جامعة قطر
QATAR UNIVERSITY

Toward Society 5.0?
What are the essential keys from academia?

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

The Democratisation of Research Impact Strategy Conference
29 March 2023

- Outline:
- Higher education – a quick timeline
- Industry 5.0 Vs. Society 5.0, role of higher education
- Transformative/ Sustainable University of the Future
- Personnel experience and Recommendations

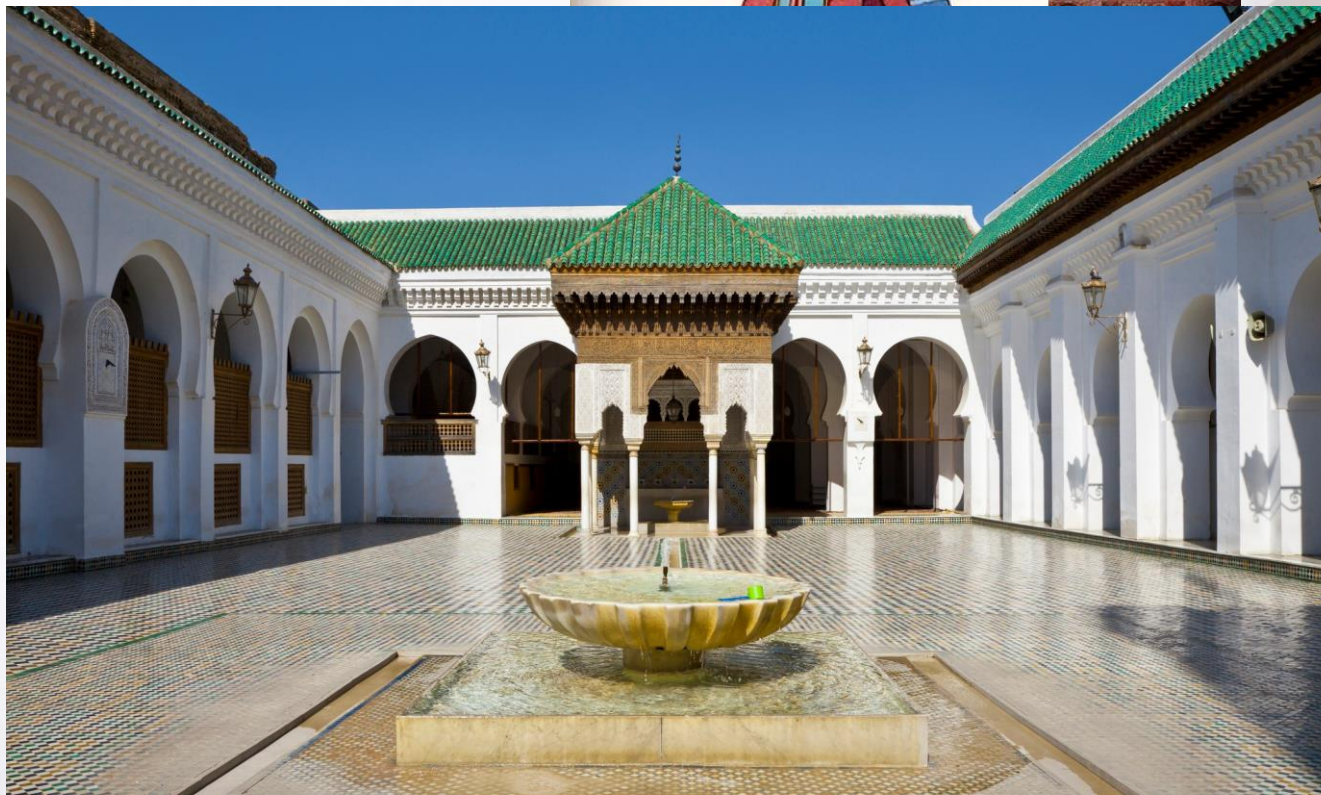
Oldest existing university in the world

The AlQarawiyyin University, was founded by Fatima AlFihri around 850 AD.

Al-Azhar University in Cairo, dates back to 970.

It was a knowledge hub for the region in the Middle Ages were mathematics, astronomy, medicine, music, Arabic and Islamic studies were taught.

This model of higher education system was adopted after that in Europe in the 10th century and new universities were founded such as University of Oxford.



Thirteenth century

- University starts to have “Colleges” as part of the system.
- Students have their own facilities (dorms) with a chapel.
- Mostly male students with limited number of rich women with private instructors (university faculty).

John C. Moore, A Brief History of Universities

The nineteenth century

The needs of industrialism produced more technical schools, many of which evolved into universities, and engineering became a standard part of higher education.

New workforce in the World War (I,II)

5.0
Industry ~~4.0~~ Vs. Society 5.0

What is Industry 4.0?

According to McKinsey, Industry 4.0 is the next phase in the digitization of the manufacturing sector, driven by four disruptions:

1. the rise in **data volumes**, **computational power**, and **connectivity**, especially new low-power wide-area networks;
2. the emergence of analytics and **business-intelligence capabilities**;
3. new forms of **human-machine interaction** such as touch interfaces and augmented-reality systems;
4. and improvements in transferring **digital instructions** to the physical world, such as advanced robotics and 3-D printing.

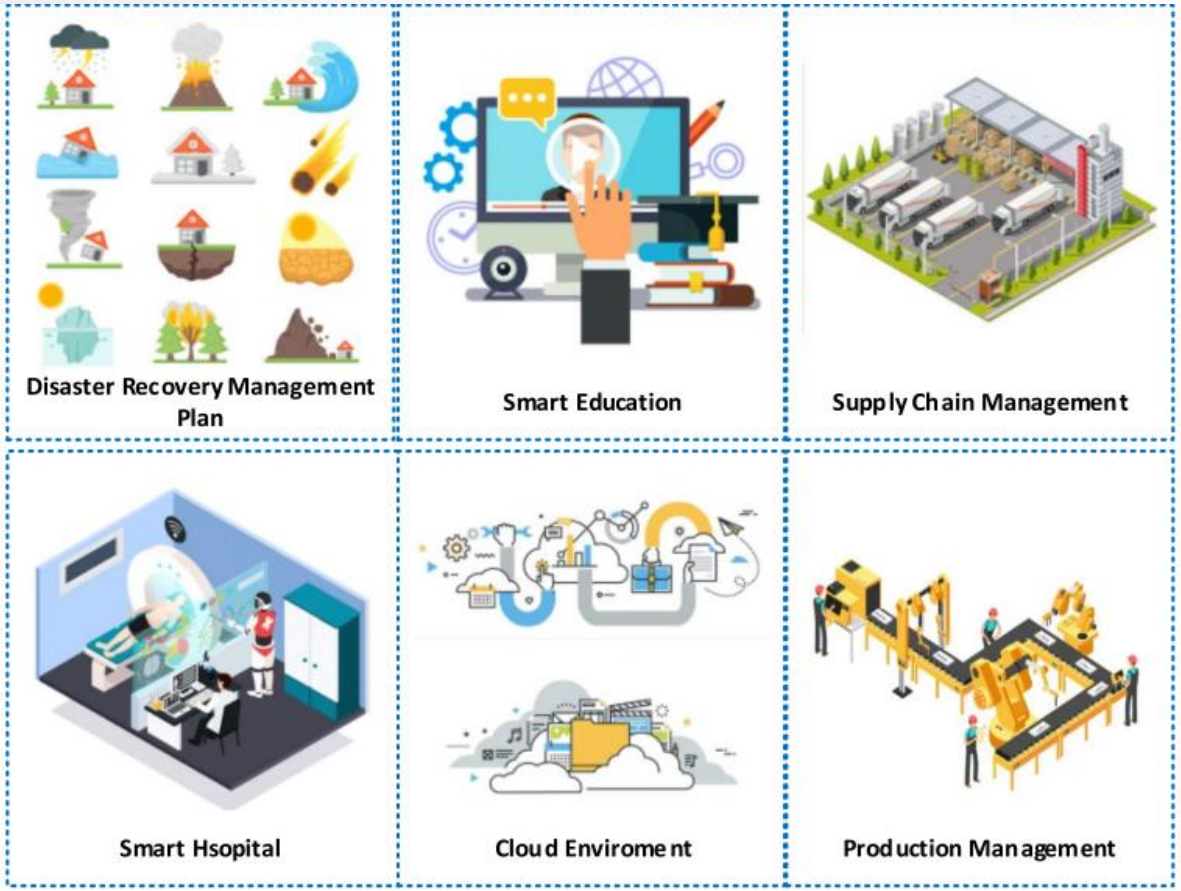
Industry 5.0

Industry 5.0 is a concept on the future of industry **towards a human-centric, sustainable, and resilient manufacturing system**.

Industry 5.0 is predicated on the observation or assumption that Industry 4.0 places a greater emphasis on digitalization and AI-driven technologies for enhancing production efficiency and flexibility than it does on the original principles of **social justice and sustainability**.

Journal of Manufacturing Systems 64 (2022) 424–428

Industry 5.0 is changing paradigm and brings the resolution since it will decrease emphasis on the technology and assume that the potential for progress is based on **collaboration among the humans and machines.** The industrial revolution is improving customer satisfaction **by utilizing personalized products**.

