

# Research Portfolio

2015-2017



Annual Report

# Office of Sponsored Programmes and Research (OSPR)

Office of Sponsored Programmes and Research (OSPR) is actively pursuing its mandate to promote research culture at LUMS and is acting as a bridge between LUMS faculty and external funding agencies and managing internally sponsored research activities at LUMS. The aim of OSPR is to ensure that all submitted proposals conform to sponsor guidelines and LUMS policies, and if funded, the projects comply with sponsor requirements and applicable LUMS policies and procedures. Sponsored research includes, but is not limited to, externally funded research proposals; unrestricted grants; travel grants; sponsored conferences / workshops / seminars; consulting assignments; service activities; contracts; agreements and arrangements related to sponsored and externally funded activities. Moreover, the OSPR also manages internal grants, which are provided by LUMS including Faculty Initiative Fund (FIF), Faculty Travel Grant (FTG) and Start-up Grants.

Recently OSPR has set up a Technology Transfer Wing (TTW) to provide help in filing copyright and patent applications. Through its TTW, formal support mechanisms are established to provide legal, administrative and financial support required in the patent and commercialization process to LUMS faculty in order to ensure that their focus remains on the research and innovation aspect, leaving the legal and administrative hurdles for the TTW team.



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## Message from the Vice Chancellor

Research at LUMS continues to power ahead with a focus on quality and impact. It is heartening to see the high percentage of publications appearing in top ranked journals. Many of these publications are with students, even including, undergraduate students and are a testimony to the dedication of LUMS faculty to nurture the next generation of research leaders. This report presents a comprehensive analysis of research activity at LUMS that includes the impact of support provided by the institution itself through PhD fellowships, travel support, start up grant and small faculty research grants.



The report also covers the entire ambit of externally funded research and consultancies, showcasing the tremendous progress made by faculty at LUMS in attracting both local and internationally competitive grants. The availability of the research publications and grants dashboards at LUMS provides everybody involved with research a real-time view into research activity of an individual, a department, school and the entire university. The dashboard has been invaluable in providing an unbiased snapshot of research activity at LUMS.

While research output is dominated by work of the science and engineering school, it is heartening to see significant research output in the areas of business studies, economics, humanities and law. The establishment of interdisciplinary research centers is catalyzing joint publications by researchers from diverse fields. The Office of Sponsored Programs and Research at LUMS is also leading efforts of the university to work with entrepreneurs and startups, commercializing new ideas. The results to date are promising and as the entrepreneurial culture takes root, it is envisioned that these will lead to significant employment generation as well as having an economic impact on the region.

Prof. Dr. Syed Sohail H. Naqvi  
Vice Chancellor



## Message from the Director

In keeping with the interdisciplinary nature of modern research, I am extremely delighted to present to you the LUMS Research Portfolio 2015-2017, a compilation of the funded research endeavours of the faculty at Lahore University of Management Sciences (LUMS) in the past two and a half years. Research at LUMS aims to develop innovative solutions to the world's most daunting challenges, from addressing the energy needs of tomorrow to improving cancer therapies. Research efforts at LUMS are enhanced through creative collaborations with leading research institutions and consortia around the world. It is through

collaborations that LUMS' faculty has transformed laboratory research into real-world projects that make a difference to society.

At LUMS, we are committed to achieving excellence in research ensuring that our research contributes to the well-being of society and make significant contributions to the global innovation agenda. We seek to provide a creative and supportive environment in which ideas are generated and can flourish. The University strives for the highest levels of quality in research and education and for significant and lasting impact in pursuing its mission of service to the nation and humanity. Through funding, facilities and other means, the University offers tremendous support to the faculty. The excellence and diversity of our research spread across the areas of Social Sciences, Humanities, Law, Business, Natural Sciences, Technology and Engineering. Our aim is to provide academic leadership in these areas and to develop strategic partnerships around the world to propagate the essence of research, innovation and commercialization.

Since July 2014 till June 2017, research accomplishments of the faculty have won 352 externally funded grants (including research, travel, conference & consultancy) of PKR 1,183 million. Apart from that, one hundred and forty (140) faculty members have won 387 research grants worth PKR 237 million from the LUMS' internal funding. The objective of presenting this report is to highlight the pioneering accomplishments and innovative achievements of the LUMS faculty that have made LUMS a regional centre of excellence today, evident from its international rankings, and also to provide an opportunity to further develop research collaboration activities for LUMS.

Looking forward to your feedback.

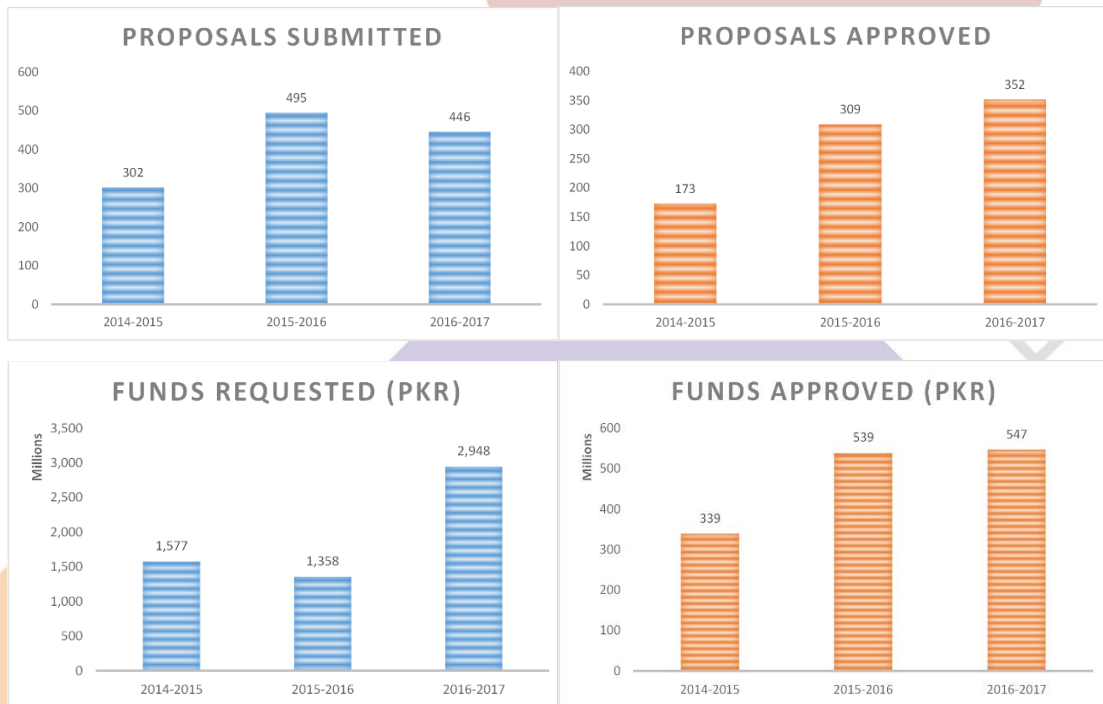
Dr. Shafay Shamail  
Director  
Office of Sponsored Programmes and Research (OSPR)



# Research Statistics

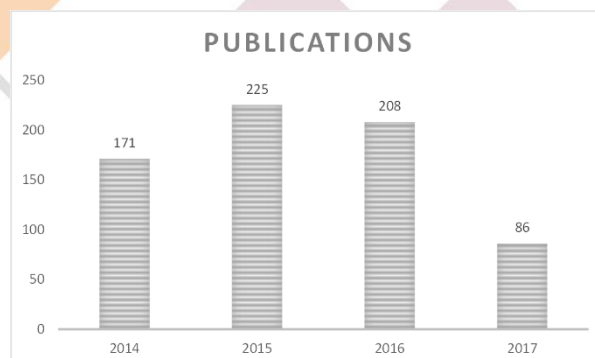
## Submissions & Grants

LUMS is one of the nation's top research universities, not only generating important new knowledge in the fields of medicine, technology, business, science, and beyond, but also applying this knowledge to improve the lives of individuals and communities at home and around the world. As a result of constant focus on research support, around 48% increase has been observed in the faculty research proposals seeking funding during the last three (3) fiscal years (2014-2015 to 2016-2017). The proposals that were approved during the last three years also experienced a 103% rise.



## Publications

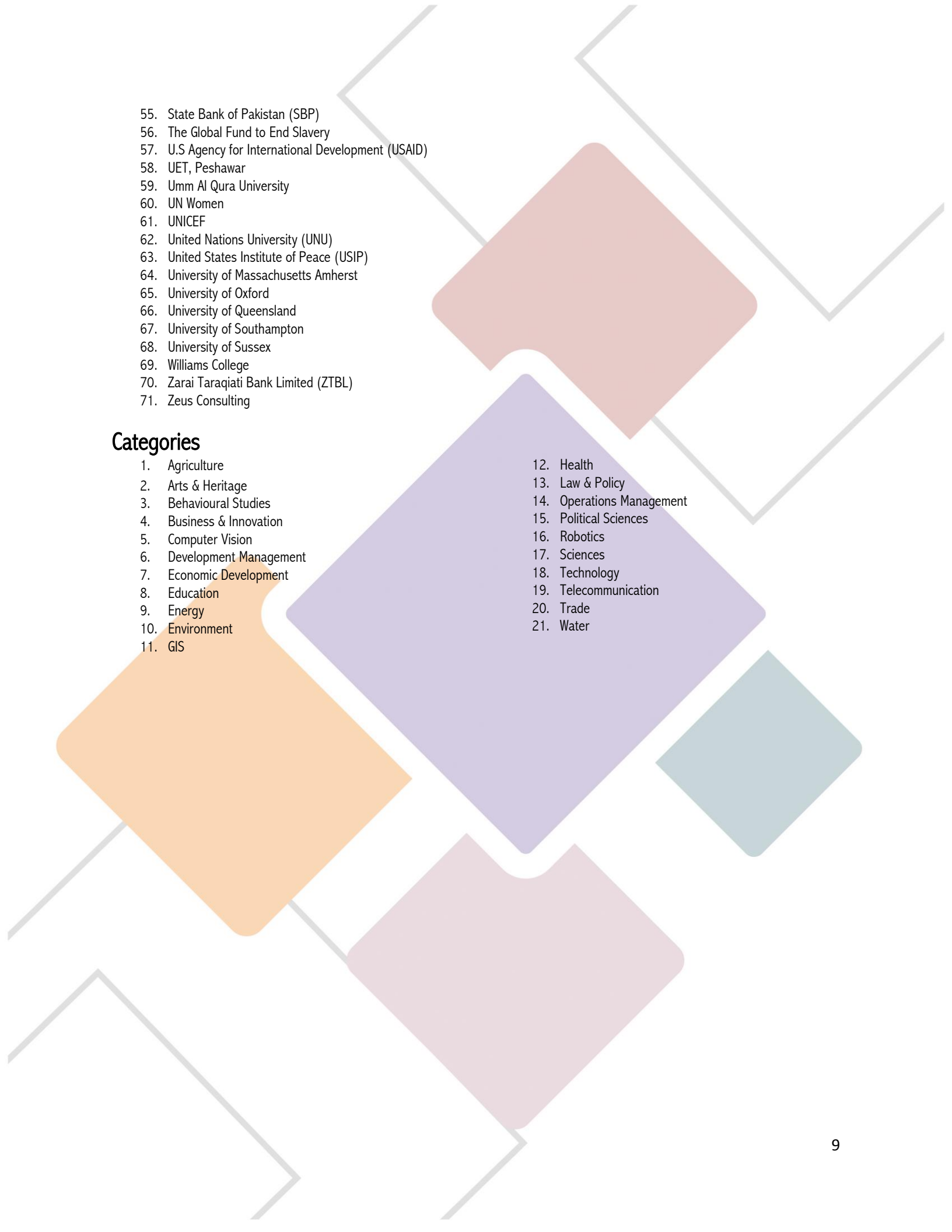
At LUMS, the biggest challenges of the day are being addressed to create a better world. The range of research activities at LUMS is broad and profound. The graph below is a reflection of the increase in the total unique publications authored by LUMS Faculty in last three (3) calendar years (2014 to 2016). The research publications saw a growth of 22%, demonstrating a healthy trend which is a reflection of extensive research endeavours by LUMS faculty over the years.



Note: This data is extracted from Scopus and publications for 2017 are from January 2017 till June 30, 2017.

## Sponsors

1. Adam Smith International (ASI)
2. Aga Khan Cultural Service - Pakistan (AKCS-P)
3. American Bar Association (ABA)
4. American Business Forum (ABF)
5. American University
6. Assessment and Strengthening Program (ASP)
7. Australian Centre for International Agricultural Research (ACIAR)
8. Carleton University
9. Center for Economic Research in Pakistan (CERP)
10. Central Park Medical College
11. Comstech-Twas
12. Department for International Development (DFID)
13. Descendants of Late Begum Saida Waheed
14. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
15. EBE Group
16. Economic and Social Research Council (ESRC)
17. EdVenture Partners
18. Engineering and Physical Sciences Research Council (EPSRC)
19. Facebook
20. German Pakistani Research Cooperation Program (DAAD)
21. Global Development Services International (GDSI)
22. Health and Nutrition Innovation Fund (HANIF)
23. Higher Education Commission (HEC)
24. HomeNet
25. Huawei
26. Human Frontier Science Program
27. IGI Insurance Limited
28. Ignite (formerly National ICT R&D Fund Company)
29. Indus Hospital
30. Innovations for Poverty Action
31. International Foundation for Science (IFS)
32. International Growth Centre (IGC)
33. Japan International Cooperation Agency (JICA)
34. Lahore Electric Supply Company (LESCO)
35. Microtech Industries (Pvt.) Ltd
36. Ministry of Commerce, Government of Pakistan (MOC)
37. Ministry of Overseas Pakistanis and Human Resource Development
38. National Engineering and Scientific Commission (NESCOM)
39. National University of Science and Technology (NUST)
40. Nestle
41. Packages Pvt (Ltd)
42. Pakistan Air Force (PAF)
43. Pakistan Centre for Philanthropy (PCP)
44. Pakistan Institute of Corporate Governance (PICG)
45. Pakistan Microfinance Network (PMN)
46. Pakistan Science Foundation (PSF)
47. PakShine (Pvt.) Ltd.
48. PeaceTech Lab
49. Planning and Development Department, Government of Punjab
50. Punjab Economic Research Institute (PERI)
51. Qadri Group of Companies
52. Re-engineering With Research (RWR) Private Ltd.
53. Society for Advancement of Higher Education (SAHE)
54. Sony

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55. State Bank of Pakistan (SBP)
  56. The Global Fund to End Slavery
  57. U.S Agency for International Development (USAID)
  58. UET, Peshawar
  59. Umm Al Qura University
  60. UN Women
  61. UNICEF
  62. United Nations University (UNU)
  63. United States Institute of Peace (USIP)
  64. University of Massachusetts Amherst
  65. University of Oxford
  66. University of Queensland
  67. University of Southampton
  68. University of Sussex
  69. Williams College
  70. Zarai Taraqiati Bank Limited (ZTBL)
  71. Zeus Consulting

## Categories

1. Agriculture
2. Arts & Heritage
3. Behavioural Studies
4. Business & Innovation
5. Computer Vision
6. Development Management
7. Economic Development
8. Education
9. Energy
10. Environment
11. GIS
12. Health
13. Law & Policy
14. Operations Management
15. Political Sciences
16. Robotics
17. Sciences
18. Technology
19. Telecommunication
20. Trade
21. Water

## About LUMS

The Lahore University of Management Sciences (LUMS) is a world class academic institution with a proud history of achievement, and ambitious plans for the future. The idea of establishing the university took root in the mind of Syed Babar Ali, Pro Chancellor, LUMS who is the guiding spirit behind the university. With his resilient efforts and patronage of the business community, academia and representatives of the government, started the establishment of what was to become one of the leading universities of South Asia. The Lahore University of Management Sciences was granted University Charter in 1985 and is a leading academic institution with a history of excellence and achievements and a vision of carrying out quality research work and to train its students to excel in their personal and professional lives.

The university initially started off with one school and successfully expanded to four schools: Suleman Dawood School of Business (SDSB), Syed Babar Ali School of Science and Engineering (SBASSE), Mushtaq Ahmad Gurmani School of Humanities & Social Sciences (MGSHSS) and Shaikh Ahmad Hassan School of Law (SAHSOL). LUMS has announced the establishment of the School of Education following the approval of the Board of Trustees. The School of Education (SOE) joins as the fifth school at LUMS.

LUMS offers 17 programmes at the undergraduate level, 9 programmes at graduate levels and 7 PhD programmes. It has always endeavoured to provide first-class education to students while encouraging research and intellectual growth concurrently. As a result, it has played a key role in setting high standards of academic excellence and producing high caliber professionals.



# Schools at LUMS



## Suleman Dawood School of Business (SDSB)

Established in 1986, the **Suleman Dawood School of Business (SDSB)** was the first of the schools at Lahore University of Management Sciences. Its unique pedagogies, such as the case method of teaching and the meticulous personal and professional development of students prepare them to become successful entrepreneurs and global leaders. With more than 2,000 graduates now, SDSB is currently ranked as one of the leading business schools in the region and is recognised for its excellent teaching methods and research-oriented environment.

The school offers a variety of programmes including an intensive full-time MBA, a week-end Executive MBA, a course-based PhD Management and Bachelor's programmes with majors in Accounting and Finance, and Management Science.

### Research at SDSB

The school is involved in several research areas related to management. Following research centres are a part of SDSB:

#### **Case Research Centre (CRC)**

The Case Research Centre (CRC) plays a coordinating and editorial role in the development of well-researched case studies written by the SDSB faculty. It has a collection of over 700 Pakistan specific cases/industry notes drawn from real life issues in organisations experienced first-hand by the faculty as the result of their research or consultation activities. The CRC disseminates the offers the contextually and academically rich teaching material to business schools and the corporate sector worldwide. Scholarly output of LUMS faculty through its international case research journal "Asian Journal of Management Cases" and also offers the contextually and academically rich teaching material to business schools and the corporate sector worldwide.

#### **Social Enterprise Development Centre (SEDC)**

The Social Enterprise Development Centre (SEDC) serves as a scholarship-based research centre working towards the capacity building of the social sector in Pakistan. The Centre works to promote genuine research, praxis and public policy dialogue to promote gender equality. The Centre has led initiatives in governance, maternal health, education, microfinance and women's entrepreneurship to name a few. Over the years SEDC has published over 200 case studies and technical notes, several numerous casebooks, policy briefs and other publications. Having successfully developed a network of more than 500 social sector organisations across the country, the Centre also assists development partners to form linkages, collaborate and work on policy initiatives.

#### **Strategic Sectors Research Centre (SSRC)**

The Strategic Sectors Research Centre (SSRC) is a new initiative in institutionalising research and knowledge generation at SDSB. It focuses on strategic sectors including development (education management, health management, and entrepreneurship) and economic sectors (energy and water management, agribusiness, textiles, food, banking, sports goods and pharmaceuticals).

#### **Raising Executive Development Centre (REDC)**

The Raising Executive Development Centre (REDC) imparts executive education with the excellence and rigor that is directed at making every executive's experience a valuable one. It is modelled on the structure of some of the leading executive education centres from around the globe. It offers over 70 programmes every year inclusive of open enrolment and customised programmes backed by in-depth research and a solid grasp on the needs of the modern businesses.

#### **Center for Governance and Public Management (CGPM)**

The Center for Governance and Public Management (CGPM) is part of the Suleman Dawood School of Business (SDSB) at the Lahore University of Management Sciences (LUMS). Its mandate is to impart undergraduate and postgraduate education in the area of Public Management/Policy, and to carry out related research and training activities. CGPM's strategic objectives are to be the preferred choice for Public Policy Management education and training and to undertake academic and professional usable research in Public Policy areas with a special focus on education, health, energy, and agriculture

#### **Centre for Islamic finance**

The vision of centre for Islamic finance is the creation and dissemination of indigenous knowledge in the domain of Islamic Finance to help resolve the challenges facing this sector. Their mission is to establish Islamic finance education and research infrastructure to meet the growing human resource and knowledge requirements of the industry. They are involved in a number of activities including executive programmes, research, academics, and local and international collaborations.

## Mushtaq Ahmad Gurmani School of Humanities & Social Sciences (MGSHSS)

The **Mushtaq Ahmad Gurmani School of Humanities & Social Sciences (MGSHSS)** (formerly School of Arts and Sciences) is the largest school at LUMS with a maximum share of the student body. It has made a great contribution towards the country's repertoire of superior multi-disciplinary education in humanities, social sciences and liberal arts.

Exposure to studies at the MGSHSS has led many students to develop a deep interest in the social sciences and several have opted to pursue their PhDs in liberal arts. Some graduates have gone on to serve as faculty members at LUMS and other credible universities in different parts of the world after completing their doctoral degrees.

At present, the school offers several undergraduate programmes such as B.Sc. Economics, B.Sc. (Honours) Economics & Political science, B.Sc. (Honours) Political Science, B.Sc. (Honours) Anthropology & Sociology, BA (Honours) English, BA (Honours) History and B.Sc. (Honours) Economics and Mathematics. The school also offers a competitive MS programme in Economics. The curriculum has been carefully designed and developed over the years by the faculty at LUMS, in conjunction with feedback from distinguished faculty from international universities.

### Research at MGSHSS

Following are the research centres at MGSHSS:

#### **Development Policy Research Centre (DPRC)**

The Development Policy Research Centre (DPRC) at LUMS is structured around interdisciplinary research in areas including economics, econometrics, sociology, development studies, political science, anthropology, regionalism and globalisation, environmental and natural resources, culture, heritage, policy and democracy, as well as social movements and civil society. It provides a platform to channel expertise in these areas towards sustained, thematic research work and also contributes to evidence based policy making and public discussion.

#### **Gurmani Centre for Languages and Literature (GCLL)**

The Gurmani Centre for Languages and Literature (GCLL) at the Lahore University of Management Sciences was initiated by the Gurmani Foundation on Friday April 09, 2010, for the advancement of national and regional languages including Arabic, Persian, Urdu and several other languages. The Centre is part of the Department of Humanities & Social Sciences (HSS) and promotes languages and their literature through teaching, research/publication and its outreach programme.

## Syed Babar Ali School of Science and Engineering (SBASSE)

The Syed Babar Ali School of Science and Engineering (SBASSE) is known for its world-class science and engineering students, faculty and its high quality industrially relevant research. Established in 2008, SBASSE is the first private research school for science and engineering in Pakistan.

SBASSE offers a four-year undergraduate programme of Bachelor of Science (BS) degree in Biology, Chemistry, Computer Science, Electrical Engineering, Mathematics and Physics. New majors offered this year are the BS Chemical Engineering and BS in Economics and Mathematics at SBASSE. In addition, it offers MS programmes in Computer Science and Electrical Engineering. The school also offers PhD programmes in Biology, Chemistry, Computer Science, Electrical Engineering, Mathematics and Physics.

### Research at SBASSE

In the “no boundaries spirit” of the school, the faculty at the SBASSE is involved in multi-disciplinary research, working on various interfaces between biology, chemistry, physics, mathematics and engineering.

### Centre for Water, Informatics & Technology (WIT)

The Centre for Water Informatics & Technology (WIT) was established at the Lahore University of Management Sciences (LUMS) in October 2015. WIT aims to serve as a hub with a disciplinary focus on hydro-informatics and systems analysis but touching multidisciplinary research themes in water by engaging faculty and students from all departments of SBASSE; and by forging collaborations among the different schools within LUMS to provide the much needed, interdisciplinary perspective to water issues, under the guidance of a world-class advisory group.

### Centre for High Performance Computing (CHPC)

The Centre for High Performance Computing (CHPC) provides scientific computing facilities for the LUMS research community. The goals of the centre are to engender and facilitate science and engineering research efforts; assist researchers with specialised computational needs and provide research and development exposure to our students.

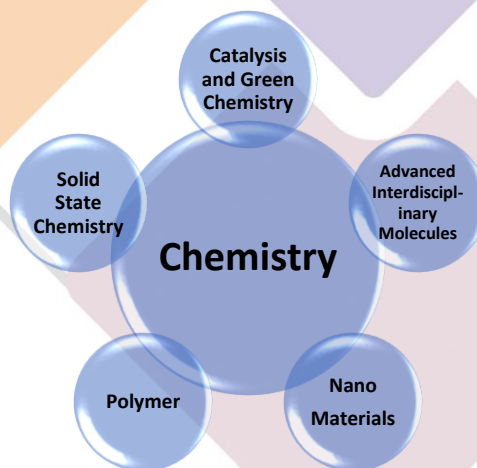
### Centre for Advanced Studies in Mathematics (CASM)

The Centre for Advanced Studies in Mathematics (CASM) runs workshops/conferences and seminars on selected topics in Mathematics with applications every year. It also attracts research scholars from Overseas and Pakistan to interact with faculty.

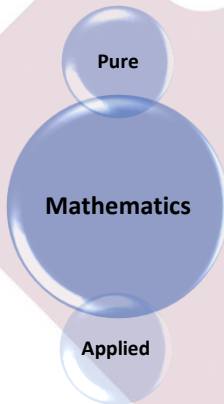
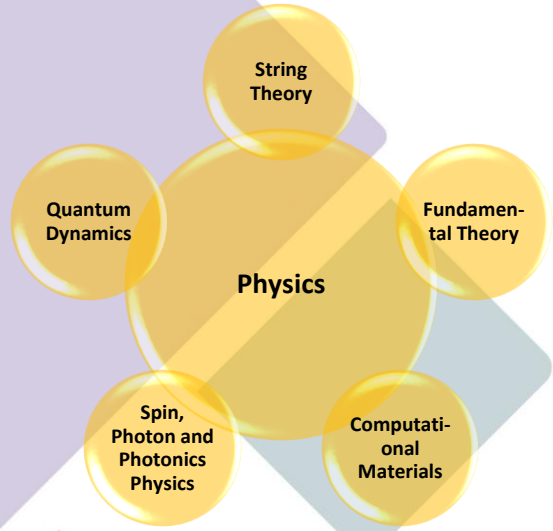
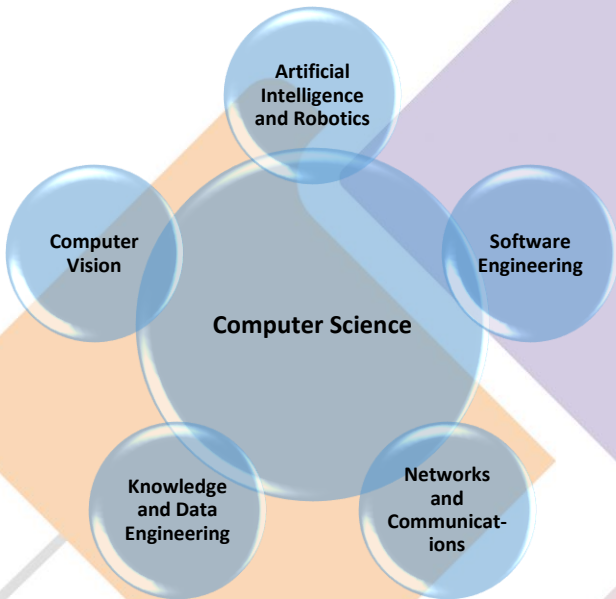
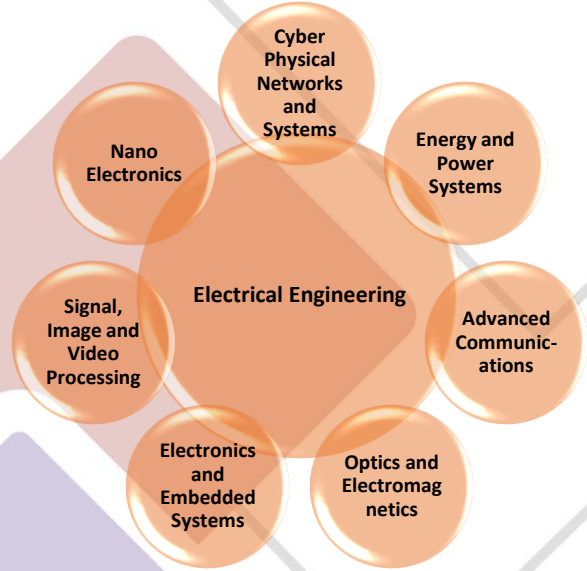
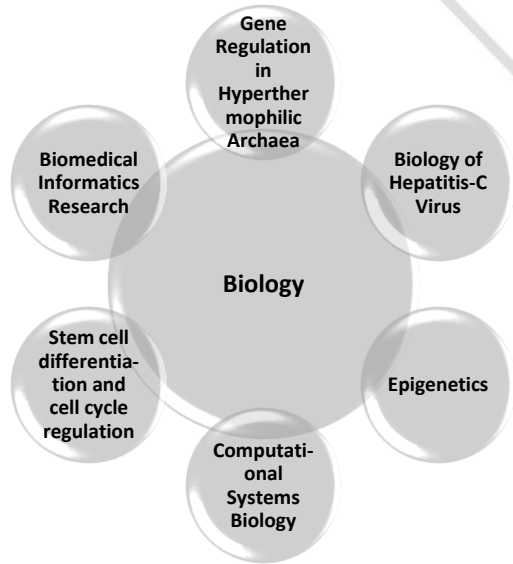
### Technology for People Initiative (TPI)

Technology for People Initiative (TPI) is an applied research centre at LUMS. It is focused on designing innovative, low-cost, practical technology solutions for problems in the public sector. Formally founded in April 2012 and housed in the SBASSE at LUMS, TPI brings together a host of talent in inter-disciplinary faculty, fellows and students to work on practical problems having widespread impact.

