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Office of Research & Graduate Studies
Aga Khan University

THE AGA KHAN UNIVERSITY

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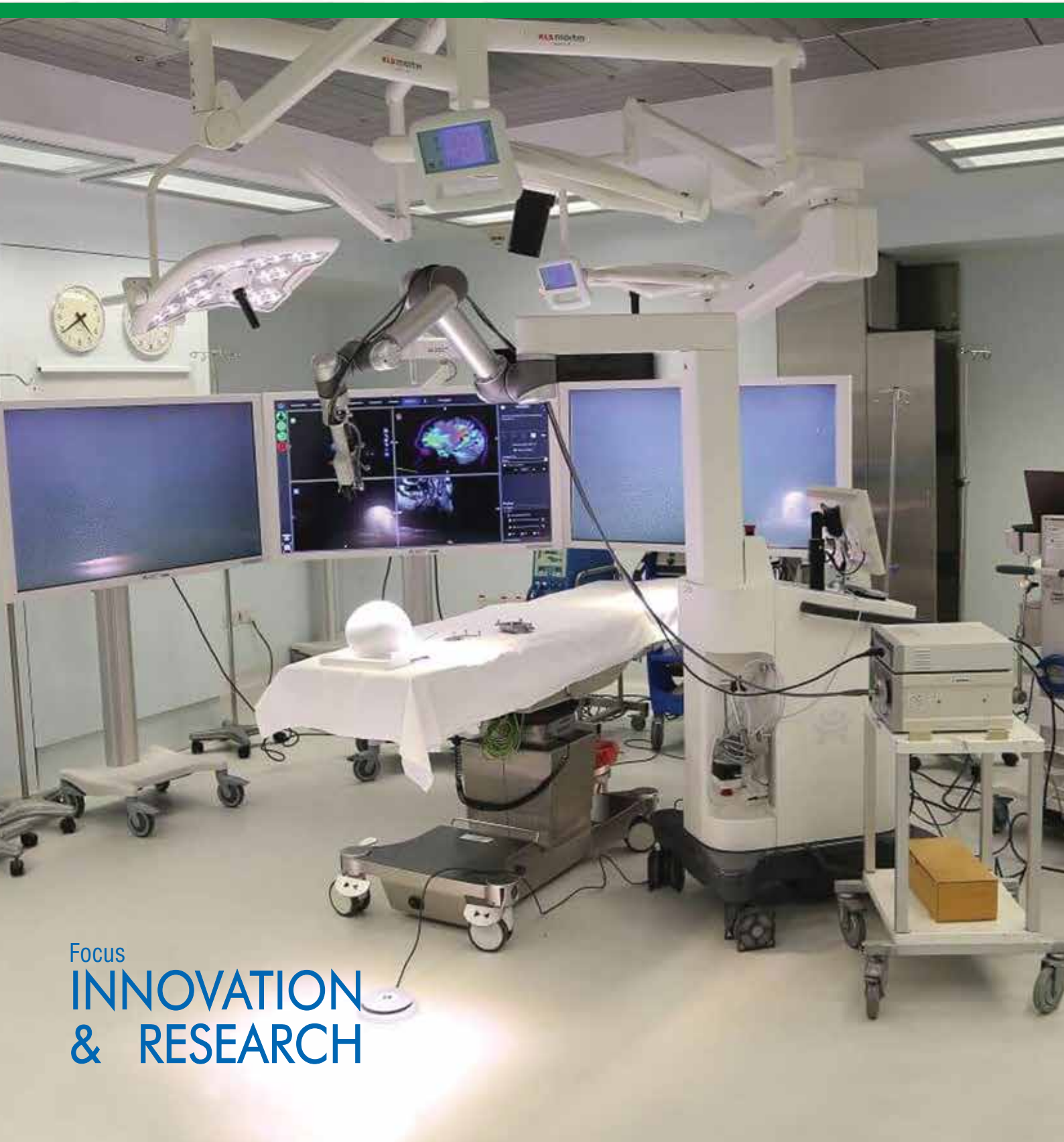

Focus

INNOVATION & RESEARCH

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Welcome

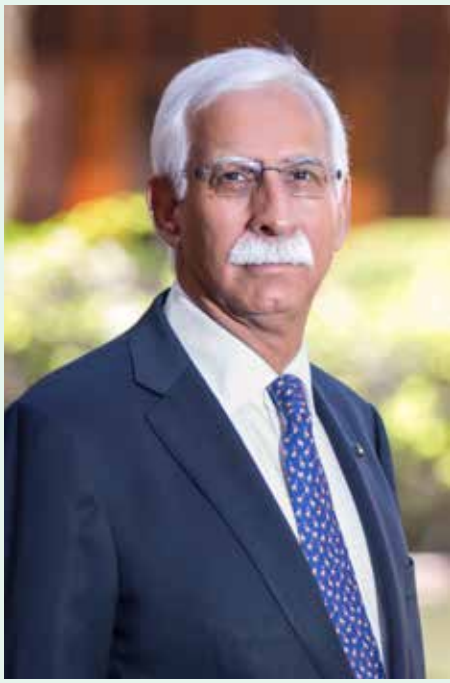
It is often said that if you want to gauge the success of any region, look at its academic institutions and their output of new knowledge through research. Universities are the hallmark of change and development, generating and nurturing a trail of concepts and ideas that eventually seep into the various segments of society and industry. The very nature of Aga Khan University as a progressive institution of higher learning makes it the harbinger of creativity and growth, with its defined vision to develop capacities of discovery and dissemination of knowledge, and ultimately leading its way to the application of that knowledge in innovative ways for the betterment of society.

Over the years, AKU has created national and global impact stemming from thinking that resulted from bold ideas. It supports the best minds as they explore for unconventional solutions in health, education and humanities. Professor Zulfiqar Bhutta's innovative strategy to eradicate polio from Pakistan is a remarkably successful vaccination campaign to benefit not just a region but the entire world. The kind of impact such scholars and researchers make is reflective in the recognition they receive nationally and globally. Very recently, Pakistan's President has conferred prestigious awards on Professor Syed Ather Enam for his work in the field of medicine and Professor Bhutta for his contributions to healthcare education.

Our achievements are embedded in our collaborative efforts as a team utilizing diverse skills and resources. For example, to fight outbreaks of deadly preventable childhood diseases due to low accountability of routine immunization, the Aga Khan Development Network e-Health Resource Centre worked with our faculty, researchers and technicians to design a smart phone android application named *Teeko,* an innovative product to monitor the number of children being immunized, vaccinators' movement and the availability of vaccine stock. Another breakthrough in medical field is the introduction of the extraordinarily advanced brain surgery technology to Pakistan with its highly detailed 3D imaging, navigation and robotic positioning system for delicate brain surgery. Such a revolutionary technology will radically improve the care provided for all diseases related to the nervous system and spine.

Technology can change the way we operate to improve university education and to integrate new pedagogies. The Centre for Innovation in Medical Education was recently inaugurated at Karachi campus to experiment with new ways of teaching that involves more practice-based teaching using robots and mannequins as well as simulation and visual reality. The technology also allows connection with distant areas or regions with limited access to resources through telecasting, tele-learning, tele-teaching, and video conferencing.

These are just a few of a spectrum of innovative options that show how AKU could be at the cutting edge, pushing the boundaries of conventional practices and norms. Other than training the intellect through the acquisition of universal knowledge, the role of university is to create an environment where bright ideas can take shape into practical solutions for the betterment of human lives. Radical innovation is the current need. And there is an absolute urge for cultivation of systematic changes. We aspire to deliberate on innovations to cultivate solutions better suited to the need of the developing world.



Firoz Rasul
President
Aga Khan University

This year, *Research Outlook* comes with a simple, emphatic message: innovate and make a difference.

Universities are the hub of research, creativity, invention, discoveries and breakthroughs. At Aga Khan University, our aim is to encourage faculty, students and staff to innovate using their imagination, instinct, curiosity, experience and relationships to develop and implement ideas: creating a culture - sparking innovation.

Innovations can either improve on established technologies or can be disruptive. Disruptive technologies such as the mobile internet, advanced robotics, next generation sequencing, 3-D printing, automation of knowledge work amongst others are poised to transform the global economy and life as we know it.

Thinking out of the box and innovating is not limited to a select few but applies to all of us. It is everyone's job. It is important for us to share our ideas, thoughts, inventions and failures with others. Sharing our stories with others is important; it can turn apparent mistakes into opportunities. The Medical Hackathon recently conducted on the Karachi, Stadium Road campus provided a platform to faculty, students, and staff, to share, to dream, to collaborate and innovate.

To assist faculty, students and staff with patenting, commercializing, connecting with entrepreneurs, business leaders, government bodies, an Office of Research, Innovation and Commercialization has been set up (contact at research.office@aku.edu). Please come, visit us and discuss your ideas over a cup of coffee.

This issue of *Research Outlook* aims at sharing innovations from across AKU in diverse fields such as neurosurgery and rural education. Our aim is to encourage and galvanize research and innovation. There is no idea too small or too big!

Professor El-Nasir Lalani
Director, AKU-Centre for Regenerative Medicine & Former Dean of Research & Graduate Studies,
Aga Khan University

The Express Tribune reports Aga Khan University Hospital to be the "first medical center to introduce the new advanced brain surgery technology, Neuro-Robotic Exoscope, in Pakistan and the only hospital outside North America to have advance neurosciences equipment."

Inaugurated on April 11, 2016, this equipment, with its highly detailed 3D imaging and robotic positioning system gives a visual representation of the complex structures of the brain. This will help the surgeons to conduct safer and more precise surgeries on delicate areas of the brain and radically alter treatment options for patients during the surgery.