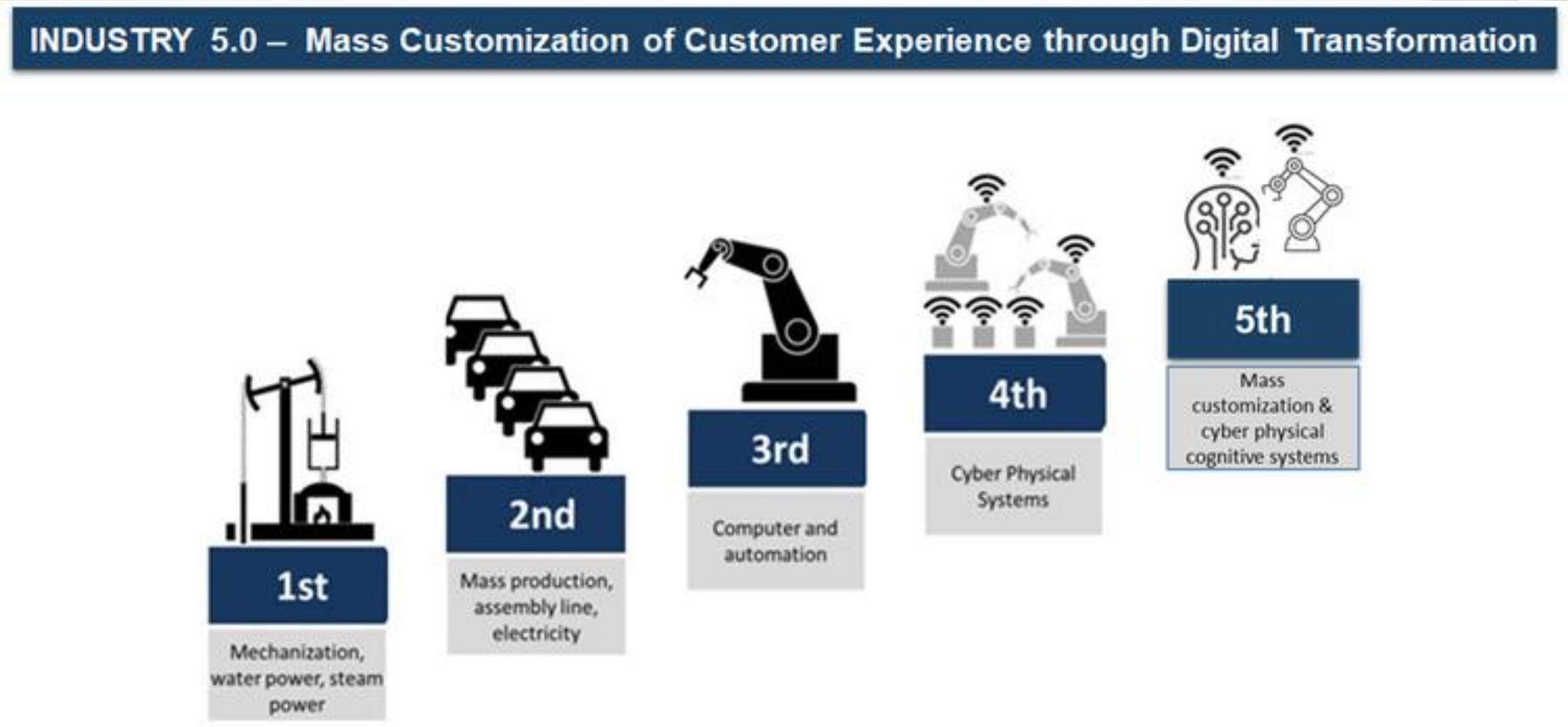


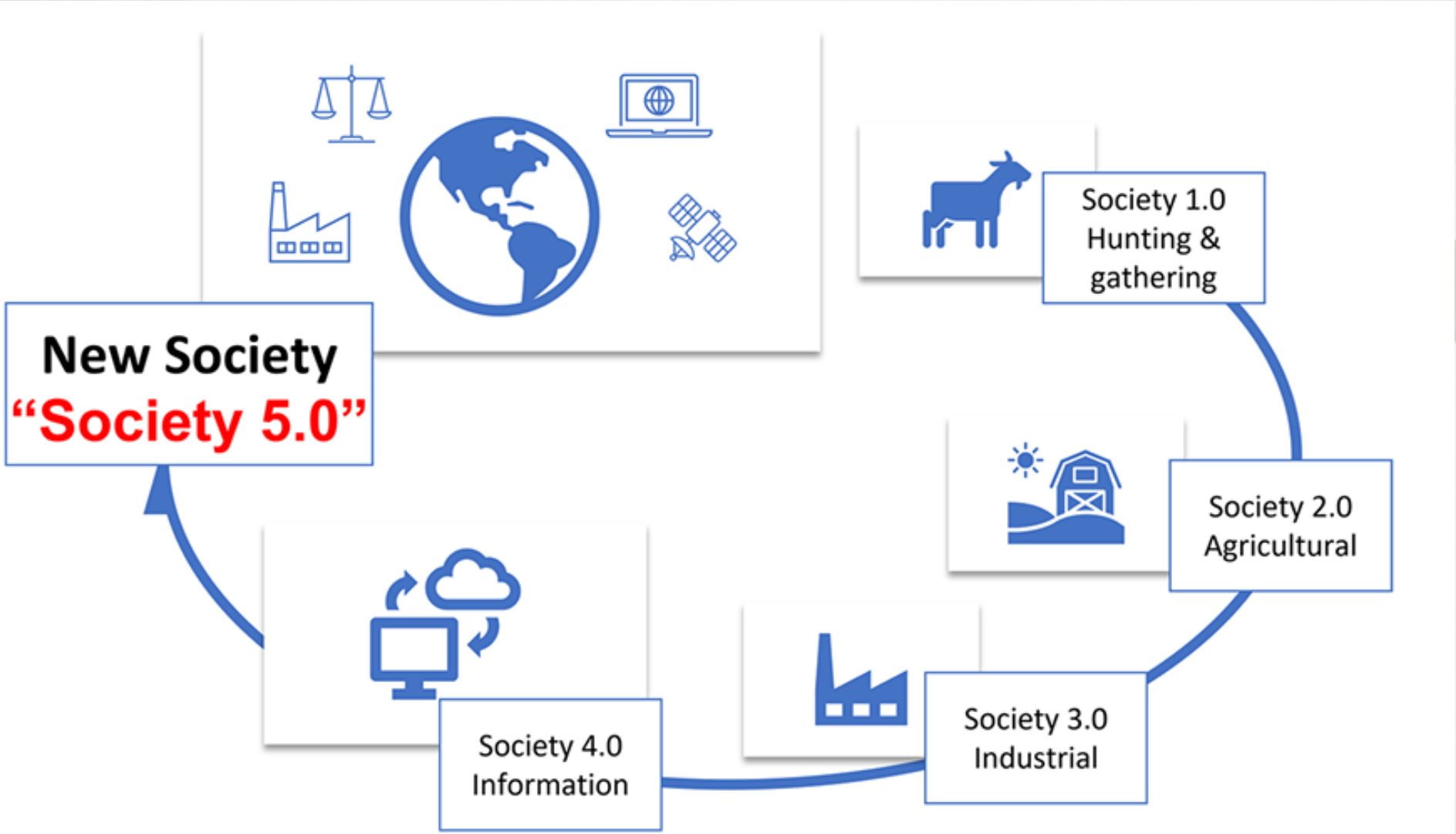
Applications of Industry 5.0

Adel *Journal of Cloud Computing* (2022) 11:40
https://doi.org/10.1186/s13677-022-00314-5

Industry 5.0

Adds a personal human touch to the Industry 4.0





A human-centered society that balances economic advancement with the resolution of social problems

ACS Nano 2021, 15, 12, 18608–18623
Publication Date:December 15, 2021
https://doi.org/10.1021/acsnano.1c10919

	Society 1.0	Society 2.0	Society 3.0	Society 4.0	Society 5.0
Society	Hunter-gatherer	Agrarian	Industrial	Information	Super smart
Productive approach	Capture/Gather	Manufacture	Mechanization	ICT	Merging of cyberspace and physical space
Material	Stone・Soil	Metal	Plastic	Semiconductor	Material 5.0*
Transport	Foot	Ox, horse	Motor car, boat, plane	Multimobility	Autonomous driving
Form of settlement	Nomadic, small settlement	Fortified city	Linear (industrial) city	Network city	Autonomous decentralized city
City ideals	Viability	Defensiveness	Functionality	Profitability	Humanity

Fig. 1 Contextualizing Society 5.0. Categories created by the authors. Source: Produced by authors. ∗Research conducted by the University of Tokyo's Material Innovation Research Center

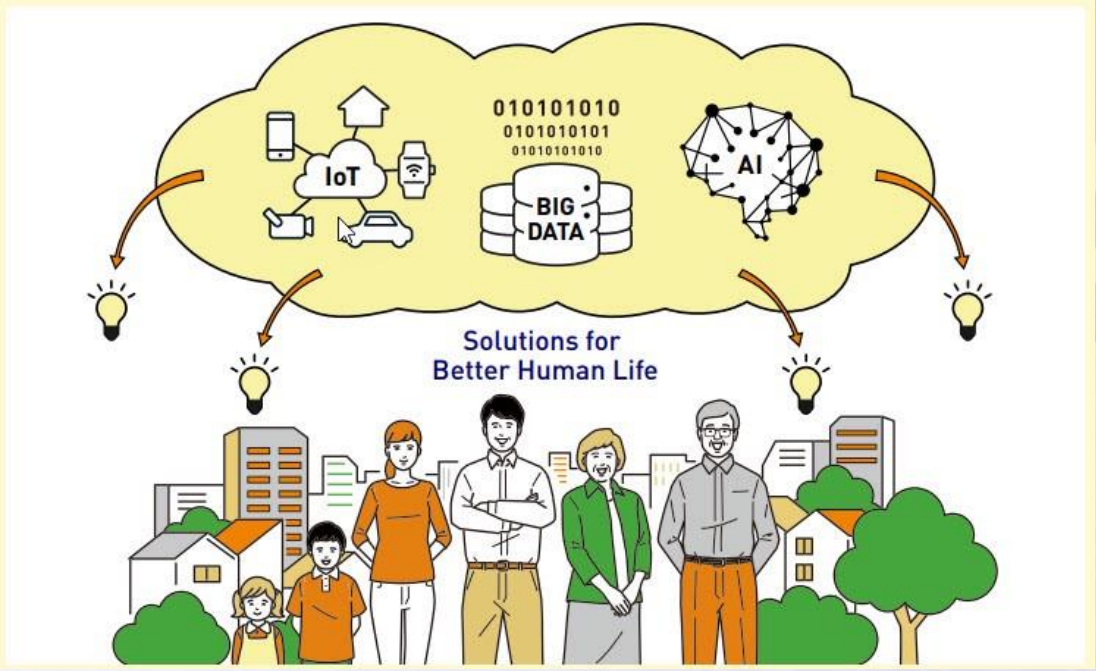
Society 5.0 is a model to communicate the government's vision of a future society to industry and the community.

Ref: **Hitachi-UTokyo Laboratory (H-UTokyo Lab.)**
Society 5.0
A People-centric Super-smart Society, Springer

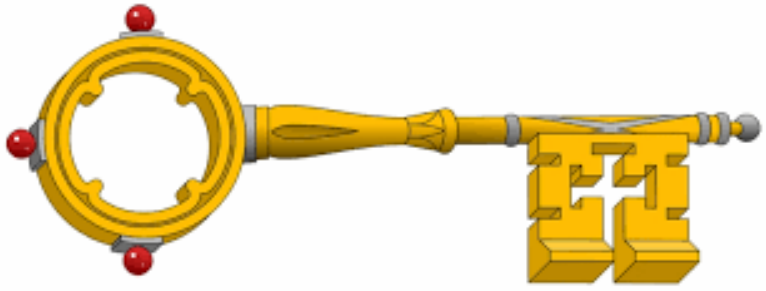
Society 5.0 is a people-centric society

Society 5.0: Revolution of the industry (through integration of IT) + living spaces and behaviors of the public (whole society).

Industry 4.0 is effective only in industry.



So?
Higher Education Institutes?



SUSTAINABLE DEVELOPMENT GOALS

Socioeconomic impact?

ELSEVIER

Research Policy 29 (2000) 109–123

research policy

www.elsevier.nl/locate/econbase

The dynamics of innovation: from National Systems and ''Mode 2'' to a Triple Helix of university–industry–government relations

Henry Etzkowitz [a,*], Loet Leydesdorff [b,1]

[a] Science Policy Institute, Social Science Division, State University of New York at Purchase, 735 Anderson Hill Road, Purchase, NY 10577-1400, USA