The school has a number of research clusters, groups and labs in the following areas:







## Shaikh Ahmad Hassan School of Law (SAHSOL)

LUMS has launched an independent School of Law, the **Shaikh Ahmad Hassan School of Law (SAHSOL)**, as its fourth School, and a stand-alone building for the School has been established.

SAHSOL has grown out of the Department of Law & Policy, which had been functioning since 2004, offering a 5-year joint B.A.-LL.B. undergraduate programme, which is accredited by the Pakistan Bar Council. This unique five-year programme provides rigorous interdisciplinary exposure to Law and its related disciplines. The first two pre-LL.B years lay down foundation principles in social sciences. Students undergo extensive academic training in core and specialised subjects in Law over the next three years. Other advanced degrees will be offered as the SAHSOL evolves further.

The school plays a productive and significant role in catalysing reform in the legal system, in promoting both corporate and social responsibility strengthening the legal profession and judicial institutions for the promotion of justice and the rule of law.

The housing of such a law and policy programme at LUMS is a vital step towards the creation of a centre of excellence where academics working in the increasingly inter-related areas of economics, finance, politics and law can collectively take on the challenges being posed by the transformation of the Pakistani economic and legal system.

### Research at SAHSOL

Continuous and on-going research is a fundamental value and corner stone of the Law and Policy Programme initiative as apart from other impacts, such research directly translates into better teaching. Law is a dynamic subject with very frequent changes of text, approach and issues. The introduction of the research dimension is, therefore, a vital contribution by the Law and Policy Programme to the broader society.

## School of Education (SOE)

Lahore University of Management Sciences (LUMS) has announced the establishment of **School of Education (SOE)** following the approval of the Board of Trustees. The School of Education joins as the fifth school at LUMS, a vibrant campus with schools of Business, Humanities and Social Sciences, Science and Engineering, and Law, already in place.

The exploratory phase for LUMS School of Education was initiated in October 2015, with funding from the Babar Ali Foundation and the objective of enabling LUMS to intervene as a thought leader and change maker in a rapidly expanding educational milieu of Pakistan. Dr. Tahir Andrabi has been appointed as the Inaugural Dean of LUMS School of Education.

The LUMS School of Education will operate at the crucial nexus of research, policy and practice, supporting a faculty that is internationally competitive, connected, and relevant. The curriculum, featuring extensive field engagement, will produce graduates capable of becoming strategic leaders, policy researchers, and reflective practitioners, distinctly placed to direct and shape a reimagined and vibrant education reform agenda for Pakistan.

# Institutional Bodies

## Office of Sponsored Programmes and Research (OSPR)

The Office of Sponsored Programmes and Research (OSPR) focuses on sponsored research and programmes. It is responsible for managing all sponsored research related activities of academic and research units and act as a bridge between LUMS faculty and national/international donors. This includes, but is not limited to, externally funded research proposals; unrestricted grants; travel grants; sponsored conferences / workshops / seminars; consulting assignments; chair funds; instructional and service activities; contracts; agreements and arrangements related to sponsored and externally funded activities. Moreover, OSPR also manages internal grants, which are provided by LUMS including Faculty Initiative Fund (FIF), Faculty Travel Grant (FTG) and Start-up Grants. OSPR has set up a support mechanism to provide help in filing copyright and patent applications through its Technology Transfer Wing (TTW) so that formal support mechanisms are established to provide legal, administrative and financial support required in the patent and commercialization process to LUMS faculty in order to ensure that their focus remains on the research and innovation aspect, leaving the legal and administrative hurdles for the TTW team.

## Institutional Review Board (IRB)

Institutional Review Board (IRB) is responsible for overseeing all projects that involve the use of human and animal subjects. All issues related to the bio-safety are also under the review of the IRB. More information can be viewed on the following link:

<http://lums.edu.pk/osp/page.php/institutional-review-board-irb-osp>

## University Research Council (URC)

The University Research Council (URC) is a standing committee of the University Faculty Council (FC) that promotes and advocates research environment in LUMS. It is involved in developing policies and acting as an advisory group to the Vice Chancellor and Deans in matters related to research.

### URC Charter

The purpose of the Research Council is to identify and recommend those baseline policies that will be applicable to research endeavours of the faculty. Specifically it will be addressing the following:

1. To advocate for and to promote research culture at LUMS
2. To develop standardised policies and guidelines to promote quality research
3. To serve as an advisory group to the Vice Chancellor and other members of the administration including Deans
4. To act as a University Standing Committee in reviewing and recommending new research policies and changes in existing ones
5. To prepare a brief, written report on the year's activities of the Council at the end of each academic year and to submit copies of the reports to the Vice Chancellor of the University and to the Faculty Council

### Terms of Reference for the Operations of the Research Council

The following are the Terms of Reference for URC:

- Members are decided by the University Faculty Council (FC) in consultation with the convener
- Faculty is asked for choice of membership and based on the faculty's feedback, the convener selects members and sends recommendation to the Vice Chancellor for final nomination
- Vice Chancellor finalises the membership of URC based on recommendations of the URC convener
- 50 percent of the URC members are rotated every year using the same formula
- URC convener is elected through voting by members
- Convener is elected from the house after every 2 years
- The quorum of URC Meetings consist of a minimum of 60 percent of the total members
- Decisions are based on consensus among all present members. If disagreement persists between members, the issue is moved to the next meeting for debate and efforts are then made to build consensus. Issues that remain unresolved are then decided upon by the Council through a resolution method
- URC meets at least once a quarter every year and more meetings are scheduled when required

### Research Council Members List 2016-2017

The following is the list of the URC members for 2016-17, who were appointed on July 1, 2016 till June 30, 2017:

1. Dr. Abid Aman Burki (Department of Humanities & Social Sciences, MGSHSS) - Convener
2. Dr. Ali Qasmi (Department of Humanities & Social Sciences, MGSHSS)
3. Dr. Azmat Hussain (Department of Mathematics , SBASSE)
4. Dr. Choudhry Tanveer Shehzad (Suleman Dawood School of Business, SDSB)
5. Dr. Ghazal Mir Zulfiqar (Suleman Dawood School of Business, SDSB)
6. Dr. Hassan Javid (Department of Humanities & Social Sciences, MGSHSS)
7. Dr. Husnain Fateh Ahmed (Department of Humanities & Social Sciences, MGSHSS)
8. Dr. Muhammad Sabieh Anwar (Department of Physics ,SBASSE)
9. Dr. Muhammad Saeed (Department of Chemistry and Chemical Engineering, SBASSE)
10. Dr. Muhammad Shehryar Shahid (Suleman Dawood School of Business, SDSB)
11. Dr. Rahman Shah Zaib Saleem (Department of Chemistry and Chemical Engineering, SBASSE)
12. Dr. Suleman Shahid (Department of Computer Science, SBASSE)
13. Dr. Zubair Abbasi (Department of Law and Policy, SAHSOL)
14. Dr. Shafay Shamail – Ex-Officio (Department of Computer Science, SBASSE) – Director OSPR

### Research Council Members List 2015-2016

The following is the list of the Research Council members for 2015-16. These members were appointed on July 1, 2015 to June 30, 2016.

1. Dr. Abid Aman Burki (Department of Humanities & Social Sciences, MGSHSS) – Convener
2. Dr. Ali Usman Qasmi (Department of Humanities & Social Sciences, MGSHSS)
3. Dr. Atif Saeed Chaudry (Suleman Dawood School of Business, SDSB)
4. Dr. Ayaz Qureshi (Department of Humanities & Social Sciences, MGSHSS)
5. Dr. Syed Azer Reza (Department of Electrical Engineering, SBASSE)
6. Dr. Choudhry Tanveer Shehzad (Suleman Dawood School of Business, SDSB)
7. Dr. Fahd Rehman (Suleman Dawood School of Business, SDSB)
8. Dr. Husnain Fateh Ahmed (Department of Humanities & Social Sciences, MGSHSS)
9. Dr. Irshad Hussain (Department of Chemistry and Chemical Engineering, SBASSE)
10. Dr. Mian Muhammad Awais (Department of Computer Science, SBASSE)
11. Dr. Mohammad Waseem (Department of Humanities & Social Sciences, MGSHSS)
12. Dr. Uzair Kayani (Department of Law and Policy, SAHSOL)
13. Dr. Shafay Shamail - Ex-Officio (Department of Computer Science, SBASSE)- Director OSPR

More information can be viewed on the following link: <http://lums.edu.pk/osp/page.php/research-council-osp>

# LUMS Funding Sources

LUMS provides extensive funding opportunities to pursue research at LUMS. These opportunities also help faculty members to prepare for and seek larger international grants.

## Faculty Initiative Fund (FIF)

The LUMS Faculty Initiative Fund (FIF) is an internal funding mechanism that awards competitive grants of between PKR 500,000 to PKR 1,000,000 to the LUMS faculty. These grants are intended to help faculty members develop innovative projects and benefit from new research initiative opportunities in order to enhance the research endeavours of the university. All full-time and research faculty members at LUMS are eligible to apply for this grant. Proposals are submitted individually or by a group of faculty within or across schools to the Office of Sponsored Programmes and Research (OSPR)

## Faculty Travel Grant (FTG)

Faculty Travel Grant (FTG) provided by LUMS assist in the research activities of the university's full-time regular faculty at various stages of their academic careers. The purpose of FTG is to encourage research-related international travels and collaborations by full-time LUMS faculty. Full-time, regular faculty members applying for FTG have their applications reviewed for funding by the FTG review committee.

## Start-up Grant (STG)

Start-up Grant is the first grant given to full-time regular faculty newly recruited on tenure track or as tenured faculty. This grant is awarded by the Deans of the respective schools. In case the School decides not to award start-up grant to new faculty at the beginning of their stay at the university, the school may institute any scheme for the promotion of research using these funds. Mechanism for award of the start-up grant in such a case may be documented and forwarded to the Vice Chancellor by the Dean.

## Summer Research Programme (SRP)

Summer Research Programme (SRP) thus seeks to promote research activities during summer. SRP will engage undergraduate students in a meaningful research in which they will have a valuable opportunity to independently carry out a funded research project. SRP will also serve as an outreach activity by LUMS to engage good high school students (FSC and A-level) in the research projects and mentor them. Duration of SRP will be 8 to 10 weeks.

## Overhead Account

Carrying out research related activities at LUMS requires the use of general physical and administrative facilities of LUMS for which the university needs to be compensated. Thus, LUMS charges a financial overhead (indirect cost) from the externally funded programmes at the rate of 30/130 of the total project cost, unless otherwise restricted by the sponsor. In case of consultancy projects, overhead is calculated at the rate of 30/130 of total consultant(s) fee. While the bulk of overhead amount is directly retained by the university and included in the total revenue earned, a portion of the funds is distributed to the relevant school to support seeding of research activities, with the remaining funds being placed with the Principal Investigator (PI) for his/her academic and research use. For funded research projects that generate overhead, the distribution of overhead income within the University is as follows:

- University takes upon payment (LUMS share) - 65%
- The relevant School receives (Department share) - 20%
- The PI receives (Grantee share) - 15%

In case of consultancy projects, overhead is transferred wholly to the University. In case of research projects undertaken by a LUMS research centre, grantee share of the overhead shall be transferred to the research centre's account. Thereafter, these funds shall be placed at the disposal of the head of that research centre.

The image features a central text element surrounded by a complex geometric pattern. The pattern consists of several overlapping diamonds in muted colors: a large purple diamond in the center, an orange diamond to its left, a reddish-brown diamond above it, a light pink diamond below it, and a teal diamond to its right. The background is filled with light gray zigzag lines that create a sense of movement and depth. The text 'Page Deliberately Left Blank' is centered over the purple diamond.

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**SDSB**

Dr. Choudhry Tanveer Shehzad  
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**Profile:** Dr. Choudhry Tanveer Shehzad holds a PhD from University of Groningen, the Netherlands and is a Certified Financial Risk Manager from GARP (USA). He is specialized in the area of Banking and Finance. His current research topics include banking and financial crises, empirical analysis of corporate finance theories, market concentration and competition, supervision and regulation of banks, credit ratings and stock market perception of financial reform. He has published in reputed journals like Journal of Banking and finance, Applied Economics and North American Journal of Economics and Finance and has presented his research in a number of international conferences in recent years. Additionally, he is a referee for international journals like Journal of Banking and Finance, Applied Economics and European Journal of Political Economy. Before joining LUMS, he was working at the State Bank of Pakistan as Deputy Director.

#### Selected Publications:

- Shehzad, C. T., & De Haan, J. (2013). Was the 2007 crisis really a global banking crisis? North American Journal of Economics and Finance, 24(1), 113-124
- Shehzad, C. T., de Haan, J., & Scholtens, B. (2013). The relationship between size, growth and profitability of commercial banks. Applied Economics, 45(13), 1751-1765
- Forssbæck, J., & Shehzad, C. T. (2015). The Conditional Effects of Market Power on Bank Risk-Cross-Country Evidence. Review of Finance, 19(5), 1997-2038
- Shehzad, C. T., & De Haan, J. (2015). Supervisory powers and bank risk taking. Journal of International Financial Markets, Institutions and Money, 39, 15-24



**Title:** Penny Wise, Pound Foolish? Capital Budgeting Decisions in Listed Companies on Pakistan Stock Exchange (PSX)

**PI:** Dr. Choudhry Tanveer Shehzad

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 925,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Economic Development

**Description:** The main objective of this project is to determine the important factors that affect the choice of capital budgeting techniques employed by the companies in

Pakistan and how are those capital budgeting techniques employed. This study empirically examines if there is a significant effect of the firm size, growth opportunities, less debt, manufacturing industry classification and ownership structure on the choice of capital budgeting method employed. This study further aims to build on the calculation methodologies of these capital budgeting techniques and the computation of the cost of capital by these firms in Pakistan. Capital budgeting methods aid the Corporate Boards and management in large scale investment decision making. It includes the comparison and analysis of various proposals before making commitment of resources to the project.



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**Profile:** Dr. Farrah Arif is an Assistant Professor of Marketing in the Suleman Dawood School of Business at the Lahore University of Management Sciences. As a Commonwealth scholar, she obtained a PhD from the University of Cambridge Judge Business School. She is also a certified Associate Fellow of the Higher Education Academy (AFHEA), UK. Dr. Farrah has been teaching in business schools (Pakistan and abroad) since 1999. Currently, she teaches Consumer Behaviour and Marketing Research to MBA and Marketing Management, Business Strategy, and New Product Development to EMBA. She has also designed and delivered executive programmes for MNCs and local companies including Telenor Pakistan, Packages Pvt (Ltd), Bulleh Shah Packaging Limited and Coffey International Limited.

**Selected Publications:**

- Shrum, L. J., Wong, N., Arif, F., Chugani, S. K., Gunz, A., Lowrey, T. M., & Sundie, J. (2013). Reconceptualising materialism as identity goal pursuits: Functions, processes, and consequences. *Journal of Business Research*, 66(8), 1179-1185



**Title:** Evaluating the PICG Brand Positioning and PICG Training and Education Programs - Consumer Insights Research Project

**PI:** Dr. Farrah Arif

**Sponsor:** Pakistan Institute of Corporate Governance (PICG)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 2 Months

**Category:** Economic Development

**Description:** The Pakistan Institute of Corporate Governance (PICG) aims to bring about national economic and social transformations by improving the quality of corporate governance in Pakistan. With this vision, PICG started its services offering, membership, training programs and other related services. The research project headed by Dr. Farrah Arif will help PICG in developing and executing its three-year strategic plan, which focuses on increasing the number of members and effectiveness of its services to members and non-members.

Dr. Kamran Ali Chatha  
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**Profile:** Dr. Kamran Ali Chatha has research interests in the areas of Manufacturing Strategy, and Technology & Innovation Management. He was involved in a multi-country study that aimed at developing an Atlas of Science and Technology based Innovations in the Muslim World sponsored by The Royal Society and Organisation of the Islamic Countries. He has continuing interests in developing techniques for planning, formulating, implementing and evaluating manufacturing strategy in SME sector. Dr. Kamran is the director of the Factory Management Program that aims to develop know-how of contemporary manufacturing management practices among industry executives.

#### Selected Publications:

- OMar, A., & Chatha, K. A. (2012). National institute for biotechnology and genetic engineering (nibge): Genetically modified spider cotton. *Asian Journal of Management Cases*, 9(1), 33-58
- Chatha, K. A., & Aziz, O. (2015). GIKI MEMS Lab—Architects of Tiny Machines. *Asian Journal of Management Cases*, 12(1), 55-83
- Chatha, K. A., & Butt, I. (2015). Themes of study in manufacturing strategy literature. *International Journal of Operations and Production Management*, 35(4), 604-698
- Chatha, K. A., Butt, I., & Tariq, A. (2015). Research methodologies and publication trends in manufacturing strategy a content analysis based literature review. *International Journal of Operations and Production Management*, 35(4), 487-546



**Title:** Determinants of Internationalization Performance of SMEs: Institutional, Cultural, and Capability Factors

**PI:** Dr. Kamran Ali Chatha

**Co-PI:** Dr. Muhammad Shakeel Sadiq Jajja

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 880,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Business & Innovation

**Description:** In this research project, the aim is to understand whether there is a relationship between technology, innovation, capability and internationalization

performance (e.g. export performance) of SMEs in Pakistan, and if not, what conditions would influence the existence of this relationship. Specifically to prove that organizational culture and institutional pressures (e.g. pressures from competitors, customers, and government) may influence this relationship.

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**Profile:** Dr. Khawaja Zain ul Abdin is an Assistant Professor at the SDSB. He holds a PhD in Media and Communication Studies (2013) and an MA from the FSU School of Communication (2009), attaining Fulbright scholarships for both degrees. He also completed his MBA in Marketing from the Lahore School of Economics in 2007. Dr. Khawaja's research interests include the effects of social media marketing in the development sector in Pakistan.

**Selected Publications:**

- Ashraf, R., Zahid, A., & Yousaf, S. (2016). Union Railways: Selling Advertising Rights on Trains and Stations. *Asian Journal of Management Cases*, 13(2), 125-147
- Khawaja, Z. U. A., Ali, K. I., & Khan, S. (2017). Using Facebook for Sexual Health Social Marketing in Conservative Asian Countries: A Systematic Examination. *Journal of Health Communication*, 1-13
- Vahe, M., Zain-Ul-Abdin, K., & Türel, Y. K. (2012). Social Media as a Learning Tool in Medical Education: A Situation Analysis. *Virtual Professional Development and Informal Learning via Social Networks*, 168



**Title:** SOP Formation and Research Agendas for USAID

**PI:** Dr. Khawaja Zain ul Abdin

**Sponsor:** Zeus Consulting

**Funding Amount:** PKR 400,000

**Project Initiated in:** 2016

**Duration:** 3 Months

**Category:** Law & Policy

**Description:** Under this Agreement, LUMS, through Dr. Zain-ul-abdin Khawaja, shall be responsible for carrying out a Needs Assessment for the designing and implementation of the research centre at both HBPRC and CAPRIL. LUMS shall contribute in developing the Standard Operational Procedures (SOP's) for a research centre with checklists and

guidelines on major functions, and a presentation on these SOP's and guidelines to the research centre staff at both HBPRC and CAPRIL, as per the satisfaction of the Project Head.

Dr. Misbah Tanveer Chaudhry  
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**Profile:** Dr. Misbah Tanveer Chaudhry holds a PhD in Development Economics. Her research is focused on labour markets and unemployment issues, labour productivity and economic growth, demographic transition, impact of European economic crises on labour markets and gender disparity in labour markets. Her research has been published in high-quality journals like The European Journal of Development Review, International Journal of Manpower and Economic Systems.

#### Recent Publications:

- Marelli, E., Choudhry, M. T., & Signorelli, M. (2013). Youth and total unemployment rate: The impact of policies and institutions. *Rivista Internazionale di Scienze Sociali*(1), 63-86
- Bruno, G. S. F., Choudhry, M. T., Marelli, E., & Signorelli, M. (2014). Youth Unemployment: Key Determinants and the Impact of Crises (Vol. 7)
- Signorelli, M., & Choudhry, M. T. (2015). Symposium: Youth labour Market and the "Great Recession". *Economic Systems*, 39(1), 1-2
- Choudhry, M. T., Marelli, E., & Signorelli, M. (2016). Age dependency and labour productivity divergence. *Applied Economics*, 1-23
- Bruno, G. S., Choudhry Tanveer, M., Marelli, E., & Signorelli, M. (2016). The short-and long-run impacts of financial crises on youth unemployment in OECD countries. *Applied Economics*, 1-23



**Title:** Tracing Women in the Informal Sector of Pakistan-Labour Market Dynamics

**PI:** Dr. Misbah Tanveer Chaudhry

**Co-PI:** Dr. Enrico Marelli - Professor of Economic Policy, University of Brescia, Italy.

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 870,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Economic Development

**Description:** This project aims to stream line the ongoing research regarding the informal sector by determining the share and importance of women entrepreneurs in the informal economy. It will integrate primary and secondary sources into measurable results and analyze which factors theoretically and empirically affect women entrepreneurs in the informal economy. Moreover, it will identify the repercussions of augmenting women's share in the informal economy on the overall economic development and social well-being of the country.



**Title:** Socio-cultural Norms Influence on Women Entrepreneurship

**PI:** Dr. Misbah Tanveer Chaudhry

**Co-PI:** Dr. Enrico Marelli - University of Brescia, Italy

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 790,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Business & Innovation

**Description:** The primary focus of this project is on home based or micro entrepreneurs in Pakistan and other developing countries. This project intends to integrate primary and secondary sources into measurable results and analyze which socio-cultural factors theoretically and empirically affect women participation in entrepreneurial activities. This research will highlight an important and less discussed aspect of women entrepreneurship, that is, the role of society and culture in promoting or dampening women entrepreneurial prospects in a country.



**Title:** Women Entrepreneurship Program

**PI:** Dr. Misbah Tanveer Chaudhry

**Sponsor:** American University

**Funding Amount:** PKR 30,970,234

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Business & Innovation

**Description:** This academic linkage between American University in Washington D.C. and Lahore University of Management Sciences (LUMS) in Lahore, Pakistan emphasized on helping promising female entrepreneurs to develop the expertise and leadership they need to scale their businesses. The establishment of this partnership enriched academic and

cultural understanding in the U.S. and Pakistan through exchanges of students and faculty members from both universities.

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**Profile:** Dr. Mohsin Bashir is an Assistant Professor at the SDSB, LUMS. His areas of academic interest include Public Private Partnerships, Organisational Power and Politics, and Non-profit Leadership and Management. He holds a PhD in Public Administration and Policy from Arizona State University's School of Public Affairs where he was a Fulbright Scholar. He also holds degrees in Business Administration (LUMS) and Computer Science (FAST). Among his recent publications was a chapter in the Taylor & Francis book "Public Administration in South Asia". He has also published research articles on Public Administration, teaching cases on Non-profit Management and industry reports on Corporate Citizenship. His consulting assignments have been in the areas of Monitoring and Evaluation, Decentralisation/Devolution, Responsible Business Frameworks, Organisational Effectiveness and Information and Communication Technologies; for organisations such as Nike Inc., Engro Corp., Government of the Punjab, USAID, CIDA, GIZ, SDC, various RSPs and other for-profit and non-for-profit organisations.

#### Selected Publications:

- Bashir, M. (2016). Using power to achieve network outcomes: why Funders should maintain a hands-on approach. *International Review of Public Administration*, 1-16
- Bashir, M. & Sethi, A. (2014). Note on Monitoring and Evaluation Frameworks. Teaching Case No. 30- 001-2014-2 at the LUMS Case Research Center
- Bashir, M. & Sethi, A. (2014). Performance Management at Akhuwat. Teaching Case No. 05-762-2014-1 at the LUMS Case Research Centre
- Bashir, M. (2013). Policy process and public participation in Pakistan. In E. Berman, & M. Sabharwal (Eds.), *Public Administration in South Asia*. Taylor & Francis

## Training

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**Title:** Monitoring and Evaluation framework for Punjab Vocational Training Council, Lahore

**PI:** Dr. Mohsin Bashir

**Sponsor:** Assessment and Strengthening Program (ASP)

**Funding Amount:** PKR 916,034

**Project Initiated in:** 2015

**Duration:** 4 Months

**Category:** Economic Development

**Description:** This consultancy developed a comprehensive Monitoring, Evaluation and Reporting (MER) manual for the Punjab Vocational Training Council (PVTC) to design monitoring, evaluation and reporting systems for the organisation. The manual serves

as a Performance Management Plan (PMP) as well as a complete guide to conduct M&E data collection, analysis, assessment and reporting. The organisation was also provided multiple instruments and data analysis databases as part of the MER manual.

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**Profile:** Dr. Shakeel Sadiq Jajja did his PhD research in the area of supply chain and innovation management. He has presented several research papers at globally esteemed research platforms. During his PhD, he won the Best Student Paper Award at 43rd Annual Meeting of the Decision Sciences Institute (DSI) 2012 in San Francisco USA, Emerging Economy Doctoral Student Award at 23rd Annual Conference of Production and Operations Management Society (POMS) in 2012 in Chicago USA, and Best Graduate Student Paper Award at 40th Annual Meeting of Western Decision Sciences Institute in 2011 in Portland, USA. He received Doctoral Fellowship from Association of Management Development Institutions in South Asia (AMDISA).

#### Selected Publications:

- Jajja, M. S. S., Brah, S. A., Hassan, S. Z., & Kannan, V. R. (2014). An examination of product innovation and buyer-supplier relationship in pakistani firms. *International Journal of Productivity and Performance Management*, 63(8), 1031-1045
- Jajja, M. S. S., Brah, S. A., & Hassan, S. Z. (2014). Supply chain strategy and organisational performance: Role of core operational functions. *International Journal of Services and Operations Management*, 17(3), 330–349
- Asif, M., Awan, M. U., Jajja, M. S. S., & Ahmad, H. (2016). Developing a scale for service quality measurement in banks. *International Journal of Services and Operations Management*, 23(2), 153-168
- Jajja, M. S. S., & Hassan, S. Z. (2016). Millat Tractors Limited: Has The Time Come to Say Goodbye to Massey Ferguson? *Asian Journal of Management Cases*, 0972820115619258
- Jajja, M. S. S., Jajja, M. S. S., Kannan, V. R., Kannan, V. R., Brah, S. A., Brah, S. A., ... & Hassan, S. Z. (2016). Supply chain strategy and the role of suppliers: evidence from the Indian sub-continent. *Benchmarking: An International Journal*, 23(7), 1658-1676



**Title:** Family Constitution of Qadri Group  
**PI:** Dr. Muhammad Shakeel Sadiq Jajja  
**Sponsor:** Qadri Group of Companies  
**Funding Amount:** PKR 1,000,000  
**Project Initiated in:** 2015  
**Duration:** 3 Months  
**Category:** Law & Policy

**Description:** The aim of this consultancy is to provide consultancy in the development of the family constitution. In 2015, Qadri Group (QG), which started as a business concern of two brothers in 1896, is a more than hundred years old family business. QG family has expanded to a size of more than eighty family members owning eight

companies dealing with foundry and steel products in the local and international markets. QG's third generation male members who are currently leading the business want to develop a family constitution to manage QG's family, business, and ownership matters.



**Title:** Evaluation of Prequalification of for Government of the Punjab (2017-18)  
**PI:** Dr. Muhammad Shakeel Sadiq Jajja  
**Sponsor:** Planning and Development Department, Government of Punjab  
**Funding Amount:** PKR 974,400  
**Project Initiated in:** 2017  
**Duration:** 1 Months  
**Category:** Political Sciences

**Description:** Planning and Development Department (P&D), Government of the Punjab (GoP), is mandated to pre-qualify competent and qualified national and international firms to provide consultancy services to GoP in various industrial sectors. These firms can be engaged on time to time basis by line departments, public sector companies

and authorities of GoP under Punjab Public Procurement Regulatory Authority Rules 2014. The objective of this consultancy service is to guide the P&D team to develop a comprehensive and objective evaluation criteria for the pre-qualification process. This pre-qualification process will result in a list of pre-qualified companies to be used by GoP for the fiscal year 2017-18.

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**Profile:** Dr. Muhammad Shehryar Shahid is an Assistant Professor of Entrepreneurship at SDSB at LUMS and is also a leading member of the Entrepreneurship Working Group at the university. Dr. Shahid received his PhD from University of Sheffield in 2011, his MBA from Lahore University of Management Sciences in 2006, his bachelor's degree from Ghulam Ishaq Khan Institute of Engineering and Technology in 2003, and his intermediate degree from Aitchison College in 1999. Prior to his appointment at LUMS, he served as the Head of Management and Organisation Division and the Director of Centre for Entrepreneurship and SMEs (CESME) at the University of Central Punjab from 2011 to 2013. He has taught courses like Entrepreneurship, Principles of Management, Business Model Development, Lean Launchpad and SME Management at both undergraduate and postgraduate level. He is also an Editorial Board Member of Journal of Small Business & Entrepreneurship (JSBE) and an Editorial Advisory Board Member of The Lahore Journal of Business (LJB).