This story first appeared at tribune.com.pk on April 13, 2016

Dawn reports on the harrowing problem of stunting in Pakistan with reference to research by the Aga Khan University. The preliminary research at AKU reveals that stunting rates are 10pc lower in areas where interventions take place.

The article calls for action - "Pakistan's success in reducing polio cases to nearly zero shows us what can be achieved through strong leadership and action by key actors — the government, international partners, communities and parents themselves [sic]. There is no reason why it cannot make similar progress on reducing stunting. With the right prioritisation, the right programmes and the right support, Pakistan can make sure that no child suffers from stunted growth."

This story first appeared at dawn.com. on August 17, 2016

The Express Tribune reports on AKU's first medical hackathon hosted by Critical Creative Innovative Thinking (CCIT), an open forum at AKU that promotes biomedical and healthcare-related creative ideas and innovations.

On the last day of the event, the teams presented their ideas to the jury where the 'best idea' award was won by 'HistorER' for their idea on developing an electronic solution to save time in the ER by introducing cards with Quick Response codes that can show a patient's medical history when scanned.

"Traditionally, healthcare systems are hierarchical, risk averse and slow to change. The lack of innovation, especially in environments with few resources, has not delivered positive healthcare outcomes for the majority," said former AKUH ER head Dr Junaid Razzak, while speaking on the need of a medical hackathon. Solving the challenges of healthcare for countries like Pakistan is possible through innovation, claimed Razzak."

This story first appeared at tribune.com.pk on August 17, 2016

NTV Uganda presented a story on their website on the Uganda Youth Survey Report conducted by the East African Institute of the Aga Khan University.

The report generates findings to analyze the attitudes and aspiration of the youth of Uganda where 80% of the population is below 35 years of age.

The survey is intended to gather data "that can inform the debate on how to address the problems that face the youth in the region." The minister of state for Youth and Children Affairs promised on behalf of the government to use this data to find solutions to the challenges addressed in the report.

This story first appeared at ntv.co.ug on September 02, 2016

The Need to Innovate

How can Aga Khan University continue to grow? President Firoz Rasul said at AKU convocation ceremony in Dar es salaam, Tanzania in 2015: "Ours is a time in which opportunities for innovation abound along the intersections where different disciplines and professions meet. For example, we want to see educators and health professionals working together to prevent illness. We want to see business, government and civil society leaders building frameworks to protect the environment while promoting economic growth. We would like to see journalists and technology entrepreneurs connecting rural audiences to essential information. We want to create an environment in which conversations between biologists and sociologists, ecologists and philosophers, economists and anthropologists open up new perspectives on our world."

Universities are the fundamental source of generating knowledge as an asset that supports innovation and growth. Acting as the core of networks that link its scholars with the wider innovation ecosystem, universities dynamically contribute to local economies, businesses, and the innovation and research capacities of countries.

The Aga Khan University (AKU) provides access to world-leading facilities; scientific services; a unique training environment; and advanced subject expertise. AKU fosters and promotes a culture of collaboration and innovation to support the creation and growth of new ideas and policies. The knowledge base, which includes various research groups and networks, is widely known among the regions where it operates. It has a proud record of making national and global impact – from building the evidence base for policy changes to the development of new procedures, best practices and solutions.

To succeed in the innovation system, the Office of Research and Graduate Studies (ORGS) plays a key role in ensuring scholars, financiers and innovators have the best possible environment in which to operate by:

- Identifying potential funding;
- Improving the interface between Higher Education Commission/Government and University;
- Delivering a better environment for publicizing and commercialising research;
- Creating awareness related to research through workshops and training programs

To develop and maximize the impact of research, ORGS is increasingly collaborating with the University's departments and with external organizations, last year (2015) securing 69 grants worth US$24.02M from the external sources. For greater access to

Global Tales of Innovation

Richard Turere, 13 year-old Kenyan boy was responsible for safeguarding his family's cattle during night. Discovering that lions were scared of people carrying flashlights at night, he rigged a series of automated flashing LED light bulbs around his livestock. The blinking lights tricked the preying lions into thinking that he is present with the cattle while he slept. These "Lion Lights" have been improved upon and are being used in various parts of Kenya. Simple and affordable, this invention not only protects the livestock of rural communities but also saves lions which are vital to the economy as they are the main tourist attraction to the country.

Ronnie Stuiver, engineer and borehole-driller in South Africa dreamt an idea as he traveled the country drilling wells. Seeing that fascinated children would crowd round him wherever he drilled wells, he devised a merry-go-round attached to a simple pump. When children spin the merry-go-round, the attached pump pulls water from underground. This invention was transformed into a sustainable solution to alleviate the water crisis in Africa and other regions of the world. The main purpose of play pump is to extract water from the ground for various usages, especially in remote areas where there is inadequate supply of electricity. The word PlayPump is now a registered trademark in many countries including the European Union.

A group of five Pakistani students developed a Smartphone application, Groopic that seamlessly merges two images into a single frame. The person taking the picture can switch positions with one member of the group, who then takes a second picture and Groopic instantly merges the two pictures creating a single one with the photographer in it. With Groopic, Eyedeus Labs, a startup created under platform of Plan9, Technology incubator out of Lahore, Pakistan has evolved into a dynamic company with a robust branding, partnership and commercialization strategy.

Three young men from Pakistan won the Karachi Grand Innovation Challenge 2015 held by Pakistan Innovation Foundation, Alif Ailaan and I Am Karachi for developing WonderTree games as a therapy aid. Costing less than a therapist fee, these games can be annually subscribed to help players with special needs to develop hand-eye coordination, physical movement, reflexes, mirroring, attention retention and decision making. The team works with a panel of physiotherapists, to develop the games. The innovators were invited to showcase WonderTree at Global Entrepreneurship Summit 2016, Silicon Valley, USA. WonderTree was placed third to win $3,000 out of the 15 selected teams from a total of 1074.

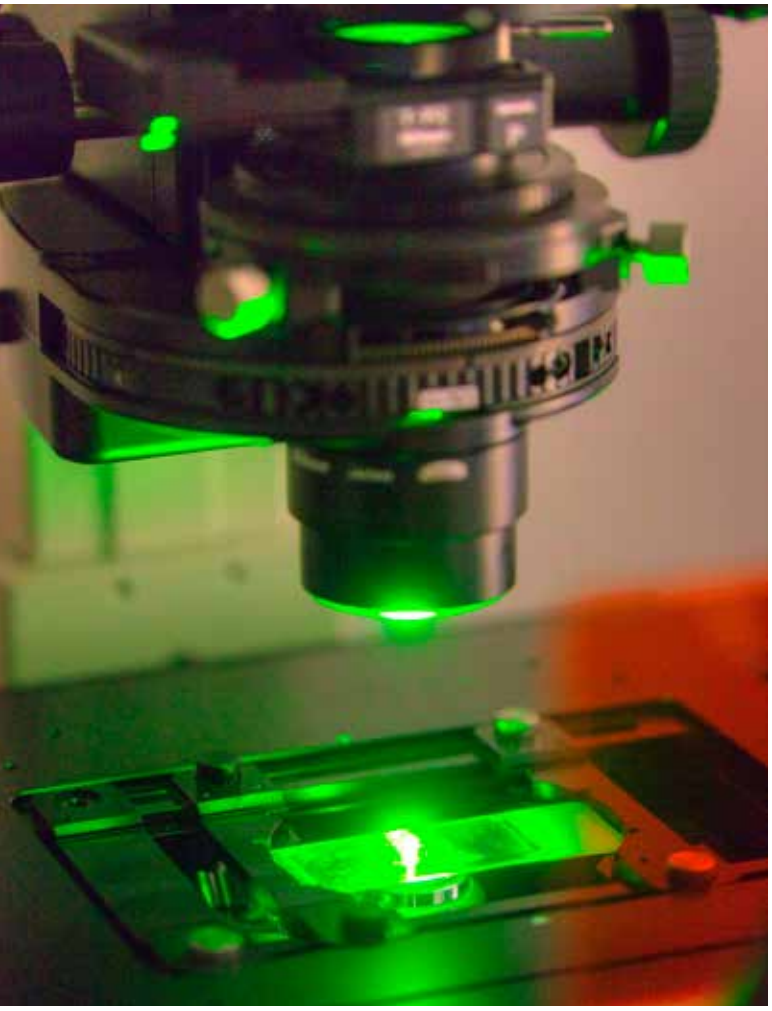
grant opportunities for AKU researchers, ORGS regularly circulates Research Grant Funding Opportunities Bulletin across all campuses. This bulletin provides funding alerts and opportunities available worldwide for low and middle income countries.

AKU aspires to be a national leader in research, development and innovation. The future prosperity rests on its ability to compete in the national economy that is increasingly driven by innovation. Hence, there is a need to strengthen their innovative capability and encourage greater investment in innovation. With this intention, ORGS aims to encourage stronger links through network initiatives between entrepreneurs, researchers and experts. Strong connections between key actors in the innovation system are instrumental to create and disseminate knowledge.

Presently, **AKU is one of the 46 universities in Pakistan which has a Higher Education Commission (HEC), Pakistan recognized Office of Research, Innovation and Commercialization (ORIC).** Over the recent past, the HEC has put its emphasis on directing universities towards changing the economic landscape by setting up ORIC. While some of the essential ingredients required by HEC for formulation of ORIC were already functional at AKU since 2010, a need was felt to reorganize the office in line with HEC requirements so that an ecosystem for innovation and commercialization could be nurtured at AKU.