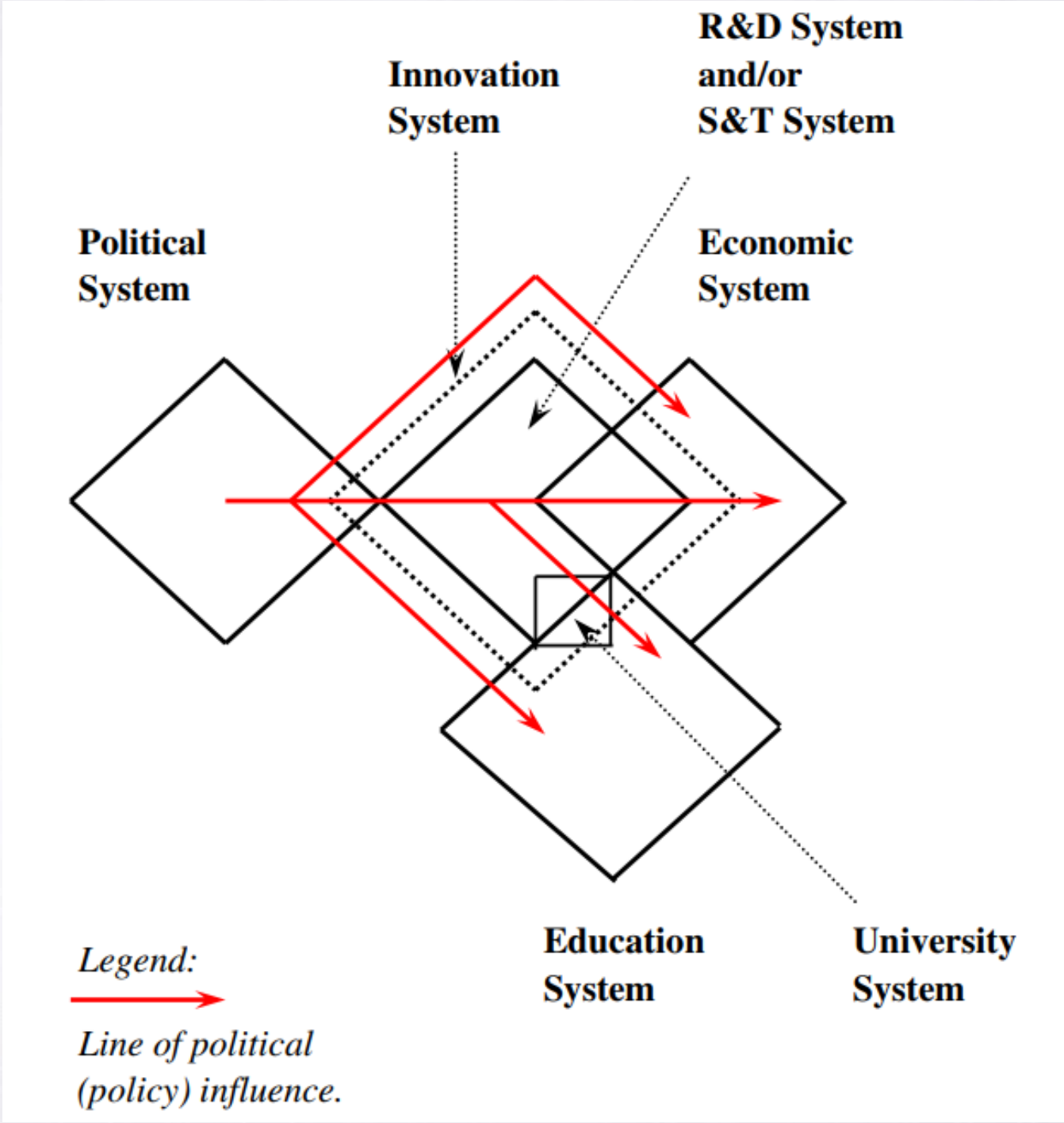
[b] Department of Science and Technology Dynamics, Nieuwe Achtergracht 166, 1018 WV Amsterdam, Netherlands

Can academia encompass a third mission of economic development in addition to research and teaching? How can each of these various tasks contribute to the mission of the university? The late 19th century witnessed an academic revolution in which research was introduced into the university mission and made more or less compatible with teaching, at least at the graduate level. Many universities in the

gles. The complex dynamics is composed of subdynamics like market forces, political power, institutional control, social movements, technological trajectories and regimes. The operations can be expected to be nested and interacting. Integration, for example, within a corporation or within a nation state, cannot be taken for granted. Technological innovation may also require the reshaping of an organization or a community (Freeman and Perez, 1988). But the system is not deterministic: in some phases intentional actions may be more successful in shaping the direction of technological change than in others (Hughes, 1983).

Research Policy 29 (2000) 109–123

Different societal systems: lines of political (policy) influences



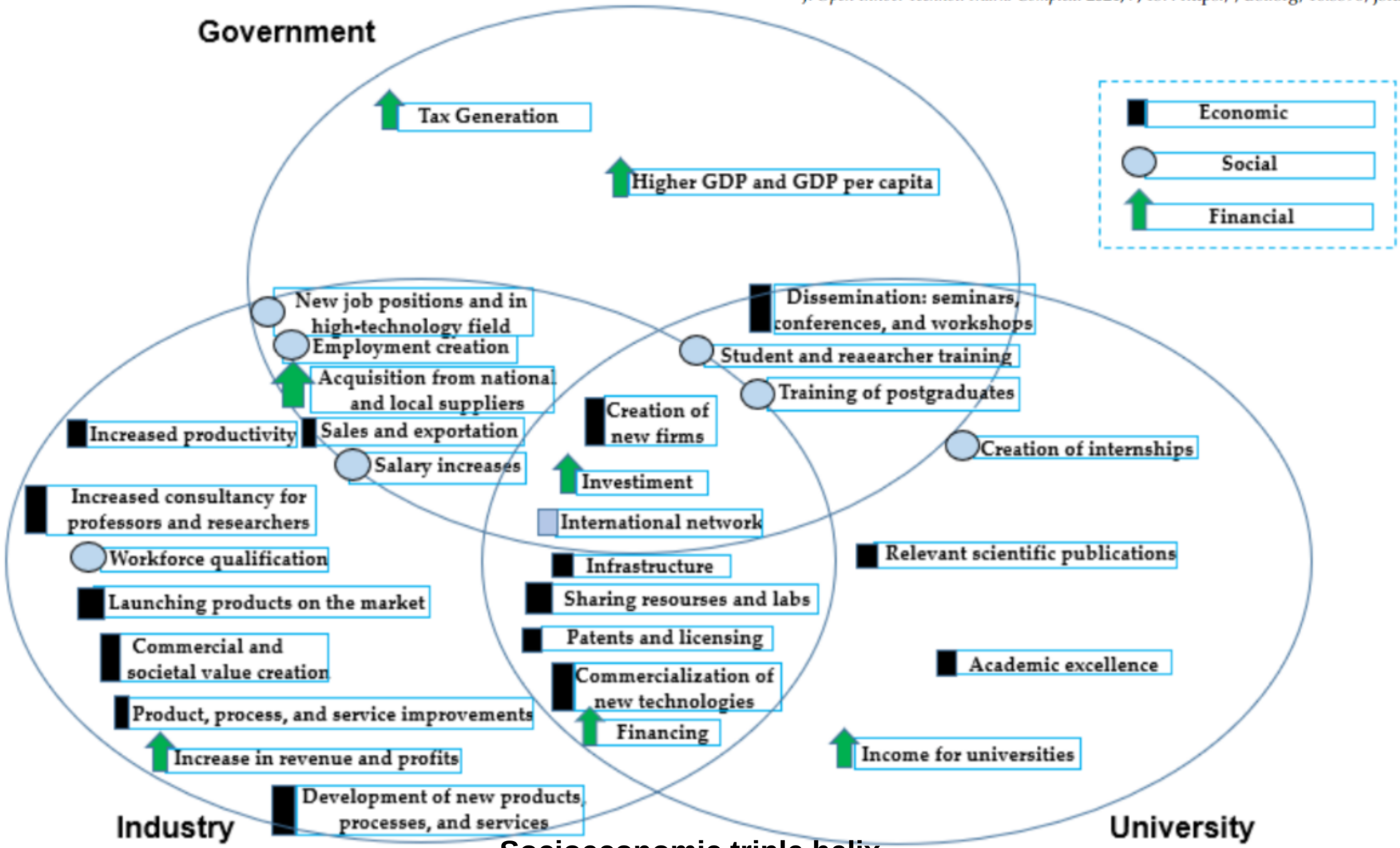
J Knowl Econ (2011) 2:327–372
DOI 10.1007/s13132-011-0058-3

To model innovation:

- **Triple helix** innovation model

- **Quadruple** (with civil society) and **quintuple** (with environment)

J. Open Innov. Technol. Mark. Complex. 2021, 7, 137. https://doi.org/10.3390/joitmc7020137



Socioeconomic triple helix

- First Helix: Academia
- Second Helix: Industry
- Third Helix: Government
- Fourth Helix: Culture?

The triple helix in developed countries: when knowledge meets innovation?☆

Filip Fidanoski [a], Kiril Simeonovski [b], Tamara Kaftandzieva [c], Marina Ranga [d], Leo-Paul Dana [e], Milivoje Davidovic [f], Magdalena Ziolo [g], Bruno S. Sergi [h,*]

J Knowl Econ (2011) 2:327–372
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Variable
Input variables
Education Index
Industrial value added
R&D expenditure
Civil Society Participation
CO_2 emissions per capita
Output variables
Patent applications

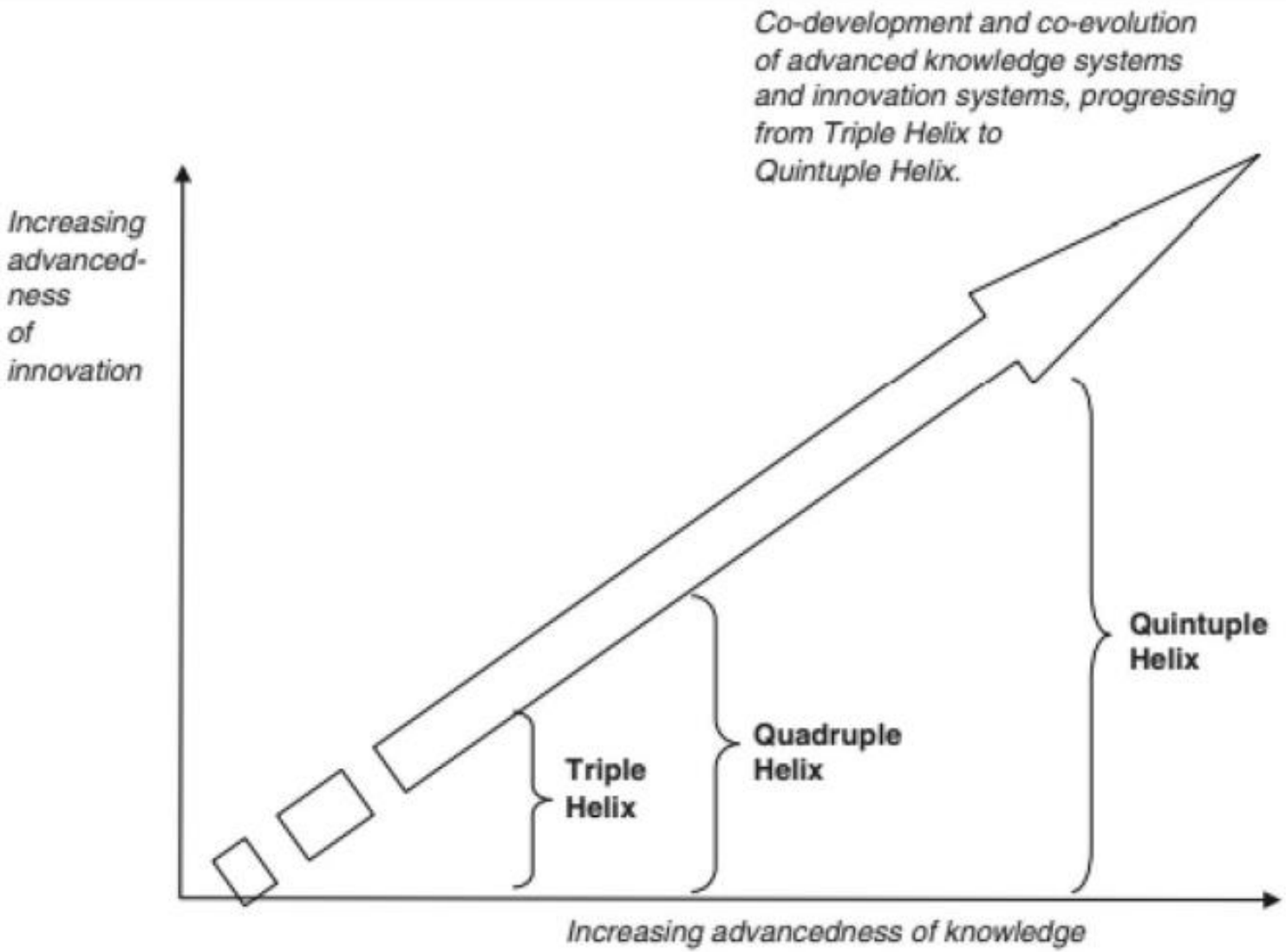
Heliyon

Volume 8, Issue 8, August 2022, e10168

Are all variables have the same power?