#### Selected Publications:

- Williams, C. C., Shahid, M. S., & Martínez, A. (2016). Determinants of the level of informality of informal micro-enterprises: some evidence from the city of Lahore, Pakistan. *World Development*, 84, 312-325
- Williams, C. C., & Shahid, M. S. (2016). Informal entrepreneurship and institutional theory: explaining the varying degrees of (in) formalization of entrepreneurs in Pakistan. *Entrepreneurship & Regional Development*, 28(1-2), 1-25
- Shahid, M. S., Rodgers, P., & Williams, C. C. (2016). Evaluating the participation of an ethnic minority group in informal employment: a product of exit or exclusion? *Review of Social Economy*



**Title:** Informal Sector Entrepreneurship: Evaluating the Degrees of (in) Formalization of Entrepreneurs in the Automotive Sector of Pakistan

**PI:** Dr. Muhammad Shehryar Shahid

**Co-PI:** Prof. Colin Williams (University of Sheffield, UK)

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 500,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Business & Innovation

**Description:** The aim of this project is to transcend the dualistic portrayal of entrepreneurs as either formal or informal and re-conceptualise entrepreneurs as

existing on a continuum from wholly formal to wholly informal. Given that no known studies have evaluated the degree of formalization of entrepreneurs or the factors influencing their degree of (in)formalization, this project will begin to bridge that knowledge gap in an in-depth study of the automotive sector.



**Title:** Explaining Informal Domestic Work Practices In Pakistan through a Post-Structuralist Lens: An Empirical Analysis

**PI:** Dr. Muhammad Shehryar Shahid

**Co-PI:** Prof. Colin Williams - Cardiff University

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 560,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Economic Development

**Description:** The main objective of this research to transcend the capitalist-centric discourse on informal work, so far firmly entrenched in the literature, and lend support

to the post-structuralist explanations of informal work practices, which assert that individuals often prefer to engage in non-capitalist work strategies, embedded in a complex set of cultural, political, and social rationales. This project seeks to not only explicitly unravel the reasons for Pakistani employers and employees to engage in informal work practices, but also elucidate certain implicit social constructs and the negotiated nature of work relations existing within the dynamics of informal domestic work.



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**Profile:** Dr. Saad Azmat did his BSC. (Hons) from the University of Hull on a full scholarship. From there, he went on to do MA (Economics), from University of British Columbia (Canada). Thereafter, he did a PhD in Accounting and Finance from Monash University (Australia). Dr. Azmat is an active researcher and focuses primarily on fixed income securities, commercial banking, credit risk modelling, value investing and Islamic finance. He has a number of published research articles and conference papers to his credit. In 2011, he was invited as an Organisation of the Islamic Conference (OIC) research scholar to deliver Islamic finance seminars and workshops in Malaysia.

#### Selected Publications:

- Azad, A. S. M. S., Azmat, S., Fang, V., & Edirisuriya, P. (2014). Unchecked manipulations, price-volume relationship and Market efficiency: Evidence from emerging Markets. *Research in International Business and Finance*, 30(1), 51–71
- Azmat, S., Skully, M., & Brown, K. (2015). Can Islamic banking ever become Islamic? *Pacific Basin Finance Journal*, 34, 253-272
- Azmat, S., Skully, M., & Brown, K. (2015). The (little) difference that makes all the difference between Islamic and conventional bonds. *Pacific-Basin Finance Journal*
- Azmat, S., Jalil, M. N., Skully, M., & Brown, K. (2016). Investor's choice of Shariah compliant 'replicas' and original Islamic instruments. *Journal of Economic Behavior & Organization*



**Title:** Establishment of Centre for Islamic Finance - Financial Innovation Challenge Fund (FICF)

**PI:** Dr. Saad Azmat

**Co-PI:** Dr. Kamran Ali Chatha, Dr. Muhammad Junaid Ashraf, Dr. Ayesha Bhatti, Mr. Abdul Rauf

**Sponsor:** State Bank of Pakistan (SBP)

**Funding Amount:** PKR 52,647,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Economic Development

**Description:** State Bank of Pakistan is managing Financial Innovation Challenge Fund (FICF) under UK-aid funded Financial Inclusion Program (FIP). FICF has been designed to help the financial sector reach the financially excluded with use of innovations. The core objective of the Challenge Round 3 is to promote Islamic Finance to meet the unmet demand for Shariah compliant financial services in Pakistan. This round aims to establish Islamic finance education and research infrastructure in partnership with Lahore University of Management Sciences to serve the Islamic finance industry by meeting its growing human resource and knowledge requirements through quality and value added services and knowledge products.



**Title:** Persuasion by Islamic Banks

**PI:** Dr. Saad Azmat

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 480,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Economic Development

**Description:** The last decade has seen Islamic banks grow at an impressive rate of 15% per annum. At the same time, there are claims that Islamic banks essentially mimic conventional banking products. It is argued that Islamic banks are employing persuasion techniques, such as renaming interest as profit, to convince their customer about their Shariah compliance. This study focuses on the different persuasion and marketing strategies of Islamic banks to see how a financial product with conventional features is sold as an Islamic instrument.

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**Profile:** Dr. Hassan has more than two decades of extensive experience in the higher education sector. At LUMS, he has served in many capacities besides teaching and research, including Associate Dean, Dean, Pro-Vice Chancellor and Vice chancellor (VC) (2002-8). During his six year tenure as VC, LUMS expanded in all dimensions (academic programmes, faculty, schools and infrastructure) and formulated its vision to become a broad-based research university. Launch of the National Outreach Programme (NOP), through which bright students from the under privileged sections of our society are groomed and developed to join LUMS on full financial support, is a key highlight of Dr. Hassan's term as VC. Now almost 20% of students at joining B.Sc. at LUMS are from NOP. Dr. Hassan's current research interests include management of technology, innovation and entrepreneurship in the global world. Besides consulting for many leading local companies and international organisations, like UNDP and World Bank, he has also served on the boards of organisations like PTCL and NTDC. He is also actively involved in helping a number of Pakistani and Indian educational institutions improve their systems and processes as a mentor and accreditation peer reviewer.

#### Recent Publications:

- Jajja, M. S. S., Brah, S. A., Hassan, S. Z., & Kannan, V. R. (2014). An examination of product innovation and buyer-supplier relationship in pakistani firms. *International Journal of Productivity and Performance Management*, 63(8), 1031-1045
- Saleem, A., & Hassan, S. Z. (2015). US Denim Mills: Quest for Alternative Fuel Sources in the Wake of Energy Crisis (A). *Asian Journal of Management Cases*, 12(1), 84-101
- Jajja, M. S. S., & Hassan, S. Z. (2016). Millat Tractors Limited: Has The Time Come to Say Goodbye to Massey Ferguson? *Asian Journal of Management Cases*, 0972820115619258
- Jajja, M. S. S., Jajja, M. S. S., Kannan, V. R., Kannan, V. R., Brah, S. A., Brah, S. A., ... & Hassan, S. Z. (2016). Supply chain strategy and the role of suppliers: evidence from the Indian sub-continent. *Benchmarking: An International Journal*, 23(7), 1658-1676



**Title:** Understanding Technology Based Innovation Ecosystem of Pakistan and Impact of Innovation on Performance of Pakistani Organizations

**PI:** Dr. Syed Zahoor Hassan

**Co-PI:** Dr. Kamran Ali Chatha

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 3,497,187

**Project Initiated in:** 2015

**Duration:** 24 Months

**Category:** Business & Innovation

**Description:** The first phase of this proposed research will focus on developing case studies of innovative organisations within the five industrial sectors (Engineering, Agriculture, Textile, Chemicals & Pharma as well as IT and Telecom) without constrained by business areas. The second phase of the proposed research will investigate the role of innovations in supply chain management on organizational performance within five industrial sectors. The outcomes of the proposed research will act as a stepping stone to propose future research studies in order to better understand the role of innovation in various other business.



**Title:** Facilitation of the Strategic Plan Formulation Process at IGI

**PI:** Dr. Syed Zahoor Hassan

**Sponsor:** IGI Insurance Limited

**Funding Amount:** PKR 1,029,569

**Project Initiated in:** 2015

**Duration:** 2 Months

**Category:** Law & Policy

**Description:** This consultancy assignment took place in the following stages: all the related documents and reported prepared by IGI was analysed to prepare for the strategic planning sessions and interactions were carried out with the related staff of IGI. Moreover, analysis was carried out to develop preliminary ideas about possible discussion points during the strategic plan formulation meetings. Lastly, detailed assessment for the strategic plan was prepared by top management of IGI.



**Title:** Post Session Review and Preparation of Short Report on New Strategic Thrust Areas for Zarai Taraqiati Bank Limited (ZTBL)

**PI:** Dr. Syed Zahoor Hassan

**Sponsor:** Zarai Taraqiati Bank Limited (ZTBL)

**Funding Amount:** PKR 1,482,000

**Project Initiated in:** 2015

**Duration:** 2 Months

**Category:** Development Management

**Description:** This consultancy assignment took place in the following stages:

Moderation of the discussions, articulation of the key discussion points, decisions and their implications on the strategic plan of ZTBL, analysis of the overall situation will be

carried out to develop preliminary ideas about the possible discussion points during the strategy sessions and synthesis of the main ideas presented during the strategy sessions to identify revised or new strategic thrust areas and the related implementation implications. Consequently Review and comment on the plan formulated as a result of the strategic planning meetings and detailed analysis of the strategic plan and related implementation approach prepared by the top management of ZTBL in light of the ideas and decisions generated during the strategy sessions.



**Title:** Facilitation for Formulation of Group Vision, Mission and Values (V&V)

**PI:** Dr. Syed Zahoor Hassan

**Sponsor:** Packages Pvt (Ltd)

**Funding Amount:** PKR 1,456,000

**Project Initiated in:** 2016

**Duration:** 2 Months

**Category:** Law & Policy

**Description:** The overall objective of this initiative is to engage with the top management of Group, CEOs/senior management of all the group companies to prepare an overall group vision, mission and values documents. This project entails interaction with the companies based in Lahore and Karachi to develop an agreement on the overall

approach, and preparation of a rough draft that will be separately discussed and debated in each company with the help of the Group HR. The ultimate objective is to share the work done at each company, preparation of a second draft based on the work done at all companies in Lahore and Karachi, and identification of tasks for implementing the agreed V&V.

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**Profile:** Dr. Zaghun Umar is currently working as an Assistant Professor (Finance) at SDSB, Lahore University of Management Sciences, Pakistan. In addition, he is on the panel of HEC approved PhD supervisors and associated with Network for studies on Pension, Ageing and Retirement (NETSPAR), The Netherlands, as a research fellow. He received a PhD from School of Management (SOM), University of Groningen, The Netherlands and M.Sc. from University of Twente, The Netherlands, with specialization in "Financial Engineering and Management". His broad research interests include Financial Modeling, Empirical analysis, Project Finance, Corporate Finance, Infrastructure Financing, Public Finance, Public Private Partnership, Risk Management, Emerging markets and Strategic Asset Allocation.

#### Selected Publications:

- "Financing constraints on the size distribution of industrial firms: The Chinese experience" with Qigang Yuan, Yanping Zhao, Hui Shang, Wei Zhang. Applied Economics. March 2016
- "Stocks, Bonds, T-bills and Inflation Hedging: From Great Moderation to Great Recession." Journal of Economics and Business. (2015) 79, 1-37 with Laura Spierdijk
- "Are commodities a good hedge against inflation?" Journal of Investment Strategies. 3.2 – 2014 with Laura Spierdijk
- "How appreciable is the policy of appreciating local currency: The case of Pak Rupee" Journal of International Finance and Economics. (2015) 15, 67-80
- Umar, Z. (2017). The demand of energy from an optimal portfolio choice perspective. Economic Modelling



**Title:** Real Asset and Real returns: The Case of Islamic Vs Conventional Equities

**PI:** Dr. Zaghun Umar

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 580,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Business & Innovation

**Description:** The objective of this project is to extend the existing literature by analysing the portfolio choice problem of an emerging market investor. In particular, the implication of return predictability on the long run and short run asset demand will be documented.

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**Profile:** Dr. Zehra Waheed is the coordinator of the B.Sc. Management Science Program at SDSB. Prior to SDSB, Zehra has worked at Heriot-Watt University in Scotland; in Corporate and Institutional Banking and Textile sector in Pakistan; and Retail Banking in the UK. Dr. Zehra's teaching experience spans undergraduate and postgraduate teaching in the areas of Construction Project Management, Facilities and Asset Management, Value and Risk Management and Construction Financial Management at Heriot-Watt University, Scotland. She has taught executive, undergraduate and postgraduate students at SDSB. Her primary teaching areas at SDSB and the Rausing Executive Development Centre (REDC) are Project Management and Public Procurement.

**Selected Publications:**

- Case Studies in Project, Program and Organizational Project Management Z Waheed, Facilities, 2016
- Capture and Reuse of Project Knowledge in Construction Z Waheed - Facilities, 2016
- Understanding Project Management: Skills and Insights for Successful Project Delivery Z Waheed, - Facilities, 2016



**Title:** Building Inclusive and Sustainable Urban Waste Management Systems in Large Urban Centres of the Developing World: A Case of the City of Lahore

**PI:** Dr. Zehra Waheed

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 675,000

**Project Initiated in:** 2015

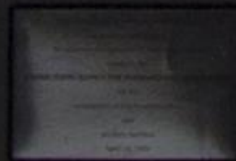
**Duration:** 12 Months

**Category:** Environment

**Description:** This study is intended to be an exploratory case study of the city's waste landscape: a lens through which the evolution of desired systems, governance processes and organizational development (in this case, the Lahore Waste

Management Company) will be viewed. It is also meant to be a vehicle of culturally interpreting the city's need for waste, its historical handling of its excrement and the various narratives that define the city's inhabitants', including the industry's, approach towards waste. Whilst the results will map current waste management practice in the city, the development of its infrastructure and identify future challenges of solid waste management in Lahore, they will also unveil the implications of current practice on the sustainable development of the second largest city of the country and the role that local industry can play in waste reduction and disposal.

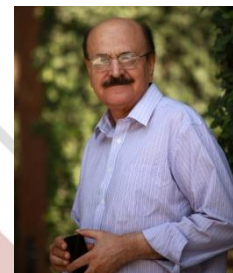
**MGSHSS**





# DEPARTMENT OF ECONOMICS

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**Profile:** Dr. Abid Aman Burki, a Professor of Economics at LUMS, has been the Director of the Centre for Management and Economic Research of LUMS from 2003 to 2010. Dr. Burki received his PhD in Economics from Kansas State University. Prior to his appointment at LUMS, he was on the economics faculty of Quaid-i-Azam University (1985-2002) and most recently as Professor and Head of the Economics Department. He serves on several high-level committees and taskforces of the government. His research interests lie in the areas of applied microeconomics; development economics; and production economics. He has also taught courses at Kansas State University and is a referee for numerous academic journals. He has authored or co-authored more than 70 articles, book chapters and professional reports and has supervised three PhD, 18 MPhil and 28 Master's theses. In recognition of his services he was conferred the President of Pakistan's academic distinction award Ijaz-i-Fazeelat in 2001.

#### Selected Publications:

- Burki, A. A., & Khan, M. A. (2011). Formal participation in a milk supply chain and technical inefficiency of smallholder dairy farms in Pakistan. *Pakistan Development Review*, 50(1), 63-81.
- Jung, H. M., Burki, A. A., & Khan, M. A. (2012). Supply of dairy products in developing countries. *Economics Bulletin*, 32(4), 3213-3223.
- Burki, A. A. (2015). Group-based BDS matching grants and farm-level outcomes in Pakistan. *Journal of Development Effectiveness*, 7(1), 43-63.
- Ahmad, S., & Burki, A. A. (2015). Banking deregulation and allocative efficiency in Pakistan. *Applied Economics*, 1-15.



**Title:** Access to Education and Social Cohesion in Conflict-Ridden Areas (SCR): End-line Study and Review of Outcome 4 Activities

**PI:** Dr. Abid Aman Burki

**Co-PI:** Dr. Syed Muhammad Hussain, Dr. Rashid Memon

**Sponsor:** United Nations International Children's Emergency Fund (UNICEF)

**Funding Amount:** PKR 8,415,700

**Project Initiated in:** 2015

**Duration:** 6 Months

**Category:** Economic Development

**Description:** UNICEF Pakistan launched the four-year SCR Programme in 2012 in conflict-affected districts within the provinces of Baluchistan, Punjab, Khyber

Pakhtunkhwa (KP), and Sindh. SCR aims to strengthen social cohesion and resilience through education in vulnerable contexts, including contexts at risk of or experiencing and recovering from instability. The programme builds on the theory of change that when delivered equitably and effectively, education can strengthen the resilience of children and communities, reduce risk of recruitment and indoctrination by armed actors, and limit the loss of human capital while sustaining longer-term opportunities for children and youth for civic engagement and entering the labour market. It aims to contribute towards individual and community capacity building which is being achieved through helping students, parents, teachers and other community members to cope with instability and promoting social cohesion among them.



**Title:** Boosting FDI Inflows to Pakistan: What Can Policy Makers Do?

**PI:** Dr. Abid Aman Burki

**Co-PI:** Dr. Syed Muhammad Hussain

**Sponsor:** Japan International Cooperation Agency (JICA)

**Funding Amount:** PKR 2,835,000

**Project Initiated in:** 2015

**Duration:** 6 Months

**Category:** Economic Development

**Description:** The aim of this Project is to conduct a rigorous quantitative exercise to find out the most effective methodology to attract FDIs in Pakistan and will attempt to identify the optimal balance between investment incentives and tax revenue. This

project will explore the relationship between changes in corporate tax structure, FDI inflows, and corporate tax revenues in Pakistan. In this process, the key factors that influence these practices and will identify the barriers to implement them.





**Title:** Impact Assessment of Microfinance in Pakistan  
**PI:** Dr. Abid Aman Burki  
**Co-PI:** Dr. Syed Muhammad Hussain, Dr. Rashid Memon , Dr. Ayaz Qureshi  
**Sponsor:** Pakistan Microfinance Network (PMN)  
**Funding Amount:** PKR 36,052,500  
**Project Initiated in:** 2015  
**Duration:** 36 Months  
**Category:** Economic Development

**Description:** Microfinance in Pakistan has come of age as a financial industry, with three million active microcredit clients, nearly six million savers and more than three million micro insurance policy holders. This study on microfinance seeks to estimate the

impact of microcredit on (1) consumption expenditure; (2) asset creation; (3) employment generation or number of jobs created; (4) schooling of children and (5) gender empowerment.



**Title:** Farmer's Capabilities, Productivity, and Profitability: A Case Study of Smallholders in Selected Agro Zones in Pakistan

**PI:** Dr. Abid Aman Burki  
**Co-PI:** Prof. Shabbir Ahmad - University of Queensland  
**Sponsor:** University of Queensland, Australian Centre for International Agricultural Research (ACIAR)  
**Funding Amount:** PKR 1,047,150  
**Project Initiated in:** 2015  
**Duration:** 6 Months  
**Category:** Economic Development

**Description:** The improvement in farmer's capabilities to enhance farm productivity is part of a national priority to raise the living standard of the population and reduce poverty. This research project aims to influence policy by identifying intervention strategies that policy makers could use to support small farmers and create wealth in the agricultural sector.



**Title:** Rapid Assessment/Research for Identification of Contributing Factors Related To Alarming Rates in Certain Districts of Punjab

**PI:** Dr. Abid Aman Burki  
**Sponsor:** UNICEF  
**Funding Amount:** PKR 4,283,750  
**Project Initiated in:** 2017  
**Duration:** 6 Months  
**Category:** Environment

**Description:** The fundamental objective of this project is to conduct assessment/research study for identification of multi-sectoral contributing factors related to high rates of wasting in certain districts of Punjab. Successful execution of

this project will have positive effect on the environment and waste management system.



**Title:** Out-of School Children (OOSC) Study 2014-2015

**PI:** Dr. Abid Aman Burki  
**Sponsor:** UNICEF  
**Funding Amount:** PKR 4,995,600  
**Project Initiated in:** 2016  
**Duration:** 4 Months  
**Category:** Education

**Description:** The key objective of this project is to generate an updated OOSC study based on the latest data sets, and the analyses and profiles developed by conducting regression analysis and other relevant statistical tests. This study will also revisit and update the barriers and bottlenecks analysis, policies, strategies and recommendations sections. This

project will contribute to the evidence-base and analytical work for the development of UNICEF's new Country Programme ( 2018-2022) as well as to further inform policies and strategies of the government and key stakeholders related to SDG4.

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**Profile:** Dr. Hadia Majid joined LUMS as an Assistant Professor in August 2012. A Fulbright Scholar, she holds a PhD in Development Economics from The Ohio State University, an MA in Economics from The Ohio State University, an MSc in Economics from the University of Warwick, and a B.Sc. in Economics from Lahore University of Management Sciences. Her research interests include aspects that relate to the economic characteristics of the household, including parental decision-making and human capital acquisition. Her previous work has looked at CCT evaluations at the intra-household level, factors that affect parental investment in child education, female bargaining power in rural Pakistan, and agricultural taxation in Pakistan. On-going research includes impact evaluation of climate change on health industry.

#### Selected Publications:

- Majid, H., & Mukhtar, N. (2015). Pakistan-India Trade: An Analysis of the Health Sector. In India-Pakistan Trade (pp. 273-309). Springer India
- Cluster Based Industrialization and its Effect on Firm Productivity in Pakistan MA Khan, H Majid, A Riaz, MS Awan
- Hassan, F. S., Javaid, K., & Majid, H. (2015). Pakistan-India bilateral trade in sports goods sector India-Pakistan Trade: Strengthening Economic Relations (pp. 245-272)



**Title:** Electricity and Rural Development: Insights from a Natural Experiment in Punjab, Pakistan

**PI:** Dr. Hadia Majid

**Co-PI:** Dr. Lauge Skovgaard Poulsen, University College London, Dr. Mahvish Shami, London School of Economics and Political Science

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 780,963

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Economic Development

**Description:** The paper starts from the fact that load-shedding has made many farmers who were previously dependent on groundwater for their water supply shift to much more expensive diesel-powered tube wells. The analysis in this paper will assess the implications of this increase in input costs for agricultural production caused by the electricity crisis. For the dependent variables, the paper will focus not only on agricultural output, as earlier studies, but also crop- choice, where it is expected that electricity shortages have reduced cultivation of water-intensive crops such as rice, sugarcane, and cotton - resulting in inefficient crop decisions.



**Title:** Study on Individual Indigenous Philanthropy in Pakistan

**PI:** Dr. Hadia Majid

**Co-PI:** Dr. Husnain Fateh Ahmed

**Sponsor:** Pakistan Centre for Philanthropy (PCP)

**Funding Amount:** PKR 1,500,000

**Project Initiated in:** 2015

**Duration:** 4 Months

**Category:** Development Management

**Description:** PCP works with a vision to increase the volume and effectiveness of indigenous philanthropy for social development in Pakistan. Instead of getting into direct service delivery mode or receiving grants, PCP seeks to promote altruistic efforts of national and international philanthropists by establishing effective linkages between the grant maker and non-profit organizations.



**Title:** Female Labour Supply and the Escape from Poverty: New Evidence from Household Data

**PI:** Dr. Hadia Majid

**Co-PI:** Professor Dr. Andy McKay -University of Sussex

**Sponsor:** Economic and Social Research Council (ESRC), University of Sussex

**Funding Amount:** PKR 6,048,384

**Project Initiated in:** 2016

**Duration:** 24 Months

**Category:** Economic Development

**Description:** The main objective of this study is to utilize household survey data from 4 African and Asian countries (Bangladesh, Ethiopia, Pakistan and Rwanda) to examine

on a comparable basis the evolving nature of female labour supply in low income countries over the past 2-3 decade. The purpose is to analyse how this has been associated with poverty reduction. This research is particularly interested in examining the transition of female work from a buffering role to a longer term income generating role. This research proposal will shed light on the institutional and policy factors that facilitate the transition.

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**Profile:** Dr. Husnain Fateh Ahmed is an Assistant Professor of Economics at LUMS. His research interests fall under the umbrella of microeconomic theory and industrial organisation. Ahmad has applied behavioural game theory to study the phenomenon of over bidding in since joining LUMS, his interests have expanded, and he has been conducting exploratory work the areas of maternal health and the interaction of identity and economic behaviour. The common theme to his research, is his interest in identifying and rationalising seemingly irrational behaviour.

#### Selected Publications:

- Endogenous price expectations as reference points in auctions HF Ahmad Journal of Economic Behaviour & Organization 112, 46-63 2015
- Ahmad, H. F. (2015). Endogenous price expectations as reference points in auctions. Journal of Economic Behaviour and Organization, 112, 46-63



**Title:** Urban Informal Livelihood Study  
**PI:** Dr. Husnain Fateh Ahmed  
**Sponsor:** HomeNet | Oxfam International, Pakistan  
**Funding Amount:** PKR 201,960  
**Project Initiated in:** 2015  
**Duration:** 2 Months  
**Category:** Development Management

**Description:** The overall purpose of conducting this study is to support Oxfam Pakistan and the Urban Institute in accessing available baseline information (both quantitative and qualitative) on the nature of challenges and conditions that informal wage workers in the domestic work sector face in urban Pakistan. The project is conducting the focus

groups interviews and analysing the response of members.



**Title:** Slices of Self – Identity and Context  
**PI:** Dr. Husnain Fateh Ahmed  
**Co-PI:** Dr. Rashid Memon  
**Sponsor:** LUMS Faculty Initiative Fund (FIF)  
**Funding Amount:** PKR 1,000,000  
**Project Initiated in:** 2016  
**Duration:** 12 Months  
**Category:** Education

**Description:** The main objective of this project is to conduct a lab-in-the-field experiment using the well-established “dictator game”. Subjects will be drawn from a population of workers in an ethnically diverse industrial town in Sindh or South Punjab.

Experiments are designed to study the effects of changing the context of an individual's natural identity on his behaviour towards his peers. This project will provide us with insights in to the political economic dynamics of fractionalised labour markets. Insights would allow us to also make policy recommendation on how to encourage cooperation and avoid conflict.



**Title:** Air Pollution Monitoring in Pakistan  
**PI:** Dr. Husnain Fateh Ahmad  
**Sponsor:** Williams College  
**Funding Amount:** PKR 262,062  
**Project Initiated in:** 2016  
**Duration:** 6 Months  
**Category:** Environment

**Description:** This project aims to provide real time monitoring of pollution levels to residents in various localities of the city. It seeks to study the gap between real and perceived levels, and make policy recommendations for low cost mitigation tailored to the Pakistani context.

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**Profile:** Dr. Imtiaz ul Haq is an Assistant Professor of Economics at the Lahore University of Management Sciences. He completed his PhD in Finance from the Manchester Business School, University of Manchester (UK). He also holds an MSc in Finance from the Manchester Business School and a B.Sc. (Hons) in Economics from LUMS. His research interests are Corporate Finance, Financial Intermediaries, Private Equity Investments and Capital Markets. His doctoral research focused on investor behaviour in the mutual fund industry in the U.S. and U.K, particularly on investor fund-selection ability, investor behaviour over economic cycles and investor reactions to mutual fund name changes. More recently, Dr. Imtiaz has looked at herding in venture capital investments and their effect on economic productivity.

#### Selected Publications:

- Hussain, Z., Anwer, S., Hussain, F., & Haq, I. (2006). Economics of cotton production in Indus Basin: A price risk analysis. *Int. Res. J. Fin. Econ*, 6, 24-30
- Hussain, Z., Awan, H., Hussain, I., & Farhan, M. Imtiaz-ul-Haq (2006), Demand for money in Pakistan. *International Research Journal of Finance and Economics*, (5), 209-218



**Title:** Preferences for Islamic Mutual Funds: The Role of Altruism, Religiosity, and Risk Preferences

**PI:** Dr. Imtiaz ul Haq

**Co-PI:** Dr. Sheheryar Banuri

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 950,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Economic Development

**Description:** The primary objective of this research is to examine investor preferences for Islamic mutual funds. Previous studies find mixed results on the aggregate

performance of the Islamic fund industry, yet no study examines heterogeneity amongst investors at the individual level. This research project aims to do so by focusing on certain factors that influence the investment decision-making process: religiosity, altruism and risk preferences. Furthermore, it will also highlight the additional cost borne by Islamic investors participating in the market.

