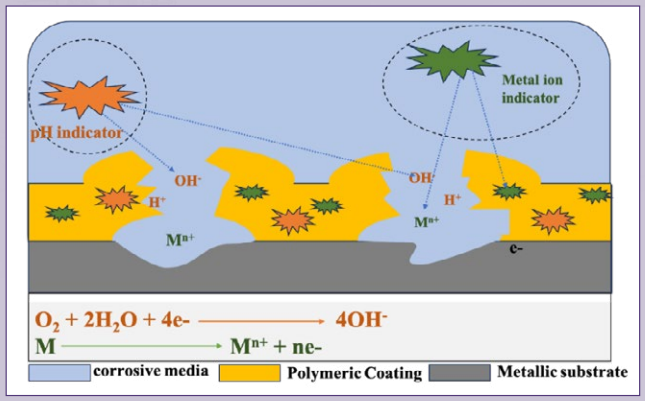


Figure 1: Scheme of mechanisms of corrosion detection, detecting local pH, Metal ions, or mechanical damage caused by corrosive media.

Addressing Limitations of Conventional Coatings

Smart Polyurethane coatings are well-known for their excellent mechanical resistance, adhesion to steel, and surface tolerance. However, conventional Polymeric formulations have notable drawbacks:

- They are difficult to modify with corrosion inhibitors without compromising their barrier properties.
- Detecting early-stage corrosion in thick Polymeric layers often requires manual inspections.
- Damage to the coating can lead to localized corrosion, escalating the problem if not addressed promptly.

Smart Polyurethane coatings address these challenges by integrating advanced functionalities into the coating's design.

The Science Behind Smart Coatings

At the core of these coatings are molecular markers engineered to respond to specific environmental triggers. For instance, pH-sensitive compounds or metal-ion detectors can be embedded within the polymer matrix. These markers emit fluorescence when exposed to chemical changes, such as the release of Fe cations during corrosion (Figure 2). This fluorescence can be remotely monitored via color change at corroded areas, enabling the creation of corrosion probability maps. The ability to monitor corrosion in real-time significantly reduces reliance on manual inspections. Advanced detection methods allow industries to identify problem areas early, preventing further damage. To enhance corrosion protection, high-porosity carriers are loaded with corrosion inhibitors. These carriers act as reservoirs, releasing inhibitors in response to environmental changes, ensuring sustained protection. This controlled release mechanism optimizes efficiency and prolongs the coating's lifespan.

Self-Healing Mechanisms

A key innovation in smart Polyurethane coatings is their ability to self-heal. When a coating is damaged, embedded modified carriers containing repair agents release their contents to fill cracks or voids. This prevents moisture, oxygen, and corrosive agents from reaching the underlying metal, effectively halting the corrosion process. This self-healing ability reduces the need for immediate repairs and enhances the durability of coating in challenging environments (Figure 2).

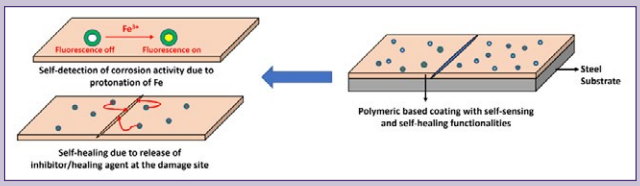


Figure 2: Illustration of the overall concept of self-healing and self-sensing in Polymeric based coatings.

Cost-effective and Predictive Maintenance

The integration of self-sensing functionality offers significant cost savings by enabling predictive maintenance. Industries can now detect and address corrosion issues before they escalate, avoiding expensive repairs and downtime. Furthermore, the use of durable polyurethane matrices ensures longer service life, reducing the frequency of reapplication. Predictive maintenance enabled by these coatings also allows for better resource allocation. Maintenance teams can focus on high-risk areas, minimizing waste and improving overall efficiency. This approach is especially beneficial in industries such as oil and gas, where infrastructure often extends across remote or inaccessible locations.

Applications and Industrial Impact

Smart Polyurethane based coatings have broad applications across industries that rely on steel components, including:

- **Oil and Gas**: Protecting pipelines, storage tanks, and offshore platforms from harsh environments. Corrosion is a major concern in these sectors, where failure can lead to catastrophic consequences.
- **Infrastructure**: Enhancing the durability of bridges, buildings, and transportation systems. Maintaining structural integrity is critical as urbanization increases.
- **Energy**: Safeguarding wind turbines, solar panel frames, and other renewable energy infrastructure. Robust corrosion protection ensures long-term reliability for clean energy sources.

By addressing the critical need for smart corrosion protection, these coatings are set to become indispensable for industries worldwide. Their ability to combine durability with intelligence offers a significant advantage over traditional solutions.

Overcoming Challenges

Innovative projects often face technical challenges, such as ensuring the compatibility of corrosion inhibitors with the PU matrix or optimizing the fluorescence yield of sensing molecules. Systematic approaches, involving extensive testing and modeling, are essential to address these hurdles. Scalability is another key consideration. Collaborating with industrial partners ensures that coatings can be validated under field conditions and aligned with market requirements. Developing coatings that maintain their effectiveness across varying environmental conditions, from extreme heat to high humidity, is another critical focus area.

Environmental and Economic Benefits

Smart Polyurethane-based coatings offer dual advantages: Enhancing operational efficiency while contributing to environmental sustainability. By reducing the frequency of maintenance and manual inspections, these coatings lower carbon emissions associated with transportation and repairs. Additionally, the controlled release of corrosion inhibitors minimizes the risk of environmental contamination. From an economic perspective, the long-term savings from reduced downtime, fewer repairs, and extended asset life outweigh the initial investment in smart coatings. Industries benefit from increased efficiency and a stronger bottom line.

A Vision for the Future

The vision for smart Polyurethane-based coatings extends beyond corrosion protection. By demonstrating the potential of advanced materials and sensing technologies, this approach paves the way for broader applications in environmental monitoring, infrastructure maintenance, and sustainable manufacturing. For example, similar sensing technologies could be adapted for applications such as detecting structural weaknesses in buildings or monitoring environmental pollutants. The versatility of these coatings ensures their relevance across diverse fields. The outputs—from scientific advancements to industrial applications—will not only advance knowledge but also create economic opportunities. By fostering innovation, these coatings contribute to a more sustainable and prosperous future. To maximize their benefits globally, governments and industries must collaborate to accelerate their adoption.

Conclusion

Smart Polyurethane-based coatings represent a bold step forward in the fight against corrosion. By combining advanced sensing technologies, self-healing mechanisms, and innovative materials science, they deliver a comprehensive solution to address current and future challenges. These coatings offer unmatched advantages in terms of durability, intelligence, and environmental sustainability. As industries worldwide strive for smarter solutions, these coatings are poised to lead the way, ensuring the protection of critical assets, and enhancing operational efficiency. Their ability to adapt to changing environmental conditions and provide real-time monitoring sets them apart as a transformative technology.

Acknowledgment

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Administrative Regulation: How do States Balance Security and Freedoms without Overstepping the Law?

A Comparative Analytical Study

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Introduction: Administrative Regulation between Necessity and Respect for Freedoms

In the face of growing security, health, and economic challenges, administrative regulation has become indispensable for ensuring societal stability and organizing public life. These measures are implemented to prevent crimes, protect public health, and regulate daily activities that may affect security and public order.

However, the central question remains: To what extent can administrative regulation restrict public freedoms? And is it always applied in a manner that respects individual rights and remains within the framework of legality?

This study explored the concept of administrative regulation, its objectives, its impact on fundamental rights, and the key legal issues it raises. It also analyzed international experiences that can serve as models for balancing security and freedom.

The Concept of Administrative Regulation and Its Legal Evolution

Administrative regulation refers to a set of measures and procedures taken by the executive authority to maintain public order, which includes three main pillars:

1. **Public Security:** Preventing crimes, protecting properties, and regulating demonstrations and major events.
2. **Public Health:** Preventing epidemics, regulating the healthcare sector, and monitoring food products.
3. **Public Tranquility:** Regulating noise pollution, commercial activities, and the use of public spaces.

Distinguishing Administrative Regulation from Judicial Regulation

Administrative regulation is primarily preventive, aiming to prevent problems before they arise, whereas judicial regulation intervenes after a violation occurs to impose legal sanctions.

Historically, the significance of administrative regulation has grown with the development of the legal state, as governments are required to maintain public order without exceeding constitutional limits that protect individual freedoms.

Objectives of Administrative Regulation: Between Protecting Society and Controlling Behavior

Administrative regulation is implemented to achieve several fundamental objectives:

Ensuring Public Security: By regulating public events, monitoring dangerous activities, and preventing behaviors that threaten order.

Protecting Public Health: By enforcing health regulations, monitoring medical facilities, and regulating the trade of pharmaceuticals and food.

Preserving Public Tranquility: By restricting working hours for noisy businesses, organizing the use of public facilities, and monitoring noise and environmental pollution.

However, some strict measures may infringe on individual freedoms, making it essential to establish clear legal frameworks that prevent potential abuses.

How are Administrative Regulation Measures Implemented?

Authorities employ several tools to enforce administrative regulation, including:

- Issuing Regulatory Legislation: Such as laws governing working hours, traffic regulations, and public hygiene.
- Imposing Administrative Sanctions: Such as fines for violators or the closure of establishments that fail to comply with regulations.
- Direct Interventions: Such as dispersing unauthorized gatherings or restricting certain high-risk activities to protect society.