Variable	Abbreviation	Unit	Note	Source
Input variables				
Education Index	EDI	index value from 0 to 100	measure for academia in interaction with industry	HDR
Industrial value added	IVA	per cent of GDP	measure for the industry in interaction with the government	WDI
R&D expenditure	RDE	per cent of GDP	measure for government in interaction with academia	WDI
Civil Society Participation	CSP	index value from 0 to 100	measure for civil society	GOV
CO_2 emissions per capita	CO2	metric tones per capita	measure for environment	EIA/WDI*
Output variables				
Patent applications	PAT	number per 100,000 persons	measure for innovation	GOV/WDI*

Notes: The original index values for the Education Index and Civil Society Participation ranges from 0 to 1 but, for convenience, they are multiplied by 100. The symbol * denotes own calculation based on data from the given sources.



Triple Helix:	**University-industry-government relations (helices).**
Quadruple Helix, Fourth Helix:	**"Media-based and culture-based public", and "civil society".**
Quintuple Helix, Fifth Helix:	**"Natural environment, natural environments of society".**

J Knowl Econ (2011) 2:327–372
DOI 10.1007/s13132-011-0058-3

CONCERN

nature

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Article | Published: 04 January 2023

Papers and patents are becoming less disruptive over time

Michael Park, Erin Leahey & Russell J. Funk ✉

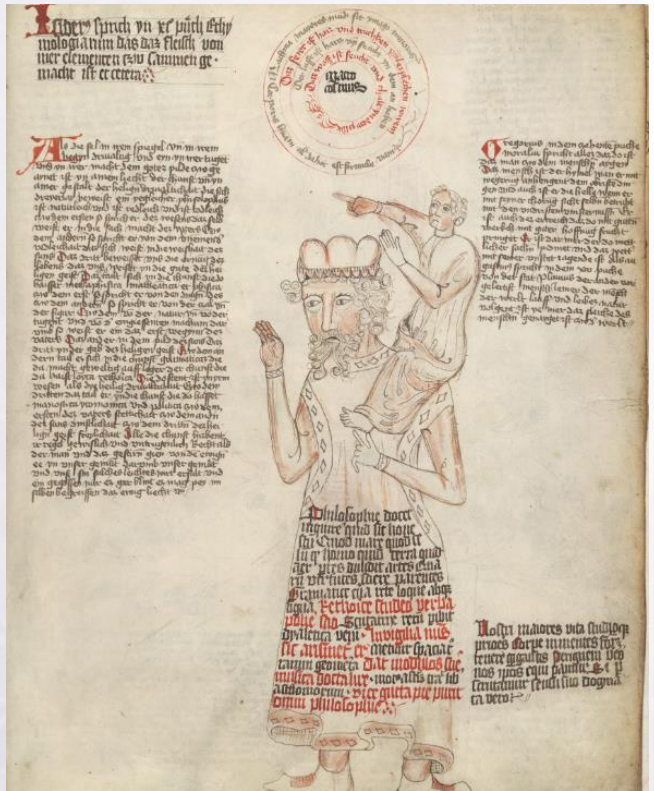
Nature **613**, 138–144 (2023) | Cite this article

268k Accesses | **17** Citations | **3970** Altmetric | Metrics

Recent decades have witnessed **exponential growth** in the volume of new **scientific and technological knowledge**.

Papers and patents are increasingly l**ess likely to break with the past in ways that push science and technology in new directions**. This pattern holds universally across fields.

This decline in disruptiveness is due to narrowing the use of previous knowledge, allowing us to reconcile the patterns we observe with the ‘shoulders of giants’ view.



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Papers and patents are becoming less disruptive over time

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To characterize the nature of innovation

Two types of breakthroughs:

1- Some contributions **improve** existing streams of knowledge, and therefore consolidate the status quo.

2- Specific contributions **disrupt** existing knowledge, rendering it obsolete, and propelling science and technology in new directions.

Alternative indicators of the decline in disruptive science

nature

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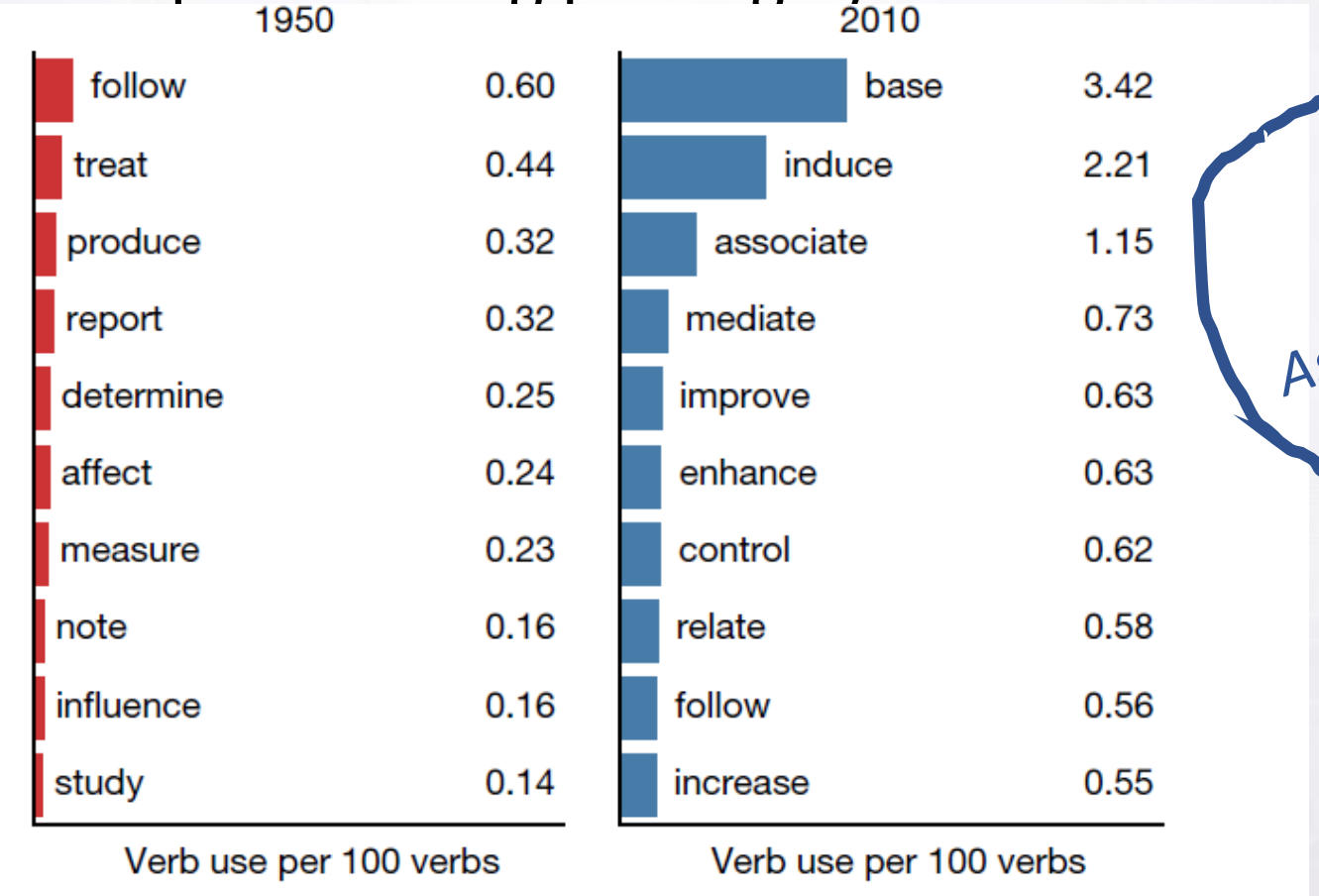
Disruptive papers and patents are likely to introduce new words (for example, words used to create a new paradigm might differ from those that are used to develop an existing paradigm)

Creation- Discovery or Perception of new things



Improvement- Application or Assessment of existing things

This trend is unlikely to be driven by changes in citation practices or the quality of published work.

It is part to scientists' and inventors' dependence on a narrower set of existing knowledge.

Evidence from various industries, products, and firms showing that **research effort is rising** substantially while research **productivity is declining sharply**.

The Sustainable University of the Future: Reimagining Higher Education and Research

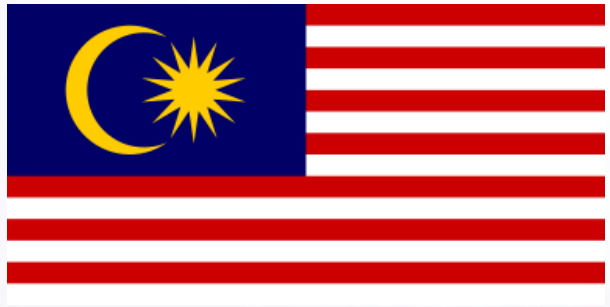
- “Sustainable University of the Future: Re-imagining Research and Higher Education” represents a set of important-needed topics to address nowadays.

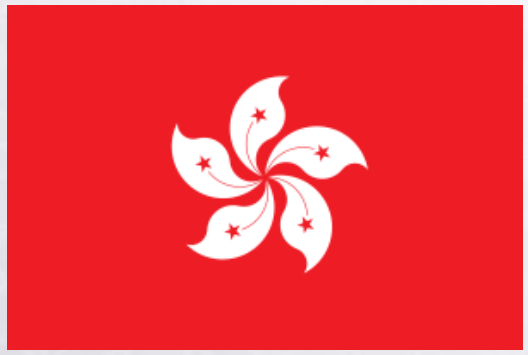
- Need to reconsider the universities traditional policies and plans and adopt more sustainable and modern programs and tools, which keep pace with transformations and anticipate the next challenges. In addition, it expands opportunities and options for faculty members and students.

13 Institutions

AN INTERNATIONAL AWARD-WINNING INSTITUTION FOR SUSTAINABILITY

10 Countries





Higher education needs to be more student centered and at the same time **better connected to the grand sustainable development challenges of our time**.

This collection of chapters published in this book provides a true contribution to the existing body of knowledge and is of special interest to those who are interested in the transformation of the university and its development in the future.

Pam Fredman

President of the International Association of Universities (IAU) Paris, France

- The pandemic had taught us that change at scale is possible, and ongoing organizational, technological, and pedagogical changes have been initiated by higher education institutions. Indeed, higher education needs to be more open, more inclusive, and more resilient. A roadmap for a new era of education is necessary to go beyond the challenges of our current systems toward a sustainable future. It requires our most creative capacities, with imagination and innovation.
- This book provides opportunities to the members of academic institutions and governmental agencies to better understand the current mutations and explore their implications on higher education and on how to reimagine the university of tomorrow.