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**Profile:** Dr. Kashif Zaheer Malik is an Assistant Professor of Economics at LUMS. He is a Fulbright Scholar and has a Masters and PhD degree in Economics from Florida State University. His area of research ranges from empirical macroeconomics, theoretical macroeconomics and Industrial Organisation. Dr. Malik has conducted various quantitative researches in multiple areas: Trade, Industry and Microfinance. He has consulted for Barclays Bank and Coca-Cola Beverages Pakistan Limited and has also been involved with the International Growth Centre (IGC). He is currently working on a Randomised Evaluation of Micro-Venture Capital. The project aims to study the impact of introducing Sharia compliant micro financing in collaboration with Akhuwat. Dr. Kashif has recently concluded a project that measures the Economic Impact of Coca-Cola Beverages Pakistan Limited (CCBPL). The study employs input-output model and Social Accounting Matrix to measure income and employment effects of CCBPL on the economy. Previously, Kashif has conducted two research studies for IGC, one focusing on the industrial clusters in Punjab and the other focusing on the garment sector. Both projects involved extensive field work and data analysis. His research articles are published in Economic Modelling and Lahore Journal of Economics.

#### Selected Publications:

- Malik, K. Z., Ali, S. Z., & Khalid, A. M. (2014). Intangible capital in a real business cycle model. *Economic Modelling*, 39, 32-48
- Hussain, S. T., Khan, U., Malik, K. Z., & Faheem, A. (2012). Constraints faced by industry in Punjab, Pakistan (No. id: 5090)
- Malik, K. Z. (2011). Essays on Productivity, Labour Allocations and Intangible Capital. *Electronic Theses, Treatises and Dissertations*. Paper 5012



**Title:** Creating and Utilizing Comic Books to Bridge Knowledge Gaps in Child Health in Rural Okara, Punjab

**PI:** Dr. Kashif Zaheer Malik

**Co-PI:** Dr. Spenta Kaklia

**Sponsor:** Health and Nutrition Innovation Fund (HANIF) | Department for International Development (DFID)

**Funding Amount:** PKR 5,017,166

**Project Initiated in:** 2015

**Duration:** 10 Months

**Category:** Health

**Description:** The proposed project will address the four areas of childhood illness that

contribute to mortality in children under the age of 5 years in Pakistan. The under-five mortality rate in Pakistan is 87 per 1000 live births, one of the highest in the world. Dr. Zaheer's suggested innovation is to create comic books addressing the gaps in maternal knowledge in these four areas of children's health. The comics will be designed with graphics and wording that is culturally appropriate to a rural Punjabi setting. Printing half the comics with only graphics, and no written script will appeal to most of the women in the area, especially to those with limited reading ability. The overall goal of the project is to improve maternal knowledge, especially amongst women of child bearing age, addressing the main causes of childhood mortality in Pakistan amongst children less than five years of age.



**Title:** An Analysis of Economic and Social Impacts of Mechanization of Brick-Kiln in Punjab

**PI:** Dr. Kashif Zaheer Malik

**Co-PI:** Dr. Syed M. Hassan

**Sponsor:** The Global Fund to End Slavery

**Funding Amount:** PKR 1,392,858

**Project Initiated in:** 2015

**Duration:** 4 Months

**Category:** Economic Development

**Description:** The overall objective of this project is to assess the economic benefits and the economic and social impacts of targeted brick kiln mechanization in Punjab. In

addition, one of the objectives of the study is to investigate the impact of targeted mechanization on the bonded labor. Furthermore, the study will also compare economic structure and labor arrangements of representative, traditionally operated brick-kiln in Punjab with partly-mechanized brick-kiln to explore a case for adopting new technologies.



**Title:** Equity-Based Financing for Microenterprise in Pakistan  
**PI:** Dr. Kashif Zaheer Malik  
**Co-PI:** Dr. Faisal Bari, Prof. Simon Quinn, Prof. Muhammad Meki  
**Sponsor:** LUMS Faculty Initiative Fund (FIF)  
**Funding Amount:** PKR 1,000,000  
**Project Initiated in:** 2015  
**Duration:** 12 Months  
**Category:** Business & Innovation

contract by local male and female entrepreneurs; and To test for heterogeneous effects by key characteristics of the participants namely their gender, the type of enterprise, their business and managerial skills, as well as behavioural characteristics (such as time and risk preferences).

**Description:** The main objectives of this research are to design a new equity-based microfinance product and to test its impact on growth of small enterprises, using a field experiment, To test the understanding of and demand for this new equity-based



**Title:** Equity-Based Contracts for Microenterprises  
**PI:** Dr. Kashif Zaheer Malik  
**Co-PI:** Dr. Faisal Bari  
**Sponsor:** University of Oxford, Innovations for Poverty Action  
**Funding Amount:** PKR 4,264,032  
**Project Initiated in:** 2016  
**Duration:** 30 Months  
**Category:** Business & Innovation

business through the purchase of a fixed asset. Furthermore, the main objective of this project is to plan the design of the field experiment and to finalise the microfinance contract structure for the product offered to clients.

**Description:** Under this research project, Dr. Faisal is responsible to work with a microfinance institution to identify 900 entrepreneurs who have previously completed at least one loan cycle with Akhuwat and expressed an interest in expanding their

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**Profile:** Mr. Mohammad Usman Khan started his professional career in banking and investment consulting in London, UK. In the UK, he advised large institutional clients on financial matters including financial strategy, asset allocation, manager selection and corporate governance. After spending 6 years in investment industry in the UK, he moved to Pakistan where he joined Lahore University of Management Sciences (LUMS) as a faculty in the Economics Department. He has been lecturing at LUMS since 2006 and has headed the Development Policy Research Centre (DPRC) at LUMS for two years. He won research studies over US\$1,000,000 in the inception stage of the centre. His work in Bangladesh comprised of trade analysis within the SAARC region while his work in Nigeria involved working with the State Government of Kano to design a development strategy aiming improvement in key sector value chains mainly agriculture and enhance the role of the private sector. He has also worked with Indian Council for Research and International Economic Relations (ICRIER) on normalising Pakistan India trade. Mr. Khan's research interests include policy and strategy in development sector.

#### Selected Publications:

- Taneja, N., Khan, M. U., Dayal, I., & Bimal, S. (2017). India–Pakistan: Second Trade Perception Survey. In India-Pakistan Trade Normalisation (pp. 271-311). Springer Singapore



**Title:** Punjab Economic Report (2014-15): A Comprehensive Profile on Socioeconomic Development

**PI:** Mr. Mohammad Usman Khan

**Co-PI:** Dr. Abid Aman Burki

**Sponsor:** UN Women

**Funding Amount:** PKR 8,100,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Economic Development

**Description:** This project is divided into key chapters covering overall economy, its performance and reflection on various strata of society and providing a compendium

of economic profiling of the Punjab; socio economic and poverty profiling; sectoral profiling, issues and key public sector programmes; public sector financial management issues, policies and reforms; mega projects and their assessment and a host of policy options.



**Title:** Punjab Economic Report: 2016 - The Punjab's Socio Economic Profile

**PI:** Mr. Mohammad Usman Khan

**Co-PI:** Dr. S.M. Turab Hussain , Dr. Mushtaq A. Khan

**Sponsor:** Punjab Economic Research Institute (PERI)

**Funding Amount:** PKR 17,240,268

**Project Initiated in:** 2016

**Duration:** 5 Months

**Category:** Economic Development

**Description:** Punjab is the largest province of Pakistan holding more than half of the population of the country. Due to largest population size, Punjab significantly influences most of the social development indicators of the country. Punjab Economic

Report 2016 will provide an analytical snapshot of socio-economic status of the province with some insight of the future prospects. This report will be a basic guiding document for government departments, public sector institutions, development partners, civil society organizations and the private sector contributors for development.





**Title:** Drafting Evaluation Policy Punjab in coordination with Directorate of Monitoring and Evaluation, Planning and Development Department and in consultation with all Government departments engaged in Annual Development Program (ADP) implementation

**PI:** Mr. Mohammad Usman Khan

**Co-PI:** Dr. Abid Aman Burki

**Sponsor:** UNICEF

**Funding Amount:** PKR 5,806,600

**Project Initiated in:** 2017

**Duration:** 5 Months

**Category:** Law & Policy

**Description:** The fundamental aim of this project is not only to produce a stand-alone evaluation policy document, but also to suggest a robust framework that will guide the evaluations work in Punjab. The Policy Document will be supported with a 5-year Long Frame that will detail the headline activities, targets, milestones and roles and responsibilities. Moreover, strong emphasis will be placed on the human and institutional capacity building for the understanding and conduct of high quality, equity focused evaluations as well as on results-based M&E, impact evaluation methodology and use of evidence for planning and policy making.

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**Profile:** Dr. Rashid's work focuses on the causes and consequences of ethnic and gender inequality in economic outcomes. He is also interested in the economic history of the Indian sub-continent with a particular focus on land tenure arrangements and peasant rebellions.

**Selected Publications:**

- Majid, H., & Memon, R. (2016). Group inequality and regional development: Evidence from Pakistan: Evidence from Pakistan (No. 151). World Institute for Development Economic Research (UNU-WIDER)
- Majid, H., & Memon, R. (2016). Group inequality and regional development



**Title:** UNU-WIDER Project on Disadvantaged Groups and Social Mobility

**PI:** Dr. Rashid Memon

**Co-PI:** Dr. Hadia Majid

**Sponsor:** United Nations University (UNU)

**Funding Amount:** PKR 627,930

**Project Initiated in:** 2015

**Duration:** 8 Months

**Category:** Behavioural Studies

**Description:** This research initiative, supported under UNU-WIDER's 2014-2018 research programme, addresses the measurement of horizontal inequalities in developin countries. It focuses on inequalities among ethnic, racial, religious, and

communal groups. This work is an integral part of a larger research effort on the politics of group-based inequalities, which considers causes, correlates, and possibilities for change. The project aims to build a comprehensive picture of variation in such group-based inequalities across countries at the national level, as well sub-nationally and diachronically for a selected set of developing countries.



**Title:** Stereotype Bias, Discrimination, and Performance

**PI:** Dr. Rashid Memon

**Co-PI:** Dr. Sheheryar Banuri

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 990,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Behavioural Studies

**Description:** This project aims to investigate the relationship between stereotype bias and discrimination within organizations. More specifically, the purpose is to uncover the mechanism which explains the persistence of gender discrimination in light of

contemporary policies designed to combat it. This project measures the impact of stereotype bias on (a) workers' willingness to cooperate with team members of the disadvantaged group and (b) the willingness of managers to promote members of the disadvantaged group.



**DEPARTMENT OF HUMANITIES AND  
SOCIAL SCIENCES**

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**Profile:** Dr. Ali Khan is an Associate Professor of Anthropology and Department Chair at the Department of Humanities & Social Sciences at LUMS. He has an MPhil and a PhD in Social Anthropology from the University of Cambridge in England. Dr. Khan's research interests vary from labour issues, particularly child and bonded labour to popular culture in Pakistan focusing mainly on cinema and sports. Ali Khan's book 'Representing Children: Power, Policy and the Discourse on Child Labour in the Football Manufacturing Industry of Pakistan' was published in October 2007 by Oxford University Press. He is also the General Editor for a series of books on Sociology and Anthropology in Pakistan.

**Selected Publications:**

- Khan, A. (2014). Pakistani Film Poster Art. Bioscope: South Asian Screen Studies, 5(2), 183-190
- Khan, A. Discourses on Childhood: Policy-making with regard to Child Labour in the Context of Competing Cultural and Economic Perceptions in History and Anthropology. 21(2), Taylor and Francis
- Khan, A. (2010). Peshgi without bondage: Reconsidering the links between debt and bonded labour. Cultural Dynamics, 22(3), 247-266



**Title:** Cricket in the Age of Late Capitalism: an Inter-disciplinary Perspective from the Social Sciences

**PI:** Dr. Ali Khan

**Co-PI:** Dr. Ali Nobil Ahmad

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Education

**Description:** This project proposes to study, research and analyze cricket as a social, political, cultural and commercial phenomenon in Pakistan and beyond. Although the

project focuses on cricket in Pakistan, it studies our national game in comparative and transnational perspective – that is, in relation to connections and contrasts with neighbouring countries and societies. The project's projected output includes academic articles and chapters in peer reviewed journals; an edited book, and a short documentary. The project will contribute to the establishment of an inter-disciplinary course of academic study at the department of Humanities and Social Sciences.

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**Profile:** Dr. Ali Raza is an Assistant Professor of Economics at LUMS. He obtained a DPhil in Modern South Asian History from St. Antony's College, University of Oxford, England. His Thesis was based on Interrogating Provincial Politics: The Leftist Movement in Punjab. Prior to that, he graduated with a distinction in Masters in African/Asian History from the School of Oriental and African Studies, University of London, England and Bachelors of Science (Honours) with a major in Computer Science; minor in Social Sciences from Lahore University of Management Sciences. Prior to joining LUMS, he worked as a postdoctoral researcher at the Zentrum Moderner Orient in Berlin. His research interests include the histories of leftist internationalism and fascism in South Asia. He teaches courses related to colonialism, decolonization, and modern South Asia.

#### Selected Publications:

- Raza, A., & Roy, F. (2015). Paramilitary Organisations in Interwar India. *South Asia: Journal of South Asian Studies*, 38(4), 671-689
- 'Separating the Wheat from the Chaff: Meerut and the Creation of Official Communism in India.' *Comparative Studies of South Asia, Africa, and the Middle East* (December 2014)
- 'An Unfulfilled Dream: The Left in Pakistan ca. 1917-50,' *South Asian History and Culture*, Vol.4 No. 4 (October 2013)
- 'Looking towards Moscow: The Ghadar Party's Engagement with Communism,' in J.S. Grewal, Harish K. Puri and Indu Banga (eds.), *Ghadar Movement: Background, Ideology, Action and Legacies* (University of Punjab Press, June 2013)



**Title:** Bards, Minstrels, and Outcastes: Oral Narratives and Subordinate Histories

**PI:** Dr. Ali Raza

**Co-PI:** Prof. Ishtiaq Ahmed

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Education

**Description:** This project is an attempt in archiving the narratives of subordinate and marginalised groups who have, by and large, been neglected in dominant historiography. The eventual aim is to establish a repository of digitised archival

materials at LUMS. Aside from being an invaluable resource to researchers, this archive will also be an important first step in working towards a 'people's history' of Pakistan, the historiography of which has largely tended to privilege the narratives of elite groups.



**Title:** LUMS Digital Library: Digitizing Partition Testimonies

**PI:** Dr. Ali Raza

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 840,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Technology

**Description:** The fundamental objective of this project is to transcribe and digitize partition interviews collected by Professor Ishtiaq Ahmed during the course of his research on the Partition of Punjab. The ultimate objective is to launch an online portal for these testimonies by next year in time for the 70<sup>th</sup> anniversary of Partition. This will

also be the first initiative of LUMS in digital archives and the digital humanities in general.

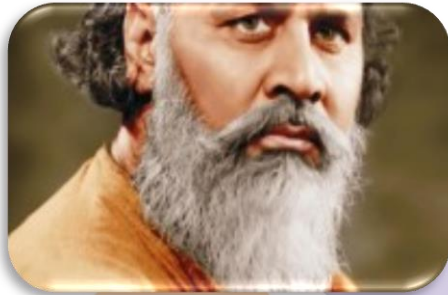
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**Profile:** Dr. Ali Usman Qasmi is an Assistant Professor (History) at MGSNSS since January 2012. He received his PhD from the South Asia Institute of Heidelberg University in 2009. Before joining LUMS, he was a Newton Fellow for Post-Doctoral research at Royal Holloway College, University of London. He has published extensively in reputed academic journals such as *Modern Asian Studies*, *The Muslim World* and *The Oxford Journal of Islamic Studies*.

#### Selected Publications:

- Jones, J., & Qasmi, A. U. (Eds.). (2015). *The Shi'a in Modern South Asia: Religion, History and Politics*. Cambridge University Press
- Qasmi, A. U. (2015). *The Ahmadis and the Politics of Religious Exclusion in Pakistan*. Anthem Press
- Ansari, S., Jones, J., & Qasmi, A. U. (2014). Special issue *isna 'ashari and isma'ili shi'ism: From south Asia to the Indian Ocean*. *Journal of the Royal Asiatic Society*, 24(3), 351
- Qasmi, A. U. (2017). Identity formation through national calendar: holidays and commemorations in Pakistan. *Nations and Nationalism*



**Title:** Rhetoric and Politics: The Life and Ideas of Sayyid Ata Ullah Shah Bukhari (1892-1961)

**PI:** Dr. Ali Usman Qasmi

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 800,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Arts & Heritage

**Description:** The proposed project is aimed at producing a well-researched biography of Sayyid Ata Ullah Shah Bukhari (1892-1961) which will also discuss the ideology of *Majlis-i-Ahrar*. This project seeks to fill the gap in the academic literature on colonial

Punjab's history. The main objective is to trace the colonial origins of sectarian mobilizations among the Muslims of South Asia and its continuities/transformations during the postcolonial period. This project is discussing the politics and history of British Punjab during the interwar period using the prism of Bukhari's life story.

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**Profile:** Dr. Anushay received her PhD from the School of Oriental and African Studies, University of London in 2013. She received the Bachelor of Science in 2008 from Lahore University of Management Sciences (LUMS) and complete her Masters with a distinction in 2009 from School of Oriental and African Studies, University of London. Since 2013, she is serving LUMS as an Assistant Professor. Her areas of interest include Histories of Work, Violence and Conflict in the Post-colonial state in South Asia and Pakistan Studies.

#### Recent Publications:

- Alternative Politics And Dominant Narratives: Communists And The Pakistani State In The 1950s, South Asian History And Culture,( 4:4): 520-537
- 'Nationalist Articulations in Pakistan and Bangladesh, 1947 – 1971,' Brown Bag Series, Department of Economics, Lahore University of Management Sciences (2014)
- Malik, A. (2015). From Subjects to Citizens: Society and Everyday State in India and Pakistan, 1947-1970



**Title:** The Many Stories of Youhanabad's Christian Minorities

**PI:** Dr. Anushay Malik

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 960,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Behavioural Studies

**Description:** In recent years, Christians in Pakistan have been given a lot of media attention that has focused on their status as a minority community. This project aims to explore how Christians have engaged with what it means to be a citizen within the Pakistani nation state. This project will focus on the residents of Youhanabad and will combine oral history and primary documents gathered from case law,

newspapers, the records of Churches and Christian Organisations (such as the Salvation Army and the Jesuit archives in Loyola Hall) that have worked in the area.

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**Profile:** Dr. Furrukh Khan has been with LUMS since 2001. He has a PhD in Postcolonial Studies from University of Kent at Canterbury, where he taught for two years prior to coming to LUMS. He has also taught English as a Foreign Language in the UK during the summers. His research interests include the Partition of India, Postcolonial Literature, Shakespeare and Oral History. His publications have appeared among others in *Index on Censorship*, *AngloFiles* and *The International Journal of Punjab Studies* as well as a chapter in *The Novels of Bapsi Sidhwa* and in *Gender, Conflict and Migration*. He was hosted by The Center for the Study of Developing Societies in Delhi as the ASIA Fellow, funded by a grant from the Asian Scholarship Foundation in 2006. He was selected as the British Academy/ESRC Visiting Fellow from South Asia and the Middle East and affiliated with University of Manchester in 2007. Dr. Furrukh has also directed *Stories of the Broken Self*, a documentary on the Pakistani women's narratives of the 1947 Partition.

#### Selected Publications:

- Khan, F. A. (2006). Speaking violence: Pakistani women's narratives of partition. *Gender, conflict and migration*, 97-115
- Khan, F. A. (2006). Empowerment through Representation: Aurat Foundation's Initiative in Local Governance. *Managing NGOs in Developing Countries Vol. III: Gender Challenges*. Karachi: Oxford University Press, 33-53
- Khan, F. A. (1997). Of Victims and Villains: Representation of Muslims in Khushwant Singh's *Train to Pakistan* and Chaman Nahal's *Azadi*. *The International Journal of Punjab Studies*. 4(2), 181-200
- Khan, F. A. (1996). Crossing Imaginary Boundaries: Partition And Temporal Post-Colonial Identities in Bapsi Sidhwa's *Ice-Candy-Man*. 99, 21-33



**Title:** The Walton Refugee Camp Project

**PI:** Dr. Furrukh A. Khan

**Co-PI:** Dr. Anne Christine Hubbard

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 340,500

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Development Management

**Description:** The Walton Refugee Camp Project aims at studying, documenting and analysing the impact and legacy of the Walton Camp. It is done in active collaboration with the University of St. Andrews, UK. Walton Camp was set up in Lahore in 1947 to

cater for the refugees arriving from India. It became an extraordinarily important place, the lieu de passage and main entry point into Pakistan for hundreds of thousands of newcomers and hence the project aims to identify the key agencies concerned with immediate relief granting and to determine the lifespan of their activities in relation to the Camp. Moreover, it also seeks to identify the key agencies involved in facilitating and resettling the refugees and to analyse the refugees' itineraries to and from the Camp.



Dr. Nadhra Shahbaz Naeem Khan  
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**Profile:** Dr. Nadhra Khan's primary area of research and interest is 19th Century Sikh Art and Architectural Ornament in the Punjab, but she also focuses on Mughal Art and Architecture (16th to 18th century). Her work emphasizes the significance of the Sikh period as the last episode of century's old indigenous art and architectural tradition before annexation of the Punjab by the British in 1849 that changed, among other things, the visual culture of the Punjab forever. A research project that started with one Sikh funerary monument or samadhi built to honour Maharaja Ranjit Singh has led her to study almost all major monuments dateable to this period, including the Golden Temple Amritsar, Sikh period havelis and various other samadhis. Her current research includes the impact of Sikh architectural vocabulary on subsequent British Raj architecture in the Punjab and the deep impact of British art and craft education on traditional art and craft practices.

#### Recent Publications:

- "Posthumous Homage Paid to Maharaja Ranjit Singh," in Jamal: A Journal of Aesthetics, Vol. 1, No. 1 (2012): 65-74. Shahbaz Naeem Khan, Nadhra 2012
- "Carved Doors of the Gateway to Maharaja Ranjit Singh Samadhi" Published in Sikh Arts & Heritage, Sikh Arts Forum, August 4, 2011 Shahbaz Naeem Khan, Nadhra 2011
- Frescoes at Maharaja Ranjit Singh's Samadhi Shahbaz Naeem Khan, Nadhra MARG Vol. 61, No. 4 (June 2010): 72-85
- The Secular Sikh Maharaja and his Muslim Wife: Rani Gul Bahar Begum in Indian Painting: Themes, Histories, Interpretations (Essays in Honour of B. N. Goswamy), eds. Mahesh Sharma and Padma Kaimal (Ahmedabad: Mapin, 2013): 247-254. Shahbaz Naeem Khan, Nadhra, Ahmedabad: Mapin, 2013



**Title:** Documentation, Presentation and Promotion of Picture Wall, Lahore Fort

**PI:** Dr. Nadhra Shahbaz Naeem Khan

**Sponsor:** Aga Khan Cultural Service - Pakistan (AKCS-P)

**Funding Amount:** PKR 700,000

**Project Initiated in:** 2016

**Duration:** 2 Months

**Category:** Arts & Heritage

**Description:** The consultancy services shall meet the following requirements; Photographic documentation of the northern part of the picture wall not included in AKCSP's current documentation work, Inventorying of all panels and, if necessary, establishing a panel nomenclature system which will supplement AKTC identifiers of

each panel in its respective section of the picture wall. For this purpose, Dr. Nadhra will establish a Classification of decorative elements and themes assigning a title to each individual motif and theme Building up an archive of published and other data on the Picture Wall and translate any epigraphy on the picture wall and its associate architectural elements such as the Hati Pol gate, and of other relevant texts into English, relating them with other epigraphic material and historic references from the Lahore Fort and elsewhere.



**Title:** Digital Documentation of Lahore Fort

**PI:** Dr. Nadhra Shahbaz Naeem Khan

**Sponsor:** Aga Khan Cultural Service - Pakistan (AKCS-P)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2017

**Duration:** 5 Months

**Category:** Arts & Heritage

**Description:** The main objective of this project is the detailed iconographic analysis of the northern section of the PW creating an interpretive document containing the interpretation and analysis of iconography found on the monument. Relating them with other epigraphic material and historic references from the Lahore Fort and elsewhere

as well as describing possible symbolical, political, cultural or any other significance.

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**Profile:** Dr. Nida Kirmani completed her PhD in Sociology in 2007 from the University of Manchester. Since then, she has been working as a Research Fellow with the Religions and Development Research Programme at the University of Birmingham. Dr. Nida has been an Assistant Professor of Sociology at LUMS since January 2011.

**Recent Publications:**

- Kirmani, N. (2013). Treading a dangerous path? The use of Islam in women's rights advocacy Alternative Islamic Discourses and Religious Authority (pp. 179-198)
- Kirmani, N. (2013). Contentious encounters: A comparison of developments in the contemporary Indian and Pakistani women's movements' relationships with Islam. Religion, Gender, and the Public Sphere: 197-207
- Kirmani, N. (2015). Fear and the City. Journal of the Economic and Social History of the Orient, 58(5), 732-755
- Kirmani, N. (2015). Religion, gender and development in South Asia. [Book Chapter]. The Routledge Handbook of Religions and Global Development, 215-230
- Kirmani, N. (2017). "Resistance and its limits protesting urban violence in Lyari, Karachi." Economic and Political Weekly 52(7)



**Title:** Understanding the Causes and Consequences of Urban Conflict in Lyari, Karachi

**PI:** Dr. Nida Yasmeen Kirmani

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 605,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Behavioural Studies

**Description:** This project builds on previous research, which explores the multiple discourses of marginalization and insecurity narrated by Lyari's residents, focusing in particular on those neighbourhoods that are populated largely by Baloch communities. The research highlights the diverse ways in which this process of marginalisation is

framed, explained and experienced by residents depending on their age, class, and ethnic background. Furthermore, it places these narratives within the wider socio-political context of Karachi, where the fear of violence increasingly permeates all areas of the city.

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**Profile:** Dr. Rasul Bakhsh Rais is Professor of Political Science in the Department of Humanities and Social Sciences, LUMS, Lahore since 2002. He took time off from LUMS and served at the Institute of Strategic Studies, Islamabad from August 2013 to December 2014. Dr. Rais has PhD in Political Science from University of California, Santa Barbara. Before joining LUMS, he remained associated with the Quaid-i-Azam University, Islamabad for nearly 22 years as Professor/Director, Area Study Centre and prior to that as Associate Professor in the Department of International Relations. He was Quaid-i-Azam Distinguished Professor of Pakistan Studies at Columbia University, New York for 3 years, 1991-94. He took Fulbright fellowship at Wake Forest University, Winston-Salem, 1997-98, Social Science Research Fellowship at Harvard, 1989-90, Rockefeller Foundation fellowship in International Relations at the University of California, Berkeley, in 1985-85. He is author of *Recovering the Frontier State: War, Ethnicity and State in Afghanistan* (Lanham: Lexington Books, 2008), *War Without Winners: Afghanistan's Uncertain Transition after the Cold War* (Karachi: Oxford University Press, 1996), *Indian Ocean and the Superpowers: Economic, Political and Strategic Perspectives* (London: Croom Helm, 1986), editor of *State, Society and Democratic Change in Pakistan* (Karachi: Oxford University Press, 1997) and with Charles H. Kennedy, *Pakistan 1995* (Boulder: Westview Press, 1996). He has published widely in professional journals on political and security issues pertaining to South Asia, Indian Ocean and Afghanistan. His current research interests are: "Modernism, State and Challenge of Radical Islam in Pakistan".

#### Recent Publications:

- Rais, R. B. (2015). Pakistan's Strategic Culture and Deterrence Stability on the Subcontinent. *Deterrence Instability*, pp. 95
- Rais, R. B. (2011). Religious Extremism and Terrorism in Pakistan: Challenges for National Security. In *South Asia: Beyond the Global Financial Crisis* (pp. 117-139)



**Title:** HEC Distinguished National Professor Program

**PI:** Dr. Rasul Bakhsh Rais

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 1,200,000

**Project Initiated in:** 2015

**Duration:** 24 Months

**Category:** Education

**Description:** Dr. Rasul Bakhsh Rais has been selected as a Distinguished National Professor, a programme launched by The Higher Education Commission known as "HEC Distinguished National Professors" programme in order to use the services of outstanding senior Professors and Scientists in Universities and R&D Organisations

with the objective of acknowledging their services.



**Title:** Junior Fellowship in Peace and Conflict Studies

**PI:** Dr. Rasul Bakhsh Rais

**Sponsor:** United States Institute of Peace (USIP)

**Funding Amount:** PKR 4,310,188

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Education

**Description:** The aim of the fellowship is to groom and train young scholars in the field of Peace and Conflict Studies and promote innovative, empirical research and fresh approaches to the study of conflicts and peace building. The Department of Humanities and Social Sciences at LUMS will invite research proposals in the fields of new approaches to Peace and Conflict in Pakistan, Contemporary Conflicts in Pakistan, Peace Building and Conflict Resolution.