Administrative Regulation: Between Necessity and Restriction of Freedoms

Despite its importance, administrative regulation can sometimes restrict fundamental freedoms, such as:

Freedom of Movement: Travel bans or quarantine measures, as seen during the COVID-19 pandemic.

Freedom of Expression and Assembly: Prohibiting protests or imposing media restrictions.

Digital Privacy: The use of electronic surveillance technologies without clear legal constraints.

Thus, a delicate balance must be maintained

between ensuring public order and safeguarding fundamental rights.

Legal Challenges of Administrative Regulation

Administrative regulation poses several legal challenges, including:

1. **Potential Abuse of Executive Power**: In some countries, administrative measures are used as tools of repression rather than for protecting society.
2. **Ambiguity in Legal Provisions**: Some laws governing administrative regulation are vague or insufficiently defined, leading to conflicting interpretations.
3. **Weak Judicial Oversight**: In certain cases, executive decisions are made without the possibility of legal appeal, raising concerns about the respect for the principle of legality.

International Experiences: How do Different Countries Apply Administrative Regulation?

1. **France**: State of Emergency as a Security Model
   The French government implemented emergency measures during the 2015 Paris attacks, granting authorities the power to conduct home searches without judicial approval. This measure sparked widespread criticism due to its infringement on freedoms.
2. **China**: Digital Surveillance and Social Control
   China employed advanced administrative regulation mechanisms, such as facial recognition technologies and social credit scoring systems, where individuals' behaviors are monitored and rated based on their compliance with laws.
3. **United States**: Restriction of Public Gatherings
   During the COVID-19 pandemic, some U.S. states enforced strict restrictions on public gatherings and business operations, leading to legal challenges over whether these measures violated constitutional rights.

How Can We Balance Administrative Regulation and the Protection of Freedoms?

To ensure a fair balance between security and freedom, the following recommendations are proposed:

1. Establishing clear and well-defined laws that precisely outline the scope of administrative regulation.
2. Subjecting administrative regulation decisions to periodic judicial review.
3. Ensuring transparency in decision-making related to administrative regulation.
4. Strengthening citizens' rights to challenge arbitrary administrative decisions.
5. Minimizing reliance on digital surveillance technologies except in extreme necessity.

Conclusion

Administrative regulation is a necessary legal tool for ensuring the stability of society and maintaining public order, but it must be exercised within a strict legal framework that protects fundamental freedoms. Countries that implement effective administrative regulation measures can successfully address security, health, and social challenges. However, excessive use of these measures can lead to the erosion of basic freedoms and a disconnect between the state and society.

Balancing security and liberty is both a legal and political challenge that demands cooperation among legislative, executive, and judicial bodies, as well as active participation from civil society in overseeing the enforcement of administrative measures.

Administrative regulation should function as a safeguard for society rather than a mechanism for repression. Future regulatory frameworks should be based on clear legal principles, effective oversight mechanisms, and transparency in decision-making. Governments must also develop legal instruments that ensure a balance between security and freedom so that administrative measures remain effective without becoming tools for absolute control.

Ultimately, the most critical question that must always be asked when imposing any administrative measure is:

Is this action necessary?

Is it proportional to the intended objective?

The response to these questions defines the legitimacy of these measures and their alignment with the principles of justice and fundamental human rights.

Qatari *Pulicaria* Natural Fibers:

Promising Antioxidant and Antimicrobial Materials for Biomedical Applications

Dr. Mohammed Alsafran, Associate Vice President for Research and Graduate Studies, and Director of the Agricultural Research Station (ARS) – Qatar University

Dr. Deepak Kasote, Research Associate, Agricultural Research Station (ARS) - Qatar University

Dr. Deepak Kasote

Dr. Mohammed Alsafran

Over the past few decades, people worldwide have become increasingly aware of environmental pollution. As a result, more people are choosing natural fibrous materials over synthetic ones. The main issue with synthetic fibrous materials is their persistence in the environment, leading to long-term complications and pollution. On the contrary, plant fibrous materials are cost-effective, abundantly available, and have unique features such as biocompatibility, biodegradability, and mechanical strength.

Local plant resources offer numerous benefits, positioning them as key contributors to the bio-based economy. Researchers are increasingly exploring the potential of plant-based resources to develop eco-friendly alternatives. Qatar is home to approximately 400 plant species, one-third of which are reported to have medicinal value. As an industrialized country with limited agricultural land, Qatar does not cultivate fibrous crops such as bamboo, hemp, flax, and cotton, which are commonly used in textiles and industrial applications. Given the importance of self-sufficiency in natural resources and the goal of a more sustainable future, there is a pressing need to explore and identify new fibers from local plants with unique properties. At the Agricultural Research Station (ARS) at Qatar University, the focus is on exploring Qatar's natural resources and their potential for bioprospecting. As part of a flagship research initiative, studies are conducted to identify local medicinal plants that produce fibers that could be used for therapeutic purposes.

Based on preliminary observations regarding fiber richness, natural fibers were extracted and characterized in the present research, particularly from two medicinally important aromatic plant species, *Pulicaria undulata* and *Pulicaria gnaphalodes* (Figure 1). *P. undulata* (locally known as "Jithjath") is widely distributed followed by *P. gnaphalodes* (local name "Nufaij") among three reported *Pulicaria* species in Qatar. Traditionally, these species have been used by locals as herbal tea and medicine. In other Arabian countries, these species have a long history of use as an insect repellent, anti-inflammatory, wound healing, and anti-gastritis agent. Before this study, these species had been investigated for their bioactive phytochemicals and essential oils, but not for their fiber content and utility. Considering this research gap, the research focused on the bio-functional properties of these fibers, including their chemistry.

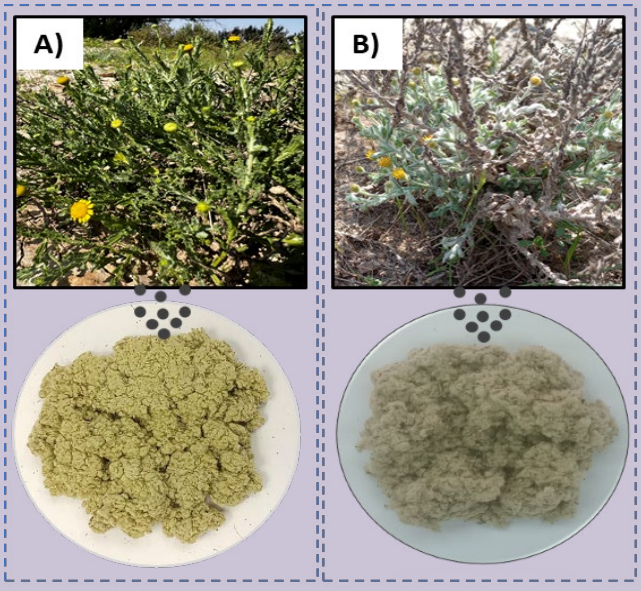


Figure 1: A) *Pulicaria undulata* and B) *Pulicaria gnaphalodes* and their respective extracted fibers.

In this study, natural fibers were extracted from *Pulicaria* species for the first time. The raw fiber yields obtained were 28.1% for *P. undulata* and 18.1% for *P. gnaphalodes*. Previous studies have shown that raw fibers can be used in various applications, including biomedicine, due to their high moisture absorption, low durability, poor thermal stability, and strength. Therefore, various physical, chemical, and biological treatments are applied to crude fibers to improve their structural and surface properties. However, the effect of these treatments on fiber quality, more precisely on their intrinsic bio-functional properties, is not yet clearly known. Therefore, the effect of commonly used treatments, specifically alkali treatment, on the physiological and bio-functional properties of *Pulicaria* fibers was also investigated.

The results of the physicochemical analysis revealed that raw *Pulicaria* fibers are lignocellulosic in nature (Materials that are primarily composed of lignin, cellulose, and hemicellulose). However, alkali treatment removed a significant portion of the hemicellulose, lignin, and bioactive extractives from the raw fiber. This treatment increased the fibers' crystallinity and hydrophobicity but also led to a decrease in their

bio-functional properties. A comparative scanning electron microscope image of the raw and alkali-treated *P. undulata* fibers is shown in Figure 2.

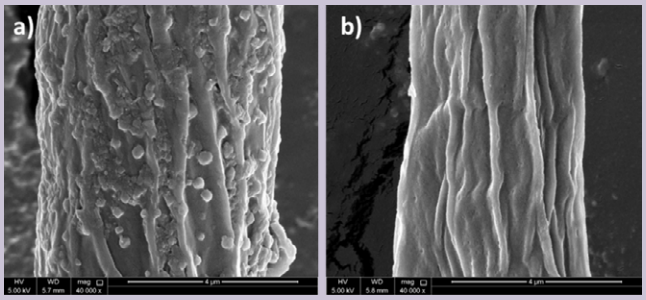


Figure 2: a) Representative scanning electron microscope image of the raw and b) alkali-treated *P. undulata* fibers, showing the loss of hemicellulose, lignin, and bioactive extractives from the raw fibers after alkali treatment.