Former President of Qatar University (QU) Sheikha Abdulla Al-Misnad

Doha, Qatar

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Prof. Mariam Al-Maadeed, Prof. Abdelaziz Bouras, Prof. Mohammed Al-Salem, Nathalie Younan
Qatar University

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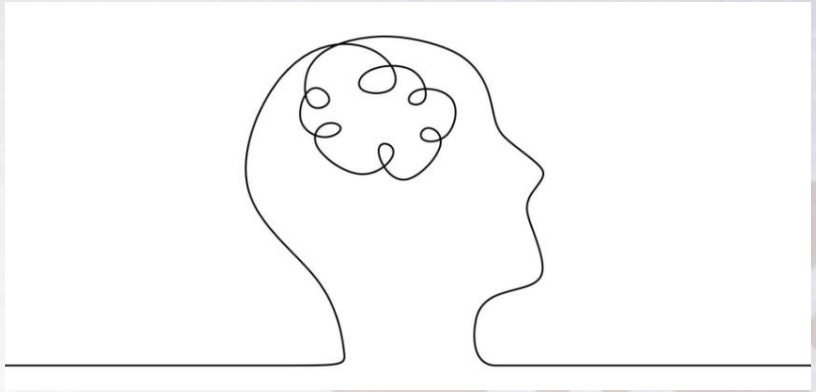
    Dr. Mirella Aoun – American University of Beirut, Dr. Rami Alhusseini – American University of Beirut, Dr. Rabi Mohtar – Texas A&M University

Chapter 1

- Through systematic collaboration with faculty, students, alumni and the surrounding stakeholder community, universities can play a more proactive role in meeting the SDGs.
- QU realizes that such incorporation of HEIs into the localization of SDGs from a social responsibility perspective should be communicated via the three comandates of any HEI: teaching and learning, research, and community engagement.

Chapter 8



- Economy-centred, industry-led, reputation-obsessed, and hence dehumanising occur. It should be replaced with a wholesome, inclusive, sustainable, equitable and resilient (WISER) framework that will lead to a humane society with equal opportunities for all.

- The universities of the future must reclaim values and the human outcomes and realise human-technology convergence by humanising technology.

- The key performance indicators (KPIs) must be rightly balanced with KIP (Key Intangible Performance), things that cannot be measured in the conventional and structured way.

- There can be nothing more important to the civilisation than to bring the soul back into education as the interaction between human beings and advanced technology share the global stage for the better of humanity and for the mercy to all.

Personnel experience

جامعة قطر
QATAR UNIVERSITY

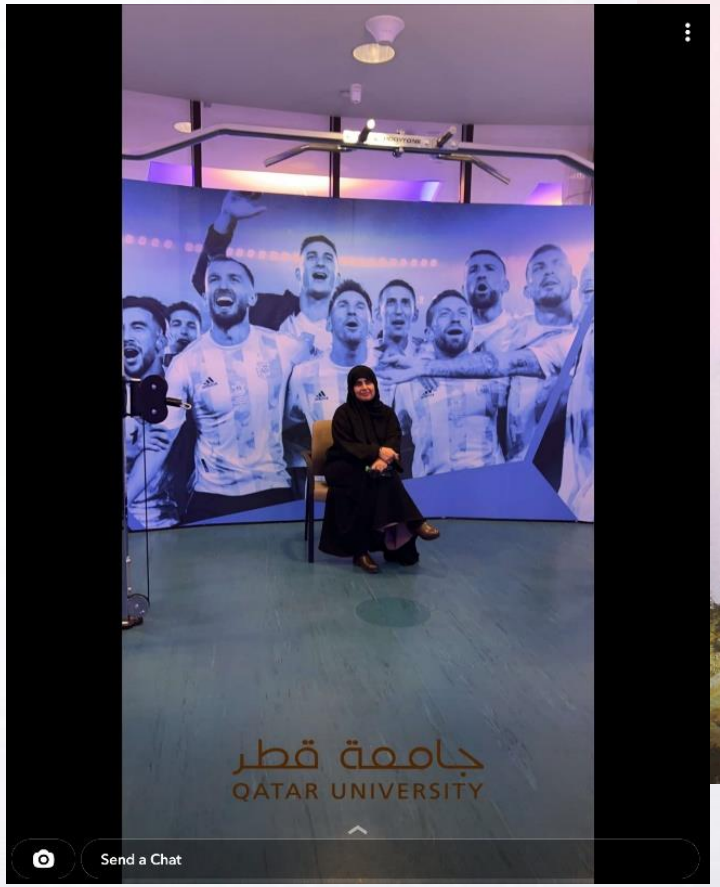
Qatar University 1973

150 students
“93 Female Students & 57 Male Students”

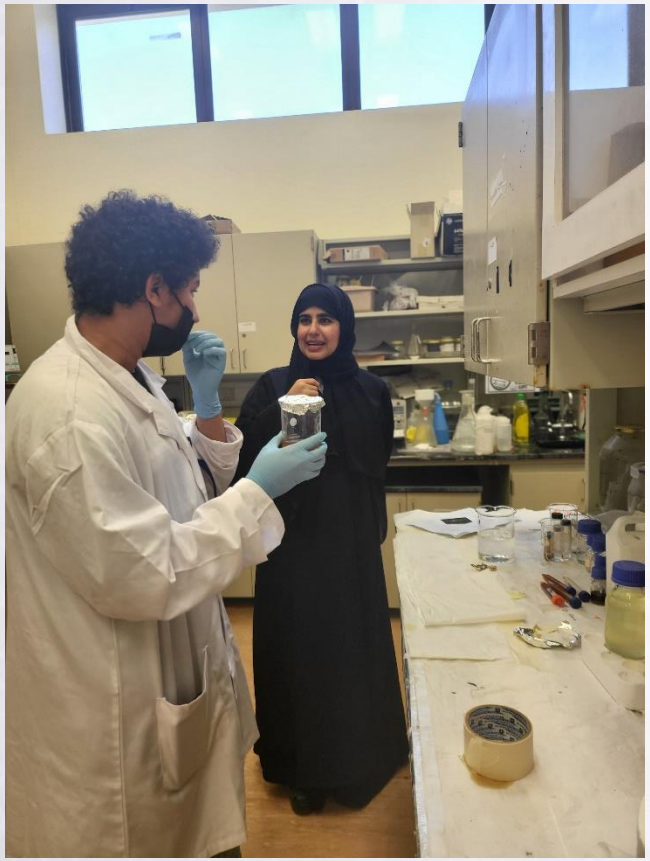
Qatar University Today

Around 28000 Students “more than 75% are Female Students”

HOST A NUMBER OF FOOTBALL TEAMS DURING THE FIFA WORLD CUP QATAR 2022

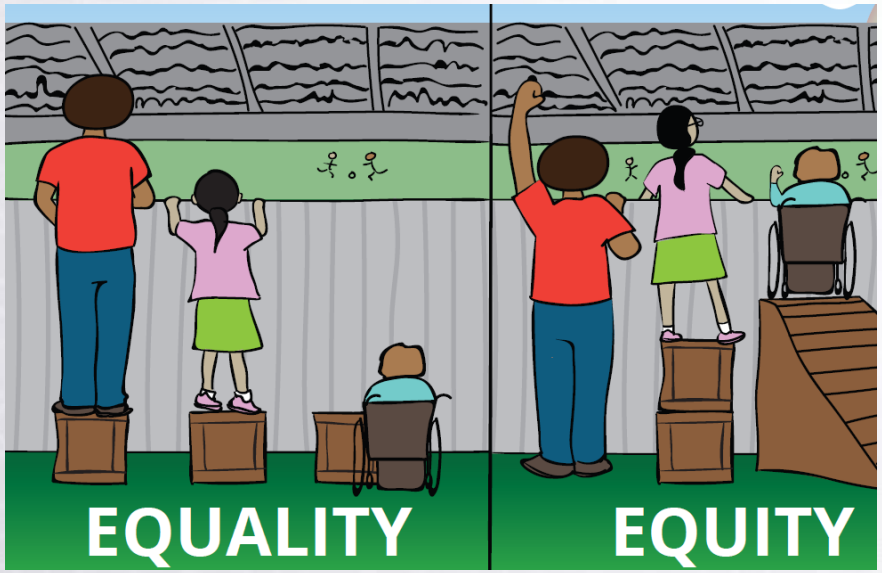


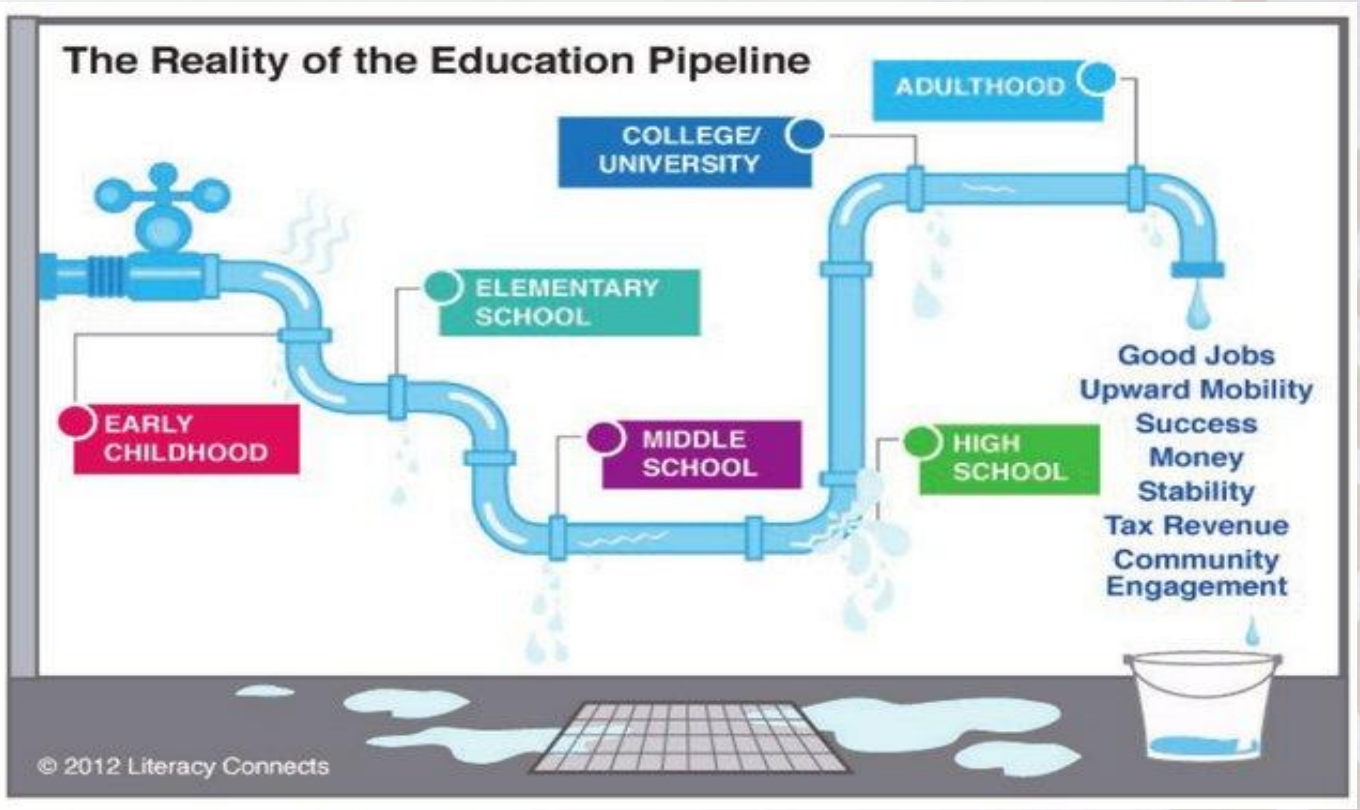
Examples of Impact



Leaking pipes?

So: Leaving no one behind!