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**Profile:** Dr. Sadaf Ahmad completed her PhD in Cultural Anthropology from Syracuse University in the United States in 2006, and has Masters Degrees in Gender, Anthropology and Development from Goldsmiths College, the University of London (2001), and in Psychology, from the National Institute of Psychology, Quaid-e-Azam University (2000). Gender has been a cross cutting theme in all of her research to date - whether it has been exploring the extent to which university students believe in rape myths and understanding the awkward relationship development organizations have had with the issue of gender based violence in her M.A. dissertations, or understanding how its techniques of expansion and pedagogies of persuasion have allowed Al-Huda, an Islamic school for women established in Islamabad in the early 1990s, to turn into a social movement in her doctoral dissertation. Her book, *Transforming Faith*, is based on her doctoral research, and was published by the Syracuse University Press in the fall of 2009. Her edited book *Pakistani Women: Multiple Locations and Competing Narratives*, a collection of works done on women in Pakistan was published by the Oxford University Press in 2010. She spent a year teaching at the Hobart and William Smith Colleges in upstate New York in 2005-06, and covered courses such as Gender and Islam, Women and Fundamentalism, and Introduction to Islam, while the courses she has taught at LUMS include Introduction to Cultural Anthropology, Anthropology of Islam, Gender and Power, Food and Culture, and Qualitative Research Methods.

#### Recent Publications:

- Al-Huda and Women Religious Authority in Urban Pakistan. *The Muslim World*, Vol 103(3):363-74. Ahmad, Sadaf 2013
- Identity Matters, *Culture Wars: An Account of Al-Huda (re)-defining Identity and Reconfiguring Culture in Pakistan* Ahmad, Sadaf *Religion and Culture*, 9(1): 63-80. 2008
- Ahmad, S. (2013). Al-huda and women's religious authority in urban Pakistan. *Muslim World*, 103(3), 363-374
- Ahmad, S. (2016). Sexualised Objects and the Embodiment of Honour: Rape in Pakistani Films. *South Asia: Journal of South Asian Studies*, 1-15



**Title:** Pakistani Police Women-An Ethnography

**PI:** Dr. Sadaf Ahmad

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 691,500

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Behavioural Studies

**Description:** This ethnographic research project aims to use interviews and participant observation to understand women's experience of working in the police force and the meaning doing so has for them. More specifically, it aims to explore and understand the diverse ways in which women's experiences (e.g. working with colleagues, the

public) may be influenced by a combination of factors that may include gender, age, rank, geographical location, class, caste, ethnicity, etc. As such, it will situate and understand women's experiences as understood through direct observation and their personal narratives in the larger context of the socio-political structures and ideologies which permeate both their specific locality and the larger region. This research also aims to understand what impact working in an occupation that has been traditionally associated with men and 'manly' characteristics' (but which may also be associated with other themes) has had on police women along a range of axes that include but are not limited to their personal life, policing style, identity, etc.

Dr. Taimur Rahman  
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**Profile:** Dr. Taimur received his doctorate from School of Oriental and African Studies, University of London, United Kingdom in 2010. He completed his masters in international relations from University of Sussex, Brighton, and United Kingdom in 2002. Dr. Taimur Rahman has been teaching political science at LUMS since 2002. He is also the spokesperson for the band Laal and a grassroots political activist. His research interests include Political theory and philosophy, political economy and class, socio-political history and structures of Pakistan, Marxism and critical theory, and 20th century left politics.

#### Recent Publications:

- Rahman, T. (2016). Mazdoor Kissan Party. Economic and Political Weekly (EPW) , Sameeksha Trust Publications , pp. 22-24
- Rahman, T. (2015). Internet Youth and Education in Pakistan: An Appraisal and a Plan for the Future. National Human Development Report, 2015 , UNDP, Pakistan
- Rahman, T. (2016). An Unequal World. Big Questions of our Time: The World Speaks , Strategic Foresight Group , pp. 63
- Rahman, T. (2015) "The Democratic State and the Labour Movement" in Democratic Governance and Politics of the Left in South Asia, Aakar Books Delhi
- Rahman, T. (2015) "Review: The Army and Democracy: Military Politics in Pakistan. By Aqil Shah", Pacific Affairs, University of British Columbia, Vancouver



**Title:** Peer to Peer (P2P): Challenging Extremism

**PI:** Dr. Taimur Rahman

**Sponsor:** EdVenture Partners

**Funding Amount:** PKR 470,250

**Project Initiated in:** 2016

**Duration:** 8 Months

**Category:** Education

**Description:** The project was called PEACE which stood to promote Education and Counter Extremism. A team of students entered into a world-wide student competition to design a campaign that would be online as well as on the grassroots level to create tolerance amongst the members of their community. As part of PEACE campaign the

students of LUMS visited nearly 30 schools where they conducted various workshops and activities that encouraged religious and communal harmony amongst young people. They reported their activities on their online Facebook page. The campaign was a very big success and the Peer 2 Peer judges gave it an honourable mention amongst the various competitors from all over the world.

Dr. Tania Saeed  
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**Profile:** Dr. Saeed obtained her DPhil in Education from the University of Oxford, UK and MSc in Gender, Development and Globalization from the London School of Economics and Political Science in 2013 and 2006, respectively. She has worked as an Equity and Social Inclusion Advisor for DFID's Punjab Education Sector Programme (PESP)-II, focusing on planning interventions to improve access to quality education for out of school children belonging to the most marginalized communities in Punjab. She has also worked on education and intolerance as part of a University of Oxford and Centre on Religion and Geopolitics project, studying teacher attitude and biases in government schools in Lahore and on monitoring and evaluating teacher education policy in India (Madhya Pradesh, Uttar Pradesh and Bihar). Dr. Saeed completed her Bachelor's degree in Social Sciences from LUMS in 2005. She is an Associate Fellow at the Institute of Development and Economic Alternatives (IDEAS).

#### Recent Publications:

- Saeed T. and Johnson D. (2016) intelligence, Global Terrorism and Higher Education: neutralising threats or alienating allies? British Journal of Educational Studies, 64(1), pp.37-51
- Brown. K.E. and Saeed T. (2015) Radicalisation and Counter-Radicalisation at British Universities: Encounters and Alternatives. Ethnic and Racial Studies, Vol. 38 (11), pp. 1952-68
- Niethammer, C , Saeed T., Mohamed S.s and Charafi Y. (2007) Women Entrepreneurs and Access to Finance in Pakistan, Women's Policy Journal of Harvard, John F. Kennedy School of Government, Volume 4,pp. 1-12



**Title:** Higher Education and the Neo liberal economy: Examining Education Quality and the University Ranking Framework in Pakistan

**PI:** Dr. Tania Saeed

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 661,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Education

**Description:** The proposed study investigates the link between higher education ranking systems and neoliberal market forces in Pakistan by focusing on the Higher Education Commission's (HEC) university ranking. The aim of the study is to understand

how the ranking system works in Pakistan and to propose recommendations to either improve the ranking system or provide an alternative. This research study examines the HEC's university ranking system and its impact on 5 universities in Pakistan. The HEC's ranking system aims to improve quality, while competing in the international market in order to encourage Pakistani universities to become "world class."



# SBASSE

SCHOOL OF SCIENCE & ENGINEERING

The background features a central arrangement of overlapping diamonds in various colors: a large purple diamond in the center, a smaller red diamond above it, an orange diamond to the left, a light blue diamond to the right, and a pinkish-purple diamond below it. Light gray lines form a network of interconnected zig-zag patterns across the page.

# DEPARTMENT OF BIOLOGY



Dr. Ahmed Jawaad Afzal  
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**Profile:** Dr. Ahmed Jawaad is an Associate Professor at the Department of Biology in SBASSE. Plants employ multiple layers of immunity to guard against infection. The first layer responds to structures within conserved microbial molecules. The second layer responds to effector proteins, which are pathogen-encoded virulence factors. These two “branches” of the immune system synergize to provide robust host defence that halts most infections. His current work focuses on understanding the role of the multifunctional protein RIN4, which regulates both branches of the plant immune system. His current work focuses on understanding the role of the multifunctional protein RIN4, which regulates both branches of the plant immune system.

#### Selected Publications:

- Ahmad, M., Chaudhary, S. U., Afzal, A. J., & Tariq, M. (2015). Starvation-Induced Dietary Behaviour in *Drosophila melanogaster* Larvae and Adults. *Scientific Reports*
- Iqbal, M. J., Majeed, M., Humayun, M., Lightfoot, D. A., & Afzal, A. J. (2016). Proteomic Profiling and the Predicted Interactome of Host Proteins in Compatible and Incompatible Interactions between Soybean and *Fusarium virguliforme*. *Applied Biochemistry and Biotechnology*, 1-18
- Espada, J. (2016). Current methods to unravel ROS biology. *Methods (San Diego, Calif.)*, 109,1
- Afzal, A. J., Kim, J. H., & Mackey, D. (2013). The role of NOI-domain containing proteins in plant immune signalling. *BMC genomics*, 14(1), 327



**Title:** Identifying the Role of the Rin4- Noi Domains in Plant Disease Resistance and Developmental Regulation

**PI:** Dr. Ahmed Jawaad Afzal

**Co-PI:** Dr. Jibrán Tahir

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Sciences

**Description:** In this project, the aim is to understand the evolution of the interaction of a classical component of plant immune system RIN4. With multifunctional properties,

RIN4 regulates immunity at multiple levels and this is surprisingly achieved by the two domains, referred as NOI (Nitrate induced), anchored at both the N and C terminus of this protein. Dr. Jawaad is interested to explore how these domains are regulating molecular interactions with other seemingly crucial components of the bi-layer immune system and hence trying to understand the molecular switches that regulate plant immune responses.



**Title:** Understanding Elicitor Specificity of RPM1 and RPS2 by the Generation of Protein Chimeras

**PI:** Dr. Ahmed Jawaad Afzal

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Sciences

**Description:** The main objective of this project is to investigate the underlying molecular mechanisms by which RPM1 and RPS2 are able to specifically respond to AvrRpm1 and AvrRpt2, two distinct elicitors introduced by *Pseudomonas syringae*. This study

may also lead to the development of pathogen-resistant varieties of agronomically important crops via the incorporation of durable “R genes” that may eventually reduce plant morbidity, yield loss, food shortage and malnutrition. The long-term objective is to enhance the understanding of disease resistance (R) proteins in plants so that the functioning of the plant immune system can be better understood.

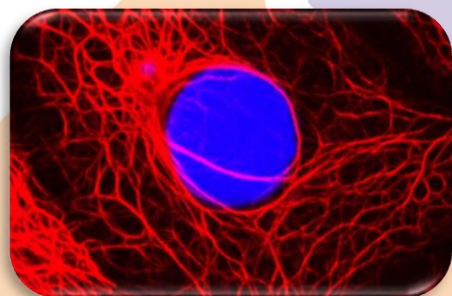
Dr. Amir Faisal  
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**Profile:** Dr. Amir Faisal received his PhD in Cell Biology from Friedrich Miescher Institute for Biomedical Research/University of Basel, Switzerland in 2004. During his PhD he identified novel roles for Shc protein, an important adaptor downstream of tyrosine kinases, in insulin signalling and cytoskeletal reorganization. He received his first postdoctoral training (2004-2008) in Protein Phosphorylation Laboratory at London Research Institute where he discovered that another adaptor protein, MyD88, couples Protein Kinase C epsilon to Toll like receptors during innate immunity. From 2008 to 2014, he worked at Cancer Therapeutics Unit of Institute of Cancer Research in Sutton first as postdoctoral fellow and later as senior scientist. He played an important role in progression of several drug discovery projects, one of which resulted in discovery of a pre-clinical development candidate that will undergo phase I clinical trials in 2016. After joining LUMS in August 2014, he has been establishing a cancer therapeutics lab at SBASSE.

#### Selected Publications:

- Bavetsias, Vassilios, Faisal, Amir, McIntyre, Patrick J. Atrash, Butrus, Kosmopoulou, Magda N. 7-(Pyrazol-4-yl)-3H-imidazo[4,5-b]pyridine-based derivatives for kinase inhibition: Co-crystallisation studies with Aurora-A reveal distinct differences in the orientation of the pyrazole N1-substituent: *Bioorganic and Medicinal Chemistry Letters*, 10.1016/j.bmcl.2015.08.003
- Innocenti, P., Woodward, H. L., Solanki, S., Naud, S., Westwood, I. M., Cronin, N. & Faisal, A. (2016). Rapid Discovery of Pyrido [3, 4-d] pyrimidine Inhibitors of Monopolar Spindle Kinase 1 (MPS1) Using a Structure-Based Hybridization Approach. *Journal of medicinal chemistry*, 59(8), 3671-3688
- Riaz, M., Bilal, A., Ali, M. S., Fatima, I., Faisal, A., Sherkheli, M. A., & Asghar, A. (2016). Natural products from *Cuscuta reflexa* Roxb. with anti-proliferation activities in HCT116 colorectal cell lines. *Natural Product Research*, 1-5
- Faisal, A., Mak, G. W., Gurden, M. D., Xavier, C. P., Anderhub, S. J., Innocenti, P., ... & Brandon, A. K. D. H. (2017). Characterisation of CCT271850, a selective, oral and potent MPS1 inhibitor, used to directly measure in vivo MPS1 inhibition vs therapeutic efficacy. *British journal of cancer*



**Title:** Development of Pten Knockout Isogenic Breast Cancer Cell Lines to Study the Mechanism of Resistance to PI3 Kinase/Akt Inhibitors

**PI:** Dr. Amir Faisal

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

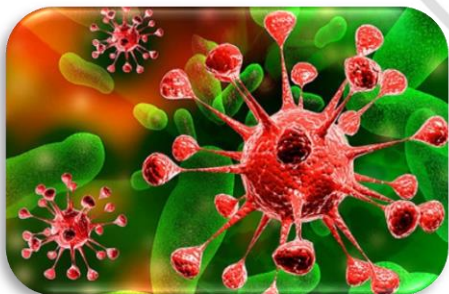
**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Health

**Description:** The research focuses on studying the role of PTEN tumour suppressor in sensitivity of isogenic breast cancer cell lines towards PI3 kinase pathway inhibitors and in development of resistance in these cell lines to the inhibitors. The aim is to

mimic tumour heterogeneity by creating an in vitro cell line based system, where we will knockout PTEN tumour suppressor in breast cancer cell lines, MDA-MB-361 and MDA-MB-231 to generate two isogenic sets of cell lines with and without PTEN protein expression. This will allow to study the sensitivity of these cell lines to different inhibitors of PI3 Kinase pathway and to develop resistance against these inhibitors in the presence or absence of PTEN. Understanding the mechanism of any differential resistance of PTEN isogenic cell lines to these inhibitors will identify specific role PTEN plays in development of resistance. The findings will help devise better treatment strategies for such tumours.



**Title:** Cellular Characterization of Aurora - A Kinase Inhibitors for Cancer Therapeutics and Identification of Resistance Mechanisms

**PI:** Dr. Amir Faisal

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

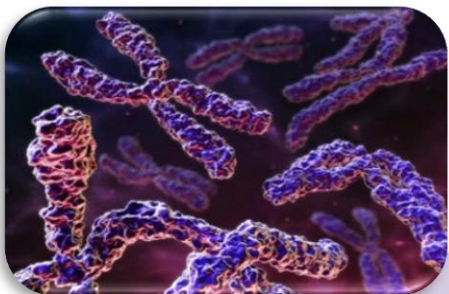
**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Sciences

**Description:** The project aims to characterize Aurora A kinase selective inhibitors (co-discovered by PI at the Institute of Cancer Research, UK) in cancer cell lines. This will include studying the effect of inhibitors on activation of Aurora A kinase and its

substrate(s) in the cells and consequences of this inhibition in the form of Aurora A specific phenotypes. This research project will also screen a number of cancer cell lines for their "sensitivity" towards these inhibitors in order to determine whether these inhibitors can potentially kill or stop the growth of cancer cell lines derived from different tissues.



**Title:** Pre-Clinical Identification and Evaluation of Novel Therapeutic Strategies for Targeting Oral Cancer in Pakistan; Molecular Profiling Based Personalized Approach

**PI:** Dr. Amir Faisal

**Co-PI:** Dr. Saira Saleem - Shaukat Khanum Memorial Cancer Hospital and Research Centre

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 4,599,998

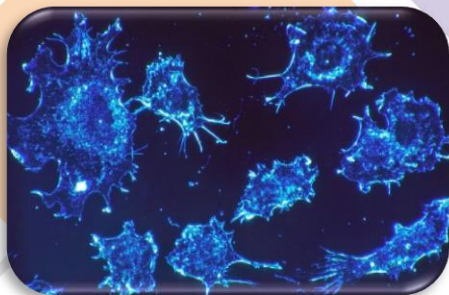
**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** The purpose of proposed study is to characterize oral cancers from the

local population and investigate various targeted drugs (alone or in combination) for their treatment for the first time in Pakistan. Successful completion of the project will propose new therapeutic strategies to be tested in the clinic for treatment of oral cancer in Pakistan. This project will lead to Identification of new targeted drugs that show in vitro efficacy in oral cancer cells of South Asian and Pakistani origin. The new therapeutic strategies identified in this study could be further evaluated by clinicians for treatment of advanced metastatic oral cancers. If successful in clinic, these would have impact on the patient survival and their quality of life.



**Title:** Discovery and Characterization of In-House Microtubule Targeting Compounds as Potent Anti-Cancer Agents that can Overcome Multidrug Resistance

**PI:** Dr. Amir Faisal

**Co-PI:** Dr. Rahman Shah Zaib Saleem

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Sciences

**Description:** Cancer is caused by the uncontrolled division and spread of abnormal cells; it is responsible for over 8 million deaths worldwide each year making it the 2<sup>nd</sup>

leading cause of deaths after coronary heart disease. As a result of collaborative effort between chemistry and biology departments at LUMS, a series of novel compounds (synthesized at LUMS) that potently inhibit proliferation of cancer cells have been identified. The main objective of this project is to validate microtubules as their targets in vitro and in cells, and further characterize them in various cancer cell lines including multidrug resistant (MDR) ovarian cell line. The proposed project would, therefore, result in discovery and characterization of a novel microtubule-targeting drug that can overcome resistance to chemotherapy.

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**Profile:** Dr. Aziz Mithani started as a computer scientist and received his Masters in Computer Sciences from FAST-NU, Karachi before going to the University of Cambridge, UK where he did MPhil in Computational Biology. In summer 2006, he went to Harvard Medical School for a research internship in Paulsson Lab at Department of Systems Biology. Dr. Mithani received his DPhil in Statistics (Computational Biology) from University of Oxford, UK in November 2009 under the supervision of Prof. Jotun Hein and Dr. Gail Preston. His dissertation focused on modelling the evolution and analysis of the properties of metabolic networks. Subsequently, Dr. Mithani joined Harberd Lab at the Department of Plant Sciences, University of Oxford, UK as a postdoctoral research associate where he worked for two years on the evolution of bread wheat. His research interests include the application of computational and mathematical methods in the area of modern biology. Specifically, he is interested in the development of computational tools and techniques to model and analyse biological systems and to investigate how different organisms evolve over time.

#### Selected Publications:

- Belfield, E. J., Brown, C., Gan, X., Jiang, C., Baban, D., Mithani, A., Harberd, N. P. (2014). Microarray-based optimization to detect genomic deletion mutations. *Genomics Data*, 2, 53-54
- Jiang, C., Mithani, A., Belfield, E. J., Mott, R., Hurst, L. D., & Harberd, N. P. (2014). Environmentally responsive genome-wide accumulation of de novo *Arabidopsis thaliana* mutations and epimutations. *Genome Research*, 24(11), 1821-1829
- Belfield, E. J., Brown, C., Gan, X., Jiang, C., Baban, D., Mithani, A. Harberd, N. P. (2014). Microarray-based ultra-high resolution discovery of genomic deletion mutations. *BMC Genomics*, 15(1)
- Leach, L. J., Belfield, E. J., Jiang, C., Brown, C., Mithani, A., & Harberd, N. P. (2014). Patterns of homoeologous gene expression shown by RNA sequencing in hexaploid bread wheat. *BMC Genomics*, 15(1)
- Khan, A., Belfield, E. J., Harberd, N. P., & Mithani, A. (2016). HANDS2: accurate assignment of homoeallelic base-identity in allopolyploids despite missing data. *Scientific Reports*, 6
- Fones, H. N., McCurrach, H., Mithani, A., Smith, J. A. C., & Preston, G. M. (2016, May). Local adaptation is associated with zinc tolerance in *Pseudomonas* endophytes of the metal-hyperaccumulator plant *Noccaea caerulescens*. In *Proc. R. Soc. B* (Vol. 283, No. 1830, p. 20160648). The Royal Society



**Title:** Rahnuma: A Hypergraph Based Tool for Comparative and Evolutionary Analysis of Metabolic Networks

**PI:** Dr. Aziz Mithani

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 2,971,600

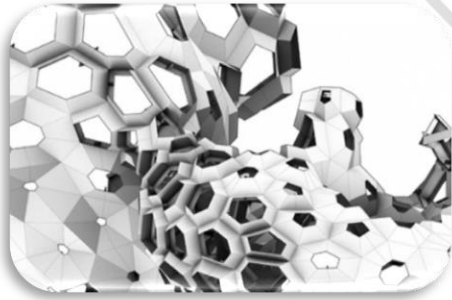
**Project Initiated in:** 2014

**Duration:** 36 Months

**Category:** Sciences

**Description:** Comparative and evolutionary analyses of metabolic networks have a wide range of applications, ranging from research into metabolic evolution through to practical applications in drug development, synthetic biology and biodegradation. This

project aims to develop a software tool called Rahnuma that will contain a variety of tools that can be used to study the evolution and function of metabolic networks. Rahnuma will provide a unique and powerful web-based tool for comparative and evolutionary analysis of metabolic networks, which can be used to address a wide variety of biological questions. This project will open doors for further research in comparative and evolutionary analyses of metabolic networks ranging from research into metabolic evolution through to practical applications in drug development, synthetic biology and biodegradation.



**Title:** Understanding the Genetic Architecture of Wheat Using Next-Generation Sequencing Analysis

**PI:** Dr. Aziz Mithani

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 2,116,000

**Project Initiated in:** 2015

**Duration:** 36 Months

**Category:** Sciences

**Description:** This project aims to use a multidisciplinary approach consisting of the latest genomic science including high-throughput sequencing analysis, comparative genomics and associated computational analyses to understand of the complex

genome architecture of wheat and to determine the precise nature and extent of the genetic variation that confers additional salt-tolerance in these wild relatives thus providing insights into the pressures of domestication on cultivated wheat during the last 10,000-15,000. Results obtained from this project will help in the long run in the development of strains of wheat that have increased resistance to salt stress through the incorporation of natural genetic variance into wheat lines.



**Title:** Genome-Wide Identification of Salt Tolerant Genes in Using High-Throughput Sequencing Data

**PI:** Dr. Aziz Mithani

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Agriculture

**Description:** The main objective of this project is to use a multidisciplinary approach consisting of the latest genomic science including high-throughput sequencing analysis, comparative genomics and associated computational and statistical analyses

study the differences in the expression of the genes relating to salt stress in bread wheat. Results obtained from this project will not only enhance understanding of the complex genome architecture of wheat but also provide the ability to relate, on a genome-wide basis, specific transcriptional variants to an important agronomic trait, namely salt tolerance, thus increasing the precision of crop-breeding solutions to address the challenge of global food security.

Dr. Muhammad Tariq  
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**Profile:** Dr. Muhammad Tariq received his PhD in Molecular Cell Biology from Friedrich Miescher Institute for Biomedical Research, Switzerland. During his PhD, he worked in Jerzy Paszkowski's lab specializing in epigenetic gene silencing in Arabidopsis. In 2003, he joined Renato Paro's lab as a postdoctoral fellow at Zentrum für Molekulare Biologie Heidelberg (ZMBH). He was awarded EMBO long term fellowship for his postdoctoral studies elucidating a link between molecular chaperones, in particular Hsp90 (Heat shock protein 90), and epigenetics in Drosophila. He joined ETH Zurich as an Oberassistent (Senior Researcher) in 2006 where he continued his work on Hsp90 and Epigenetics in Department of Biosystems Science and Engineering (D-BSSE), Basel.

#### Selected Publications:

- Ahmad, M., Chaudhary, S. U., Afzal, A. J., & Tariq, M. (2015). Starvation-Induced Dietary Behaviour in Drosophila melanogaster Larvae and Adults. Scientific Reports, 5
- Iqbal, A., Muhammad, I. F., Faraz, M., Tariq, M. S., & Banna, H. U. (2015, June). Economic analysis of a small hybrid power system. In Power Generation System and Renewable Energy Technologies (PGSRET), 2015(pp. 1-5). IEEE
- Siddiqi, S. A., Manzoor, F., Jamal, A., Tariq, M., Ahmad, R., Kamran, M., & Rehman, I. U. (2016). Mesenchymal stem cell (MSC) viability on PVA and PCL polymer coated hydroxyapatite scaffolds derived from cuttlefish. RSC Advances, 6(39), 32897-32904
- Shahzadi, L., Yar, M., Jamal, A., Siddiqi, S. A., Chaudhry, A. A., Zahid, S., ... & MacNeil, S. (2016). Triethyl orthoformate covalently cross-linked chitosan-(poly vinyl) alcohol based biodegradable scaffolds with heparin-binding ability for promoting neovascularisation. Journal of biomaterials applications, 0885328216650125



**Title:** Aberrant DNA Methylation as Signature for Breast Cancer Patients in Pakistani Population

**PI:** Dr. Muhammad Tariq

**Co-PI:** Dr. Sohail Asif Qureshi, Dr. Shafaat Rabani (Professor, Department of Medicine, Physiology and Oncology McGill University (Health Centre, Canada))

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

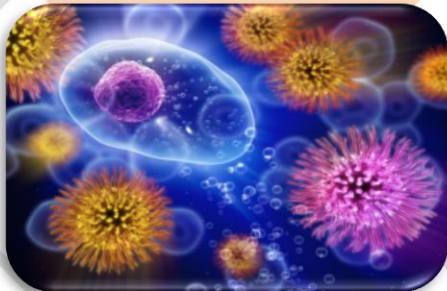
**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Sciences

**Description:** The goal of this project is to develop innovative, non-invasive blood based diagnostic markers that will allow early prediction and monitor prognosis with high accuracy and specificity. Dr. Tariq in this project has proposed that the coating of genes by chemical marks termed "DNA methylation" is disrupted in cancer which correlates with clinical factors. Due to the important role of immune system in cancer, the project is attempting to focus on mapping "DNA methylation" T cells rather than breast cancer cells. He aims to isolate T cells from blood of a prospective cohort of different stages of breast cancer patients.



**Title:** Reverse Genetics Approach to Link Epigenetic Cell Memory and Cell Signaling

**PI:** Dr. Muhammad Tariq

**Co-PI:** Dr. Aziz Mithani

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 9,659,998

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** The aim of this project is to develop a systematic approach to functionally evaluate all the candidates emerging from RNAi screens in the long run and construct a high confidence interaction network of genes affecting the PcG/TrxG mediated epigenetic cell memory. Such a network will predict and study the involvement of PcG/TrxG in different functional gene modules.

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**Profile:** Dr. Safee Ullah Chaudhary received his PhD in 2013 from the Department of Bio. & Brain Engineering, Korea Advanced Institute of Science and Technology (KAIST), South Korea. His research was focussed on the computational modelling of multiscale cancer systems biology. He took an agents-based (multi-agent) approach to model tumorigenesis as described in the Warburg Effect. His work also led to the development of Electronic Cancer System (ELECANS), which is a next-generation modelling platform for applications in cancer systems biology. In 2014, he joined the Department of Biology at LUMS where he is involved in the development of a GPU-based cancer modelling and simulation pipeline by leveraging the CUDA Toolkit. He is also keenly interested in investigating the oncological manifestations of the Warburg Effect during cell death.

#### Selected Publications:

- Ahmad, M., Chaudhary, S. U., Afzal, A. J., & Tariq, M. (2015). Starvation-Induced Dietary Behaviour in *Drosophila melanogaster* Larvae and Adults. *Scientific Reports*, 5
- Ahmad, F., Hussain, A., Chaudhary, S. U., Ahmad, I., & Ramay, S. M. (2016). A novel method for detection of voxels for decision making: An fMRI study. *International Journal of Imaging Systems and Technology*, 26(2), 163-167
- Hamera, S., Yan, Y., Song, X., Chaudhary, S. U., Murtaza, I., Su, L., & Fang, R. (2016). Expression of Cucumber mosaic virus suppressor 2b alters FWA methylation and its siRNA accumulation in *Arabidopsis thaliana*. *Biology Open*, 5(11), 1727-1734



**Title:** Design and Development of a Next-Generation Modelling and Simulation Platform for Cancer Systems Biology

**PI:** Dr. Safee Ullah Chaudhary

**Co-PI:** Dr. Sameer Ahmed

**Sponsor:** Ignite

**Funding Amount:** PKR 14,987,180

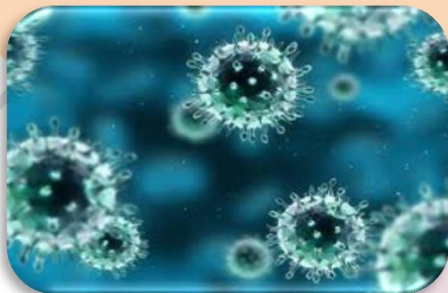
**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Technology

**Description:** The proposed project outlines the design and development of a next generation multiscale modelling platform for applications in cancer systems biology.