The bioactivity evaluation revealed that the raw fibers from both species displayed promising radical scavenging and reducing power properties. Furthermore, *P. undulata* fibers demonstrated remarkable antifungal activity against *Candida albicans*, a major contributor to candidiasis. Together, these findings highlight the potential of these fibers, particularly *P. undulata* as powerful biomaterials for wound healing and other medical and cosmetic applications. Representative results of the antioxidant activity of raw and alkali-treated *P. undulata* fibers using a novel assay approach, including antifungal activity, are shown in Figure 3.

However, in this study, it has also been found that alkali treatment significantly reduces these bio-functional properties, suggesting the need for further research on extracting fiber extractives and incorporating them into other natural fibers. This could facilitate the development of advanced natural fibers for biomedical applications.

In conclusion, this article provides an overview of our published work on the natural fibers of *Pulicaria* species, focusing on their physicochemical and biofunctional properties, including the impact of alkali treatment. The findings highlight the unique characteristics of these fibers, demonstrating their potential for use in various biomedical applications, particularly in wound healing and cosmetics. The promising properties of these fibers, combined with further research, could lead to innovative, sustainable solutions in the healthcare and cosmetic industries.

The work presented in this article is a summary of our research, published in the journals *Carbohydrate Polymer Technologies and Applications* (December 2024, DOI: https://doi.org/10.1016/j.carpta.2024.100542) and *Frontiers in Chemistry* (August 2024, DOI: https://doi.org/10.3389/fchem.2024.1437277). The research was conducted in collaboration with the Center for Advanced Materials (CAM) and the Environmental Science Center (ESC) at Qatar University, under the guidance and support of Dr. Mohammed Alsafran, Director of ARS.

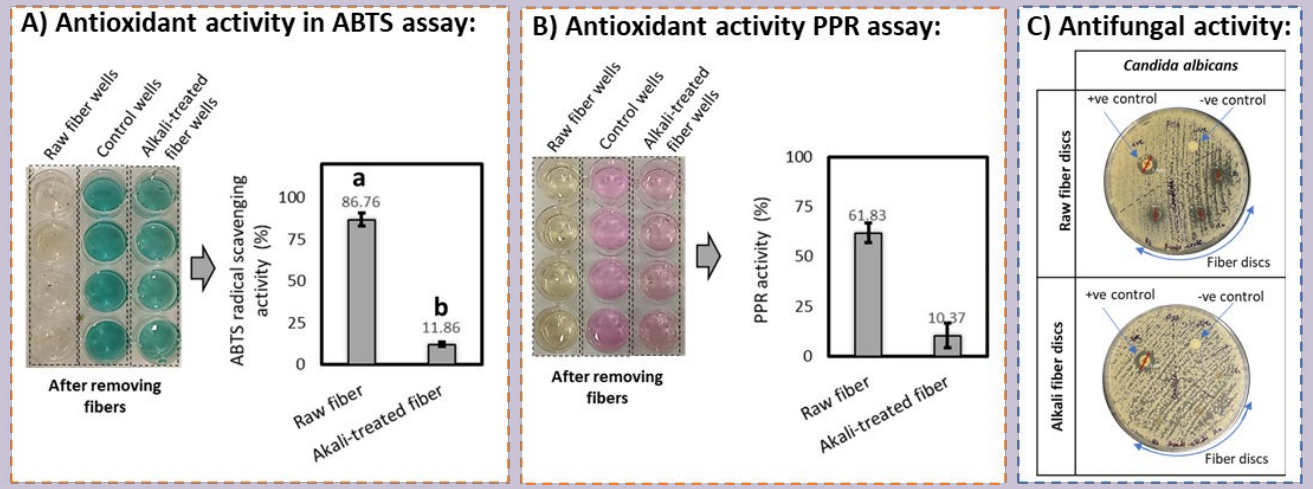


Figure 3: Antioxidant activity of raw and alkali-treated *P. undulata* fibers in A) ABTS and B) PPR assays, along with their C) antifungal activity.

Story of a Knowledge Platform:

Center for Sustainable Development (CSD)

College of Arts and Sciences - Qatar University

Prof. Sami Sayadi
Director of the Center

Experimental greenhouse for hydroponic cultivation.

The Center for Sustainable Development was established in 2013 under the supervision of the College of Arts and Sciences to develop pioneering scientific research. Research programs have been developed in various disciplines to address key sustainability issues in Qatar. Today we meet Prof. Sami Sayadi, Director of the Center for Sustainable Development, to learn about the center and its contribution to achieving the Sustainable Development Goals.

Prof. Sami Sayadi, what was the purpose of the establishment of the Center for Sustainable Development? What is its mission?

The Center for Sustainable Development (CSD) aims to develop integrated and sustainable solutions to address the challenges posed by Qatar's rapid economic and demographic growth. Its purpose is to enhance the quality of life by promoting environmentally sustainable, economically viable, and socially acceptable practices. The CSD focuses on sustainability in environmental and natural resources, with key efforts in biodiversity conservation, water resource management, food and energy systems, and waste reduction through recycling. Its mission is to establish a knowledge hub that advances sustainable technologies through applied multidisciplinary research, aligning with Qatar's National Vision 2030. The Center's primary goal is to drive innovative research that supports government agencies, academia, private enterprises, and communities in implementing sustainable development practices. It prioritizes interdisciplinary collaboration in areas related to energy and environment, in complete alignment with Qatar University's (QU) core priorities and with the United Nations' sustainable development goals. To achieve this mission, the CSD fosters research clusters within QU, engaging industrial partners, students, and scholars across various fields. Additionally, it provides advanced research services to both the University faculty and external organizations, ensuring the integration of sustainability-focused initiatives into Qatar's development framework and contributing to sustainability efforts globally.

What are the main facilities available in the Center?

CSD has steadily expanded its facilities alongside its growing research activities. Initially, it operated three laboratories for Algal Technologies within the BCR Building at Qatar University, along with the Outdoor Algae Research Facility in Al Zubara. Over time, its infrastructure has grown to include four additional laboratories: one dedicated to the FWWS Program and another supporting the Biotechnology Program. Further extending its research scope, the CSD is actively involved in the Aquatic Fisheries Research Center in Ras Matbakh, under the Ministry of Municipality. Recently, large-scale initiatives have been introduced, including pilot-scale facilities in CAS. These include a greenhouse for pilot-scale algae production, as well as another greenhouse designed for agricultural experimentation.

What are the specialized research programs that the Center adopts?

The CSD was established during the 2013-2014 academic year with the primary goal of conducting innovative research that integrates environmental, social, and economic sustainability. Since its inception, the Center has focused on key research areas related to Algal Technologies, then expanded its activities to Food and Water Security, Renewable Energy, Waste Management, and Social Sustainability. In 2023, the CSD adopted a new organizational structure, introducing five distinct research programs: *Food-Water-Waste Sustainability*, *Algal Technology*, *Biotechnology*, *Sustainable Renewable Energy,* and *Human Sustainability*.

Tell us about the most prominent research projects currently underway at the Center.

Below are the titles of 2 ongoing projects in CSD that have accomplished a high Technology Readiness Level of 5 to 6.

Sustainable and Cost-effective Production of Microalgae-based Superior Fish Feed in Qatar: This project focuses on improving fish aquaculture by developing high-quality, nutrient-rich microalgae-based fish feed.

Promoting Local Poultry Industry: Pilot-scale Cultivation of Algae-enriched Feed for Broilers and Omega-3 Egg Production: This initiative focuses on developing nutrient-rich algae-based poultry feed to support local poultry production.

Apart from the two, CSD is leading several additional projects on the development of biofertilizers and biopesticides (halotolerant bacteria-based biofertilizers, biopesticides for palm trees Nano-biofertilizers for improving crop production). Research is also being conducted on bioplastic production by Archaea sustainable solid waste management and plastics' circularity.

How has the Center improved and developed research performance and supported the strategy of excellence in research and development at Qatar University?

By expanding research clusters within the university, CSD can encourage innovations across diverse disciplines such as science, engineering, and economics which will contribute to groundbreaking,

applied research. Additionally, increasing funding for large-scale, high-impact projects and scaling successful pilot studies can strengthen Qatar University's leadership in sustainable solutions for global challenges. Integrating more advanced technologies and ensuring the alignment of research initiatives with national frameworks such as Qatar's National Vision 2030 and the SDGs will ensure that the research produced is relevant and impactful. Furthermore, investing in infrastructure, such as state-of-the-art laboratories and research facilities, and promoting knowledge-sharing platforms will facilitate collaborative, cutting-edge work.

What services does the Center provide to University students and the community?

Faculty members of the CSD play a vital role in supervising and co-supervising undergraduate and graduate student projects. Additionally, they serve as examiners for Master's and PhD Theses defenses and chair comprehensive exam committees. In addition, CSD faculty actively contributes to students' internship programs, playing a key role in offering students hands-on experience in critical areas such as algal technologies and applications, sustainable agriculture, and waste management. These internships provide students the opportunity to develop essential skills in critical thinking, problem-solving, data analysis, communication, and teamwork. CSD also provides access to facilities and research support for QU faculty, students, and students from local schools.

What innovative research applications has CSD accomplished?

The Centre has pioneered innovative research applications that address critical environmental challenges, aligning with Qatar's National Vision 2030 and the UN SDGs. The Center has made significant innovative contributions in the production of marine algae-based fish and animal feed, the development of biofuels and bio-lubricants, the production of salt-tolerant bacteria-based fertilizer and Nano-biofertilizers, and the automated membrane filtration system for microalgae harvesting.