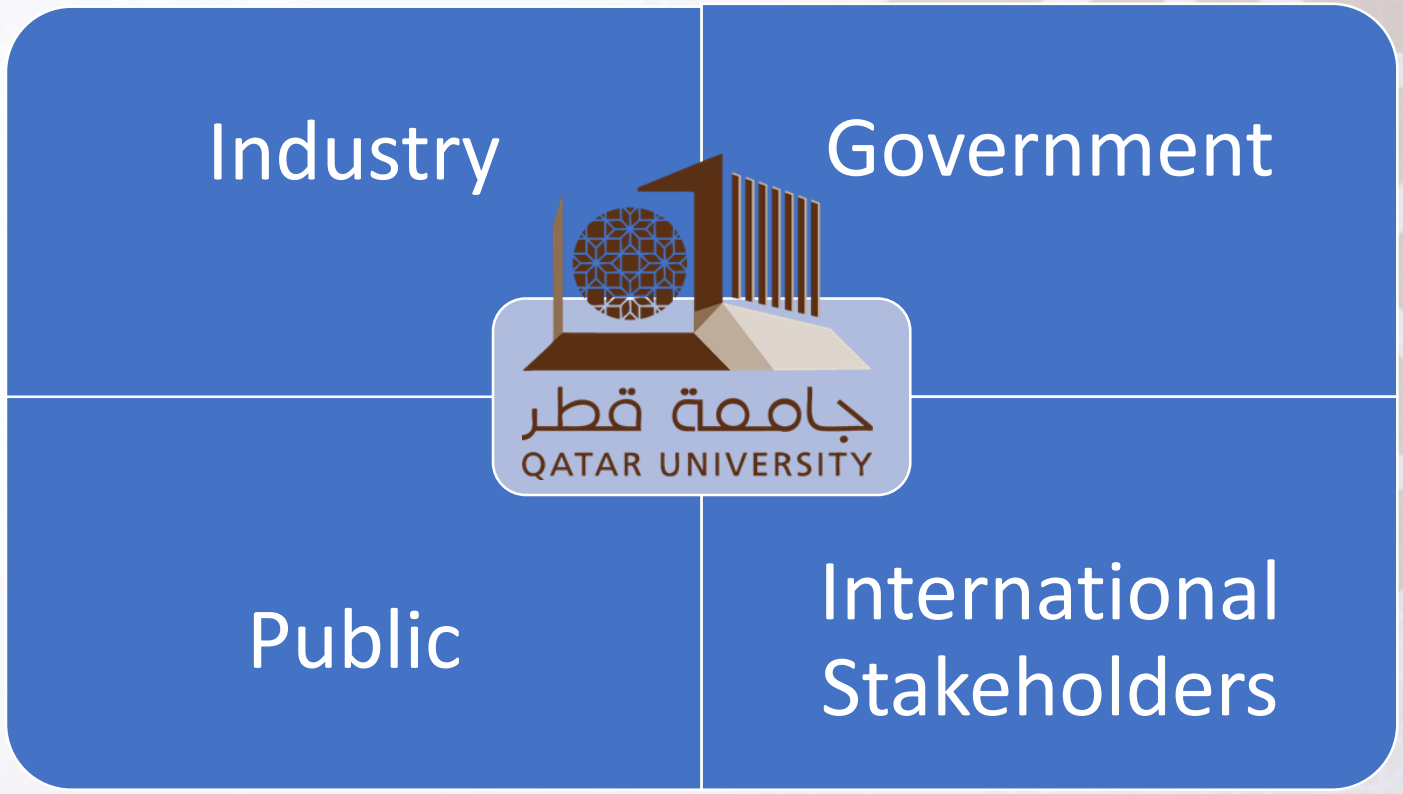


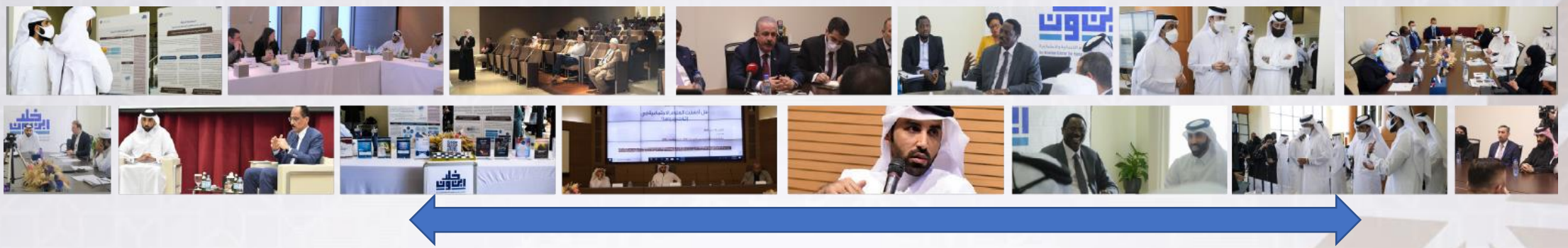


Global partnership Personnel Experience

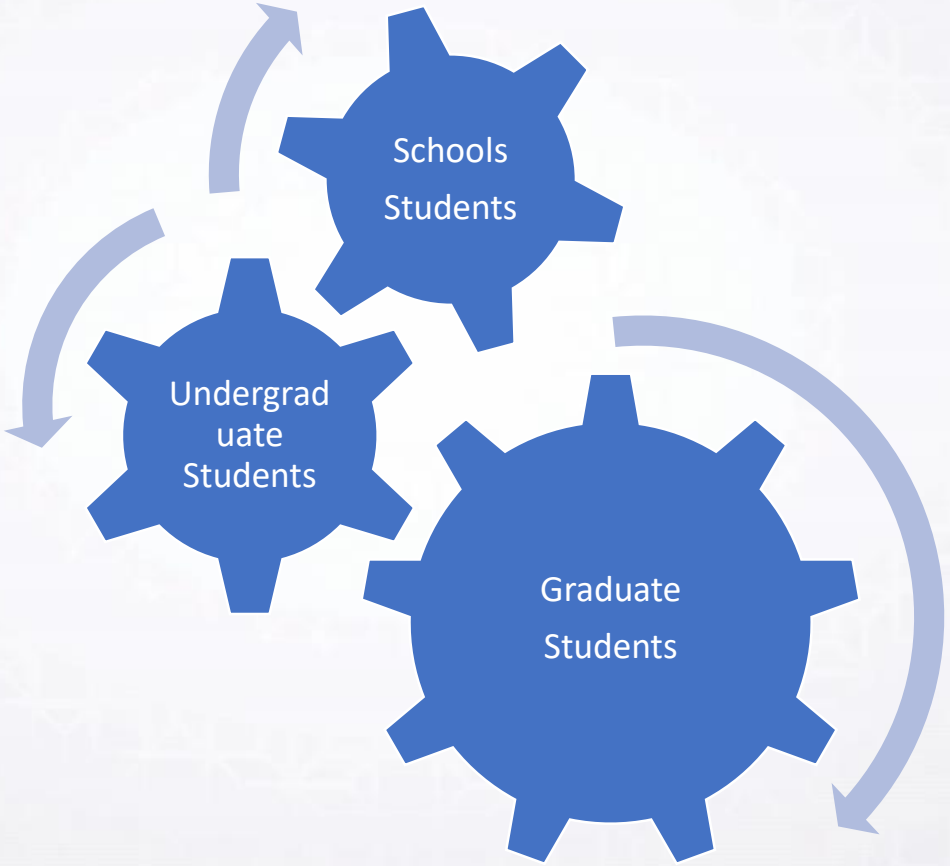
Integration between scientific, social, economic and governance dimensions.

The scientific and technological development can play better role in socio economic impact and society 5.0.





Graduate Learning Support (GLS)



New support for Post-Doctoral Researchers

مركز جامعة قطر
للعلمـــاء الشـــباب
Qatar University
Young Scientists Center

بعلم على صواب وحق صايب

المؤسس

Annual National 3MT

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

جامعة قطر
QATAR UNIVERSITY

TEXAS A&M UNIVERSITY at QATAR

DOHA INSTITUTE FOR GRADUATE STUDIES

ORYX UNIVERSAL COLLEGE
in partnership with
LIVERPOOL JOHN MOORES UNIVERSITY

AFG COLLEGE with the University of Aberdeen
UNIVERSITY OF ABERDEEN

جامعة حمد بن خليفة
HAMAD BIN KHALIFA UNIVERSITY
عضو في مؤسسة قطر
Member of Qatar Foundation

QFBA
Northumbria University NEWCASTLE

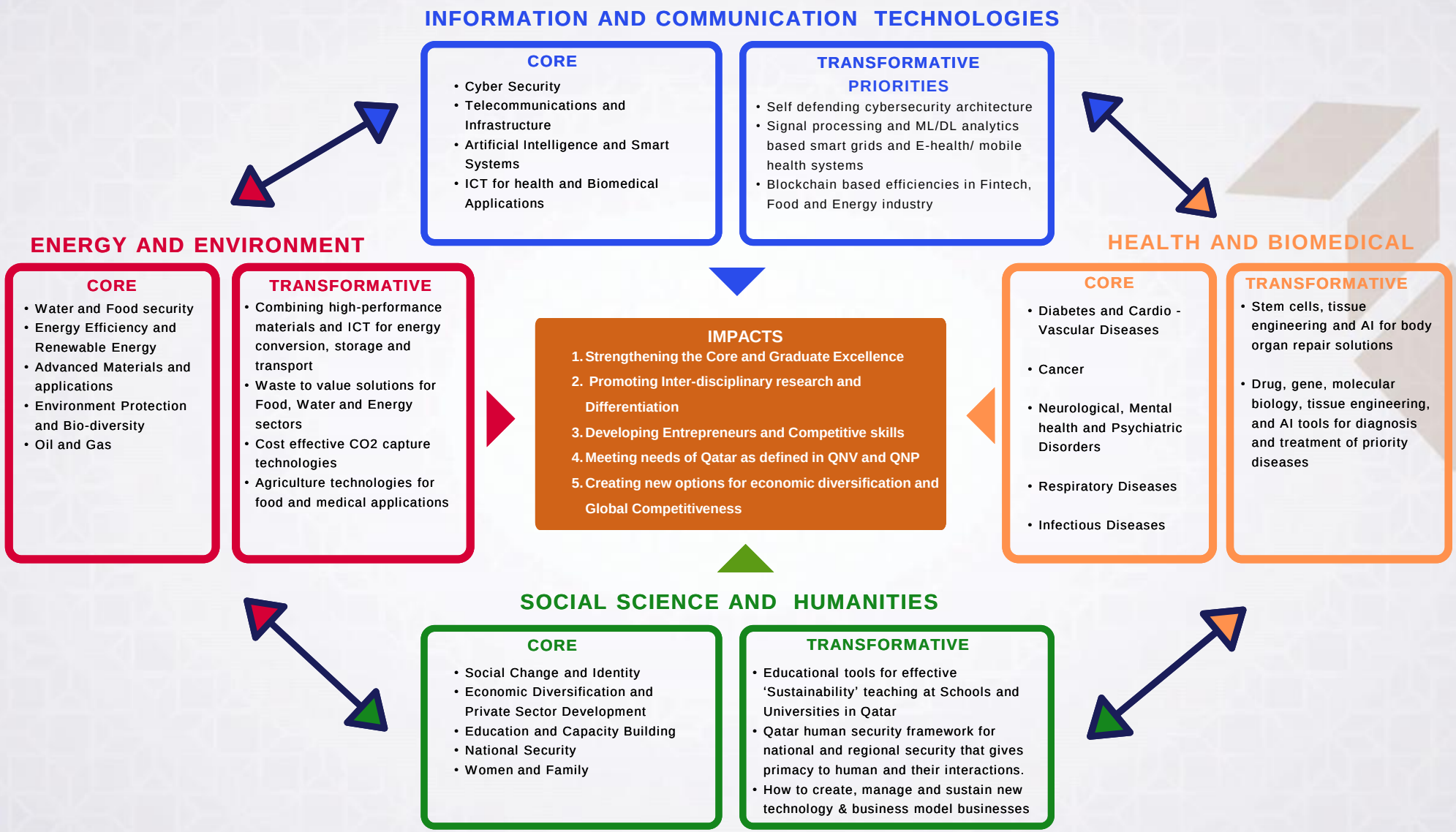
AL RAYYAN INTERNATIONAL UNIVERSITY COLLEGE
In partnership with
UNIVERSITY OF DERBY