In the developing world, innovation can be a viable solution to economic and social challenges. However, the innovation system needs to have some strong characteristics. Among those is the requirement of an integrated innovation system within organizations which must include support for research as well as support for product development. The framework must strengthen the linkage of ‘public–private’

and ‘academia-private (university-industry)’ as well as ‘academia–public.’ Moreover, there should be more focus on enhancing innovation capacity and Research & Development (R&D) expenditure level. This indicates that universities need to strengthen the linkages between knowledge creation, diffusion and application. The importance of converting knowledge to practice and injecting this knowledge based input into our economic and social growth is a requirement which cannot be over emphasized. While socio-economic progress of a country is dependent upon research and development, a university too requires high quality and substantial quantity of research activity, to progress and to maintain its reputation as a comprehensive research-led university, with focus on innovation and entrepreneurship.



Saher Muslim
Assistant Manager,
Office of Research and Graduate Studies,
Aga Khan University, Pakistan

Lessons to Start

Your ideas can grow into business if nurtured in an incubation centre. "Entrepreneurship must be given more space in the coming years through a more thoughtful policy and regulation. It must be given place in the value system by allowing merit to overtake privilege. Education too must give entrepreneurship space by replacing bureaucratic management by creativity, merit and risk-taking"

– Planning Commission of Pakistan, August 2011.

Prof. Dr. Mukhtar Ahmed, Chairman Higher Education Commission Pakistan & H.E. Margaret Adamson, Australian High Commissioner to Pakistan (first row, centre) with participants of the course

The last couple of decades have witnessed a high placement for entrepreneurship especially by the government of Pakistan in the economic and educational plans with focus on necessary training for success in creating, guiding, and managing business. As entrepreneurship is given more space through a regulated policy and a new framework for economic growth is laid out, the private and public sectors also realize the need of equipping human resources with proper tools and training for business development. The Planning Commission of Pakistan, under its New Growth Framework, intends to create an environment conducive to productive rather than dissipative entrepreneurship which would lead to development of small-scale entrepreneurial ventures and innovative, high growth firms.

In consonance with the Higher Education Commission Pakistan's objective to enhance the national capacity of entrepreneurship, the Australia's aid program on Trade and Economic Development offered a funded course to stress on the need for higher education institutions in the country to focus on research and entrepreneurship. To mentor the university staff to effectively manage innovation and incubation, Mr Nur Ali Jivani, Manager, Office of Sponsored Research at Office of Research and Graduate Studies (ORGS) was awarded a grant along with twenty other professionals within higher education institutions and non-academic sector to attend a course on Business Incubation Management at University of Queensland, Australia during November and December 2015. In the pre-departure briefing for the course participants, the Australian High Commissioner to Pakistan, HE Margaret Adamson, highlighted the objective of the course:

"The skills and knowledge of successful business incubation management and entrepreneurship are integral to healthy economic growth in both the public and private sectors. This short course award responds to

the Higher Education Commission of Pakistan's desire to develop capacity to effectively manage Business Incubation Centres in Pakistan, and to stimulate entrepreneurship within higher education institutions and also the non-academic sector."

The short course provided practical training on managing Business Incubation Centre (BIC) established within higher education institutions and non-academic sector as vital component promoting entrepreneurial culture in a country. **The purpose of BIC is to nurture budding entrepreneurs with an existing startup to build a successful firm. Such a centre has the potential to open up opportunities for new jobs, commercialize new technologies and innovative ideas and add more revenue to local and national economy.** It is apparent from the increased interest of the various universities across the country in opening up of incubation centres, which have created greater impact when they connect with universities. An entrepreneurial spirit, able to serve as cultural character, can be achieved by education, training, and entrepreneurship development. Hence, it is important for universities to focus on the development of entrepreneurial culture to make learners independent. The HEC, Pakistan is also encouraging universities to establish BICs across all provinces and has made some progress in this direction. HEC has identified the need for capacity building of personnel to effectively manage BICs and to stimulate entrepreneurship within academic environment.

The course participants were expressed to various theoretical frameworks and practical guidance on how to manage, grow and sustain an effective BIC through visit of state and privately managed incubation centres. The objectives of this course were as follows:

- To provide recipients with skills and knowledge necessary to manage and sustain an effective BIC.
- To equip recipients with practical and appropriate tools to develop and implement sound management policy and practice to promote entrepreneurship and drive innovation in Pakistan.
- To facilitate cross-fertilization of ideas and experiences among participants and to explore creating linkages between academia and industry and also with their counterparts in Australia to develop sustained networks.
- To enable interpretation of experience and learning acquired through the development of a Return to Work Plan (RWP) that applies the knowledge and skills gained from the course in a manner appropriate to their work context in Pakistan.

Being a primary driver of innovation, research leads to discovery and allows exploitation of new technologies, which at times can give rise to the development of new industries. The rapid adoption of technologies and the development of intangible assets are essential to innovate, sometimes transforming existing industries. However, the link between discovery and its commercialization is often missed which does not provide opportunities to harvest the benefits of research outcome. Therefore, a speedy approach to develop commercialization potential of business ideas is desirable to create enabling environment in universities to engender a spirit of entrepreneurship amongst faculty, staff and students.

Nurali Jivani
Manager,
Office of Research & Graduate Studies,
Aga Khan University, Pakistan

Right to Claim

Protect creativity by claiming your ideas.

"Egyptians branded cattle, Chinese marked their porcelain, and Romans used logos and brand names for stores, lamps, and other products. Marking objects was perhaps the first practice of the differentiation and separating of goods, conditions of their designation as intellectual property. Marks could indicate reliability and the reputation of the craftsman [or] maker as well as origin."

- May, C. and Sell, S. K., Intellectual Property Rights: A Critical History, 2006.

The seminar on "Emerging Importance of Intellectual Property Rights in Knowledge Society" was a successful event held on March 9, 2016 at Aga Khan University, Pakistan attended by a diversified group of young individuals across the University. The seminar was a collaborative effort of AKU, Pakistan Science & Technological Information Centre (PASTIC) and Pakistan Science Foundation (PSF). It underlined the importance of copyrights, patents and emphasized on how researchers can protect bold ideas through copyright and patent filing. The presenters of the seminar addressed the dire need of reaching out to indigenous and global concerns of humanity by advancement in discoveries and inventions which simultaneously requires assurance for inventors and scientists of their ownership and to foster trademark and copyright to solve the global challenges.

The presentations were preceded with an inspiring keynote speech by the then Dean of Research and Graduate Studies, Professor El-Nasir Lalani. He stated that the protection of intellectual property was the foremost priority by which a scientist or any erudite scholar can maintain rights to his intellectual assets. **With increasing emphasis on commercialization and innovation, there grows a need to safeguard the intellectual capital of these scholars and scientists.** Dean Lalani stressed on the capacity of Intellectual Property Rights (IPR) as a pathway to commercialization of innovation and stimulation of the economy.

Prominent field experts were invited from diverse organizations of public and private sector, who spoke invariably of intellectual property rights and its benefits. An IP expert from Ali & Associates and an examiner of patents was invited from the Patent Office, Intellectual Property Organization of Pakistan (IPO-Pakistan) to sketch the patent system and the filing procedure in Pakistan. More significantly, they traced the importance of IPR to be an urban development creating new economic sectors and greater economic activity. As stated during the presentation, the greatest reward is the artist or inventor's ability to earn from their creation, without infringement /unfair competition. If inventors will earn money from their patented inventions, they can have a competitive edge to reinvest in further innovation.

Director Kawasji Kheswalla presenting shield to speaker, Mr Ali Kabir Shah, Intellectual Property Expert, *Ali & Associates*

PSF Chair Prof Muhammad Ashraf and PASTIC Director Gen. Prof Akram Shaikh

A certified patent expert from Partner Intel-legal Pakistan presented an exceptionally clear message on trademarks and design and a spokesperson from Vellani & Vellani Corporate and Intellectual Property Law firm introduced the topic of "Patents and Technology Protection:

Everything you wanted to know about IP." The speaker defined the general public attitude resulting in lack of respect for knowledge, originality or innovation as the biggest challenge to execute IPR. "The immediate gratification of buying a cheaper copy supersedes the long term deleterious effects caused by IPR infringement," observed the speaker. **The most viable solution to such an attitude is to enhance the value given to knowledge and intellectual property. This requires the research institutes and researchers to understand their role and responsibility in changing into a culture where original research has value.** Unchecked plagiarism devalues the entire institution and drives down the value of good research. Many patent applications filed by Pakistani inventors fail owing to the inadequate evidence. This strengthens the gravity for adopting plagiarism detection tools especially in educational institutions.

The last session demonstrated the robustness of AKU's IP Policy by Fizza Kazmi, an expert from the Office of Legal Affairs, AKU. She inculcated that **the University owns all rights, title and interest in and to intellectual property developed from work undertaken by the University support.** An outline of filing for local and international patent application was demonstrated by Ms. Kazmi.

The conducive environment of the seminar led to creative and thought-provoking discussions about how researchers and inventors can compete in the national economy and nurture the growth of the knowledge culture. A large body of evidence shows that innovative economies are more productive and faster growing. They deliver higher returns on investment and increased living standards. They are better at responding to changing circumstances through redeploying old activities and jobs. They are more able to find solutions to global challenges such as reducing dependence on fossil fuels, helping people live longer and healthier lives. We have all witnessed that innovations have changed the world like Alexander Graham Bell's telephone has transformed to Steve Job's Smartphone. Innovation continues to revolutionize our lives and it is mesmerizing for me to think that we may one day live underwater without oxygen as innovation is surely a quest for convenience.