Does CSD have local and international collaborations?

Through its various programs, the Centre actively collaborates with various departments and colleges within QU. The CSD has active involvement with various industries such as AGRICO, Qatar Airways Catering Company, TotalEnergies, Shell, and ExxonMobil. It is also working jointly with government entities, such as the Ministry of Municipality, the Ministry of Environment and Climate Change, and Ashghal. In the academic sector, there are active international collaborations with the Center of Biotechnology of Sfax and Technopark Borj Cedria, Murdoch University, Sultan Qaboos University, University of Tsukuba, and others.

How has the Center contributed to achieving the Sustainable Development Goals in Qatar and the world?

The CSD is dedicated to advancing sustainability programs in the University and beyond, contributing to QU's goal of becoming a sustainable campus. Through ongoing collaborations, CSD supports the implementation of the QU 2025 Zero Waste initiative. The Center's research aligns with several UN Sustainable Development Goals (SDGs). It addresses Zero Hunger (SDG 2) through advancements in agriculture and novel food sources like algae. Clean Water and Sanitation (SDG 6) is tackled through efficient desalination and bioremediation strategies. Affordable and Clean Energy (SDG 7) is supported through biofuels and solar energy research. Additionally, Responsible Consumption (SDG 12) promotes a waste-less society and a circular economy. Climate Action (SDG 13) explores carbon capture, and Life Below Water (SDG 14) examines marine biodiversity conservation.

Microalgae cultivation station.

Interview with a Researcher:

Dr. Noof Fahad Al Kuwari
Associate Dean for Student Affairs,
College of Nursing–Qatar University

The College of Nursing aims to educate and train top-tier nursing professionals to deliver high-quality healthcare in line with international standards and Qatar's National Vision 2030. It also strives to excel in research and contribute to the ongoing advancement of the nursing profession. Therefore, we decided to meet with Dr. Noof Fahad Al Kuwari, the College's Associate Dean for Student Affairs, to gain insight into the international standards of excellence in nursing education and training that equip students with the skills, knowledge, and moral underpinnings necessary for a distinguished and prosperous career.

Dr. Noof Al Kuwari, how do you introduce yourself to the magazine's readers?

I am Dr. Noof Fahad Al Kuwari, Associate Dean for Student Affairs at Qatar University College of Nursing. I am a pediatric surgery nurse and pain management clinical nurse specialist. I hold a master's degree in Advanced Nursing Sciences with a focus on Pediatric Pain Management and Obstetric Critical Care. My passion has always been supporting students and developing nursing education in line with the latest international standards, which contributes to preparing distinguished nursing professionals capable of serving the community efficiently.

As the Associate Dean for Student Affairs, what role does the office perform, and tell us about its most important functions?

The Office of Student Affairs is dedicated to supporting students throughout all stages of their academic journey, from admission and mentoring to graduation in the future and transition to professional life through academic and career support. The office also works to provide a supportive environment that helps students achieve academic and personal excellence, as well as organizing events and activities that enhance their leadership and professional skills.

The nursing profession is a noble profession. What international standards of excellence does the College of Nursing incorporate into its curricula to ensure the graduation of highly qualified and competent nursing professionals?

The College of Nursing relies on international standards of excellence in the design of its curriculum, as it is based on international and evidence-based clinical practices. We ensure that our curriculum is aligned with the standards of the Academic Accreditation of Nursing Programs and is also in line with the National Nursing Competency Framework in Qatar. We also provide students with clinical training opportunities in state-of-the-art simulation centers, such as the Tamayuz Simulation Center, as well as partnerships with reputable health institutions to enhance their clinical expertise.

What about academic programs? Is there a graduate orientation in nursing?

Yes, there is a growing interest in developing graduate programs in nursing, as we seek to offer graduate programs that suit the needs of the health sector in Qatar. These programs will provide graduates with greater opportunities to specialize in areas such as nursing administration, advanced nursing, and other nursing disciplines, contributing to the advancement of the profession and enhancing the quality of health care.

How do you think the College will cover the needs of the Qatari community?

The College seeks to meet the needs of the community by graduating qualified nurses in the fields of Acute Care, Primary Care, and Community Care, in addition to promoting scientific research on priority, and global and local health issues. We also encourage students to participate in community initiatives and health education, reinforcing the role of nursing as a key profession in achieving Qatar's health vision.

What is new in the nursing profession?

The nursing profession is witnessing remarkable developments, especially in the field of health technology and artificial intelligence, where the use of health information systems has become an essential part of nursing practice. There is also a growing trend towards specialized nursing, such as critical care nursing, palliative care, and maternal and child health, which enhances the quality of health services provided to patients.

As a researcher, tell us about your research achievements and what you aspire to achieve in the future.

I have had a passion for scientific research since my time as a university student, with a particular focus on research related to Interprofessional Education (IPE) and its impact on healthcare. Over time, my research interests have expanded to include pediatric pain management and maternal and child critical care, where I aim to develop effective evidence-based care strategies.

In the future, I seek to expand my research to include new technologies in nursing care, especially in relation to digital transformation in nursing, to ensure improved patient experience and higher efficiency of health services.

Finally, I would like to express my gratitude to the magazine for this chance and look forward to supporting scientific research and nursing education to better serve the Qatari community and advance the role of nursing in the healthcare system.

Researcher Business Card:

Dr. Najeeb Ullah
Research Assistant Professor, Agricultural Research Station - Qatar University

Dr. Najeeb Ullah, how would you present yourself to the University community and the readers of the Research Magazine?

I am Dr. Najeeb Ullah, an Assistant Research Professor at the Agricultural Research Station (ARS) Qatar University. With over 15 years of experience in agricultural sciences, my research primarily focuses on improving crop productivity under abiotic stresses. Currently, I am developing innovative solutions to improve the productivity and profitability of Qatari farms, using advanced technologies such as artificial intelligence and nanotechnology.

What are the key milestones that have shaped your academic and research journey in the field of agricultural sciences?

I completed my PhD at the University of Sydney and then worked in the leading Australian institutes, developing techniques to protect crops from extreme climates. At Qatar University, my research focuses on the integration of modern technologies into agricultural research. I have developed protocols for cultivating high-quality leafy green vegetables in the greenhouse. Using this technique, we successfully produced selenium-fortified (an essential microelement for humans) lettuce crops.

Tell us about your most significant research projects and achievements in the agricultural sector.

Apart from the application of modern research techniques, we evaluate different crops for their adaptability to Qatari climates. We identified opportunities to reduce water use by up to 500 ml/m^2 for vegetable crops without compromising yield, highlighting inefficiencies in current irrigation practices and emphasizing the potential for sustainable water management.

What are the latest advancements in agricultural physiological techniques that contribute to improving food crop production?

Recent advancements include the use of AI-based imaging technology to monitor plant growth, diseases, and crop nutritional quality. We are setting up an AI-assisted system to monitor the growth and development in the vertical farm facility. This will allow rapid and efficient identification of superior germplasm suitable for Qatari climates. Additionally, we are using nanotech solutions to improve nutrient uptake in hydroponically grown crops.

As a professor of agricultural studies, tell us how we can encourage students to engage in this field, considering the country's goal of achieving self-sufficiency and food security?

Students should be engaged through hands-on fieldwork and laboratory research to understand real-world agricultural challenges. Internship opportunities with ARS farm can give them practical experience and inspire them to contribute to Qatar's food security goals. At ARS, we engage students in developing automated hydroponic systems, allowing them to understand how cutting-edge technologies e.g. vertical farming, AI-driven crop management, and nanotechnology can assist agricultural production systems.

How will research serve the future of sustainable agriculture in Qatar? To what extent can modern technologies, such as artificial intelligence and biotechnology, enhance agricultural sustainability, address the challenges of an arid climate, and meet future demands?

Modern technologies like AI, biotechnology, and automated systems are revolutionizing agriculture. My work on heat- and salt-tolerant crops like quinoa and barley highlights how genetic research enhances resilience. AI-assisted phenotyping enables rapid screening of drought-resistant crops, while automated hydroponics optimizes resources and boosts yields, advancing sustainability and food security.

Interview with a Student:

Fahad Al-Ajmi
PhD in Chemical Engineering Program, College of Engineering - Qatar University

Qatar University's Department of Chemical Engineering is ranked among the top 151-200 according to QS World University Rankings. It conducts groundbreaking research in the fields of energy, water, gas processing, environment, nanomaterials, biochemical engineering, and sustainability. The Chemical Engineering Program is committed to the highest academic standards and is accredited by the Accreditation Board for Engineering and Technology (ABET). In this issue, we are pleased to meet the PhD student Fahad Al-Ajmi, who is enrolled in the Chemical Engineering Program at the College of Engineering, Qatar University.

Fahad, to begin with, could you introduce yourself and share with us your academic career?

First of all, I would like to thank Qatar University for allowing me to participate in this meaningful academic dialogue. My name is Fahd Dhafer Al-Ajmi, and I am currently occupying the position of Operations Support Manager at QatarEnergy LNG. At the same time, I continue my academic research in the field of chemical engineering. I started my academic career in Chemical Engineering at Doha University for Technology with a Diploma degree, where I was awarded the degree of the Excellent Student in academic attainment during the first foundation year. This motivated me to move to the UK to complete my bachelor's degree in the same field. During my studies, I was so interested in this field that I dug deeper and graduated with honors. I achieved the highest academic standing at the college level in Chemical Engineering.