This modelling platform envisages a seamless integration of next generation sequencing and quantitation data from the wet labs and its onward usage for investigating the roles of known oncological factors. The proposed modelling platform will not only assist in the modelling of next generation cancer systems biology data, but will also significantly enhance the throughput of the model building and simulation processes.



**Title:** An Integrated Computational-Experimental Study Of Hepatitis-C Virus (Genotype 3a) Sequence Heterogeneity, Protein-Drug Interactions and Immune Responses

**PI:** Dr. Safee Ullah Chaudhary

**Co-PI:** Dr. Sohail Asif Qureshi

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 4,169,592

**Project Initiated in:** 2015

**Duration:** 24 Months

**Category:** Health

**Description:** This is an exploratory research project that aims to comprehensively study the NS3 serine protease from the HCV genotype-3a circulating in Pakistan from an

evolutionary, therapeutic as well as immunological stand point. The purpose of this project is to determine the degree of sequence variation within the NS3 region of HCV genotype-3a, identify hot and cold spots in it and study the pattern of NS3 evolution. The objective of this project is to understand the relationship between sequence heterogeneity of HCV 3a and its clinical implications by correlating NS3 sequence profiles with clinical background of patients.



**Title:** Design and Development of a Top-down Protein Sequence Search Engine for High Resolution Mass Spectra

**PI:** Dr. Safee Ullah Chaudhary

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 5,662,600

**Project Initiated in:** 2016

**Duration:** 36 Months

**Category:** Technology

**Description:** In this project, the objective is to develop a next generation protein sequence search engine and the associated algorithms that can optimally leverage this high resolution spectral data and act as a platform to seed and stir computational

top-down (whole protein) and bottom-up (peptides) proteomics research in Pakistan. We propose to design and develop a web-based software architecture that will make this search engine available, free of cost, to the experimental and in silico biologists across the country. Moreover, this project will act as a collaboration avenue between academia and industry, where in industrial partners can also leverage the software to analyse their data and provide valuable feedback towards developing intelligent algorithms geared towards an improved biomolecular identification and characterization.



**Title:** Design And Development of The Mesh Partitioning Algorithm for a Distributed Numerical Estimation of Partial Differential Equation Models of Extra Cellular Environments Using CUDA Graphical Processing Unit Arrays

**PI:** Dr. Safee Ullah Chaudhary

**Co-PI:** Dr. Aziz Mithani

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 480,125

**Project Initiated in:** 2015

**Duration:** 9 Months

**Category:** Technology

**Description:** Cancer is a complex pathological disorder involving biological elements

spanning across multiple spatiotemporal scales (e.g. genetic, metabolic, cellular and tissue level). In order to systematically investigate the initiation, development and metastasis of cancer, the aforementioned multiscale biological components need to be integrated into a systematic and unified model. To that effect, Dr. Safee Ullah in his project has designed and developed a multiscale modelling platform, termed 'ELECANS', which aims to couple and model the multiple biological components underlying oncogenesis.



**Title:** Development of a MATLAB-based High Performance Computing Toolbox for Top-down Proteomics

**PI:** Dr. Safee Ullah Chaudhary

**Sponsor:** Comstech-Twas

**Funding Amount:** PKR 203,590

**Project Initiated in:** 2015

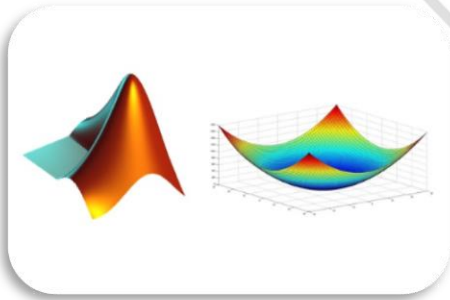
**Duration:** 12 Months

**Category:** Technology

**Description:** In this project, the aim is to develop a top-down proteomics toolbox using a popular mathematical computing platform MATLAB. The toolbox aims to provide a richly featured environment for searching and identifying proteins from top down

proteomics data obtained by using high resolution mass spectrometers. Upon implementation, this toolbox will act as an open and scalable platform for further development, testing and benchmarking of novel top down proteomics algorithms. Additionally, the proposed toolbox will be very useful for proteomics instructors in their educational and training endeavours. The project will act to seed and stir computational proteomics research in Pakistan. It is envisaged that this project will also create collaboration avenues for academia and industry, where by industrial partners can leverage the software to analyse their MS data and provide valuable feedback towards developing newer algorithms for an improved protein identification.





**Title:** LUMSPROT 2.0 – A High Performance MATLAB Toolbox for Searching Protein Mass Spectra using NVIDIA's Graphical Processing Unit Arrays

**PI:** Dr. Safee Ullah Chaudhary

**Co-PI:** Dr. Sadia Hamera

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** In this project, the aim is to develop such a high-performance version of this toolbox 'LUMSPROT 2.0', by using the popular and affordable NVIDIA GPU clusters.

The proposed toolbox aims to provide a high performance computing (HPC) environment for searching and identifying proteins from dense proteomics data obtained by using high resolution mass spectrometers. Upon implementation, this toolbox will act as an open and scalable platform for further development, optimization, testing and benchmarking of high throughput top down proteomics algorithms. The project will act to seed and stir high performance proteomics research in Pakistan. It is envisaged that this project will create several collaboration avenues for academia and industry, where by industrial partners can leverage the software to quickly analyse their MS data and provide valuable feedback towards an improved protein identification.



**Title:** Design and Development of a Multi-User Web Platform for Integrative Modelling and Simulation of Cancer Systems Biology

**PI:** Dr. Safee Ullah Chaudhary

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Technology

**Description:** The proposed multiscale cancer modelling platform will be the state of the art software in cancer modelling which will stand to deliver major advantages to the cancer patients, researchers and the pharmaceutical industry. The patients will be

benefited by the personalized medicines and therapeutics developed by modelling and analysis of their pathological data using the proposed platform. The cancer researchers stand to gain by obtaining a computational modelling framework using which they can save precious wet-lab materials and resources. The pharmaceutical industry can use this platform to investigate novel drug targets from personalized patient data and design newer drugs for treatment of cancer.

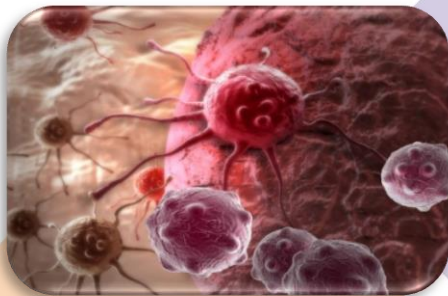
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**Profile:** Dr. Shaper Mirza holds a BSc (Hon) degree from University of Karachi and a doctorate from The University of Alabama at Birmingham (UAB). Her PhD studies involved understanding mechanisms of nasal colonisation by a Gram-positive pathogen *Streptococcus pneumoniae*. More specifically the work was focused on understanding the interaction of a human mucosal protein lactoferrin with pneumococcal surface proteins and its downstream effects on colonisation by *Streptococcus pneumoniae*. Dr. Mirza received several awards and honors during her PhD which included a student travel grant award for Gordon Conference on Structure and Functions of Lactoferrin, held in Hawaii 2005; Gail Castle award for best poster presentation as PhD student and Gail Castel Award for best post-doctoral presentation. Dr. Mirza joined LUMS as an Associate Professor in the Department of Biology at Syed Babar Ali School of Science and Engineering. Dr. Mirza's specialised areas of teaching at LUMS include immunology and bacterial pathogenesis, where she continues to develop her studies on association of immune impairments in diabetes with pneumococcal infections. While teaching at LUMS, Dr. Mirza has also developed a lab as part of her programme, which is currently investigating the role of hyperglycemia, characteristic of type-2 diabetes in impairment in immune functions of neutrophils and CD4+T cells. Information derived from these studies will be valuable in developing more targeted vaccines for prevention and control of invasive pneumococcal disease in this high-risk population.

#### Selected Publications:

- Mirza, S., Benjamin, W. H., Coan, P. A., Hwang, S. A., Winslett, A. K., Yother, J., ... & Briles, D. E. (2016). The effects of differences in *pspA* alleles and capsular types on the resistance of *Streptococcus pneumoniae* to killing by apolactoferrin. *Microbial Pathogenesis*, 99, 209-219



**Title:** Mechanisms of Immune Protection Induced by Pneumococcal Polysaccharide Vaccine

**PI:** Dr. Shaper Mirza

**Co-PI:** Dr. Bilal bin Younis - Shalamar Hospital

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 5,745,409

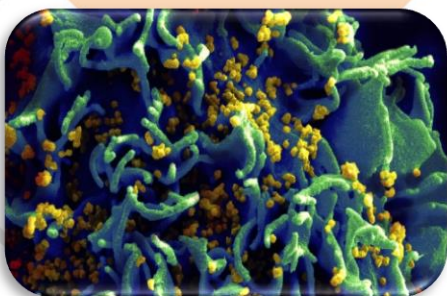
**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** The main objective of this project is to systematically understand the immune response to PPV and identify impairments and alterations in immune system

that leads to poor efficacy of vaccine in those with diabetes. Interactions between immune molecules are complex and require an integrated approach to understand all interactions and their role in immune response. The purpose of this project is to propose a novel multidisciplinary approach to understand the mechanisms at cellular level. This approach involves integration of systems of biology, immunology, proteomics and genomics. Results of the research will be used to develop immune signatures corresponding to responses in healthy individuals and in those with diabetes.



**Title:** Vero Cell Immunogenicity and Safety after A One-Week, 4-Site, Intradermal (10) Pre-Exposure Prophylaxis Regimen (4-4-4-0-0) and Four-Weeks, 2-Site, Intradermal (10) Pre-Exposure Prophylaxis Regimen (2-2-2-0-2), 4-Site 10 Booster after One Year

**PI:** Dr. Shaper Mirza

**Sponsor:** Indus Hospital

**Funding Amount:** PKR 289,302

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Sciences

**Description:** The main objective of this research project is to demonstrate that PEP using the new "one-week, 4-site" (4-4-4-0-0) ID vaccination regimen, is not inferior

to PEP (2-1-1-1-1) IM vaccination regimen in terms of seroprotection rate at D14. This project will demonstrate that PEP using the new "one-week, 2-site" (2-2-2-0-0) ID vaccination regimen, is not inferior to PEP (1-1-1-1-1) IM Essen vaccination regimen in terms of seroprotection rate at D14. The secondary objective is to describe the immune response in each group at D0, D14 and D90.



**Title:** Hyperglycemia Mediated Dysregulation of Macrophage Activation and Polarization in Type 2-Diabetes

**PI:** Dr. Shaper Mirza

**Co-PI:** Dr. Amir Faisal

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Sciences

**Description:** The main objective of this project is to investigate the role of hyperglycemia in differential regulation of activation, polarization and function of

macrophage in type 2-diabetes. A unique aspect of this study is the use of monocyte/macrophages isolated from diabetic patients. The long-term objective is to develop a more advanced understanding of metabolic control of macrophage activation. Information harnessed from results of this study will be used to develop new, more targeted and therapeutic strategies. Short-term objectives are to identify mechanisms, pathways and molecules in macrophages that are dys-regulated by hyperglycemia, and to determine the downstream effects of dysregulation on bactericidal and pro-inflammatory activity of macrophages.



**Title:** Off-site Quality Assurance Test for Products from Packages Pvt (Ltd)

**PI:** Dr. Shaper Mirza

**Co-PI:** Dr. Muhammad Tariq

**Sponsor:** Packages Pvt (Ltd)

**Funding Amount:** PKR 320,666

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Economic development

**Description:** The main purpose of this proposed collaboration is to provide consultancy for setting up quality control standards for paper products from Packages limited. The products include facial tissues , toilet rolls and party tissues (bulk

packs).Although paper products have lower risk of human infections than for example meat, dairy, fruits or vegetables, nonetheless they can still become contaminated with potentially hazardous materials that can cause anything form mild skin irritation to severe skin infections. Therefore quality assurance and identification of hazardous materials should be performed to protect consumers.

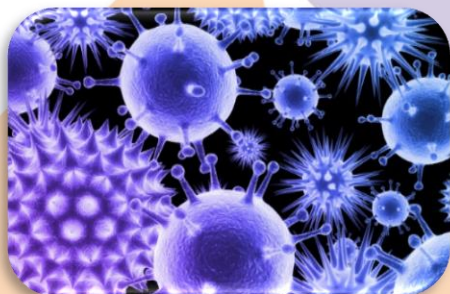
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**Profile:** Dr. Shahzad ul Hussan joined the Department of Biology at Syed Babar Ali School of Science and Engineering (SSE) in LUMS in December 2013 as an Associate Professor. He earned his PhD in Bioorganic Chemistry from the University of Luebeck, Germany in 2005. In 2005, he obtained the Postdoctoral Visiting Fellowship Award from the National Institutes of Health (NIH), USA and joined the Laboratory of Bioorganic Chemistry at NIDDK, NIH. During the postdoctoral training his research was focused on NMR structural studies of anti-HIV lectins and understanding the sub-molecular level basis of HIV entry inhibition by those lectins. In 2010, Dr. Hussan Joined the Vaccine Research Center of NIAID at NIH as a research fellow where the focus of his research was to study the atomic level details of HIV-surface-displayed-glycan recognition by HIV-1 neutralising antibodies using methodologies such as NMR, surface plasmon resonance (Biacore), isothermal calorimetry (ITC) and HIV neutralisation assays. His research during last 10 years has resulted in several publications in high-ranking journals namely, Nature, Science, Nature Structural and Molecular Biology, Journal of the American Chemical Society, Journal of Biological Chemistry, ChemBiochem and Journal of Virology. His research interests, in general, include understanding the structural properties of ligands in their macromolecular-bound state, the solution structure of proteins and biophysical characterisation of recognition phenomenon involving glycans.

#### Selected Publications:

- Miana, G. A., Riaz, M., Shahzad-Ul-Hussan, S., Paracha, R. Z., & Paracha, U. Z. (2015) Prostratin: An overview. *Mini-Reviews in Medicinal Chemistry*, 15(13), 1122-1130
- Ullah, N., Ahmed, S., Mohammad, P., Rabnawaz, H., & Malik, A. (1999). Chemical constituents of *Daphne oleoides*. *Fitoterapia*, 70(2), 214-215
- Riaz, M., Asghar, A., Rashid, R., & Shahzad-ul-Hussan, S. (2015). Treasures Hunt in Old Mines: *Terminalia chebula*-Based Traditional Herbal Medicinal Products. *The Natural Products Journal*, 5(4), 252-267
- Shahzad-ul-Hussan, S., Sastry, M., Lemmin, T., Soto, C., Loesgen, S., Scott, D. A., & Bewley, C. A. (2017). NMR insights into the conformational properties of Man-9 and its recognition by two HIV binding proteins. *ChemBioChem*



**Title:** Discovery of New HCV Entry Inhibitor Lectins and Design of an Anti-HIV Lectin as a Better Potential Therapeutic

**PI:** Dr. Syed Shahzad ul Hussan

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 5,987,705

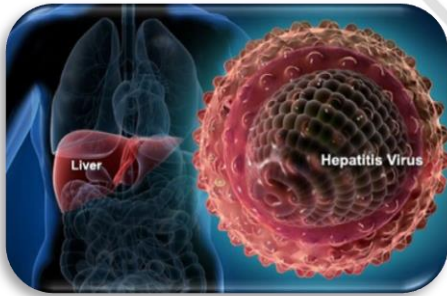
**Project Initiated in:** 2015

**Duration:** 36 Months

**Category:** Health

**Description:** This study has two main aims. To begin with, it aims to identify new HIV and HCV cellular-entry inhibitor lectins from different algal strains. Based on the observation that most of the antiviral lectins have been identified from different algal

strains, it has been hypothesised that by using specific probes consisting of envelope glycoproteins of HIV and HCV new anti-HIV and anti-HCV lectins can be identified from algal extracts. Envelope glycoprotein, gp120 of HIV and E2 of HCV have already been produced in the laboratory. In this project, these glycoproteins will be covalently linked to an appropriate resin to develop a specific affinity column to identify new anti-HIV and anti-HCV lectins by screening extracts of various algal strains and characterise their atomic level details of viral entry inhibition by using NMR, viral neutralisation assays, isothermal calorimetry titrations (ITC) and surface plasmon resonance (SPR). Secondly, the study also aims to construct a smaller sized MVN lectin to make it better drug like molecule. As potential therapeutics larger protein molecules have very limited oral availability, less membrane permeability and potential immunogenicity.



**Title:** Designing the Specific Antibody-Selecting Probes Consisting of the Conserved Regions of the Hepatitis C Envelope in the Native Conformation

**PI:** Dr. Syed Shahzad ul Hussan

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

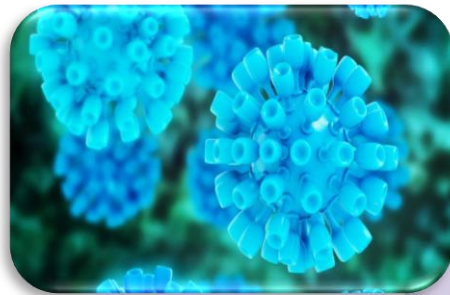
**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Health

**Description:** HCV infections are the major threat to the healthcare all over the world. In Pakistan roughly 5% of the population is infected with HCV. In the current project the aim is to design antibody-selecting probes consisting of HCV envelope variants with

exposed conserved regions and truncated variable regions so that these probes can be used to fish out only the conserved-region specific antibodies from the sera of patients. Understanding the fundamental details of how these antibodies bind to the virus will provide the basis for rational immunogen design as potential vaccine as the long-term goal.



**Title:** Identification of Hepatitis C Neutralizing Antibodies and Structural Study of Their Epitopes to Obtain Essential Information for Rational Vaccine Design

**PI:** Dr. Syed Shahzad ul Hussan

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 11,005,383

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** Hepatitis C virus (HCV) infections are one of the biggest challenges to health care all over the world. These infections are the major cause of liver cirrhosis and hepatocellular carcinoma. This project is intended to identify new HCV neutralizing

antibodies that are targeted against conserved regions of the HCV envelope and understand the structure of their target sites in the antibody bound conformation.



**Title:** Establishment of Protocols to Discover New Dengue Virus Inhibitors from Natural Sources

**PI:** Dr. Syed Shahzad ul Hussan

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Sciences

**Description:** The main objective of this project is to discover new DENV entry inhibitors from natural sources by utilizing an innovative methodology of developing a probe consisting of the E glycoprotein to specifically identify carbohydrate-binding agents

from algal strains. The primary goal is to design and synthesize the gene encoding for the soluble part of Dengue envelope glycoprotein E and sub-clone the synthesized gene in pMT/BiP/V5.

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**Profile:** Dr. Kahkeshan Hijazi received her Bachelor's degree in Bioinformatics from Mohammad Ali Jinnah University, Islamabad, Pakistan in 2006. In 2009, she was awarded the J. William Fulbright Doctoral Award from the United States Educational Foundation (USEFP), Pakistan. She received her Master's degree and a PhD in Bioinformatics from Boston University, Massachusetts, USA in 2014. Her research during her PhD was focused on developing predictors of tobacco-induced airway epithelial cell damage and the risk for having or developing tobacco-associated lung disease in humans at the Boston University Medical Center (BUMC) under the supervision of Dr. Avrum Spira. Prior to joining LUMS she served at the Research Center for Modelling and Simulation, National University of Sciences and Technology (NUST), Islamabad as Assistant Professor of Bioinformatics. Dr. Hijazi's expertise in Bioinformatics gives her great experience in the application of techniques from computer science and statistics to identify and understand patterns in the ever-more complex datasets produced by genome-wide profiling technologies. Her long terms goals are to apply post-genomic technologies and computational tools for translational research into human disease and to train graduate students who can apply these tools in a clinical setting.

#### Selected Publication:

- Christenson, S. A., Steiling, K., van den Berge, M., Hijazi, K., Hiemstra, P. S., Postma, D. S., ... & Woodruff, P. G. (2015). Asthma–COPD overlap. Clinical relevance of genomic signatures of type 2 inflammation in chronic obstructive pulmonary disease. *American journal of respiratory and critical care medicine*, 191(7), 758-766
- Steiling, K., Van Den Berge, M., Hijazi, K., Florido, R., Campbell, J., Liu, G, & Si, H. (2013). A dynamic bronchial airway gene expression signature of chronic obstructive pulmonary disease and lung function impairment. *American journal of respiratory and critical care medicine*, 187(9), 933-942
- Masso, M., Hijazi, K., Parvez, N., & Vaisman, I. I. (2008, May). Computational Mutagenesis of E. coli Lac Repressor: Insight into Structure-Function Relationships and Accurate Prediction of Mutant Activity. In *International Symposium on Bioinformatics Research and Applications* (pp. 390-401). Springer, Berlin, Heidelberg



**Title:** Identifying Nasal Epithelial MicroRNA Regulators of the Gene-expression Response to Smoking Cessation

**PI:** Dr. Syeda Kahkeshan Hijazi

**Co-PI:** Dr. Aziz Mithani

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 308,000

**Project Initiated in:** 2016

**Duration:** 9 Months

**Category:** Sciences

**Description:** The goal of this project is to identify the physiological response to smoking-cessation using microRNA sequencing on specimens collected longitudinally from the nasal epithelium. The results will provide insights into the regulation of smoking-associated processes.



**DEPARTMENT OF CHEMISTRY AND  
CHEMICAL ENGINEERING**

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**Profile:** Dr. Basit Yameen received his M.Sc. degree (1998-2000) in the subject of Chemistry with distinction (awarded a gold medal and an academic roll of honour) from Government College University, Lahore, Pakistan. During early 2001, he moved to the Department of Chemistry, Quaid-e-Azam University, Islamabad Pakistan, where he completed his M.Phil. Degree (2001-2003) with a specialization in Organic Chemistry while carrying out his one year thesis research in the field of Polymer Chemistry. He was later awarded a PhD scholarship from the Higher Education Commission of Pakistan and received his PhD degree (2004-2008) from Johannes Gutenberg University, Mainz, Germany for his research work which was carried out under the supervision of Prof. Dr. Wolfgang Knoll in the Materials Science Research Group of the Max Planck Institute for Polymer Research, Mainz, Germany.

#### Selected Publications:

- Picco, A. S., Yameen, B., Knoll, W., Ceolin, M. R., & Azzaroni, O. (2016). Temperature-driven self-assembly of self-limiting uniform supraparticles from non-uniform unimolecular micelles. *Journal of Colloid and Interface Science*, 471, 71-75
- Pinto, M. P., Arce, M., Yameen, B., & Vilos, C. (2017). Targeted brain delivery nanoparticles for malignant gliomas. *Nanomedicine*, 12(1), 59-72
- Fuentes, E., Yameen, B., Bong, S. J., Salvador-Morales, C., Palomo, I., & Vilos, C. (2016). Antiplatelet effect of differentially charged PEGylated lipid-polymer nanoparticles. *Nanomedicine: Nanotechnology, Biology and Medicine*
- Farrukh, A., Ashraf, F., Kaltbeitzel, A., Ling, X., Wagner, M., Duran, H., ... & Yameen, B. (2015). Polymer brush functionalized SiO<sub>2</sub> nanoparticle based Nafion nanocomposites: a novel avenue to low-humidity proton conducting membranes. *Polymer Chemistry*, 6(31), 5782-5789



**Title:** Summer Internship in Science and Engineering (RISE) for Young Community – RISE Community

**PI:** Dr. Basit Yameen

**Co-PI:** Dr. Irshad Hussain, Dr. Falak Sher

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 200,000

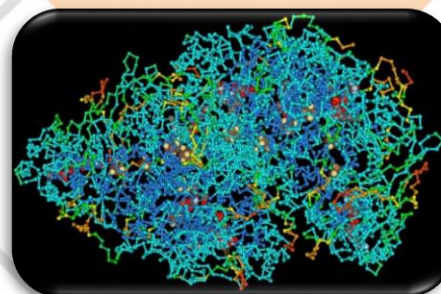
**Project Initiated in:** 2016

**Duration:** 1 Month

**Category:** Sciences

**Description:** The aim of this project is to develop a 4-weeks training program named as “Summer Internship in Science and Engineering (RISE) for Young Community – RISE

Community” where students (matric/intermediate) and teachers from the public schools in our less developed neighbourhood will spend one month in different research groups engaging in cutting-edge research at various departments at SBA School of Science and Engineering (SBA SSE) at LUMS.



**Title:** Solar Cell Performance Enhancement by Polymer Side Chain Engineering

**PI:** Dr. Basit Yameen

**Co-PI:** Dr. Habib-ur-Rehman

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 12,066,958

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** The main objective of this project is to produce an immense wealth of new polymeric materials with controlled molecular architectures thus expanding current knowledge of controlled macromolecular synthesis. The knowledge created as a result

of this project will be of importance for both local and international communities striving to develop reliable and environmentally benign energy producing technologies. The success of this project will build a strong polymer synthesis and characterization capacity, which will be beneficial for LUMS, for local institutions in the area, and will also serve as an open facility for scientists of all other institutions in Pakistan.





**Title:** Transforming Biomass Ash Residues into Commercializable Products

**PI:** Dr. Basit Yameen

**Co-PI:** Dr. Habib-ur-Rehman, Dr. Falak Sher

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 13,944,000

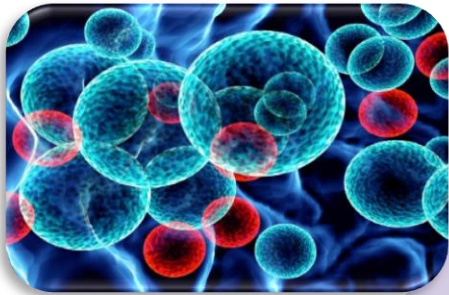
**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Economic Development

**Description:** The fundamental aim of this project is to propose a systematic approach to develop industrially viable knowledge based recycling technologies for ash residues produced in biomass thermal power stations. Biomass thermal power station produces

two types of ash residues; bottom ash and fly ash. The proposed project will establish understanding on relationship between nature of biomass fuel and the chemical nature of fly and bottom ash residues produced during the combustion of biomass in the biomass thermal power station installed at BSP facility in Kasur.



**Title:** Building From Scratch: How Nanomaterials Can Help Resolve Membrane Scaffold Geometry and Function

**PI:** Dr. K. H. Aaron Lau - University of Strathclyde

**Co-PI:** Dr. Basit Yameen, Dr. Carsten Mim - KTH Royal Institute of Technology

**Sponsor:** Human Frontier Science Program

**Funding Amount:** PKR 31,381,500

**Project Initiated in:** 2016

**Duration:** 36 Months

**Category:** Sciences

**Description:** The main objective of this project is to develop a nanosheet synthetic scaffold that can present gephyrin with its binding motif in a precisely defined geometry

and nanoparticles functionalized with GlyR drug targets that provide high electron contrast labeling and bi-functional crosslinkers for the structure-function measurements. These nanomaterials will enable assays of gephyrin scaffold formation and GlyR complex formation, and electron microscopy functional mapping of GlyR. The proposed research will provide insight into gephyrin-GlyR structure-function relationship and demonstrate new tools for biological characterization.

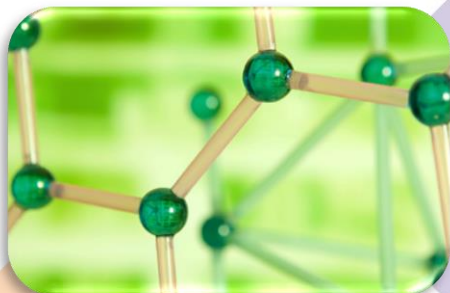
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**Profile:** Dr. Ghayoor Abbas obtained his MSc in Chemistry from Quaid-i-Azam University, Islamabad, Pakistan. After serving as lecturer in chemistry in the Punjab Education Department/GCU Lahore for couple of years, he went to the Michigan State University, USA for his PhD studies. At MSU, he worked on the applications of iridium catalysed aromatic C-H borylation in organic synthesis, and completed his PhD in Chemistry in 2008. He later worked as a Postdoctoral Associate at Indiana University, Bloomington, USA, before joining Syed Babar Ali School of Science and Engineering (SSE), LUMS in fall 2009. Dr. Ghayoor Abbas has presented his research work in various international conferences including the meetings of the American Chemical Society, the US National Organic Symposium, and the Gordon Organometallic Conference. He has a number of research publications in peer reviewed international journals as well as several patents to his credit.