Jack Fernandes
Assistant Manager,
Office of Research & Graduate Studies,
Aga Khan University, Pakistan

Intellectual Property and the Academy: Second Opinion

Intellectual Property can stimulate investment in creativity and invention; however, it can restrict access to crucial knowledge that could potentially improve the quality of life. This debate existed even in 1813 when Thomas Jefferson, American Founding Father, wrote in a letter: "That ideas should freely spread from one to another over the globe, for the moral and mutual instruction of man, and improvement of his condition, seems to have been peculiarly and benevolently designed by nature, when she made them, like fire, expansible over all space, without lessening their density in any point, and like the air in which we breathe, move, and have our physical being, incapable of confinement or exclusive appropriation. Inventions then cannot, in nature, be a subject of property."

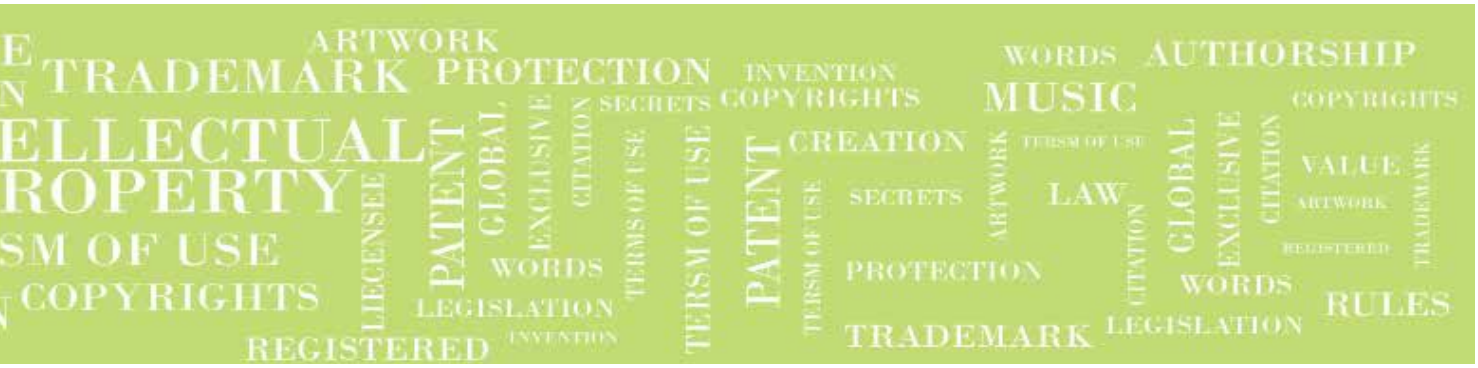
- Letter to Isaac McPherson, Monticello,1813.

The academic world and intellectual property (IP) laws are integrally entwined. In many ways, intellectual property rights (IPR) are the tools of trade of scholars. As many of you will be aware, IP laws grant a private monopoly to creators of certain intellectual endeavors, enabling them to control how their creations, inventions and innovations are used for a specified period. This means, creators and/or IP owners can impose charges and/or recoup benefits from the use of their work or invention. Intellectual property encompasses a wide range of rights including copyright, patents, trademarks, trade secrets and geographical indications (aimed at protecting traditional knowledge). Each prescribes the conditions under which third parties can use the intellectual property of others. In this way, IPRs empower and marginalize at the same time. **IPRs are important assets for nations, universities and scholars. In this way, they can empower and enrich creators; whilst stimulating investment in research, creativity and invention and promoting opportunities to commercialize research.** But IPRs can also restrict access to crucial knowledge, inventions and innovations that has the potential to improve the quality of life. The following discussion canvasses some of the opportunities and challenges arising from IP law for academics and universities.

Academics labor in copyright as we express thoughts in original ways in our course materials, lectures and workshops as well as our research publications. Academics and students alike are users of copyright works and, therefore, we are bound by the rules regulating use of works such as books, articles, lectures, films, music, sound recordings, newspapers, magazines, artworks, databases, some lists and compilations, media broadcast and computer programs. All original works attract a bundle of exclusive rights, which enable the copyright owner to prevent someone from communicating, copying, publishing or translating their work. By prescribing the manner in which original works can be used, the laws of copyright provide a legal foundation to issues of academic integrity and research ethics as they pertain to authorship, attribution and plagiarism.

Now, many academic institutions are turning to patent law and the doctrine of trade secrets to protect inventions, innovations and discoveries emerging from research, particularly in the field of medical research. Patents are statutory rights granted to inventors to encourage innovation, allowing them to exclude others from making, using or selling their invention for a specified period. Innovations attracting such protection range from improvements in research technologies to gene discoveries and stem cell research. In the area of biotechnology patent law protects “discoveries” of gene patterns and cell manipulation.

Regenerative medicine and biologics - genetically engineered proteins derived from human genes - offer great hope in the treatment of disease and injury. But the great hope for medical innovation and improved treatment must be balanced against what Eyre and Schlich call their “controversial origin” – a human embryo. Courts around the world have been asked to adjudicate on both the appropriateness of stem cell research and their patentability. At the heart of the moral conundrum is the fact that stem cell manipulation involves human life. In 2011, the Court of Justice in the European



Union determined that research involving the destruction of a human embryo could not be patented. Later cases have clarified this position, distinguishing between 'totipotent' cells which can develop into a human being and 'pluripotent' cells which are only capable of developing into human tissue. Now, it seems many jurisdictions are granting patents for stem cell technologies but "there is a reluctance to grant monopoly rights to the raw materials that offer promise of new medical treatments." The disquiet over human gene and stem cell technology patents is summed up by Professor Lori Andrew, distinguished Professor of Law and Director of the Institute for Science, Law and Technology at Illinois Institute of Technology:

> Concerns … go beyond moral disquiet about creating a commodity from a part of the human body and also beyond legal questions about whether genes are unpatentable products of nature. New concerns are being raised about harm to public health and research.

In addition to the moral and ethical issues emanating from the research per se, Professor Andrews highlights one of the fundamental tensions underlying all IP law, namely how to balance the public domain and private monopolies. **IP laws have been introduced to promote innovation and creativity. But individual ownership of creations and innovations can restrict the flow of important information and limit public access to knowledge and the benefits derived from application of that knowledge – this is known as an anti-commons effect.**

For these reasons, IP regimes have been criticized widely. In the scientific field, IPRs have been critiqued for reducing accessibility to medical procedures, drugs and the propensity of future researchers to build on prior scientific research. A 2007 study found that IPRs do "indeed restrict the diffusion of scientific research" but the study shed no light on whether they provide an incentive to undertake new research or their effect on the speed at which research is commercialized.

In developing regions, IP regimes have been accused of inhibiting education, marginalizing non-western perspectives and failing to protect traditional knowledge from unfair exploitation. Working in Pakistan and East Africa, AKU scholars are familiar with the challenge of finding indigenous materials and perspectives for teaching. Clearly, there are many opportunities for us to start filling these gaps with high quality research and scholarly publications.

However, it is the area of traditional knowledge where a university of and for the developing world can play an important role in preserving and protecting communal interests. Previously, IPR regimes have been unable to protect the interests associated with traditional knowledge. In a bid to overcome this shortfall, a new form of IPR has been recognized called a geographical indication – "a sign used on products that have a specified geographical origin and possess qualities or a reputation that are due to that origin" (World Intellectual Property Organization). Such signs are used for agricultural products, food, wine and spirits, handicrafts and industrial products. However, other forms of traditional knowledge have been turned into trade secrets by cataloguing and

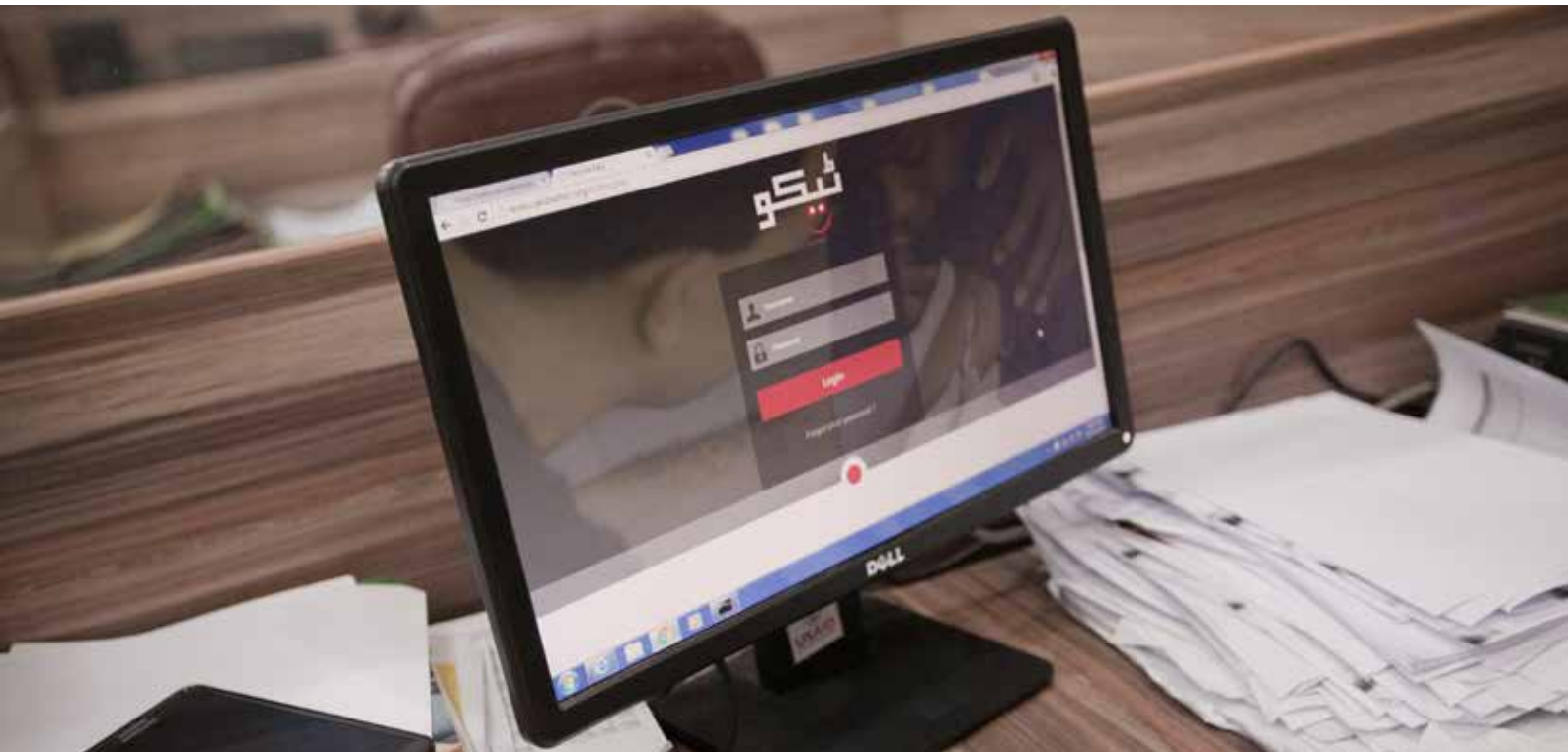
depositing it in a restricted access database. Increasingly, however, countries are introducing discrete laws to protect traditional knowledge from unfair misappropriation.