After graduation, I continued to develop my knowledge through graduate studies at HBKU, where I pursued a master's degree specializing in Energy and Resources. I also participated in several projects, research, and academic activities that allowed me to apply my knowledge in real-world contexts.

What motivated you to choose Chemical Engineering specifically?

I chose to specialize in Chemical Engineering because it combines basic science with practical applications, allowing me to understand chemical and industrial processes on a large scale. Additionally, I joined QatarEnergy at the beginning of my career before pursuing my academic path, which reinforced my concept of operations and industry and the importance of chemical engineering in this sector. I was also interested in chemistry and mathematics from a young age and loved learning how raw materials are transformed into products that are useful in our daily lives.

Not limited to one area, chemical engineering offers diverse opportunities in various areas such as energy, pharmaceuticals, environment, and petrochemicals, which makes it a vital and impactful field. I was also driven by a desire to contribute to sustainable solutions and to improve industrial processes, making them more efficient and environmentally friendly. This aspiration is what motivated me to pursue this specialization

What is the topic of your PhD Dissertation?

My PhD Dissertation focuses on the development of LNG-associated water treatments using innovative and advanced technologies. The research aimed to treat and reuse the water associated with gas instead of pumping it into the ground due to the lack of innovative processes for treating this type of water and because such treatment is even more complex. This complexity arises from the large number of organic and non-organic substances that need specialized and appropriate processes to treat water and improve the efficiency of removing all impurities, such as organic pollutants, heavy metals, and bacteria. The research explores ways to sustainably reuse water.

What are your most important research achievements in the field of Chemical Engineering?

This PhD research is one of my most significant achievements. The importance of this research lies in providing more sustainable and cost-effective solutions for the treatment of LNG-associated water in Qatar and in the region where water resources are scarce. It also contributes to improving water quality in an environmentally friendly manner. Through this research, I aim to develop a technology that can be widely applied in water treatment plants, helping to solve some of the environmental challenges associated with water pollution.

You have experience in LNG plants and wells. Tell us about what you have learnt from this experience.

Yes, I have experience working in LNG plants and wells. I started my career from the year 2000 at QatarEnergy LNG to the present day, where I was responsible for various tasks in supervising the processing operations, including the separation of associated water and gases, converting them into sulfur, and monitoring the performance of liquefaction and storage systems.

Through this experience, I gained important skills such as understanding technical processes, optimizing efficiency and safety, managing

operational risks, and coordinating between different teams serving the industry. This experience enhanced my deep understanding of the LNG industry and made me more competent in dealing with its processes, challenges, and future requirements in improving industrial efficiency.

What are your future ambitions in this field, and how do you endeavor to serve Qatar?

Qatar is one of the largest manufacturers and exporters of LNG. The amount of water extracted and associated with natural gas requires innovative engineering solutions to reuse and balance water, the environment, and industrial processes at the same time. By conducting advanced scientific research, developing new technologies, and participating in major engineering projects, I seek to contribute to the development of more efficient, sustainable, and cost-effective technologies to improve water treatment processes to provide innovative environmental solutions.

In serving my country, I aspire to apply modern technologies to advance the industrial and energy sectors. Through this research, I aim to contribute to environmental sustainability and strengthen water security. This will accordingly contribute to achieving sustainable development that supports the national economy.

What advice would you give to your fellow students when choosing a master's or doctoral thesis?

When choosing a thesis topic, select one that genuinely excites your passion and interest—it's a long journey, and having strong motivation is essential to sustain your curiosity and commitment as you research and explore the subject in depth. It is also important to identify real-world research problems that have both scientific and practical value, ensuring that your work addresses a genuine issue and offers meaningful practical or academic applications. From there, it's important to assess the availability of resources necessary to conduct your research effectively, such as access to data, laboratories, and required technologies. Developing a clear and feasible research plan, under the guidance of a supportive supervisor who specializes in the same field, will greatly facilitate your progress and ensure you receive appropriate direction throughout the research process.

Ultimately, choosing a thesis topic is a crucial decision that can shape both your academic and professional path, so it should be made thoughtfully and with careful consideration of all relevant factors.

Student Business Card:

Shaikha Hamad Al-Kubaisi
Master's in Religions and Dialogue of Civilizations
College of Sharia - Qatar University

Shaikha, introduce yourself and your academic career to the readers.

I am Shaikha Hamad Al-Kubaisi, a Qatari researcher who grew up in an environment that values knowledge. I graduated from Qatar University in Policy, Planning, and Development. I had a passion for humanitarian and religious thought. So, I endeavored to delve into it, where I found a space for reflection and understanding of the self and others. After graduation, I was driven by a strong desire to expand my knowledge, particularly in the areas of language and history. Then, I turned to the field of religions and civilizational dialogue, and I engaged in the master's degree not only as an academic stage, but as a new intellectual path.

Tell us about the topic of your master's thesis and your most prominent published research works.

My thesis, '*Al-Qaradawi's approach to dialogue with the other - an analytical study*' is an intellectual project with a civilizational dimension. Sheikh Al-Qaradawi's thought represented a balance between identity and openness. I have contributed to several research articles, such as*: 'The Relationship between Critical Thinking and Logic in Islamic Sciences, Jurisprudence of Civilization in Sheikh Al-Qaradawi's Thought, Contours of Dialogue between Monotheistic Religions through the Vatican Document of 1964,* and *Experiment on Confucianism and Islamic Dialogue.*'

What prompted you to study the civilizational dialogue with the other in Scholar Yusuf Al-Qaradawi's thought?

I've come to believe that we live in a world where clash meets the urgent need for understanding. This thought offered me a path to connect with others without compromising my identity. Also, Qatar, as a civilizational mediator, represents a practical model. So, I felt that my study is a response to a mission where knowledge intersects with civilizational responsibility.

In your opinion, what distinguishes interfaith dialogue, and what are its key elements of success?

What distinguishes interfaith dialogue is that it engages with the depth of the human being—it is not merely about pleasantries. The most important elements of its success are sincere intention, recognition of plurality, epistemological reference, and willingness to learn.

As a master's student, how was your experience with scientific writing? Did you face challenges, and how did you overcome them?

Scientific writing was an experience of intellectual refinement. I faced difficulties in the beginning, including accuracy, language, and responsibility. I overcame them with patience, reading, and the guidance of my professors. I also learnt that research starts with raising questions that open new horizons.

How does Qatar University support postgraduate students?

Qatar University is an intellectual and humanitarian space that supported me scientifically and humanely. My professors were partners in my development, opening doors for me to publish and participate. Qatar University provides a rich research environment, which made my experience rich and integrated.

What are your future ambitions and plans, both academically and professionally?

I am pursuing a PhD to complete an intellectual project that balances identity and openness. I aspire to have a role in civilizational dialogue that reflects Qatar's mission. Professionally, I aspire to join the academic faculty at Qatar University, where I can contribute to shaping a conscious generation—one that is globally connected through its language and identity and actively engaged in the national intellectual movement.

Interview with an Author:

Prof. Darwish Abdulrahman Al-Emadi,

Ex-Advisor to the President of Qatar University, Author of the book *"Engineering National Identity: The Case of Qatar –A Historical, Social, Economic and Political Perspective"*

"Identity is one of the issues that has emerged on the national, regional, and international scene, especially with the emergence of modern states in the context of renewed ethnic and sectarian conflicts and waves of migrations to northern countries, especially Europe.' To delve deeper into the topic of national identity in Qatar, we will travel through the book entitled "*Engineering National Identity: The Case of Qatar –A Historical, Social, Economic and Political Perspective"* with its author, Prof. Darwish Abdulrahman Al-Emadi, who has been a member of the faculty at Qatar University for more than four decades.

Dr. Darwish, how would you introduce yourself to the readers of Qatar University Research Magazine?

I am Dr. Darwish Abdulrahman Al-Emadi. I graduated from the University of Edinburgh in January 1986 with a degree in sociolinguistics and worked in the Department of English at Qatar University. I served as Dean of the College of Humanities and Social Sciences, the founding director of SESRI (Social and Economic Survey Research Institute), and Head of Strategy and Development at Qatar University, retiring from the University in 2022.

What is the story of this book?

Every book has a story and a beginning—and this one is no different. When I started teaching the National Identity course to students in the National Defense Program at Joaan Bin Jassim Academy for Defense Studies and Joint Staff at the master's level, it became clear that the Qatari library needed more research on the issue of national identity. I also noticed, from the students in the program, how keen and passionate they were about this issue, despite their different perceptions. For instance, I asked the students to define their identity in one or two words. The answers were mixed: Some referred to personal qualities such as magnanimity or generosity, some referred to transnational collective identities like religion, using the term 'Muslim', others referred to nationalism such as 'Arab', and others referred to tribalism such as 'I am from Bukwara' or 'from Hawajir', and a good number of learners identified themselves as 'Qatari' and others as 'Qatari Arab Muslim'. That was the reason why I embarked on this book to be an academic reference for researchers in the field of identity in general, and in the field of Qatari identity in particular.

What is your definition of national identity?