#### Selected Publications:

- Ikram, H. M., Rasool, N., Zubair, M., Khan, K. M., Abbas Chotana, G., Akhtar, M. N., ... & Rana, U. A. (2016). Efficient Double Suzuki Cross-Coupling Reactions of 2, 5-Dibromo-3-hexylthiophene: Anti-Tumor, Haemolytic, Anti-Thrombolytic and Biofilm Inhibition Studies. *Molecules*, 21(8), 977
- Batool, F., Emwas, A. H., Gao, X., Munawar, M. A., & Chotana, G. A. (2016). Synthesis and Suzuki Cross-Coupling Reactions of 2, 6-Bis (trifluoromethyl) pyridine-4-boronic Acid Pinacol Ester. *Synthesis*
- Tariq, S. R., Shafiq, M., & Chotana, G. A. (2016). Distribution of heavy metals in the soils associated with the commonly used pesticides in cotton fields. *Scientific*, 2016



**Title:** Green Chemistry Route for the Concise and Divergent Synthesis of Halogenated Pseudilins

**PI:** Dr. Ghayoor Abbas Chotana

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 2,200,332

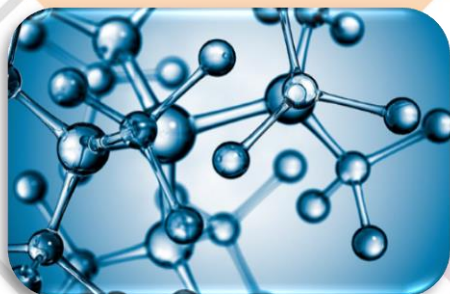
**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Sciences

**Description:** This project aims at the development of a new synthetic methodology (or route) for the concise and divergent synthesis of halogenated pseudilins analogs. The new synthetic methodology is based on two latest technologies (i) Iridium catalyzed

aromatic C–H borylation invented by Smith (along with Hartwig & Miyaura), and (ii) Mild Suzuki coupling reactions of heteroaryl boronic esters. The purpose of this project is to provide the shortest possible route to this highly important class of pharmaceutically active compounds according to the principles of Green Chemistry. The synthesized compounds will be tested for their potential to inhibit IspD protein in the enzymatic assay. In addition these will also be tested for other biological tests available at LUMS (e.g. anticancer, anti-dengue etc.) or at other Pakistani institutions.



**Title:** Iridium Catalyzed Borylation using Bis[(+)-pinanediolato]diboron: Synthesis of Chiral Arylboronic Esters by C–H Borylation

**PI:** Dr. Ghayoor Abbas Chotana

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Sciences

**Description:** The main objective of this project is to investigate the use of various chiral boranes as the boron source. If successful, this will be a shorter route to prepare chiral arylboronic esters. Also the sterically governed selectivity will allow us to prepare those

chiral arylboronic esters which are not possible through other known routes. Asymmetric synthesis is taught at undergraduate & graduate level. This project will provide students an opportunity to get involved in practical asymmetric synthesis. Asymmetric synthesis is very challenging. Establishing a new asymmetric synthetic route will definitely enhance LUMS image in international scientific community. This project will strengthen collaboration with KAUST for spectroscopic characterization.



**Title:** Development of Indigenous Process for the Synthesis of Plant Protection Fungicides for Ensuring National Food Security

**PI:** Dr. Ghayoor Abbas Chotana

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 1,809,332

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Agriculture

**Description:** Agricultural products are the major exports of Pakistan. Besides cotton based products, various fruits and vegetables are also exported. For improved shelf life, these agricultural products need proper protection from pathogens such as fungi.

In this project, the objective is to synthesize modern agricultural fungicide. This project will lay down the foundation for the indigenous production of agrochemicals (fungicides, insecticides) in Pakistan.



**Title:** Design and Synthesis of New Boscalid Analogs

**PI:** Dr. Ghayoor Abbas Chotana

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

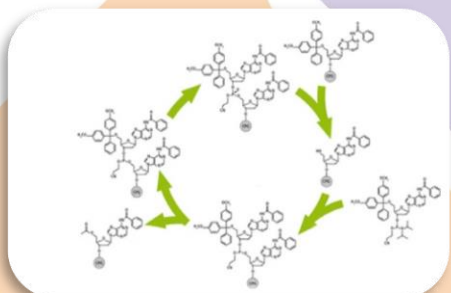
**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Sciences

**Description:** Boscalid is an important fungicide belonging to the class of carboxamides. It was introduced in 2003 in US and now its worldwide annual production exceeds 1000 Metric Ton per year. Boscalid is used in the agricultural fields of various horticultural crops, such as green beans, spring onions, strawberries, grapes

blueberries, tomatoes, and raspberries etc. Boscalid protects crops from gray mold, powdery mildew and other fungus. Boscalid acts by inhibiting spore germination, germ tube elongation and is also effective on all other stages of fungal development. The project aims to design and synthesize new analogs of Boscalid.



**Title:** Regiospecific Syntheses of Carbazoles

**PI:** Dr. Ghayoor Abbas Chotana

**Sponsor:** Comstech-Twas

**Funding Amount:** PKR 478,436

**Project Initiated in:** 2015

**Duration:** 18 Months

**Category:** Sciences

**Description:** The present proposal plans to develop a methodology for the concise & regiospecific synthesis of carbazoles using readily commercially available starting materials. This methodology will provide access to substituted carbazoles with substituents on any of the eight positions of carbazole. The significance of the newly

developed methodology will be demonstrated by synthesizing various naturally occurring carbazole products which previously have been synthesized using long routes.

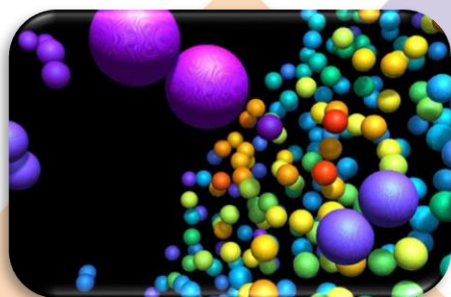
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**Profile:** Dr. Habib-ur-Rehman holds an MPhil degree in physical/polymer chemistry from QAU, Islamabad and PhD in Materials Engineering Degree from the Institute for New Materials, Saarbrucken, Germany. He is currently working as an Assistant Professor of Chemistry. Before joining Syed Babar Ali School of Science and Engineering (SSE), LUMS, he served as Head of Optical Materials, R & D Group at Exxelis Limited, U.K. There, he developed a number of new materials for optical displays and optimised innovative processes for making LED backlights and light management films. He previously worked for Terahertz Photonics, UK, and was responsible for the development of low loss optical materials for data-comm and groundbreaking sol-gel based silica on silicon deposition technology.

#### Selected Publications:

- Butt, A., Farrukh, A., Ghaffar, A., Duran, H., Oluz, Z., Ur Rehman, H., Yameen, B. (2015). Design of enzyme-immobilized polymer brush-grafted magnetic nanoparticles for efficient nematocidal activity. *RSC Advances*, 5(95), 77682-77688.
- Javed, Ibrahim, Hussain, Syed Zajif, Rehman, Habib Ur, Hussain, Irshad. (2015) Synthesis, characterization and evaluation of lecithin-based nanocarriers for the enhanced pharmacological and oral pharmacokinetic profile of amphotericin B : *Journal of Materials Chemistry*
- Farrukh, A., Ashraf, F., Kaltbeitzel, A., Ling, X., Wagner, M., Duran, H. & Yameen, B. (2015). Polymer brush functionalized SiO<sub>2</sub> nanoparticle based Nafion nanocomposites: a novel avenue to low-humidity proton conducting membranes. *Polymer Chemistry*, 6(31), 5782-5789
- Shah, S. M., Zulfiqar, U., Hussain, S. Z., Ahmad, I., Hussain, I., & Subhani, T. (2017). A durable superhydrophobic coating for the protection of wood materials. *Materials Letters*



**Title:** Development of Optically Clear Novel High Refractive Index Photo-polymerizable Nano-composites for Light Management Films and their Applications in Flat Panel Display

**PI:** Dr. Habib-ur-Rehman

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 13,786,200

**Project Initiated in:** 2015

**Duration:** 36 Months

**Category:** Sciences

**Description:** This project aims to utilize polymer brushing technique to synthesize functionalized metal oxide nanoparticles, preferably acrylate functionalized

nanoparticles of different metal oxides having high refractive indices, to prepare novel high refractive index acrylate-nano-composites based photo-polymerizable materials. These materials will then be tested for their light management potential in optical displays by making prismatic as well as microlens-based micro-structured brightness enhancement films through UV embossing. Finally recycling efficiencies of these films will be compared with the ones available in market.

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**Profile:** Dr. Hussain is among the founding members of SBASSE, LUMS and has played a key role to lead the development of the Chemistry Department. Prior to joining LUMS, Dr. Hussain spearheaded research and development program in Nanobiotechnology at National Institute for Biotechnology & Genetic Engineering (NIBGE), Faisalabad, Pakistan, and developed a Nanobiotech group/facility for the synthesis of metal nanoparticles and explored their applications in biotechnology and advanced materials fabrication, which is now among the few best facilities in Pakistan. He has published more than 50 research articles in prominent journals including Nature Materials, Angewandte Chemie - Int. Ed., Advanced Materials, and Journal of the American Chemical Society, Small, ChemCommun, Langmuir, and Nanoscale. Dr. Hussain has developed several effective research collaborations with the leading research groups in USA, Europe, China (HUST), Saudi Arabia (KAUST) and several National Institutions in Pakistan. He has got several competitive National/International research grants to explore the applications of metal nanoparticles/ nanoclusters in Chemical/Biomedical Sciences and Renewable Energy Technologies.

#### Selected Publications:

- Ashraf, M. U., Hussain, M. A., Muhammad, G., Haseeb, M. T., Bashir, S., Hussain, S. Z., & Hussain, I. (2017). A superporous and superabsorbent glucuronoxylan hydrogel from quince (*Cydonia oblonga*): Stimuli responsive swelling, on-off switching and drug release. *International Journal of Biological Macromolecules*, 95, 138-144
- Zulfikar, U., Awais, M., Hussain, S. Z., Hussain, I., Husain, S. W., & Subhani, T. (2017). Durable and self-healing superhydrophobic surfaces for building materials. *Materials Letters*, 192, 56-59
- Razzaque, S., Cai, C., Lu, Q. W., Huang, F. Z., Li, Y. S., Tang, H. B., ... & Tan, B. (2017). Development of functionalized hollow microporous organic capsules encapsulating morphine—an in vitro and in vivo study. *Journal of Materials Chemistry B*
- Mumtaz, S., Wang, L. S., Abdullah, M., Hussain, S. Z., Iqbal, Z., Rotello, V. M., & Hussain, I. (2017). Facile method to synthesize dopamine-capped mixed ferrite nanoparticles and their peroxidase-like activity. *Journal of Physics D: Applied Physics*, 50(11), 11LT02
- Abbas, A., Hussain, M. A., Sher, M., Irfan, M. I., Tahir, M. N., Tremel, W., ... & Hussain, I. (2017). Design, characterization and evaluation of hydroxyethylcellulose based novel regenerable superabsorbent for heavy metal ions uptake and competitive adsorption. *International Journal of Biological Macromolecules*, 102, 170-180
- Shah, S. M., Zulfikar, U., Hussain, S. Z., Ahmad, I., Hussain, I., & Subhani, T. (2017). A durable superhydrophobic coating for the protection of wood materials. *Materials Letters*



**Title:** Development of Nanoparticles-Based Sensitive Method for the Detection of Bacteria in Drinking Water

**PI:** Dr. Irshad Hussain

**Co-PI:** Dr. Shaper Mirza

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 990,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Health

**Description:** It is extremely important to have proper domestic, municipal and industrial wastewater disposal and effective treatment plants for drinking water with appropriate

maintenance and monitoring at all times. In particular, the bacterial detection assay needs to be sensitive and accessible to common man for on-site monitoring of drinking water for bacterial contamination. The monitoring of microbial contamination of drinking water is of a paramount importance for public health and food safety to minimize the risk of outbreak of waterborne diseases. The purpose of this project is, therefore, to supplement the funds for the purchase of chemicals and consumables to enable clean drinking water, Furthermore the project will also help us better understand the interaction of bacteria with nanoparticles. This information will later be harnessed for developing projects to combat multidrug resistance in pathogenic bacteria.



**Title:** Low-Cost but More Effective Transition Metal Alloy Nanoclusters for Electrocatalytic Water Oxidation

**PI:** Dr. Irshad Hussain

**Co-PI:** Dr. Khurram Saleem Joya - UET Lahore

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 4,187,838

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Energy

**Description:** The main objective of this project is to develop effective and economical nanocatalysts based on other abundant metals such as Fe, Cu and their alloys,

including those with Ni nanoclusters and explore their applications for water splitting electrochemically and photochemically. These metal/alloy nanoclusters are expected to be the cost-effective and highly efficient electrocatalysts for the production of hydrogen from water oxidation.



**Title:** Synthesis and Characterization of Metal Nanoparticles Chemicals and Consumables

**PI:** Dr. Irshad Hussain

**Co-PI:** Dr. Najeeb Ullah , UET Peshawar

**Sponsor:** UET, Peshawar

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 24 Months

**Category:** Health

**Description:** Dr. Irshad Hussain received funding for Synthesis and Characterization of Metal nanoparticles Chemicals and Consumables from UET Peshawar.



**Title:** Smart Nanoclusters to Address Multidrug Resistance

**PI:** Dr. Antonios G. Kanaras- University of Southampton

**Co-PI:** Dr. Irshad Hussain

**Sponsor:** Engineering and Physical Sciences Research Council (EPSRC), University of Southampton

**Funding Amount:** PKR 2,037,081

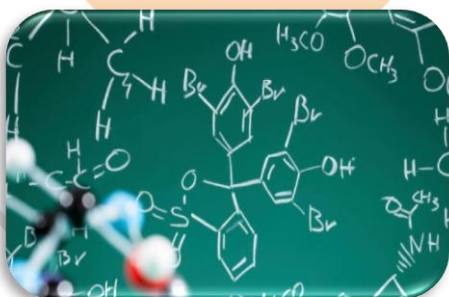
**Project Initiated in:** 2016

**Duration:** 6 Months

**Category:** Sciences

**Description:** Multidrug resistance is emerging as one of the most serious threats globally and most importantly for the underdeveloped countries because of common

drug abuse practices. This project will focus on the design of functional nanoscale materials as an alternative and non-conventional approach to address the multidrug resistance challenge. The main objective of this project is to focus on the development of metal/metal oxide water soluble nanoclusters, which will be programmed by design to kill resistant cancer cells and bacteria.



**Title:** Synthesis of Non-Noble Electrocatalysts for Anion Exchange Membrane Fuel Cells (AEMFC)

**PI:** Dr. Saim Sahir - UET Peshawar

**Co-PI:** Dr. Irshad Hussain

**Sponsor:** UET, Peshawar | USAID

**Funding Amount:** PKR 1,160,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Sciences

**Description:** The objective of this project is to explore the use of Ni nanoparticles/nanoclusters as anode catalyst and Ag nanoparticles/nanoclusters as

cathode catalyst. Reproducible and surfactant-free synthesis of well-defined and stable Ni and Ag electrocatalysts on various supports will be of great importance to explore the potential of cheaper catalyst for alkaline fuel cell applications and to study the correlation between size/shape and electrocatalytic performance in detail.

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**Profile:** Dr. Saeed is an Associate Professor at the Department of Chemistry and Chemical Engineering/SBASSE, LUMS. He received his M.Sc. in chemistry from the University of the Punjab, Lahore, Pakistan with distinction (Punjab University topper with Gold Medal) in 1996. Before his PhD research, he served at Research Assistant/Research Officer at H.E.J. Research Institute of Chemistry, University of Karachi. During this time he was awarded DAAD fellowship to conduct PhD research at the University of Tübingen, Germany under the supervision of Prof. Dr. Wolfgang Voelter. In 2000, he was selected by the DAAD to represent its students in the 50th Annual Nobel Laureate Meeting at Lindau, Germany. By 2001, he was able to synthesize several natural products and their unnatural analogs, which earned him a PhD degree from the University of Tübingen in the span of less than three years. From 2001 to 2009, Dr. Saeed conducted post-doctorate research in the area of chemical carcinogenesis and cancer biology, by investigating the metabolism of estrogens, formation of genotoxic metabolites and their reactions with DNA to induce cancer-specific mutations, and the initiation of cancer.

#### Selected Publications:

- Nilaweera, T. D., Saeed, M., & Kohen, A. (2015). Targeting the de Novo Biosynthesis of Thymidylate for the Development of a PET Probe for Pancreatic Cancer Imaging. *Biochemistry*, 54(5), 1287-1293
- Saeed, M. U., Chen, Z., Chen, Z., & Li, B. (2014). Compression behaviour of laminated composites subjected to damage induced by low velocity impact and drilling. *Composites Part B: Engineering*, 56, 815-820



**Title:** Isolation, Purification and Characterization of Protein(S) that are Modulated by Estrogen-DNA Depurinating Adducts to Induce Cancer-Specific Mutations and Drug Resistance

**PI:** Dr. Muhammad Saeed

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Health

**Description:** This project is focused on the isolation, purification and characterisation of the protein(s) involved in generation of mutations by the estrogen-DNA depurinating

adducts. In this regard we aim to synthesize modified depurinating estrogen-DNA adducts containing linkers, which will be utilised to prepare an affinity-based solid support (beads or resin) to furnish affinity-columns for selective retention of the proteins of interest from a complex cellular protein extract. Purified protein(s) will be structurally and functionally characterised by several spectroscopic methods. Discovery of these proteins will be a big step toward unraveling the mechanism of the induction of mutations and cancer initiation by estrogens and will provide new targets for biomarkers development and therapeutic targets for breast cancer intervention.



**Title:** Antiviral Drug Design by Targeting Viral Specific Proteases

**PI:** Dr. Muhammad Saeed

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Health

**Description:** Dengue Fever (DF) is a clinical manifestation of infection by dengue virus (DENV), which, in most cases, is very mild and self-healing ailment. Nevertheless, development of DF to dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) can be fatal and life threatening. Currently, there is no therapeutic treatment or

vaccine against DENV infection. Conventional practice to tackle DENV infection involves extensive use of insecticides to curb the transmitting mosquitoes. This approach has many negative effects, both on the ecosystem, as well as on the environment. Thus, an alternative approach based on the development of specific drugs against DENV infections is highly desired. Viral specific protease enzyme is a promising drug target. The DENV protease is essential for the maturation and proliferation the virus. Recently, several X-ray co-crystal structures of DENV protease with the substrate have been solved and provided details on the interactions of the substrate for its catalytic activity.



**Title:** Discovery and Development of Anti-Dengue Therapeutics by Targeting the Virus-Specific Proteases

**PI:** Dr. Muhammad Saeed

**Co-PI:** Dr. Moazur Rahaman - National Institute for Biotechnology and Genetic Engineering (NIBGE)

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 4,510,562

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** Prevalence of dengue virus (DENV) in Pakistan has resulted in frequent

outbreaks of dengue fever (DF), dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Lack of proper vaccination for prevention and/or the scarcity of a specific medicaments to treatment DENV infection are the key reasons behind the significant and incremental morbidity and mortality in various regions of the country. This project aims to synthesize computationally designed and optimized small organic molecules that will be tested for their potential to inhibit the DENV protease activity. Successful completion of the project may provide several DENV inhibitors for the preclinical and clinical trials in future.



**Title:** Development of an Affinity Support to Facilitate Isolation and Structural Characterization of Native Human Thymidylate Synthase for the Posttranslational Modifications and Their Role in Drug Resistance

**PI:** Dr. Muhammad Saeed

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Sciences

**Description:** The fundamental aim of this project is to develop an affinity support to isolate native hTS from human cancer cell line, HCT116. It is based on using a substrate

analogue/inhibitor of hTS with strong binding parameters as bait, and covalently linking it on a solid bead or resin.



**Title:** Discovering Etiology Based Strategies for the Prevention and Treatment of Estrogen-Induced Breast Cancer

**PI:** Dr. Muhammad Saeed

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 2,498,062

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Health

**Description:** Breast cancer is the one of the top leading causes of cancer-related deaths in Pakistan and worldwide. This project entails that estrogen-DNA adducts are capable of perturbing the cellular repair mechanisms by inhibiting the enzymatic activity

of protein(s) involved in the DNA damage elimination pathway, and thus lead to the induction of cancer specific mutations. Main focus of this project is the identification, isolation and characterization of such proteins, followed by designing the strategies for prevention and treatment of breast cancer by using the newly discovered protein(s) as therapeutic targets.



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**Profile:** Dr. Muhammad Zaheer earned his MPhil degree from Quaid-i-Azam University. In 2009, he was awarded with HEC Overseas Scholarship for PhD studies in Germany. He completed his degree under the supervision of Prof. Dr. Rhett Kempe from the University of Bayreuth. During his PhD, he worked on the development of robust heterogeneous catalysts for sustainable chemistry applications including biomass transformation into fuels and chemicals. Dr. Zaheer has got published papers in the scientific journals of high impact like Chemical Society Reviews and Chemistry of Materials. He was a post-doctoral fellow at the Department of Inorganic Chemistry, University of Bayreuth before joining LUMS as an assistant professor. His research interests include the development of heterogeneous catalysts for the conversion of biomass to obtain fuels/chemicals, renewable energy generation/storage and green chemistry.

#### Selected Publications:

- Zaheer, M., & Kempe, R. (2015). Catalytic Hydrogenolysis of Aryl Ethers: A Key Step in Lignin Valorization to Valuable Chemicals. *ACS Catalysis*, 5(3), 1675-1684
- Zaheer, M., Hermannsdörfer, J., Kretschmer, W. P., Motz, G., & Kempe, R. (2014). Robust heterogeneous nickel catalysts with tailored porosity for the selective hydrogenolysis of aryl ethers. *ChemCatChem*, 6(1), 91-95
- Zaheer, M. P. M. (2013). Design of Robust Heterogeneous Catalysts for Sustainable Chemistry (Doctoral dissertation, University of Bayreuth)



**Title:** Green Catalytic Conversion of Waste Paper to Fuels and Chemicals

**PI:** Dr. Muhammad Zaheer

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 860,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Environment

**Description:** Current project aims to design robust heterogeneous catalysts based on polymer derived SiCN ceramics with catalytically active metal (Ni, Pd and Ni/Pd) nanoparticles (NPs) on surface. The beauty of the design lies in the fact that Si-C-N network can stabilize very small NPs (which would provide high activity) firmly so that

metal leaching is avoided. Basicity of the support and synergic catalysis (in the case of the bimetallic Ni/Pd catalyst) may be helpful in the selective cleavage of ether and glycosidic bonds of the solid biomass (using waste paper as a model) leading to the depolymerization of it into soluble sugar compounds which would be upgraded catalytically to produce chemical and fuels. The project would not only be helpful in the solid waste management of the local industry (sugar, paper) but could also contribute significantly in the global effort for scaling up and commercialization of biomass conversion processes.



**Title:** Catalytic Conversion of Agricultural Waste into Potential Fuels and Chemicals

**PI:** Dr. Muhammad Zaheer

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 9,401,250

**Project Initiated in:** 2015

**Duration:** 36 Months

**Category:** Environment

**Description:** This projects focuses on the utilization of chemical methods in order to derive chemicals from rice husk and potentially gears about its selective degradation to simple molecules, playing with these simple molecules to prepare chemicals of industrial importance including solvents, fuels (e.g., ethanol) building blocks of

polymers (e.g., nylon, PET) and finally preparation of the materials by which the aforementioned processes can be achieved.



**Title:** Designing Stable and Reusable Catalysts for the Development of A Hydrogen Battery from Biomass Derived Formic Acid

**PI:** Dr. Muhammad Zaheer

**Co-PI:** Dr. Shabnam Shahida - University of Poonch

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 6,358,980

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** In the proposed project, efforts will be made to design catalysts that could, in the first step convert biomass to formic acid and in the second step, store or

generate hydrogen whenever demanded for the generation of electricity. Successful completion of this project would help to manage agricultural waste and related biomass waste. It could also help to reduce carbon dioxide (greenhouse gas) from the atmosphere by its conversion into formic acid. It would be helpful in small scale (renewable) energy generation and storage. Local chemical industry could also be benefited in terms of the renewable production of industrially important chemicals like methanol (hydrogenation product of carbon dioxide) thereby decreasing the annual import of chemicals.



**Title:** The Development of a Glycerol Fuel Cell for the Production of Electricity from Biodiesel Waste

**PI:** Dr. Muhammad Zaheer

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 818,480

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Energy

**Description:** This project aims to contribute towards the solution of current energy crisis in Pakistan. Pakistan State Oil has shown positive response to collaborate in terms of provision of crude glycerol for research and scholarships to the research

students involved. The aim is to provide working opportunity to talented but economically less privileged students in this project. Special consideration will be given to female students in order to give them equal working opportunity.

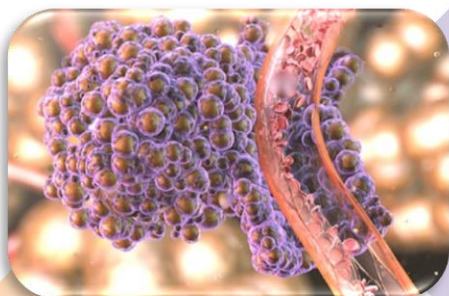
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**Profile:** Dr. Saleem joined LUMS in 2012 and since then he has been actively developing his drug discovery research group. He is interested in the synthesis of the libraries of novel molecules that could modulate various cellular proteins involved in the cell cycle (notably kinases (Aurora kinases), centrosome clustering, Phosphohistone 3, MDM2-p53, AAA+ ATPase & 12-TM), development of new methodologies to access novel scaffolds, novel ligands for nanoparticle and the isolation, characterisation & synthesis of the natural products of biological importance and food & toxicology. Dr. Saleem is also actively involved in the collaborative research across various departments in different universities to advance the scientific output and help the students with his expertise. Earlier, he obtained his MSc in Chemistry from GC University, Lahore, Pakistan with distinction (Gold Medal and Academic Role of Honour) in 2002 and MPhil in Chemistry in 2004. He was awarded Orient Dr. Ata-ur-Rehman Chemistry Award & XIVth Star Award and was selected to present Pakistan in the 56<sup>th</sup> Meeting with Nobel Laureates in Lindau, Germany, in 2006, he obtained Fulbright scholarship for PhD in Chemistry at Michigan State University, USA and completed it in 2011.

#### Selected Publications:

- Saleem, R. S. Z., & Tepe, J. J. (2015). A concise total synthesis of hymenialdisine. *Tetrahedron Letters*, 56(23), 3011-3013
- Mehnaz, S., Saleem, R. S. Z., Yameen, B., Pianet, I., Schnakenburg, G., Pietraszkiewicz, H., & Gross, H. (2013). Lahorenic acids A–C, ortho-dialkyl-substituted aromatic acids from the biocontrol strain *Pseudomonas aurantiaca* PB-St2. *Journal of natural products*, 76(2), 135-141



**Title:** Synthesis of Tethered Biaryls and their Evaluation to Selectively Kill the Cancer Cells with Supernumery Centrosomes

**PI:** Dr. Rahman Shah Zaib Saleem

**Co-PI:** Dr. Amir Faisal

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

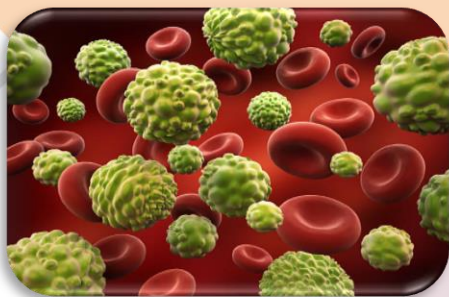
**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Sciences

**Description:** Centrosome is an important organelle that plays a role in the cell cycle proliferation. The centrosomal amplification is observed in various tumours and

provides a basis for selectively targeting the cancer cells. In the current project, the aim is to explore this area by synthesizing a novel library of organic compounds and evaluating it against cancer cell lines and normal cell lines to assess the selectivity in killing the cancer cells and avoid side effects on the normal cells.



**Title:** Inhibition Of Centrosome Clustering In Cancer Cells: An Approach To Selectively Eradicate Cancer Cells

**PI:** Dr. Rahman Shah Zaib Saleem

**Co-PI:** Dr. Amir Faisal

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 3,950,846

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** The project is about inhibition of centrosome clustering in the cancer cells. The purpose of this project is to develop a robust assay to screen organic compounds

and natural product extract against the cancer cells. Then, to prepare small organic molecules that could inhibit centrosome clustering. Finally, to explore the local flora of folk-lore anti-cancer importance to identify fractions and preferably the natural compounds with the ability to inhibit this clustering. This project will identify unique compounds that will inhibit centrosome clustering and potentially lead to therapeutic strategies for selective eradication of the cancer cells.



**Title:** Natural Dye Based High Efficiency Dye-Sensitized Solar Cells

**PI:** Dr. Rahman Shah Zaib Saleem

**Co-PI:** Dr. Habib-ur-Rehman

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 6,426,324

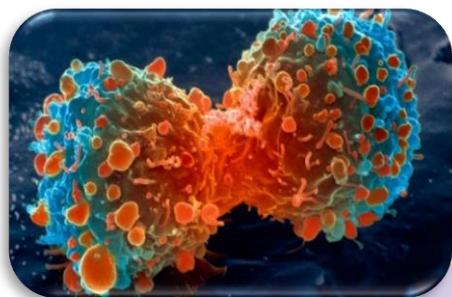
**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** The main objective of this project is to utilize naturally available dyes as efficient sensitizers in DSSCs. It is important to first identify best natural dyes in terms of solar efficiency. These dyes will then be analysed for their HOMO-LUMO alignment

with electron transport layer ( $ZnO/TiO_2$ ). In the next step, these dyes will be modified by attaching electron donors, electron acceptors or required linkers to better align their HOMO-LUMO with electron acceptor ( $TiO_2/ZnO$ ) for improved sensitization and efficient electron transfer. Finally, the efficiencies of these dyes will be compared with Ruthenium dyes or cobalt complexes base DSSCs.