Just as IP laws have been adapted to protect traditional knowledge, new approaches are being used by many creators who want to foster greater sharing and collaboration. Known as Copyleft, this strategy promotes "the equal and inalienable right to copy, share, modify and improve creative works of authorship" (Copyleft.org at https://copyleft.org). A range of licensing arrangements, including Creative Commons Licenses and Open Source Software Licenses, allow people to use, share and adapt original works provided they comply with the license conditions – thereby improving accessibility and use-ability of creative works.

As this brief overview highlights, IP is an important asset which needs to be managed individually and institutionally. But the application of IP laws involves a delicate balancing act. IP can stimulate investment in creativity and invention, promote opportunities to commercialize research and stimulate creative and cultural industries. On the flip side, however, it can restrict access to crucial knowledge, inventions and innovations that could potentially improve the quality of life of all human beings. Nowhere is this more acute than in the developing world, where traditional knowledge has been misappropriated and access to life saving medical treatment and pharmaceutical technologies are beyond the reach of the average person. Clearly IP policy, globally, has changed over time – redressing some of the potential imbalances between the public domain and private monopolies. Universities, such as AKU, can play an important role in correcting these imbalances by conducting high impact research in areas of local relevance, developing indigenous resources, publishing these works widely in formats which are widely accessible and working with indigenous communities to archive and preserve traditional knowledge.

Dr Rhonda Breit
Associate Dean,
Graduate School of Media and Communications,
Aga Khan University, Kenya

Driving improvements through Information and Communication Technologies



Aga Khan University has spaces to build ideas and innovations. One such niche is eHealth Resource Centre that focuses on innovative product development to enhance healthcare. Director AKDN eHRC, Saleem Sayani iterates the vision: "We are determined to make sure that research findings do not stay locked in a shelf to collect dust but reach the people who can translate those findings into a product or service to benefit the populations we serve.

AKDN eHRC is evolving into a dynamic, learning organisation, one that is prepared to effectively meet the challenges and opportunities presented by the developing health care needs and policy landscape in the region."

AKDN eHRC and its Innovation Lab

The Aga Khan Development Network eHealth Resource Centre (AKDN eHRC) provides eHealth support to AKDN health and partner agencies with managing their eHealth programmes in Asia and Africa. The eHRC was established in 2011 and is based at the Aga Khan University (AKU) in Karachi, Pakistan with the aim to leverage information and communication technologies to support service delivery and research projects.

AKDN eHRC has established an Innovation Lab where it ideates, develops and tests high-impact, low-cost, innovative health care products. The products aim to improve health outcomes of poor and medically underserved communities, create health awareness in target populations and strengthen health systems.

In 2015, the Centre developed its first online certificate course in eHealth designed to build the eHealth capacity of students and professionals from the health care sector. Details on the course can be found at akdnehrc.com/moodle/course.

Collaboration with the Aga Khan University

AKDN eHRC collaborates with AKU to promote research and innovation. This collaboration has resulted in the following mHealth projects:

1. One Stop for Strokes – Realize the Possibility in Your Hands

AKDN eHRC has partnered with AKU and Tech4Life Enterprises to develop a device for non-invasive diagnosis of stroke risks.

Zahir Medic is a wearable leather glove that allows patients to check their blood pressure, ECG and glucose levels non-invasively. The glove is linked to a mobile application (*Zahir*) to monitor and provide first-level preventive care to patients with non-communicable diseases. Color-coded measurements indicate to the patients whether they are at low, moderate or high risk; these measurements are understandable to patients no matter what their numeracy and literacy skills.

The project is funded by the Grand Challenges Canada, Rising Stars in Global Health Program and is steered by a multi-disciplinary team, led by Dr Ayeesha Kamran Kamal, Associate Professor and Stroke Neurologist, AKU.

The project has now entered Phase 2 in which the team is testing the glove prototype and transitioning it to scale up production. A proof of concept has been developed and funding opportunities are being explored.

2. *Bolta Parcha* – Improving Health Literacy and Medication Adherence Through Mobile Devices

Bolta Parcha, meaning Talking Prescription, a Smartphone application assesses the effectiveness and acceptability of Prescription Interactive Voice Response (IVR) Talking Prescriptions (Talking Rx) in increasing medication adherence and health literacy in patients with vascular diseases in Pakistan.

Pakistan has a unique at risk population, one in four adults is Hypertensive, Type II Diabetic, reports cardiac or stroke symptoms. Since the 18th Amendment, all provinces are responsible for regional health care. This shift of power to local governance is an opportunity to rapidly scale important initiatives. Given the complete lack of professional continuity of care and long term facilities in Pakistan, any effort to find replicable evidence based solutions has a high potential of impact.

Mobile phone users in Pakistan were recorded at greater than 137 million by the Pakistan Telecommunication Authority. The use of mobile internet is also rising steeply. In addition, we find that the major telephone services have introduced cheap mobiles with android capacity that are rapidly becoming main stream. These are less than $20 for certain models.

At the present time, the stroke research team at the Aga Khan University is either performing or has completed several small to medium size transdisciplinary innovative research projects funded by local grants, international collaborations with US collaborators, and mentored research practicum projects for Master Student Trainees through our current Fogarty funded International Cerebrovascular Translational Clinical Research Training Program. We have a full time team of android programmers, IT support personnel, biomedical engineers, IVR and Java Programmers, movie developers and digital media experts, epidemiologists, statisticians with whom we work closely on project development and solutions.

Dr Ayeesha Kamran Kamal
Associate Professor, Medical College, Aga Khan University, Pakistan

The AKU Stroke Service, Baylor College of Medicine and AKDN eHRC collaborated to develop and pilot a Talking Prescriptions IVR and a SMS reminder system which allows patients to access tailored voice messages while customised SMS medication reminders are sent.

The project is funded by the Baylor College of Medicine Center for Globalization, on grants awarded to a team of international AKU alumnus Dr Salim Virani and national AKU alumnus, Dr Ayeesha Kamran Kamal and a team of biomedical engineers from AKDN eHRC.

3. Movies4Stroke – Short Videos to Improve Outcomes Among Stroke Survivors and Caregivers

AKDN eHRC and the AKU Stroke Programme have collaborated to develop Movies4Stroke, a series of five-minute educational videos for stroke patients and their caregivers. The movies, placed in a mobile phone, are designed around conditions faced by stroke patients in low and middle income countries (LMIC) that lacks rehabilitation centres and chronic support systems.

Patients' medication adherence; functional progress; blood pressure; caregiver's knowledge; hospital readmission; and stroke-related mortality are assessed to test the intervention's effectiveness.

The project is led by Dr Ayeesha Kamran Kamal, Associate Professor, Neurology and Director, Stroke Fellowship Program, AKU. It is funded by the University Research Council, AKU and implemented by the Section of Neurology, AKU and AKDN eHRC.

4. *Teeko* – Smartphone Application Helping Improve Routine Immunization

AKU in collaboration with the Sindh (Pakistan) government's Expanded Programme on Immunization is conducting a research project titled "Improving Routine Immunization Coverage through Health Systems Strengthening" to boost routine immunization coverage in the Tando Mohammad Khan district of the Sindh province.

AKDN eHRC in collaboration with AKU are developing and implementing Teeko, an android-based application and a web portal to assist with vaccinator and immunization tracking and monitoring. Teeko provides real-time data on a vaccinator's field movements using global positioning system (GPS) tracking and on the number of children being immunized. Immunization-related SMS/robocalls and health sessions have been administered to raise awareness in the community on the importance of routine immunizations. Teeko has been endorsed by the Government of Sindh for a potential rollout in Sindh, Pakistan.

The project is funded by Global Alliance for Vaccines and Immunizations (GAVI), led by Dr Shehla Zaidi, Associate Professor, Women & Child Health Division, AKU.