'Identity' in Arabic is a word derived from the pronoun "he" ("huwa" in Arabic), which refers to the "other", not the "self". In other words, identity establishes the other before it establishes the self. We cannot know who we are in the absence of the other. I mean that when I define myself within a particular group, such as 'Muslim', I first recognize a set of categories that are similar in terms of the constitutive characteristics of that group. In my mind, there are, from the beginning, other groups that share some similarity to and differences from the Muslim group, such as 'Christian', 'Buddhist', 'Hindu', 'Atheist', etc. Without this difference, it is difficult to define the group as 'Muslim' in terms of identity.

Identity in its abstract form is a set of characteristics that distinguish an individual or a group of people from others. In the absence of these characteristics, a person or group cannot be distinguished from others. However, this definition is unable to determine whether identity is fixed or changing; whether the term "identity" is equal to a sense of belonging or whether one is part of the other; which part is the origin from which the other part emerges; and whether there can be an identity in the absence of the other.

Thus, the questions associated with identity are not always clear-cut. Identity, whether individual or collective, is like a body with multiple dimensions and many sides, like a crystal, that cannot be seen together at the same time. We often see one

side in isolation, partially see neighboring sides, and the other sides remain completely hidden. What constitutes the essence of the thing, that harmonizes the sides, remains hidden. In this sense, the identity of an individual or group is greater than the sum of their attributes, like a crystal that is greater than the sum of its sides. Since humans change and evolve at different stages of their lives, it is more difficult to identify the sides of them than doing so in an inanimate crystal.

Identity is not a fully constructed system for either the individual or the group, but rather an open-ended project that is open to the future. In other words, identity is shaped by changing circumstances and contexts. This dynamic nature is in constant interaction, changing broadly and narrowly according to the circumstances that the group, state, or tribe is going through.

National identity is a psycho-social structure that contributes to achieving psychological security and emotional stability by enhancing a person's sense of status, respect, and dignity associated with a positive image of the collective self. It is closely related to the process of producing, reproducing, and constantly interpreting the symbols, values, memories, and heritage that distinguish a particular society from others. National identity is linked to the homeland, just as collective identity is linked to the group, tribal identity to the tribe, and religious identity to the religion. In other words, defining the homeland in question is essential to defining national identity. The definition varies depending on the situation. It is influenced by spatial and temporal factors, some of which are visible to the individual and many of which are not clearly defined. However, we can offer the following definition: **National identity is based on loyalty and belonging to the homeland. It draws upon a set of characteristics and common denominators derived from historical memory, including language, literature, religion, law, political structure, social surroundings, cultural specificity, and geographical boundaries. These elements have evolved over generations, and are the basis that distinguishes 'us' from 'them', whether they differ from us completely or partially according to circumstances and national interest.**

What questions does the book try to answer?

This book was an attempt to answer several basic questions, including:

- What is the nature of the relationship between the concept of '*identity'* in the origin from which it originated, and the different forms of identity: national, Arab, Gulf, Islamic, and global?
- What are the most important historical events that contributed to the formation of the Qatari identity?
- What are the most important social factors that contributed to forming and strengthening the Qatari national identity?
- What is the impact of the educational system on the Qatari identity?
- Is the tribe still a major player in shaping the national identity in the Qatari society?
- What are the challenges to Qatar's national identity?
- How to address these challenges?

Given the space available, I will answer some of the aforementioned questions, and the reader can return to the book for more details.

What is the impact of the educational system on the Qatari identity?

Education, as a system, is one of the most important institutions through which society and authority control the nature and content of the messages conveyed to learners. Education is a relatively long stage of an individual's life and one of the most important stages of his/her development, especially since individuals enter the stage almost, at the age of 5 years and do not leave it until they reach adulthood. It forms and shapes our perspective of the world in some ways. In the light of this, we can confidently say that educational institutions in Qatar — and around the world — have always worked, not only to provide students with knowledge and information, but also to instill values and attitudes that enable them to engage with and contribute to their society. These institutions also worked on affirming the role of the legitimate authority in building and developing the nation as well as maintaining its stability. This, in turn, strengthens the students' awareness of their rights and responsibilities toward their homeland, their loyalty to it and its legitimate institutions, and their commitment to defending its national unity.

The processes of operating and reprogramming in the educational system take place in a systematic, continuous, and cumulative manner without real pressures on the recipient. Because

it's continuous for many years and unilateral in its impact, the individual eventually leaves this "factory" as a copy of the vision of the ruling elites in their perception of events and matters in terms of importance or seriousness, and in terms of being acceptable or unacceptable. This does not deny that the family (the small community) also has a role in building attitudes, values, and beliefs. The individual may change these attitudes, beliefs, and values at the advanced stages of life according to the experiences s/he go through. However, the prevailing opinion is that the school has a major role and impact on the personality of the individual, not only through the knowledge s/he obtains, but — more importantly — through the experiences and situations s/he is exposed to during their educational career.

Schools have always worked to balance between educational goals and societal transformations at all stages of the development and growth of society. So, we found out that reconsidering the curricula and contents of the courses is not limited to the cognitive aspect only, but also addresses social developments. This was evidenced by the addition of lessons on the blockade that the country was subjected to in 2017 and the reflection of this in the curriculum of social studies for the preparatory stage. Given the importance of national identity in the context of nation-building, a course called National Education has been introduced since the early years of formal education, with the main purpose of promoting national identity in the modern State. More recently, a section on citizenship has been added to the social studies curriculum. This change has huge implications for the relationship of these curricula to national identity.

What is the main message you would like to convey to the reader from your book?

We live in a world where technology shapes our values and concepts, our social relationships, and the way we communicate. This is done through a one-sided current flowing at an increasing speed. It is not wise or sensible to retreat under the pretext of the danger of this technology and boycott it to avoid the symptoms associated with it. It is virtually impossible to avoid this technology because it has penetrated every aspect of life at the moment and is expected to become even more pervasive in the future. Wisdom lies in engaging with this technology on its terms, not with the mindset of past generations. This required us to reinforce the societal values that stem from our religion and cultural heritage. It also required that our presence in this technology should be a positive one in which we actively contribute, rather than remaining passive recipients all the time.

Graduate Studies Awards

Introduction to the Office of Graduate Studies

The Office of Graduate Studies ensures graduate students' success and excellence. It aims to collaborate with the university community and stakeholders to develop students' talents, foster innovation and entrepreneurship, and promote scientific excellence. The Office of Graduate Studies has three main departments:

Academic Affairs

The Office of Academic Affairs for Graduate Studies is responsible for implementing and improving academic policies for graduate studies and reviewing academic programs. It works in collaboration with colleges and professors on the following programmes:

- Academic Policies and Programs (Unified Graduate Studies Policies).
- Academic Integrity and Academic Behavior.
- Conducting Research Responsibly.
- New Academic Programs and Graduate Degrees.
- New Programs and Review of Existing Graduate Programs.
- Program Improvement Plan.
- Review of Learning Outcomes Assessment Reports for Each Graduate Program.

Student Affairs

The Office of Student Affairs follows up with graduate students from admission to graduation. It consists of three sections:

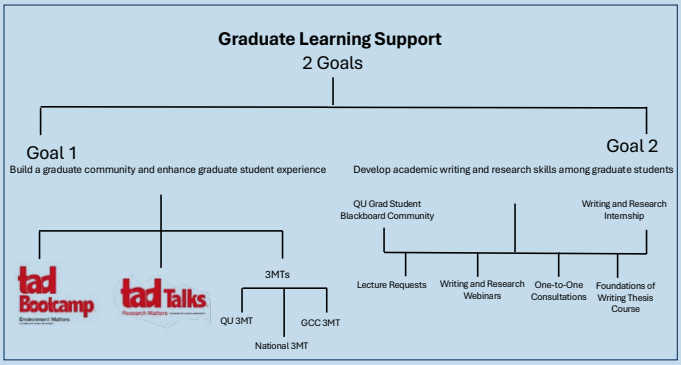
Admission Unit: The Graduate Admission Unit works in collaboration with the Admissions Department under the Student Affairs Sector to ensure the quality of the admission process. This Unit also communicates with colleges to provide them with numbers and information about applicants. In cooperation with the Admissions Department, this Unit provides a list of accepted and rejected applicants after the end of the application period. The unit liaises with external referees to judge the theses of graduate students.

Enrollment Unit: The Enrollment Unit serves all graduate students by enrolling in courses, increasing the capacity of closed courses, and following up the requests to change the degree. It also reviews and verifies study plans for all students who are approaching graduation, in addition to communicating with colleges to make the necessary amendments to student records. Furthermore, this unit handles requests for track changes and equivalencies for courses having alternatives, and follows them up. This unit also cooperates with the Enrollment Department in Student Affairs regarding the list of students expected to graduate each semester.

Student Support Unit: It provides TAD Services; a review of the formatting of the theses and dissertations received from students. The staff of this unit also organizes one-on-one meetings with students to guide them on what to do. Additionally, they organize different training workshops for students according to their different disciplines and language of study, to identify and avoid common mistakes that students may make.

Graduate Learning Support

The Office of Graduate Learning Support aims to assist the development of research and academic writing skills at the graduate level and enhance the graduate experience at Qatar University.



Graduate Studies Awards: How to Apply, Including Eligibility Requirements

College-level Awards

1- Master's Thesis Award:

Eligible candidates are graduate students who have completed their thesis manuscript, which must be approved by the primary supervisor prior to the submission deadline. Students who graduated in the previous semester are also eligible to apply.