Annual tadTalks Event

Graduate researchers from:

- Qatar (Qatar University, HBKU, Doha Institute for Graduate Studies, Texas A&M at Qatar)
- USA
- New Zealand
- Malaysia
- Italy
- South Africa

Research Priorities (2021-2025)



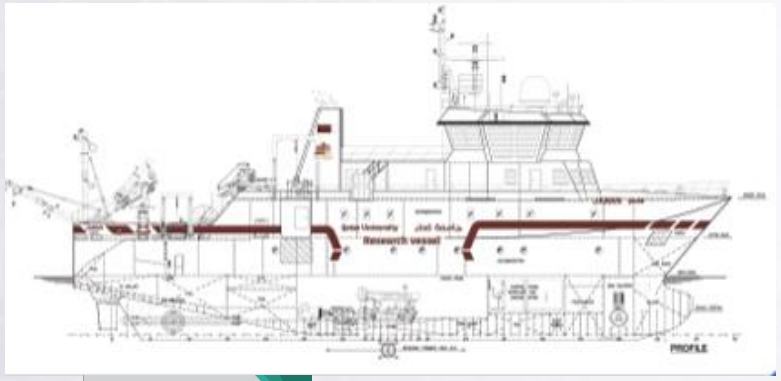
International IRCC Collaboration Map

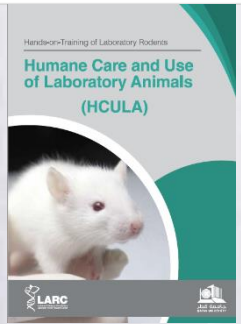
IRCC Cycle 03
IRCC Cycle 04
IRCC Cycle 05

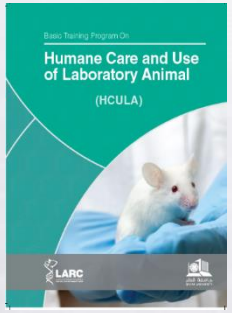
IRCC-SQU (Oman)

IRCC Cycle 06

- **Cycle 03: 16 Awarded**
- **Cycle 04 :17 Awarded**
- **Cycle 05 : 16 Awarded**
- **Cycle 06: 15 Awarded**
  SQU: 5 Awarded







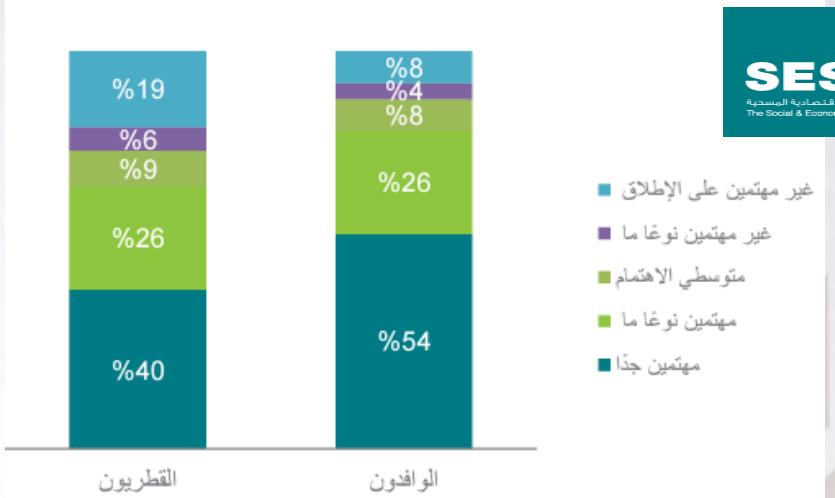
- Qatar University Station for Air and Atmospheric Research
- Artificial Coral Reefs

Real Political Changes

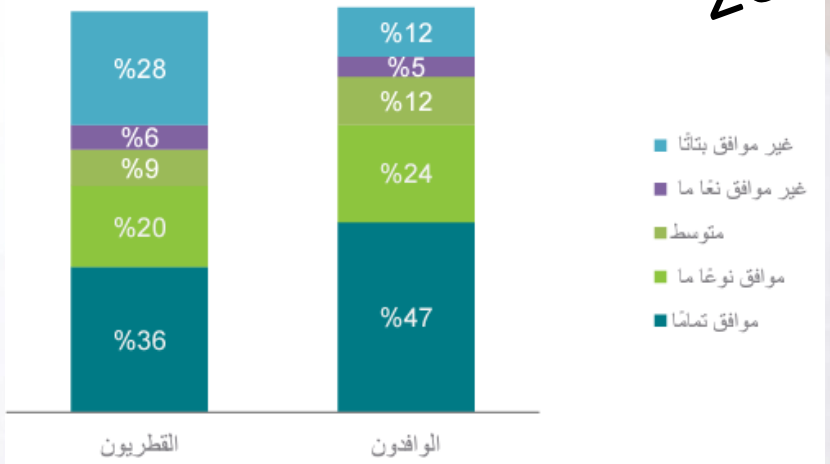
SESRI
معهد البحوث الاجتماعية والاقتصادية المسحية
The Social & Economic Survey Research Institute

- A survey of perceptions and attitudes towards the Supreme Committee and the FIFA World Cup 2022
- Survey of labor law changes in the State of Qatar and workers' welfare - attitudes and perceptions of a sustainable future

شكل 5-8: ما مدى اهتمامك بالعمل التطوعي لكأس العالم



شكل 5-9: "سأتطوع لكأس العالم 2022"



2015

كلية الآداب والعلوم
College of Arts and Sciences
QATAR UNIVERSITY جامعة قطر

مركز دراسات الخليج
Gulf Studies Center

The FIFA 2022 World Cup in Qatar:
Looking into Global and Local Perspectives

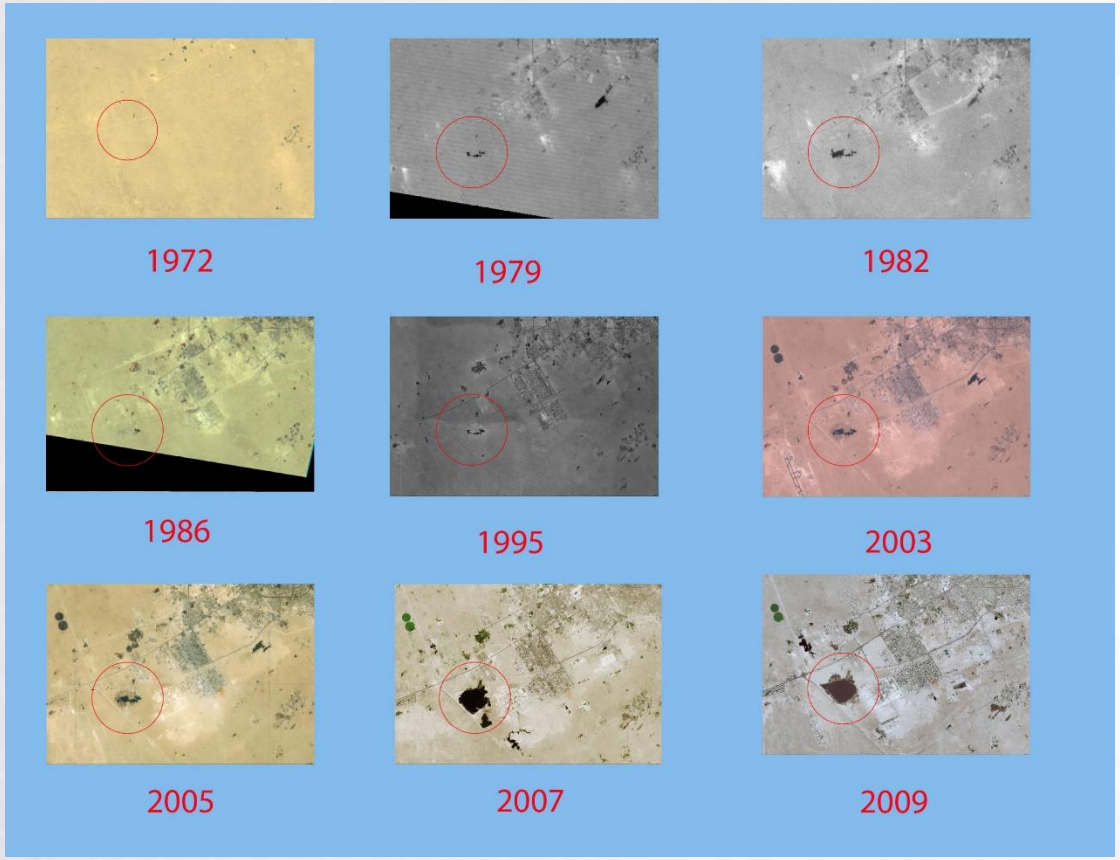
Gulf Studies Center

Monday, 19 September , 8 am - 4 pm
Tuesday, 20 September , 9 am - 2 pm
Qatar University, Research Complex
(H10), Auditorium

Surveys on the FIFA 2022 World Cup in Qatar

Abu Nakhla Sewage Pond Project

Environmental Assessment and Management Options for the Abu Nakhla Sewage Pond

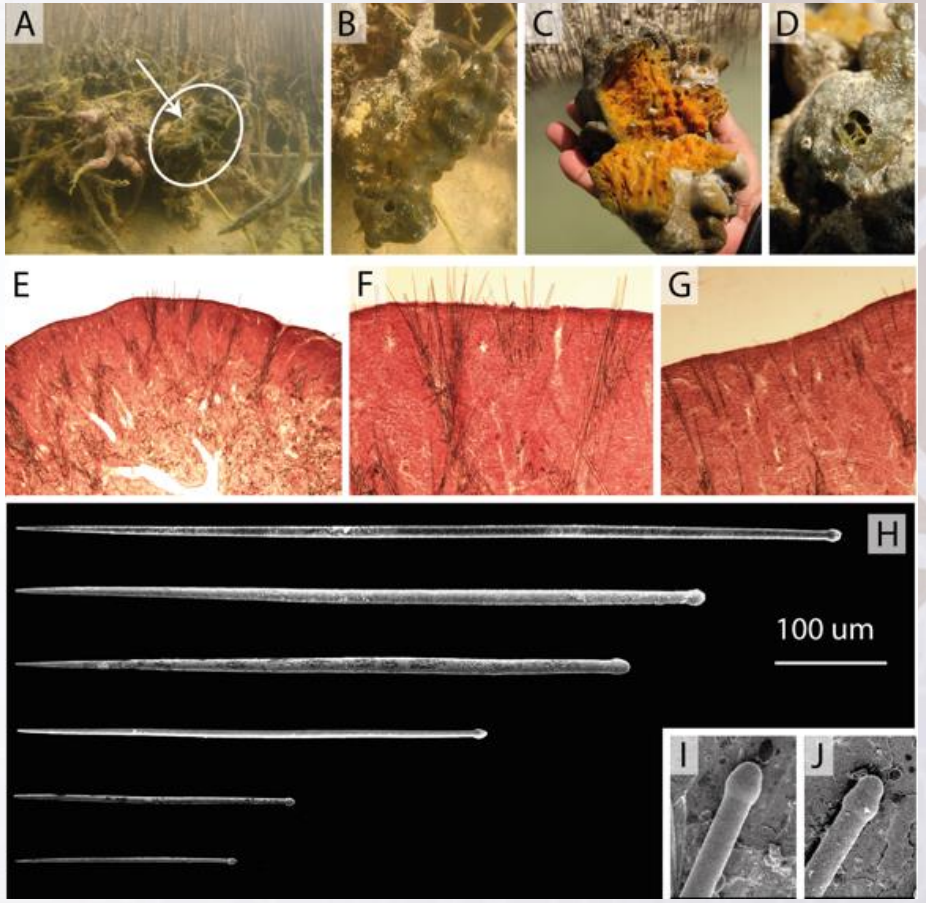


NPRP 6-1030-2-418

Genetics of Habitat and Environmental Biomonitoring in Qatar

Coleusia janani n. sp., holotype male (carapace length 13.6 mm) (ESCMC 00161).