Collaboration with Centre for Innovation in Medical Education

The Aga Khan Development Network eHealth Resource Centre (AKDN eHRC) is collaborating with Centre for Innovation in Medical Education (CIME) to promote the use of technology in health care, professional development and research. AKDN eHRC supports the delivery of live teleconsultations that are offered by the Aga Khan University Hospital, Karachi in various specialties to health care facilities in Pakistan and Afghanistan. Conducted at CIME, these teleconsultations intend to improve primary care and its link with secondary care in terms of efficacy and timeliness of interventions, thus preventing unnecessary hospital access and cost saving for the health system. AKDN eHRC's collaboration with AKU brings together an inter-disciplinary team of biomedical engineers, software engineers, researchers and health care providers, all committed to making quality health care accessible for medically underserved populations.

If you wish to learn more about our Innovation Lab or discuss collaborative opportunities, please contact Saleem Sayani, Director, AKDN eHRC, at saleem.sayani@akdn.org.

Kiran Qureshi
Manager,
Strategic Communications,
Outreach & Development,
Aga Khan Development Network
eHealth Resource Centre

Innovation in Medical Education

AKU-Centre for Innovation in Medical Education is the station to integrate teaching, research and innovation. Dr Calestous Juma, in one of his recent works, recommends combining research, teaching and commercialization in a single institution that "would depart from the common practice where teaching is carried out in universities that do little research, and where research is done in national research institutes that do not undertake teaching. Under this model, there is little connection with productive sectors. The idea therefore is not just to create linkages between those activities but to pursue them in a coordinated way under the same university structure."

– Education, Research, and Innovation in Africa, Harvard Kennedy School, 2016.

In its pursuit of academic excellence, the Aga Khan University further develops its educational resources by launching the Centre for Innovation in Medical Education (CIME) at its Pakistan campus on November 27, 2015. The Centre combines advances in education strategies with new solutions to connect the three missions of AKU – patient care, research, education – resulting in a centre that is translational and innovative. CIME aims to generate transformation in medical education, facilitate the evaluation of new medical equipment and technologies, and vitalize the adoption of new skills.

CIME is envisioned as the hub to enhance cognitive, clinical and procedural skills, ranging from critical analysis to counseling and mentoring; from small procedures to the cutting-edge emergency and operative interventions; from team training to inter-professional education. It provides a protected and safe environment for undergraduate and postgraduate medical, dental, nursing and allied health students. Here, they can learn and practice clinical and procedural skills without fear of failure, or of running out of time, or of putting patients' lives at risk. The same holds true for maintenance of competence for clinical practitioners. Through this virtual environment and the state-of-the-art 'mock operations,' students and practitioners are provided the chance to hone their skills and experience the daily challenges of the health care providers before serving the real patients - some of whom may well be seriously ill. In this way, CIME aims to uphold ethical education, improve patient outcomes and patient satisfaction, enhancing patient safety.

Aligned to the theme of innovation, CIME is dedicated to foster innovation in simulation-based education (SBE) with appropriate dissemination of its findings. This aspect focuses on finding newer pedagogies and practices to enhance higher order thinking and behavioural skills, as well as finding easier, time-efficient and cost-effective ways to carry out operative and other procedures. However, there is another aspect of innovation to which CIME is committed; and that is in the field of simulation-based biomedical engineering. CIME aims to modify and develop low-cost models and mannequins useful for the developing world. Initially, CIME plans to focus on working on low-fidelity models and mannequins, with a move towards higher fidelity models in the future.

For this purpose, CIME has a Virtual Research Unit (VRU), which works on the same principles as a Clinical Trial Unit, where

models and mannequins are used for patient simulation. The VRU consists of a Simulation Lab, a room for Master Robot and a control room. In this multi-tasking environment, new technologies and products can be assessed under controlled conditions before introduction to the real world. **The lab is meant to allow industry representatives to demonstrate their products and generate ideas for innovations, which will subsequently bridge gaps between the developers, users, researchers and beneficiaries of e-Health technologies. This can potentially attract companies that produce mannequins and computer-software for their trials.**

There is a clinical learning and assessment circuit for learning and assessment of clinical skills. There are four five bedded wards to enhance nursing skills and health care team training. There are telemedicine clinics to provide remote access to medical and nursing care. The eHealth simulated ward has high fidelity mannequins for training in higher level emergency life-saving procedures, before dealing with critically ill patients. CIME collaborates with eHRC in establishing telemedicine clinics and quality assurance of newer instruments, equipment and technologies.

With the agenda to promote simulation-based education, innovation and research, CIME will be an important resource for the country and the region. This state-of-the-art facility is open for use by all hospitals and medical, nursing, dental and allied health colleges in Pakistan. It also allows organizations interested in international education, international conferences and courses to bring the latest technology to the doorstep of the country and the region.

In order to take the CIME agenda forward, faculty members have been identified as CIME Champions (CIMEC) to work with the Interim CIME Director and Co-Director. Their role is to develop capacities in simulation–based education and research and to explore future leadership roles. The multidisciplinary team of faculty, educators, scientists, informaticians and developers work in collaboration focusing on novel research and curricular transformation to respond to the fields of technology, higher education and health care. With visionary leadership and an organized approach to research, CIME has the potentiality to lead to bold innovations which will accelerate changes in medical education and facilitate better healthcare.

Dr Rukhsana Zuberi
Professor,
Medical College &
Former Interim Director CIME,
Aga Khan University, Pakistan

Innovative Solutions in Emergency Medicine

Innovators at Pakistan's first-ever medical hackathon at the Aga Khan University have proposed new ways of tackling challenges facing Pakistan's emergency rooms (ER). Two innovative solutions presented in the Hackathon that also received awards:

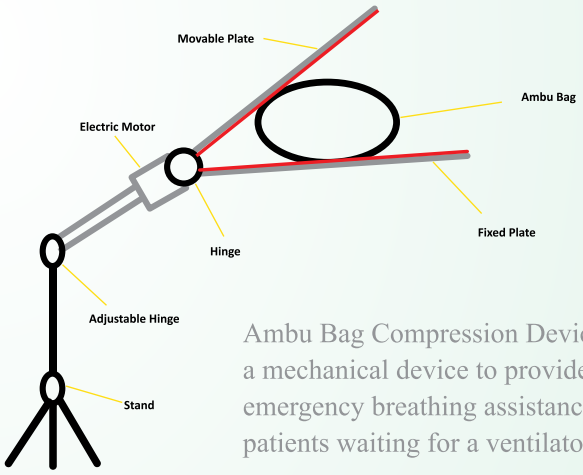
The time that elapses in providing appropriate medical care to a trauma patient is critical and can potentially affect patient's morbidity and mortality. The critical time window, between the identification of a trauma patient by a first responder to arriving at the emergency department, can be used to convey useful information to the hospital and hence prepare the trauma team beforehand.

TrICS (Trauma Information Communication System), is a web based application that can relay information to hospitals as soon as a trauma patient is picked up by an ambulance. It is not only useful in alerting the hospitals of an incoming trauma victim, but it also conveys a valuable index for the severity of injury. This app can also be a data collection tool using an artificial neural network algorithm to modify the accuracy of the trauma scoring systems, generating a more predictable index of severity and prognosis.

Communication and the quality of information communicated are key players in patient care. Such a solution makes use of data science and machine learning to efficiently communicate a trauma victim's status to a hospital enabling the trauma team at hospital to be ready and prepared with minimum panic. Hence, the patient gets appropriate treatment as early as possible with a better index of severity and prognosis.

Brooj Abro
Alumnus, Medical College,
Aga Khan University, Pakistan

When children are brought to emergency (ER) of any private or public hospital, they sometimes require placement of advance airway called endo-tracheal intubation to save their precious life. Given the limited number of ventilators as well as human resources, most patients end up in ambu bagging by parents and relative for more than 24 hours in ER. This in-effective ambu bagging sometimes results in poor outcome and eventually in the death of patient.



Ambu Bag Compression Device, a mechanical device to provide emergency breathing assistance to patients waiting for a ventilator.

To deal with this painful situation, we designed a device, Ambu Bag Compression Device (ABCD) to replace the human hand with a mechanical device. It has automated rate and pressure control according to the age of child. Such a device can reduce mortality and morbidity while also reducing parents' anxiety and stress. This can be manufactured locally with local expertise and can be mass produced.

Amna Jawaid
Senior Instructor, Medical College,
Aga Khan University, Pakistan

Setting Trends in Educational Reform: The Case of Strengthening Teacher Education in Pakistan (STEP) Project

AKU-Institute for Educational Development implemented the Strengthening Teacher Education in Pakistan (STEP) project in the selected districts of Sindh, Balochistan and Gilgit-Baltistan from January 2009 to February 2016. The project was funded by Global Affairs Canada (GAC) and the Aga Khan Foundation Canada (AKFC) with the goal of improving the quality and delivery of elementary education services. This is a remarkable step towards change in the face of current situation of education sector in the country as retorted by Mr Ahmed Laghari, Executive District Officer, Karachi: "Education in Pakistan has been at a standstill. A lack of innovation and development in the education sector is clearly evident and despite various talks and changes in policies, in practice nothing has changed."