2- Doctoral Dissertation Award

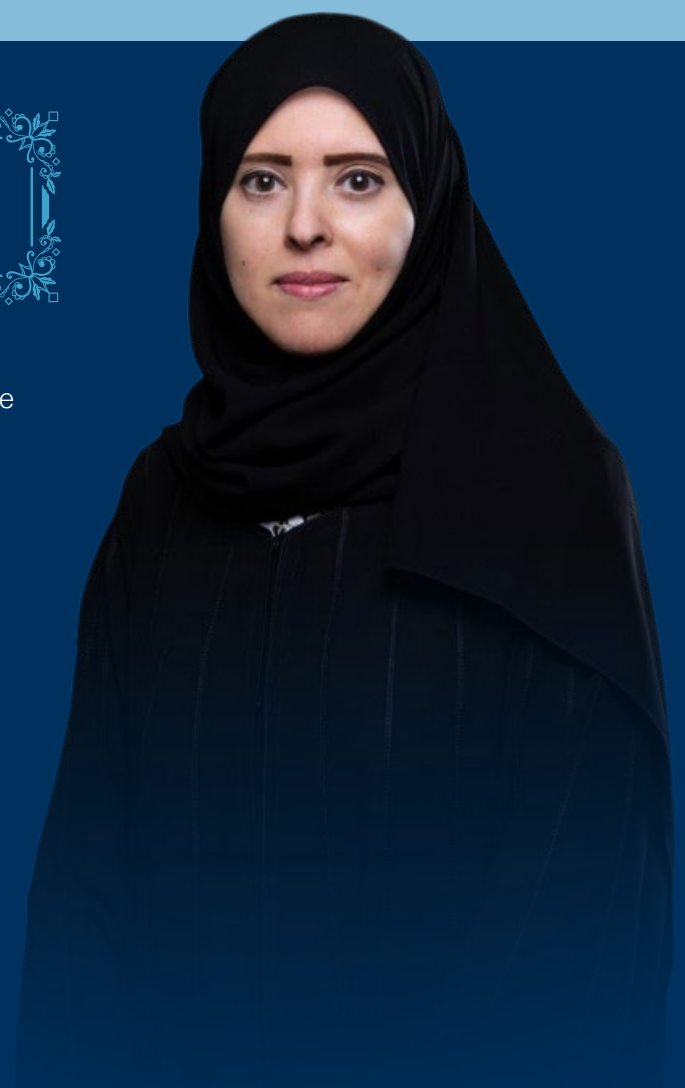
Eligible candidates are doctoral students with a completed dissertation manuscript that has been approved by the primary supervisor prior to the submission deadline. Graduates from the previous semester are also eligible.

3- Research Award

This award is open to graduate students who have either published two research papers or one published paper accompanied by proof of acceptance for a second. All publications must be in journals ranked Q2 or higher (or equivalent).

4- Graduation Project Award

This is a newly introduced category targeting master's programs that include a capstone or applied research project.



Ghada Al-Kuwari,
Assistant Dean for Student Affairs at the Graduate Studies Office

University-Level Awards

These awards are not open for direct application. Winners are selected by a specialized committee from among the recipients of the college-level awards.

1. Best Doctoral Dissertation Award at the University Level:

It includes two awards where the winners of the Best Dissertation Competition compete at the college level, considering the following criteria:

The contribution of the research to the field of specialization, the theoretical framework of the research, the applicant's publication of one or more research papers from the same thesis, and the extent to which the research priorities of the University are compatible with the topic of the student's thesis.

The award is presented to two PhD students (Applied Sciences - Social Sciences) during the Annual Forum ceremony.

2. Best Master's Thesis Award at the University Level:

It includes two awards where the winners of the Best Thesis Competition at the college level compete, taking into consideration the following criteria:

The contribution of the research to the field of specialization, the theoretical framework of the research, the applicant's publication of one or more research papers from the same thesis, and the extent to which the research priorities of the university are compatible with the topic of the student's thesis.

The award is presented to two master's students (Applied sciences - Social sciences) during the Annual Forum ceremony.

3. Best Graduation Project Award at the College Level:

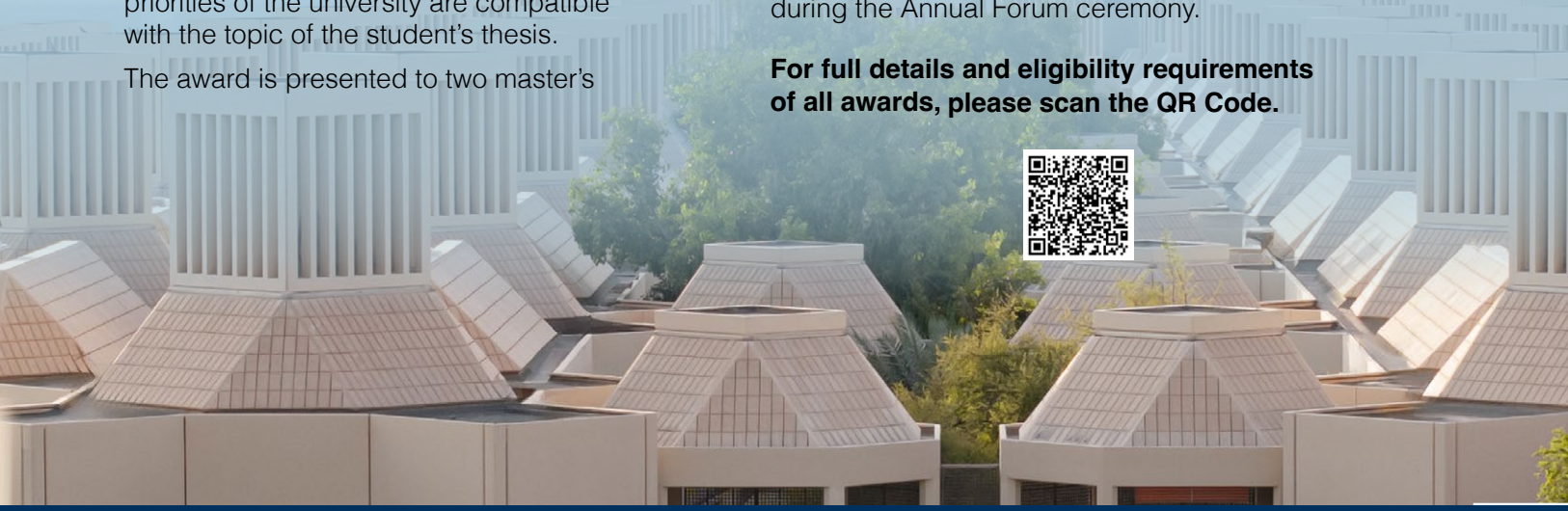
The Best Graduation Project Award at the College Level is a new award of its kind. It targets the graduation projects of master's programs that focus on research output. The assessment of research projects is based on several criteria: novelty in the field of specialization, theoretical framework, research impact, and collaboration with stakeholders. The points that the student receives based on the quality of his/her work will be 3 points for the highest ratings, 2 points for average ratings, or 1 point for poor ratings. A single winner from each college will be honored during the Annual Research Forum.

4. Best Graduation Project Award at the University Level:

The Best Graduation Project Award at the University Level is presented to the winners of the same competition at the college level, considering the following criteria when reviewing the submitted projects: novelty in the field of specialization, theoretical framework, project impact, extent of collaboration with stakeholders, and the applicant's publication of one or more research papers from the same project.

The award is presented to two master's students in the programs that require a graduation project (Applied Sciences - Social Sciences) during the Annual Forum ceremony.

For full details and eligibility requirements of all awards, please scan the QR Code.



Special Interview

with Dr. Ahmad Abdullah Al-Own,

The Dean of Graduate Studies on the Latest Graduate Studies Awards

What is the main motivation behind the launch of these new Awards for Graduate Students?

The aim is to promote a culture of distinguished scientific research based on exploring the needs and challenges of society and working to develop appropriate solutions to meet those needs, address and overcome the challenges that may be an obstacle to the development and progress of society. Master's theses and graduation projects, as well as doctoral dissertations, are an essential part of scientific research. Many major research projects - leading to various discoveries and innovations across different fields of science - originate from them. That is why the University seeks, through these awards, to guide graduate students towards research topics directly connected to society and aligned with the University's research priorities, in harmony with the national strategy and Qatar National Vision 2030.

How do these Awards contribute to motivating and encouraging students to achieve academic and research excellence?

Undoubtedly, such awards motivate students to make the most of their studies at Qatar University to develop their skills and abilities in the field of scientific research. They also support the achievement of the graduate's attributes and foster a spirit of constructive scientific competition that strives for excellence and the realization of both graduates' ambitions and the University's goals.

What are the areas of academic excellence covered by the Awards?

The awards include the best graduation project, the best master's thesis, and the best doctoral dissertation at the college level, so that one outstanding project, thesis, or dissertation is selected, according to certain criteria, from each college to be honored at The Research Forum. Then, the best research project in the humanities and the best in the sciences are selected to be honored at the Annual University Forum.

Are the Awards open to all disciplines or geared towards specific fields?

They are available to all master's and doctoral specializations at the University across the fields of humanities, social sciences, engineering, health sector, and sciences.

What are the criteria used in the judging process to select the winners?