Field collection of the sponge in mangroves in Al-Khor

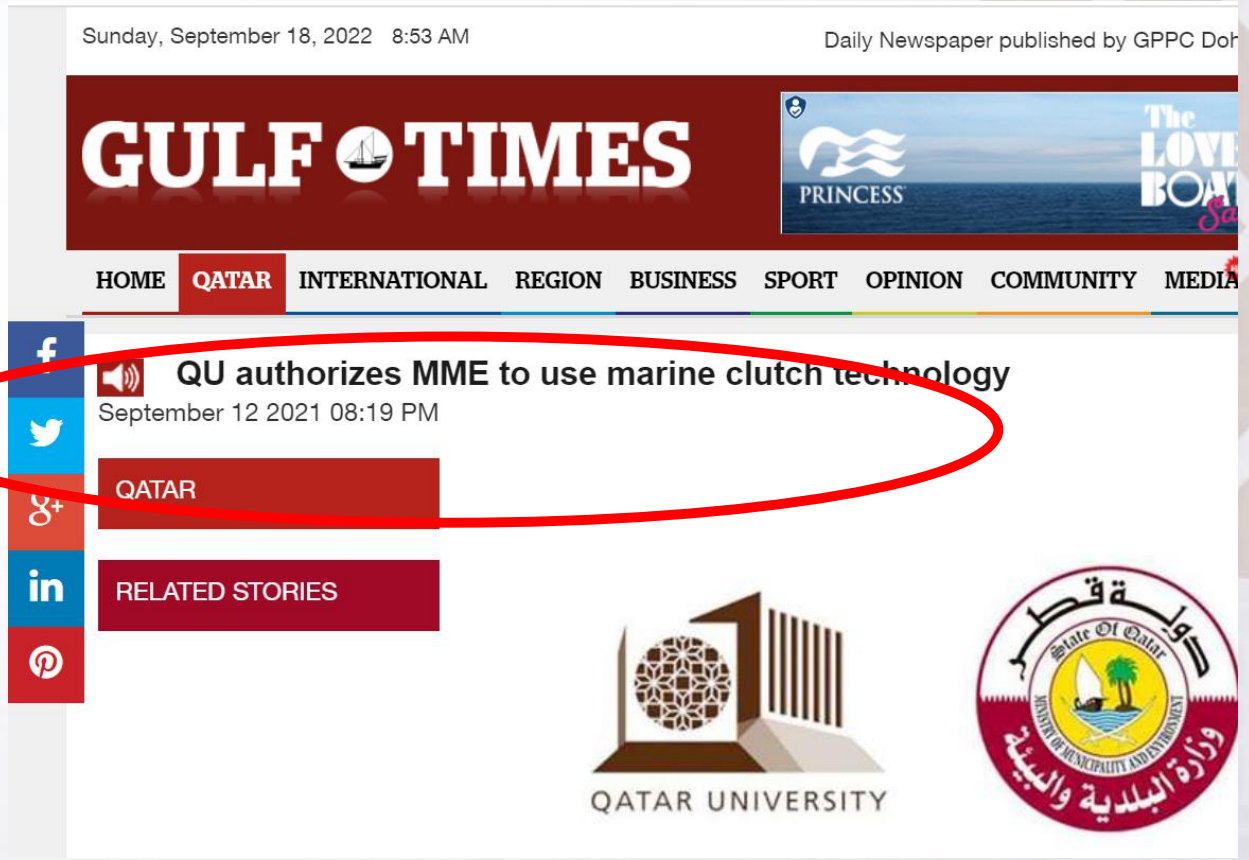


A new sponge species

***Commercialization agreements of Two patents

Artificial Coral Reefs

Marine Clutch Technology



Sunday, September 18, 2022 8:53 AM

Daily Newspaper published by GPPC Doh

GULF TIMES

PRINCESS
The LOVE BOAT

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QU authorizes MME to use marine clutch technology

September 12 2021 08:19 PM

QATAR

RELATED STORIES

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Multiple Activities to Commercialize Research & Innovations And Create Deep Tech. Startups

QU Holding is the Commercial Division of QU Economic Development Ecosystem. Expected to enable Commercializing Research and creating Deep Tech. Startups from QU R&D.

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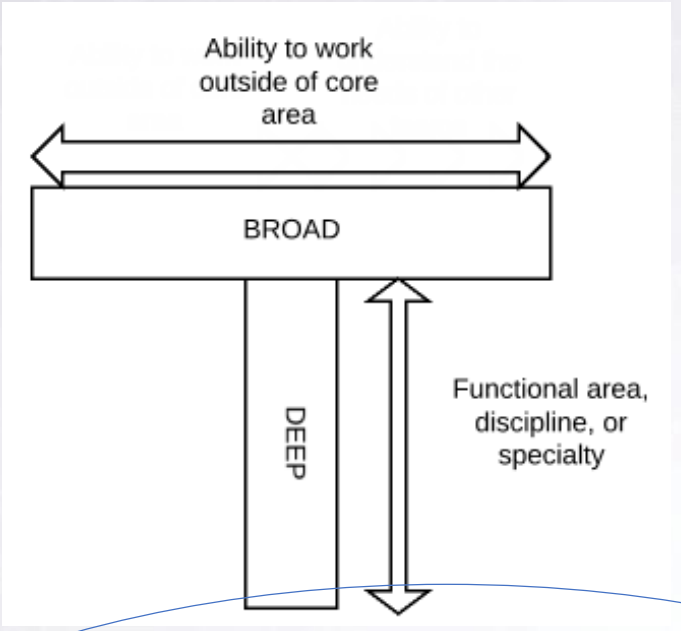
Office of Strategic Innovation, Entrepreneurship & Economic Development
QATAR UNIVERSITY جامعة قطر

Undergraduate Startups Development Program

Recommendations



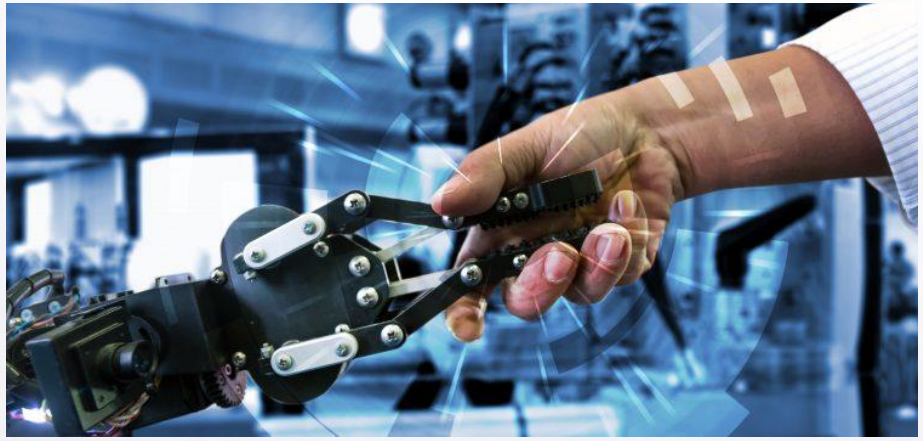
Interdisciplinary and Transdisciplinary **Research** Approaches

Prepare T- SHAPED PROFESSIONALS

Deep disciplinary knowledge + understand of systems and their ability to function cross the boundaries between disciplines

Higher Education Transformation

International Trends: the higher education sector is expected globally to undergo significant transformation with higher demands of focus on innovation and entrepreneurship, embracing the industrial fourth revolution and Society 5.0.



Higher education institutes through special research and educational programs are expected to prepare students in:

(a) Innovation and design competencies

(b) management skills (e.g. Strategy development, quality assurance and technology awareness, leadership)

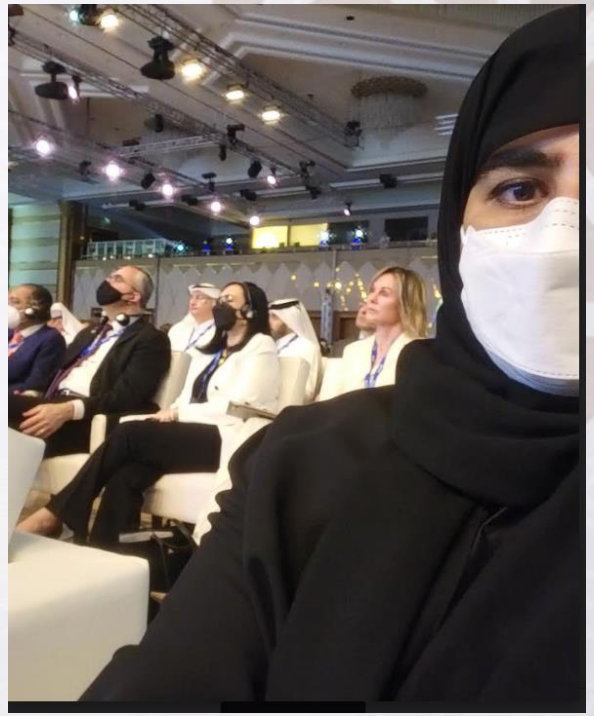
Collaboration is needed between academia, industry and government. All are expected to work together.

The economic system is changing and more cooperation is required between public and private sectors.

Research and Development (R&D) is the heart of the development.

Sustainable industrialization depends on **building up the R&D**, in addition to **increasing the number of researchers**. The contribution of the business sector in research through digitalization and smart cyber-physical systems increased productivity and efficiency, and improved the industrial outputs.

DOHA FORUM
منتدى الدوحة



H.H Sheikh Tamim Bin Hamad Al-Thani

Today's world has reached a critical stage at all levels, political, economic, environmental and social, and this stage requires revisions before the world reaches a state of loss of balance.

At the level of environment and climate change, we see that consumption patterns that are not environmentally friendly and irresponsible industrial production rates are steadily increasing. At the societal level and people's lives, the social and economic gap between countries, and in one society, predicts a serious imbalance in the macroeconomics, especially after strengthening the technology sector and its role in the economy and the lives of individuals.

H.H Sheikh Tamim Bin Hamad Al-Thani Speech at the Doha Forum – 26 March 2022

TRANSFORMING FOR A NEW ERA

- As the world recovers from the largest shock to the global economy since the Second World War, leaders and policymakers must come together to develop ~~policy~~ innovations aimed at saving the most lives and avoiding permanent damage. Nonetheless, ~~changemakers~~ have paved the way for advancements in various different spheres such as technology, medicine, sustainability and equality.

Scientists

Education

- The only path ahead for the international community is to adapt and even more importantly to transform for the New Era that we all want and that humanity needs.

https://dohaforum.org/doha-forum-2022/doha-forum-2022

Thank you!