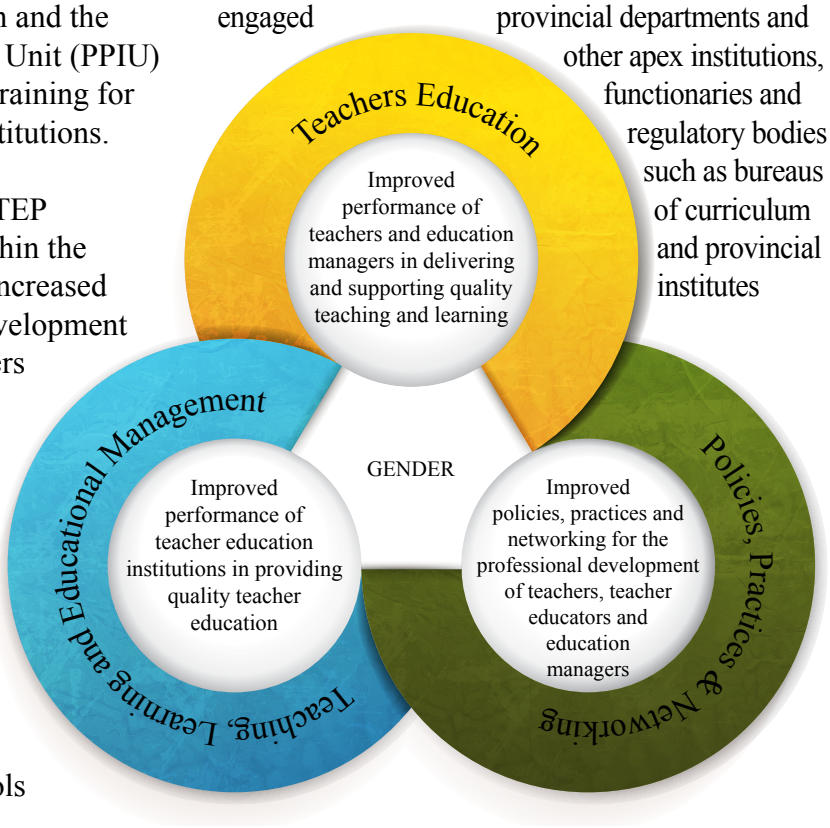
For many children, teachers and parents, STEP has been a beacon of hope. It not only helped people learn new ideas, gain new knowledge, broaden their understanding, develop new perspectives, and improve their skills in teaching and learning, managing and improving schools and institutions, but also made a qualitative difference in how people think about themselves, their roles and responsibilities in the change process and the world around them. Besides its educational and academic impacts, STEP also made a notable contribution to the economic wellbeing of the people in a resource starved society which are unintended positive outcomes of the project. For instance, it provided employment opportunities to people and contributed to economic activities in the local communities.

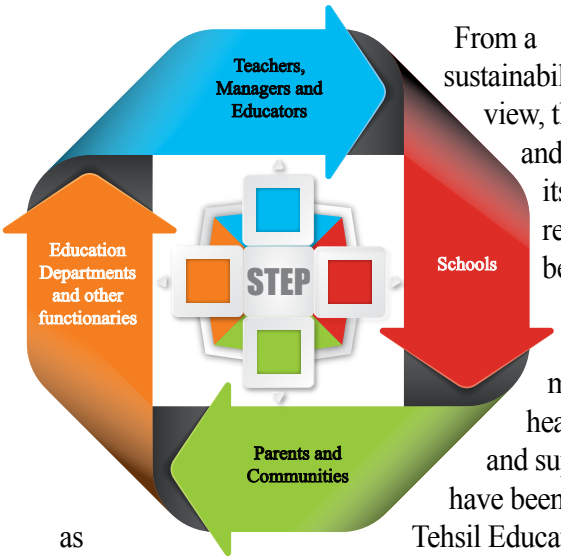
Besides working with 1600 schools in 10 districts, STEP also contributed to the capacity building of around 35 teacher training colleges and apex institutions including Bureaus of Curriculum (BoCs), Provincial Institutes for Teacher Education (PITEs) and other functionaries at provincial level such as the Reform Support Unit (RSU) in Sindh and the Policy Planning and Implementation Unit (PPIU) in Balochistan, through customized training for management and faculty of these institutions.

One of the central priorities of STEP was to address gender disparities within the public school system by promoting increased opportunities for the professional development of female education managers, trainers and teachers and by ensuring that at least half of all participants in its capacity building initiatives are women. Simultaneously, STEP also endeavoured to make existing teacher training courses, models and methods more gender sensitive to address gender biases among children at classroom level. The impact seen through this raised awareness is transformational. Schools that were part of the STEP project saw increased girls enrolment as well as more willingness from rural conservative communities to send their daughters to school. This was made possible by the evidence of quality that the schools were able to provide as well as the trust they were able to develop with them. As a result of the equitable opportunities provided by schools under the leadership of the trained head teachers, students found new confidence in the structure of school.

To effectively achieve its purpose, the programme focused simultaneously on three primary components, leading to three main outcomes, with gender being a theme cutting across all three components

STEP ensured all-encompassing coverage of stakeholder groups. It simultaneously worked with teachers, managers, educators as first line actors in reform implementation. It worked closely with school management committees, parents and members of the wider community in target districts to promote educational awareness and to meaningfully engage this vitally important stakeholder. It focused its efforts on schools as the fundamental units of change. STEP also engaged provincial departments and other apex institutions, functionaries and regulatory bodies such as bureaus of curriculum and provincial institutes





From a sustainability point of view, the activity and the model itself is replicable because STEP trained mentors, head teachers, and supervisors have been appointed as Tehsil Education Officers, whose main responsibility is to visit schools and provide academic or pedagogical support to teachers. One of STEP's significant achievements is the provision of 42 scholarships for candidates from the selected regions for two years studies at AKU-IED, Pakistan. These forty-two individuals (practicing teachers and teacher educators) successfully graduated, acquiring Masters in Education to return to their respective positions with necessary skills to serve better.

Programmatic Achievements at a Glance

One of STEP's biggest achievements was reaching out to a large number of School Management Committees (SMCs), parents and members of the wider community through its Broad Based Community Mobilisation (BBCM) programme. Through various activities such as workshops, focused meetings, seminars, and special events, STEP made efforts to promote educational and social awareness among under privileged parents and community members in remote and rural areas of Sindh and Balochistan.

> "I visit workshops and follow-ups to see mentors' and teachers' work, encourage them and assure them of my support. I get inspired every time I visit a school and see teachers in action and students engrossed in learning. I highly appreciate the work of the STEP project; it has proved that it can bring real change in any context with the support of administration and strong community participation.
> **Reflection: District Educational Officer, Sukkur**

The cross-cutting components of the project included research and documentation of best practices, lessons learnt and dissemination of knowledge through seminars, policy dialogues and publications. STEP produced eight research studies which are being published as two books (one edited and one solo author), 19 policy briefs, teacher guides and a booklet of success stories.

Under the third component of the project, a series of policy dialogues/seminars were conducted throughout the project, where a large audience from all walks of life ranging from teachers to politicians, gathered and engaged in discussion around policy relevant issues and topics. The policy dialogues/ seminars were aimed at disseminating lessons learnt in the project and to sensitize stakeholders about ways to help create an environment for the project that would be conducive to impacting the education system in a positive way. These activities provided the university with an opportunity to work closely with government institutions to ensure their ownership of the STEP initiatives and to advocate for sustainability of reform.

STEP aimed at building and strengthening linkages between AKU-IED and Canadian institutions. Under this component, an institutional partnership was established with the University of Alberta (UoA). UoA and AKU had an existing strategic partnership and developed this further through institutional linkages formalized between STEP and UoA's Centre of Global Citizenship Education and Research, Department of Educational Policy Studies (UoA-CGCER) in 2012. This partnership resulted in completion of a major collaborative research study entitled: 'Schools and Decision Making Structures, Processes and Outcomes: A Case of Educational Governance in Pakistan', and two other outcomes.

Way Forward

What appears from STEP's experiences is that at the core of professional development lies the need for promoting professionalism among practitioners. Professionalism, besides knowledge and teaching repertoire, requires teachers and other

Direct Beneficiaries

369 Education Managers

42 MEd Graduates

688 Teacher Educators

5689 Teachers

2968 School Management Committees

300,000 Students

Provision of Educational Resources

1650 Target Schools

30 Model Learning Resource Centres

250 Teacher Guide and Teaching Kit

80 Computers and Library resources

actors in education to necessarily bring a high level of commitment and strong ethics orientation towards change. This suggests that capacity building of human resource in the context of education is neither a linear process nor a quick fix, to be achieved merely through training of staff. There are numerous other factors involved in getting human resource capacity

> My experience with STEP at IED gave me another lens to look at my daily routines and life and see all the gender inequalities in my life and around me. I developed my Master's Thesis on gender leadership and professional development programmes. After returning to my context, I faced all the challenges of gender discrimination, but I persisted and now my colleagues listen to me and respect my ideas. I have a new confidence because of my Master's Degree, and am committed to helping other females in my area.
> **Reflection: STEP-Sponsored MEd graduate**

> The environment in STEP intervention schools is entirely different from other government schools' environment, in term of teaching, student motivation and involvement, displays, cleanliness and the attitude of mentee teachers and headteacher. I wish to see such an environment in all other government schools.
> **Reflection: District Educational Officer, Hyderabad**

building translated into enhanced institutional capacity in initiating and sustaining change. Institutional capacity building therefore needs to be approached as an ongoing practice which is done through enhancing internal motivation, providing continued professional development opportunities, creating challenging tasks with supportive scaffolding, building teams, and matching human resources with structural and material resources, with a strong policy support. Lasting change in education can be brought about through strengthening institutions rather than individuals. This suggests that human resource development needs to be

> I had several misconceptions about gender. I was of the opinion that gender means rights of women; this concept is against our religious education. I got clarity of such misconceptions. I can say now confidently that if we want to improve our society we need to work for gender equality.
> **Reflection: STEP-Sponsored MEd graduate**