- ***Award Criteria at the College Level are:***
  1- Originality and innovation.
  2- Methodology and research methods.
  3- Scientific and societal impact.
  4- Quality of writing and presentation.
  5- External evaluation and citations.
  6- Alignment with the University's research priorities.
  7- The researcher's commitment to Scientific Research Ethics.

At the university level, there is an additional eighth criterion, which is the "Scientific Publication" of papers from the student's thesis, dissertation, or project in distinguished scientific journals in the fields of specialization.

Can these Awards contribute to raising the University's global ranking and enhancing research and capacity building?

They will certainly have an impact on enhancing and raising the University's global ranking through scientific publications of students' theses instead of remaining in the digital repository or tucked away in drawers. In terms of enhancing research and capacity building, the impact will be clear through students' endeavors to build and enhance their capabilities and skills to write and publish outstanding theses, dissertations and projects at the level of their colleges and the university, as well as enhancing the University's cooperation with various stakeholders inside and outside the country.

Interview with a Graduate Student

Who Won the Research Excellence Award 2024

Ali Al-Hajri
PhD student in Fiqh and Usul Al Fiqh

First, introduce yourself, major, and the topic of your PhD dissertation.

I am Ali bin Shafi bin Safar Al-Hajri, and I major in Fiqh and Usul Al Fiqh at the College of Sharia and Islamic Studies. My dissertation title was *'Fatwa in the State of Qatar - An Analytical and Evaluative Study.'*

What does it mean to you to win the Best Doctoral Dissertation Award at the University level?

I thank Allah Almighty for His guidance and for granting me success throughout all stages of my study. Winning the Best Doctoral Dissertation Award motivated me to strive even harder toward achieving meaningful accomplishments, both on a personal level and within my local community.

How did you come up with the idea for your dissertation, and what motivated you to choose it?

The idea of the research emerged through my work in the field of Fatwa. I observed certain challenges during my work, and after researching existing studies on the topic, I found a significant lack in addressing such issues.

What were the main challenges you faced during the preparation of the dissertation, and how did you overcome them?

I faced some difficulties and obstacles throughout the writing of the thesis, including:

Firstly, a lack of original sources related to the topic of the study. Secondly, a lack of cooperation from some stakeholders in providing the researcher with the required information.

This prompted me to follow specific procedures to address these obstacles as follows:

Firstly, carrying out more than twenty personal interviews and electronic correspondences, which varied between meetings with notables of Al-Thani tribe and religious figures working in the field of institutional Fatwa, in addition to phone calls and friendly meetings that brought me together with some of the sons of the most prominent fatwa scholars who were selected for this study.

Secondly, visiting public and private libraries and some research centers in the country. I even visited several foreign libraries and research centers to gain access to as much historical information as possible, along with foundational information on Fatwa and Ifta.

What impact will your research have on the scientific and societal circles?

I believe this research has the potential to make a meaningful impact, particularly because it addresses a significant issue at the intersection of scientific and religious discourse in the State of Qatar. By bridging theory and practical application, the study offers valuable insights that can be directly utilized by stakeholders, making it both relevant and actionable in real-world contexts.

A scientific publication is required as part of the criteria for winning the Award. Can you tell us about the research papers you have published from your dissertation?

Yes, I have published four peer-reviewed research papers in journals accredited by the College of Sharia (Category A), and I endeavored, with Allah's support, to choose the right journal before publication. The research topics varied, but the dominant feature was related to the country and its scientific aspect. As for the titles of the published research papers, they were *Sheikh Jassim bin Muhammad Al-Thani's Fatwa Tributaries and their Practical Models, Calculating the Zakat of Palm Trees Using the Arithmetic Average Method in the State of Qatar, Civilizational Dialogue in the Thought of Sheikh Muhammad bin Abdulaziz Al-Mana,* and *Weighting between Conflicting Interests in the Sight of Imam ibn Taymiyyah.*

How did the support provided by the University, whether through the Graduate Studies Office or the academic supervisor, contribute to this achievement?

The support provided by Qatar University, whether through the Office of Graduate Studies or the supervisor of the thesis, contributed to achieving the criteria related to the thesis and winning this award. The continuous communication between students and the Office of Graduate Studies helped in making this achievement, supported by the grace of Allah. Furthermore, I will never forget the great effort provided by the supervisor through his valuable guidance that enriched the thesis.

What is your advice to graduate students aspiring to win these Awards in the future?

My advice to them is, first and foremost, to seek Allah's help throughout the study. They should also strive to choose research topics that relate to their country and contribute to its development through scientific research, which is one of the key pillars in building the future of the coming generations.

After this award, what is your next step in the academic or professional field?

I aspire to occupy a prestigious academic position, contribute to the dissemination of Islamic culture at the local and international levels, pay attention to national identity issues and their impact on the individual and the society, and be an active member of the society in order to teach values and meaningful behaviors to the future generations.

How do you see the impact of the Awards on motivating graduate students to improve the quality of research and innovation?

Launching such awards creates a stimulating environment for graduate students at the University, urging them to work hard and persevere in order to achieve accomplishments.

To what extent do you think the Awards are linked to the University's vision and research priorities?

These awards are closely linked to the University's vision in the research field so that they can contribute to raising the level of awareness among students and also help increase the quality of scientific research in published research.

How Will the Awards Contribute to Promoting Scientific Research?

Graduate Studies programs encourage students to participate in scientific research through various mechanisms, including academic assignments and encouraging students to engage in events held at both college and university levels, such as conferences and research forums, as well as participation in regional and international conferences. These activities contribute to the development of the students' research skills and enrich their experience in their field. Among these mechanisms are the Graduate Studies Awards, which cover doctoral dissertations, master's theses, and graduation projects. When selecting winners, consideration is given to the extent of students' participation in scientific research, whether individually or in groups, across various topics and disciplines. These researches may be derived from the academic theses or other topics, such as research on one of Qatar University's research pillars. These awards aim to guide students toward publishing in internationally ranked scientific journals, which are considered a reference for scientists and researchers. The awards also encourage students to benefit from the expertise of the University's academic staff, who are responsible for mentoring and guiding students toward using the latest research techniques and enhancing the quality of their research, whether in applied sciences or humanities and social sciences.

Media Coverage
of the Awards Announcement
QU Announces the New Awards for Graduate Students

Qatar University (QU) has announced the launch of a new set of awards for graduate students, aimed at promoting academic and research excellence. These awards are part of the University's strategy to provide a stimulating learning environment that fosters innovation and creativity among graduate students across various disciplines. They also seek to highlight outstanding research contributions and encourage students to make valuable efforts that support the country's aspirations in the fields of knowledge and innovation.

The graduate studies awards include college-level awards, which are: the Distinguished Master's Thesis Award, the Distinguished PhD Dissertation Award, and the Distinguished Research Award. The Distinguished Research Award falls under two categories: the Graduate Studies Research Award in the Humanities and Social Sciences, and the Graduate Studies Research Award in the Applied and Natural Sciences. Finally, there is the Distinguished Graduation Project Award.

As for the graduate studies awards at the university level, they include: the Distinguished Master's Thesis Award, the Distinguished PhD Dissertation Award, and the Distinguished Graduation Project Award.

The Distinguished Graduation Project Award is a new addition, targeting graduation projects from master's programs that adopt this type of research output. The evaluation of research projects will be based on several criteria, including novelty in the field, theoretical framework, research impact, and stakeholder engagement. Students will receive scores based on the quality of their work: 3 points for top evaluations, 2 points for average evaluations, and 1 point for lower evaluations. One winner from each college will be honored during the Annual Research Forum.

During the press conference, Prof. Ibrahim Al-Kaabi, Vice President for Academic Affairs at QU, stated, "We are pleased to announce the launch of the graduate student awards, which represent a key pillar in supporting academic excellence and enhancing the quality of graduate programs at QU. These awards reflect our ongoing commitment to advancing the standards of education and research and to encouraging graduate students to achieve outstanding academic accomplishments that contribute to knowledge development and community service. They also aim to recognize pioneering scientific efforts and inspire students to embrace excellence in their research, reflecting the quality of higher education and research at the University."

Prof. Aiman Erbad, Vice President for Research and Graduate Studies at QU, noted that in line with QU's mission to foster impactful research addressing societal challenges and aligned with the Qatar National Vision 2030, the awards were developed to honor exceptional theses, dissertations, and research projects by graduate students in various disciplines. These awards are designed to motivate students to adopt standards of excellence and strengthen their research capabilities in addressing issues that benefit the community. The award process consists of two stages: the college level, followed by the university level.

Prof. Erbad added, "The University offers an integrated academic environment that supports creativity and innovation and contributes to the preparation of qualified research professionals. These awards also provide students with broader opportunities for scientific publication, career engagement, and building strong academic networks. We are proud of our students and remain committed to supporting and encouraging them toward further academic excellence."

Dr. Ahmad Al-Own, Dean of Graduate Studies, affirmed that as the nation's premier university, QU is continuously working to enhance its academic framework to provide an environment that enables students to benefit from available resources and achieve academic excellence. He explained that several awards have been updated or newly introduced to focus on student outcomes in master's and doctoral programs, including honors for top theses, dissertations, and research projects that contribute to societal development and the advancement of scientific research. New awards, such as Best Research Project, have been added. "We are proud to recognize these outstanding academic achievements and reaffirm our continued support for our students on their academic journey," Dr. Al-Own said.