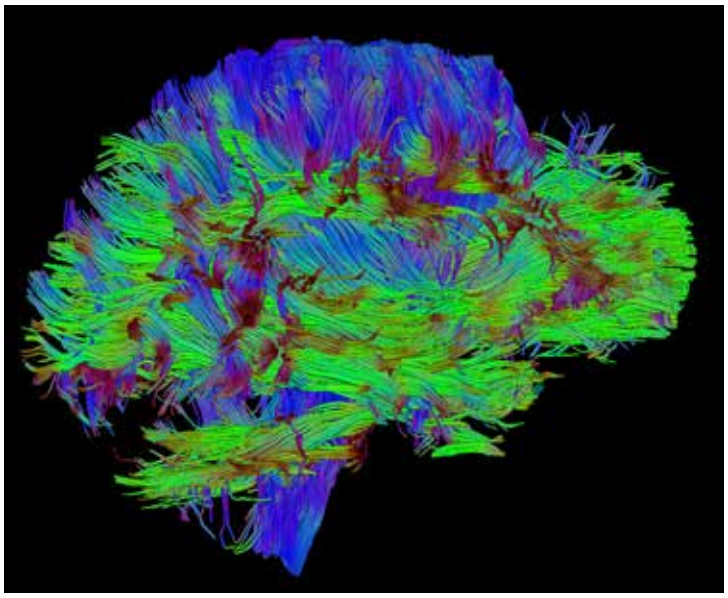
approached in a way that it contributes to institutional capacity building. Nonetheless, quality human resource (e.g. teachers, head teachers educators equipped with knowledge, skills and attitude) in educational institutions are a pre-condition for institutional capacity building.

Dr Takbir Ali
Assistant Professor,
Institute for Educational Development,
Aga Khan University, Pakistan

Novelty in Neurosurgery

Neurosciences System Clinical Programme and Aurora Neurosciences Innovation Institute Vice-president and Aurora St Luke's Medical Centre, USA, neurosurgery Chairman, Dr Amin Kassam developed the Neuro-Robotic Exoscope which is for the first time introduced in Pakistan. AKU is the first teaching hospital outside North America and the first in Pakistan to introduce the revolutionary Neuro-Robotic Exoscope, a robotic system that makes it possible for surgeons to have advanced brain mapping and use a minimally invasive surgical approach. "With its detailed 3D imaging and robotic positioning system, the equipment will take the surgical process to a whole new level in Pakistan," said Dr Kassam, while addressing the inaugural ceremony held at AKUH on April 11, 2016.

The "Emerging World" has itself emerged as a leader in innovation in many areas ranging from informational technology, population health, and more recently in novel microfinance and e-banking. Each of these advances have been founded on being able to leverage the intellectual capacity of the enormously capable minds within the region to conceptualize and prototype solutions for real world problems relevant to the local microenvironment. A common theme in this process of innovation has been bringing technology from the western hemisphere to the emerging world then allowing the resourceful local intellect to create and iterate. This results in enhanced platforms that are not just developed within the emerging world, but moreover, subsequently commoditized at much more cost-effective price points when returned to the rest of the world. The prime example of this is the cell phone and personal communication devices.



We believe neurosciences would be greatly enhanced by such collaborations and partnerships. The profound impact of conditions within neurosciences extends from cancer and trauma to cognitive degeneration and Alzheimer's with staggering socioeconomic implications. In the emerging world, there is even greater impact given that the young work force with limited resources are often affected by the first two conditions and culturally required to support the elders burdened with the later. The cost-effective solution to these devastating problems lies at the cellular level often being referred to in the lay press as "stem cells."

In trying to solve these problems surrounding brain conditions, a key requirement will be the development of a dynamic informatics operating system to continuously learn and collect data. For this to be effective, there needs to be quality assured data collected directly and wirelessly transferred from the imaging suites (MRI and CT) into the underlying operating informatics system. In the aviation industry this would be equivalent to air traffic routes. In the case of brain diseases, this means mapping in real-time millions of white matter tracts and rendering them in a dynamic 3-dimensional modelling system (BrightMatterTM Plan). In comparison to many of the systems currently used, BrightMatter Plan performs this in a rapid and automated manner with little human input and resources making this process cost-efficient and accurate. Only now can individualized surgical plans for each specific patient be generated and ready for execution.

Once the plan is generated, it is transferred directly to a Robotically Operated Video Optical Telescopic-microscope (BrightMatter Servo) with a built in navigation system (BrightMatter Guide). BrightMatter Servo represents a single integrated intraoperative solution to allow surgeons to accurately reach their target while considering eloquent white matter. Servo robotically positions (BrightMatter Drive) a unique optical system (BrightMatter Vision) that offers superior visualization, particularly in the depth of the field, in comparison to existing microscopes allowing more of the image to be in focus and therefore informative to the

surgeon. The integration of the system allows hands-free positioning by automatically tracking the surgeon's tools and thereby increasing their surgical efficiency allowing the surgeon to focus on the task at hand rather than adjusting the technology.

Aga Khan University is the first institution globally, outside of the United States, to acquire Synaptive Medical's BrightMatter technology. Synaptive Medical is a medical device company based in Toronto, Canada with the vision to create and deliver innovative medical systems to bring the right treatment, to the right patient, at the right time. The neurosurgical technology suites are collectively known as BrightMatterTM and are currently being used in leading institutions in the United States. In keeping with the theme of innovation, it will be exciting to see the rapid iterations and applications that emerge and are scaled throughout the rest of the world. The next phase of this strong collaboration will be to focus at the cellular level through next generation imaging that will allow for advanced interrogation of the brain tissue capturing this within the informatics system. AKU is ideally positioned to accomplish this given the experience of its faculty and the volume of patients that it serves. It is our hope that through the marriage of technology and innovation with informatics, AKU will lead the change in neurosciences towards precision-based cell therapy including regenerative stem cell therapies.

Dr Ather Enam
Chair, Department of Surgery,
Medical College,
Aga Khan University, Pakistan
Dr Amin Kassam
Vice President,
Neurosciences Aurora St Luke's Medical Centre,
United States of America

Funding Opportunities

GLOBAL INNOVATION FUND

Global Innovation Fund invests in a wide range of solutions with the shared goal of opening up better opportunities for people living in poverty in developing countries. GIF offers financing from USD$50,000 to $15 million, with the largest funding amounts reserved for innovations that can demonstrate evidence of success and that have potential to spread across multiple developing countries.

Start your application at

globalinnovation.fund/apply-to-gif

THE OLAM PRIZE FOR INNOVATION IN FOOD SECURITY

The Olam Prize aims to advance knowledge and recognize innovation in world food security, by rewarding an outstanding research project for its potential impact on the availability, affordability, accessibility or adequacy of food. The winner of the Prize will receive US$50,000 which is to be spent unrestrictedly on furthering the research project and/or scaling up its impact. The award will close on January 25, 2017.

Start your application at

agropolisfondation.optimytool.com/en/

CALL FOR INNOVATORS

INNOVATIVE TECHNOLOGIES FOR CANCER-RELEVANT BIOSPECIMEN SCIENCE

This Funding Opportunity Announcement (FOA) is part of a broader National Cancer Institute-sponsored Innovative Molecular Analysis Technologies (IMAT) Program. The participating organization, National Institutes of Health solicits grant applications proposing exploratory research projects focused on the early-stage development of highly innovative technologies that improve the quality of the samples used for cancer research or clinical care. The call for applications is open until September 26, 2017 for projects in need of financing up to USD$200,000.

Start your application at

grants.gov/web/grants/

YOUTH CHAMPIONS INITIATIVE

The David and Lucile Packard Foundation and the Public Health Institute have launched the second cohort of the Youth Champions Initiative to advance innovation and quality in the field of sexual and reproductive health and rights (SRHR) globally. It will integrate intensive capacity building, leadership development, mentoring, project funding, and technical assistance to launch innovative projects to improve SRHR in their countries. Young persons between ages of 18-29 can apply before January 15, 2017.

Start your application at

riseuptogether.org/en/youthchampionsinitiative/

Partners at a Glance

Cultivating a core group of partners to support current and future areas of interest

The Aga Khan University actively seeks meaningful partners to support, sustain, innovate and identify new opportunities that positively impact its values and mission of teaching, research and public service. The University focuses on creating partnerships that have a strong institutional focus, are based on reciprocity, have depth and breadth, are integrated, sustainable, and established with strong systems and processes.

For more information, please visit – www.aku.edu

North America

University of Waterloo, Canada
University of the Fraser Valley, Canada
University of British Columbia, Canada
Western University, Canada
Simon Fraser University, Canada
British Columbia Institute of Technology, Canada
University of Toronto, Canada
University of Alberta, Canada
University of Calgary, Canada
Brown University, USA
Massachusetts Institute of Technology, USA
University of California, San Francisco, USA
John Hopkins University, USA

Europe

London School of Hygiene and Tropical Medicine, UK
Univeristy of Oxford, UK
University of Cambridge, UK
Karolinska Institute, Sweden
Catholic University of Portugal, Portugal

Africa

The American University in Cairo, Egypt
National University of Rwanda, Rwanda
University of Nairobi, Kenya
Open University of Tanzania, Tanzania
University of Cape Town, South Africa
Centre for Mathematics, Science and Technology Education in Africa, Kenya

Australia

Monash University
University of Newcastle

Asia

Kabul Medical University, Afghanistan
Dow University of Health Sciences, Pakistan
Peshawar Medical College, Pakistan
Institute of Business Administration, Pakistan
The Citizens Foundation, Pakistan

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