**Title:** Synthesis of Novel Selenium Containing Redox Modulators

**PI:** Dr. Rahman Shah Zaib Saleem

**Co-PI:** Prof. Dr. Claus Jacob - University of Saarland

**Sponsor:** German Pakistani Research Cooperation Program (DAAD)

**Funding Amount:** PKR 780,769

**Project Initiated in:** 2016

**Duration:** 4 Months

**Category:** Sciences

**Description:** Cancer is the major cause of mortality in the world. Current therapies often suffer from severe primary and secondary side effects due to non-specificity. Modulation of redox balance is one such area that can be used to design selective, yet

effective cancer drugs. This modulation can be done using organic or inorganic compounds carrying redox properties. The idea of multifunctional redox modulators is currently gaining momentum and there is a need to explore the chemical space to obtain new lead molecules for subsequent biological evaluation. This project focuses on preparing such compounds that will contain the inorganic part (selenium) conjugated to organic components. This project will involve unique chemical reactions allowing incorporation of selenium atom into the organic structures. It is expected that these compounds, upon biochemical testing, will offer superior physio-chemical properties and bioactivities, thus paving the way forward in developing redox modulators for cancer therapy.

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**Profile:** Dr. Salman Noshear Arshad is an Assistant Professor of Chemistry in SBASSE, LUMS. He did his BS in Metallurgy and Materials Engineering from GIK Institute of Engineering Sciences and Technology, Pakistan. He then went to South Korea for Masters in Materials Science and Engineering from Korea Advanced Institute of Science and Technology (KAIST) under Korea Science and Engineering (KOSEF) fellowship. At KAIST he developed novel bottom-up methods to synthesize carbon nanotubes reinforced metal and ceramic nanocomposite materials with enhanced mechanical and multifunctional properties. His work was published twice in *Advanced Materials* (Impact Factor 14.8) with ~300 citations to date. On his return to Pakistan, he joined GIK Institute as Research Associate where he taught undergraduate courses in materials science and engineering and continued his research on carbon nanotubes reinforced nanocomposites. Dr. Arshad was awarded with Fulbright fellowship for graduate studies in University of Illinois at Urbana-Champaign (UIUC, USA). While at UIUC he did another Masters in Aerospace Engineering and PhD in Materials Science and Engineering. He developed optimised polymer and carbon nanofibers with modulated surfaces for enhanced strengthening and toughening for structural composite materials. This work earned him a US Patent. He also worked on developing bulk nanostructured alloys using severe plastic deformation with grain and second phase precipitate sizes on the order of 10 nm. His research work at UIUC was supported by grants from National Science Foundation and Office of Naval Research and got published in *Carbon*, *Polymer*, *Scripta Materialia*, *Acta Materialia*, and *Journal of Materials Research*.

#### Selected Publications:

- Dilpazir, S., Usman, M., Rasul, S., & Arshad, S. N. (2016). A simple UV-ozone surface treatment to enhance photocatalytic performance of TiO<sub>2</sub> loaded polymer nanofiber membranes. *RSC Advances*, 6(18), 14751-14755
- Arshad, S. N., Lach, T. G., Ivanisenko, J., Setman, D., Bellon, P., Dillon, S. J., & Averbach, R. S. (2015). Self-organisation of Cu–Ag during controlled severe plastic deformation at high temperatures. *Journal of Materials Research*, 1-14
- Ren, F., Arshad, S. N., Bellon, P., Averbach, R. S., Pouryazdan, M., & Hahn, H. (2014). Sliding wear-induced chemical nanolayering in Cu–Ag, and its implications for high wear resistance. *Acta Materialia*, 72, 148-158
- Mohsin, H., Sultan, U., Joya, Y. F., Ahmed, S., Awan, M. S., & Arshad, S. N. (2016, August). Development and characterization of cobalt based nanostructured super hydrophobic coating. In *IOP Conference Series: Materials Science and Engineering* (Vol. 146, No. 1, p. 012038). IOP Publishing



**Title:** Self-Cleaning Water Filter Based on Polymer Nanofibers for Bacterial and Viruses' Removal from Drinking Water

**PI:** Dr. Salman Noshear Arshad

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 981,090

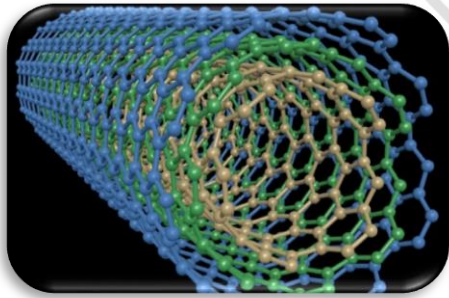
**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Water

**Description:** This interdisciplinary project is focused on developing materials chemistry based strategies for bacterial and viral removal from water. A technologically mature process, electro spinning, will be utilised to obtain filters that can discriminate

nanoscale species in the water. These filters are actually commercially available. Electro spinning process will be developed in which nanofibers of relevant polymer or polymer blends will be doped with tailored bandgap oxide nanoparticles. The electro spun polymer mesh will carry out the filtering part, isolating bacteria and most viruses, whereas the oxide nanoparticles, through photo catalysis, will oxidize these species with the final product of the oxidation being CO<sub>2</sub> and H<sub>2</sub>O.



**Title:** Surface Modulated Carbon Nanofibers for Enhanced Toughening in Nano-Composites

**PI:** Dr. Salman Noshear Arshad

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 13,587,209

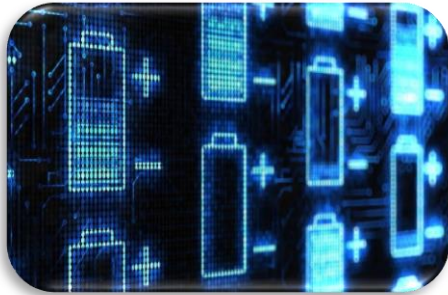
**Project Initiated in:** 2015

**Duration:** 36 Months

**Category:** Water

**Description:** This research project aims to investigate the performance of carbon nanofiber reinforced polymer nanocomposites where the surface of the carbon nanofiber will be tailored to maximize its performance. These large scale

nanocomposites will find applications as structural material, in automotive industry and as sensors etc.



**Title:** Composite Carbon Nanofiber Based Nanostructured Electrodes for Enhanced Energy Storage in Lithium Ion Batteries

**PI:** Dr. Salman Noshear Arshad

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 6,071,998

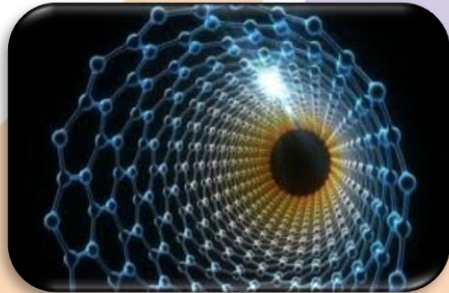
**Project Initiated in:** 2018

**Duration:** 36 Months

**Category:** Energy

**Description:** Fossil fuels are rapidly depleting highlighting the need for development of low cost, scalable, durable, sustainable and efficient energy storage solutions. Lithium ion batteries (LIBs) have emerged as the most promising candidate due to

higher specific energy capabilities and less discharge when compared to nickel-metal hydrides. This project aims to develop nanostructured composite materials as anodes for lithium ion batteries for enhanced performance. Successful execution of this project will create numerous job and investment opportunities that will positively contribute to economic development.



**Title:** Higher Capacity Lithium Ion Batteries Using Silicon/Carbon Composite Nanofiber Anodes

**PI:** Dr. Salman Noshear Arshad

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 990,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Sciences

**Description:** This project focuses on using both C and Si as a composite solution for improved electrochemical performance in modern LIBs by maintaining structural integrity and electrical conductivity. The main objective of this project is the

development of electrospun Si/C composite nanofibers as anode materials for lithium ion batteries and to improve the homogeneity and conductivity of fabricated Si/C composite nanofibers. The ultimate objective is the development of low cost and scalable battery materials for commercialization.



# DEPARTMENT OF COMPUTER SCIENCE

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**Profile:** Dr. Karim holds a B.Sc. degree from UET Lahore and a doctorate from The Ohio State University (OSU). Before joining LUMS in 2002, he worked as a research associate in the Knowledge Engineering Lab at OSU. Dr. Karim is an internationally recognized researcher in the areas of data mining, machine learning, and applied artificial intelligence. He has authored over 50 articles at leading venues including two books and 19 journal articles. At LUMS, Dr. Karim has been instrumental in developing and strengthening the graduate program in data mining and machine learning. He is founding director of the Knowledge and Data Engineering Lab, which is the centre of his research activities. The lab's recent publication venues include ICDM, CIKM, PAKDD, and COLING. Dr. Karim has supervised four PhD graduates in the data mining/machine learning area.

#### Selected Publications:

- Babar, Z., Mannan, A., Kamiran, F., & Karim, A. (2015, November). Understanding the Impact of Socio-Economic and Environmental Factors for Disease Outbreak in Developing Countries. In 2015 IEEE International Conference on Data Mining Workshop (ICDMW) (pp. 124-131). IEEE
- Hassan, M. T., Karim, A., Kim, J. B., & Jeon, M. (2015). CDIM: Document Clustering by Discrimination Information Maximization. Information Sciences, 316, 87-106
- Iqbal, M., Karim, A., & Kamiran, F. (2015, April). Bias-aware lexicon-based sentiment analysis. In Proceedings of the 30th Annual ACM Symposium on Applied Computing (pp. 845-850). ACM



**Title:** An Open-Source Project for Accessible LaTeX-based Authoring and Presentation of Mathematical Documents

**PI:** Dr. Asim Karim

**Sponsor:** Ignite

**Funding Amount:** PKR 12,525,099

**Project Initiated in:** 2016

**Duration:** 28 Months

**Category:** Computer Vision

**Description:** The primary purpose of this project is to develop ALAP, an integrated Accessible LaTeX-based Authoring and Presentation software for PVI. ALAP will provide advanced math-to-speech and basic math-to-Braille capabilities. ALAP will be

developed with open-source technologies to enable its widespread usability. As part of this project, existing technologies for accessible math will also be evaluated. The primary beneficiaries of this project are PVI in general and those in Pakistan specifically, and educational and business organizations dealing with mathematical content.



**Title:** Modelling and Normalizing Roman-Urdu Text for Automatic Processing

**PI:** Dr. Asim Karim

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 930,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Technology

**Description:** Roman-Urdu is widely used in online textual communications in Pakistan. From SMS messages to Twitter tweets users compose predominantly Urdu content using English alphabets. This writing style has developed to the extent that serious communications like public service messages and advertisements are also being done

in Roman-Urdu. Currently, there is no acceptable standard for Roman-Urdu writing, nor is there a reliable way of processing Roman-Urdu text for applications like event detection, topic modelling, and sentiment analysis. The goal of this project is to identify variants of the same word and map all those variants to its normal form. The prime objective is to focus on statistical natural language processing techniques to model and normalize Roman-Urdu text.



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**Profile:** Dr. Basit Shafiq received his BS degree in Electronic Engineering from GIK Institute of Engineering Sciences and Technology, Pakistan, MS and PhD degrees in Electrical and Computer Engineering from Purdue University, USA. He is currently an Assistant Professor in the Computer Science Department at LUMS. Prior to joining LUMS, he was a Research Assistant Professor at the Centre for Information Management, Integration and Connectivity (CIMIC), Rutgers University, USA. Dr. Shafiq's interests include information systems security and privacy, access-control management in distributed systems, Web services composition and verification, ontologies, and distributed multimedia systems. His research work resulted in several publications in well-renowned journals, including, IEEE Transactions on Knowledge and Data Engineering, ACM Transactions on Information and System Security, IEEE Transactions on Multimedia, IEEE Transactions on Service Computing, IEEE Computer, IEEE Communications Magazine, and Journal on Information and Computer Systems.

#### Recent Publications:

- Vaidya, J., Shafiq, B., Atluri, V., & Lorenzi, D. (2015). A Framework for Policy Similarity Evaluation and Migration Based on Change Detection. In *Network and System Security* (pp. 191-205). Springer International Publishing
- Irshad, H., Shafiq, B., Vaidya, J., Bashir, M. A., Asif, H. S., Ghayyur, S., ... & Nabil, A. (2015). A Privacy-Sensitive Collaborative Approach to Business Process Development. In *E-Business and Telecommunications* (pp. 318-342). Springer International Publishing
- Irshad, H., Shafiq, B., Vaidya, J., Bashir, M. A., Shamail, S., & Adam, N. Preserving Privacy in Collaborative Business Process Composition
- Ghosh, D., Ae Chun, S., Shafiq, B., & Adam, N. R. (2016, June). Big Data-based Smart City Platform: Real-Time Crime Analysis. In *Proceedings of the 17th International Digital Government Research Conference on Digital Government Research* (pp. 58-66). ACM
- Shafiq, B., Ghayyur, S., Masood, A., Pervaiz, Z., Almutairi, A., Khan, F., & Ghafoor, A. Composability Verification of Multi-service Workflows in a Policy-Driven Cloud Computing Environment
- Asif, H., Talukdar, T., Vaidya, J., Shafiq, B., & Adam, N. (2016, November). Collaborative Differentially Private Outlier Detection for Categorical Data. In *Collaboration and Internet Computing (CIC), 2016 IEEE 2nd International Conference on* (pp. 92-101). IEEE



**Title:** End-to-End Solution for Business Process Composition and Management (BP-Com)

**PI:** Dr. Basit Shafiq

**Co-PI:** Dr. Naveed Arshad, Dr. Shafay Shamail, Dr. Abdul Aziz

**Sponsor:** Ignite

**Funding Amount:** PKR 12,764,045

**Project Initiated in:** 2016

**Duration:** 24 Months

**Category:** Business & Innovation

**Description:** This project aims at improving efficiency and reducing cost for development, deployment, and management of business processes (BPs) for small

and medium enterprises (SMEs). Specifically, the objective is to utilize the cloud-based services and resources for rapid development and deployment of BPs for SME organizations that cannot bear with the high cost of personnel and software/hardware resources for coding, administration, and hosting of their business processes.



**Title:** Codec: Composition and Management of E Government Processes in the Cloud of Public Services

**PI:** Dr. Basit Shafiq

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 960,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** Governments are increasingly investing in their information technology (IT) for provisioning of e-government services. These e-government services can be composed as workflow for realization of intra-departmental or inter-departmental

government processes replacing the paper-based information exchange between different government departments with electronic information exchange. To address the IT infrastructure ownership and management issues, governments are increasingly adopting cloud infrastructure for hosting and deployment of their e-government services. This project addresses the issue of collaborative business process composition through research and development. Specifically, the objective is to develop a framework that enables generation of an executable business process from the high level design specification in an automated manner. The basic idea is to exploit the knowledge of the existing business processes of related organisations to compose an executable business process of a given organisation based on its requirements and design specifications.



**Title:** Information Sharing and Integration and Framework for Emergency Management and Response

**PI:** Dr. Basit Shafiq

**Co-PI:** Dr. Sohaib Ahmad Khan, Dr. Shahab M. Baqai

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 3,278,705

**Project Initiated in:** 2015

**Duration:** 24 Months

**Category:** Technology

**Description:** The objective of the proposed work is to address the research and development challenges for development of a decision support system for emergency

response planning and management. Such a system will enable shared situational awareness (SSA) and common operating picture (COP) among the relevant organizations (governmental, NGOs, private) for the purpose of providing effective decision support concepts at the operational and strategic levels during different phases of an emergency situation (prevention, response, and recovery).



**Title:** Codec: Composition and Management of E Government Processes in the Cloud of Public Services

**PI:** Dr. Basit Shafiq

**Co-PI:** Dr. Shafay Shamail, Prof. Nabil Adam (Rutgers University)

**Sponsor:** Higher Education Commission (HEC)

**External Collaboration:** Rutgers University

**Funding Amount:** PKR 20,136,738

**Project Initiated in:** 2015

**Duration:** 36 Months

**Category:** Technology

**Description:** The objective of the proposed work is to develop a middleware based

system (called Codec) to support composition and management of e-government processes by utilizing the services available in the Government Cloud or Public Cloud. The term Government Cloud is used to refer to the cloud infrastructure that hosts the e-government services provided by different government departments but managed by a single cloud service provider which may be a government department. Whereas, Public Cloud infrastructure hosts services provided by commercial or non-governmental service providers (e.g., Amazon, Google). Together, both Government Cloud and Public Cloud form the "Cloud of Public Services."

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**Profile:** Dr. Hamid Abdul Basit did his bachelors from Ghulam Ishaq Khan Institute of Engineering Sciences and Technology (GIKI) in 2000 and his PhD from National University of Singapore in 2007 on the analysis and semi-automated detection of similarity patterns in software. He worked as a post-doctoral researcher in the Software Engineering Lab at NUS in 2006-2007 on the extraction of software design from software similarities. Dr. Hamid developed a tool called Clone Miner for recovering higher-level similarity patterns in software using state-of-the-art string algorithms and data mining techniques. The results were presented at top software engineering conferences.

#### Selected Publications:

- Abid, S., & Basit, H. A. (2016, March). Towards a Structural Clone Based Recommender System. In 2016 IEEE 23rd International Conference on Software Analysis, Evolution, and Reengineering (SANER) (Vol. 3, pp. 51-52). IEEE
- Luciv, D. V., Koznov, D. V., Basit, H. A., & Terekhov, A. N. (2016). On fuzzy repetitions detection in documentation reuse. *Programming and Computer Software*, 42(4), 216-224
- Abid, S., Qamar, Z., Khan, N., Shayan, M., & Basit, H. A. (2016, December). Retrieving Design Pattern Usage Examples using Domain Matching. In *Software Engineering Conference (APSEC), 2016 23rd Asia-Pacific* (pp. 33-40). IEEE
- Abid, S., Javed, S., Naseem, M., Shahid, S., Basit, H. A., & Higo, Y. (2017, February). Codeease: harnessing method clone structures for reuse. In *Software Clones (IWSC), 2017 IEEE 11th International Workshop on* (pp. 1-7). IEEE



**Title:** Design and Implementation of a Language Independent Software Clone Management Tool Suite for Single and Multiple Systems

**PI:** Dr. Hamid Abdul Basit

**Co-PI:** Dr. Shafay Shamail, Dr. Basit Shafiq, Dr. Khushro Shahookar, Dr. Salman Iqbal

**Sponsor:** Ignite

**Funding Amount:** PKR 17,099,617

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Technology

**Description:** In the proposed clone management system, clones will be unified using Variant Configuration Language (VCL), which is a meta-programming language and

technique based on Bassett's frames. This is a language independent technique that provides unlimited parameterization capability to any level of detail in a given text. As part of this project, training sessions will be conducted for the selected industry personnel to effectively make use of the capabilities provided by the tool suite in managing software clones.



**Title:** Research and Development of a Design Patterns Based Code Recommendation System

**PI:** Dr. Hamid Abdul Basit

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Technology

**Description:** The main objective of this project is to propose a system that recommends concrete implementations of design patterns-based solutions, henceforth referred to as design pattern instances. The strength of proposed system will lie in its ability to

recommend highly relevant design pattern instances, based on deciphering the user context. The key idea is to build a large repository of mined design pattern instances from various open source code projects. The domain of these projects would be identified and stored as project profiles. A profile will also be built for the developer for whom a recommendation would be made and those projects with profiles similar to that of the developer will be recommended as relevant candidates for design pattern instance reuse.



**Title:** Research and Development of a Cloud-Based Systematic Code Reuse Platform for Public Administration Web Services

**PI:** Dr. Hamid Abdul Basit

**Co-PI:** Dr. Basit Shafiq

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** The overall goal of our proposed cloud-based reuse platform for Public Administration (PA) systems is to enable the development of new PA systems using

reusable artefacts extracted from existing e-government systems and services. These artefacts will be searched using simple keywords, which would provide the developer with appropriate reusable code artefacts to implement and integrate desired functionality in a time and effort efficient manner. The basis of this research is the integration of solutions offered by independent research areas from software engineering, data mining and service oriented architecture to provide a robust multifaceted solution. The major areas of research include code reuse, code mining, reusable code repositories, keyword based code search, and cloud computing.

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**Profile:** Dr. Ihsan Ayyub Qazi received his B.Sc. (Hons) degree from LUMS, with a double major in Computer Science and Mathematics, in 2005, and the PhD degree in Computer Science from the University of Pittsburgh, PA, in 2010. From 2010 to 2011, he was a Postdoctoral Research Fellow with the Centre for Advanced Internet Architectures, Australia. In 2009, he worked at BBN Technologies, Cambridge, MA USA on the Global Environment for Network Innovations (GENI) project. His research interests are in computer networks and distributed systems and span cloud computing and data centres, high speed wireless networks, smart grids, and performance modelling of networked systems. He has published in top-tier networking journals, such as IEEE/ACM Transactions on Networking, as well as top-tier conferences (e.g., ACM SIGCOMM and IEEE INFOCOM). He is the recipient of the Andrew Mellon Fellowship and the Best Graduate Student Research Award from the University of Pittsburgh in 2009.

#### Selected Publications:

- Ilyas, M. S., Qazi, I. A., Rassool, B., & Uzmi, Z. A. (2016). Low-Carb: A practical scheme for improving energy efficiency in cellular networks. *Computer Communications*, 94, 72-84
- Ahmad, S., Haamid, A. L., Qazi, Z. A., Zhou, Z., Benson, T., & Qazi, I. A. (2016, November). A view from the other side: Understanding mobile phone characteristics in the developing world. In *Proceedings of the 2016 ACM on Internet Measurement Conference* (pp. 319-325). ACM
- Iftikhar, A. M., Dogar, F., & Qazi, I. A. (2016, November). Towards a Redundancy-Aware Network Stack for Data Centers. In *Proceedings of the 15th ACM Workshop on Hot Topics in Networks* (pp. 57-63). ACM



**Title:** A High Performance Cloud Data Center Architecture Using Software-Defined Networks

**PI:** Dr. Ihsan Ayyub Qazi

**Co-PI:** Dr. Zartash Afzal Uzmi

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 5,612,842

**Project Initiated in:** 2015

**Duration:** 24 Months

**Category:** Technology

**Description:** The goals of this project is to design and analyse a high performance cloud data centre network architecture using Software-Defined Networks (SDNs) to

address critical challenges of performance and efficiency in such environments. Moreover, to design and analyse a scalable and low-complexity framework (including protocols and algorithms) for monitoring and managing cloud data centre resources, and implement a prototype and demonstrate the efficacy of the proposed scheme in achieving high performance. The proposed architecture has many advantages, including high performance due to its ability to manage cloud resources using a distributed control framework for the SDN traffic, scalable monitoring by using a framework that collects statistics from network devices in an efficient manner, as well as scalability of SDN management, leveraging the hierarchical structure of data centre topologies and the use of low-complexity algorithms for coordination.



**Title:** A Service Differentiation Framework for Next-Generation WiFi Networks

**PI:** Dr. Ihsan Ayyub Qazi

**Co-PI:** Dr. Zartash Afzal Uzmi

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 960,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Telecommunication

**Description:** The main objective of this project is to quantify the fundamental tradeoff between network throughput and the QoS of real-time applications in high-speed WLANs, such as 802.11n, over a real WiFi testbed. The purpose of this research project

is to design, analyse, implement and evaluate the performance of SlickFi, a service differentiation scheme for WiFi networks.



**Title:** Towards Predictable and Resilient Multi-Tenant Cloud Datacentres

**PI:** Dr. Ihsan Ayyub Qazi

**Co-PI:** Dr. Zartash Afzal Uzmi, Dr. Fahad Rafique Dogar (Assistant Professor, Computer Science Department, Tufts University, USA)

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 960,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** Users increasingly rely on cloud computing services for managing their computation, storage and communication requirements. Thus, a key goal for cloud

datacentres is to provide predictable performance to tenants. Unpredictable performance is not only a key hindrance to cloud adoption but also hurts application performance and causes provider loss. While prior works improve predictability by guaranteeing each tenant a certain minimum network bandwidth, they ignore an important reality of datacentres: failures. The goals of this project are as follows: (i) to analyse the resilience properties of existing data centre topologies (e.g. FatTree and Jellyfish) under realistic datacentre workloads; (ii) to design, analyse and implement resource management techniques for providing resilience (including design of the control plane and the data plant) in datacentre architecture; (iii) to quantify the cost of providing resilience on datacentre topologies (the cost is usually in terms of cloud resources such as replicas of VMs and backup network bandwidth reservations); (iv) to design new datacentres topologies with predictable performance and resilience to failures as first order goals.



**Title:** A QoS Differentiation Framework for Next-Generation High-Speed Wifi Networks

**PI:** Dr. Ihsan Ayyub Qazi

**Co-PI:** Dr. Zartash Afzal Uzmi

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 2,660,242

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Telecommunication

**Description:** The main objective of this project is to design a Quality of Service (QoS) differentiation scheme for high-speed WiFi networks that simultaneously maximizes the performance of real-time applications and network throughput. The proposed

framework will allow real-time applications like Skype and NetFlix to achieve high performance thereby improving user experience and it will allow larger number of users to effectively use a WiFi network than currently possible. The proposed design will be implemented in open source drivers in a backward-compatible manner so that all existing WiFi devices can benefit from the proposed research without requiring any changes in the WiFi standard.

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**Profile:** Dr. ImdadUllah Khan is an Assistant Professor of Computer Science at LUMS School of Science and Engineering. He received his PhD in Computer Science from Rutgers, The State University of New Jersey. Prior to joining LUMS, Dr. Khan was an Assistant Professor at the department of Computer Science, in Umm Al-Qura University, KSA.

#### Selected Publications:

- Khan, I. (2016). Perfect Matchings in 4-uniform hypergraphs. *Journal of Combinatorial Theory Ser. B*, Elsevier, pp. 333–366
- Khan, I. (2015). Ore-degree threshold for the square of a Hamiltonian cycle. *Journal of Discrete Mathematics & Theoretical Computer Science*, French association of Discrete Mathematics & TCS, pp. 13–32
- Khan, I. (2013). Perfect matching in 3 uniform hypergraphs with large vertex degree. *SIAM Journal of Discrete Mathematics*, SIAM, pp. 1021-1039
- Khan, I. Generalized Similarity Kernels for Efficient Sequence Classification. *SIAM International Conference on Data Mining*, SIAM, pp. 873-88
- DeBiasio, L., Faizullah, S., & Khan, I. (2015). Ore-degree threshold for the square of a Hamiltonian cycle. *Discrete Mathematics and Theoretical Computer Science*, 17(1), 13-32



**Title:** A Course Enrollment Recommendation System: A First Phase In Educational Data Mining For Efficient Universities Decision Support System

**PI:** Dr. ImdadUllah Khan

**Co-PI:** Dr. Naveed Arshad

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 960,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Education

**Description:** The overall project aims to develop intelligent decision support system for universities in Pakistan to improve quality of education and efficiency of processes.

The main objective is to develop efficient algorithms for mining and analyzing large datasets from educational institutions and design an intelligent decision support system to aid admissions, instructions and student's guidance processes at universities. The purpose is to design a system that will aid students in making an informed decision regarding choosing elective courses, declaring major/minor and opting for a project in a particular area. This system will predict student's success in each of the available options using statistical analysis of students past record, current trends and course analytics.

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**Profile:** Dr. Junaid Haroon Siddiqui is an Assistant Professor of Computer Science at LUMS School of Science and Engineering. Previously, he received PhD in Computer Science from UT Austin (The University of Texas at Austin) and MS and BS Computer Science from FAST-NU National University of Computer and Emerging Sciences, Lahore, Pakistan. His experience includes 8 years of teaching at FAST-NU, LUMS, and UT Austin. His 7 years of industry experience includes working at Microsoft, Google, and various Pakistan based software houses. He is leading the Program Analysis Group for research in using automated analysis for software reliability. His research interests include program analysis using static and dynamic techniques in automatic software test generation and parallel and incremental techniques in scaling algorithms for multicore processors and the intersection of these domains.

#### Selected Publications:

- Makhdoom, S., Khan, M. A., & Siddiqui, J. H. (2014). Incremental symbolic execution for automated test suite maintenance. Paper presented at the ASE 2014 - Proceedings of the 29th ACM/IEEE International Conference on Automated Software Engineering
- Rehman, W. U., Ayub, M. S., & Siddiqui, J. H. (2016, February). Verification of MPI Java programs using software model checking. In Proceedings of the 21st ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (p. 55). ACM
- Ghafoor, M. A., Mahmood, M. S., & Siddiqui, J. H. (2016, April). Effective Partial Order Reduction in Model Checking Database Applications. In Software Testing, Verification and Validation (ICST), 2016 IEEE International Conference on (pp. 146-156). IEEE
- Mahmood, M. S., Abdul Ghafoor, M., & Siddiqui, J. H. (2016, August). Symbolic execution of stored procedures in database management systems. In Proceedings of the 31st IEEE/ACM International Conference on Automated Software Engineering (pp. 519-530). ACM
- Ahmed, S., Khan, H., Siddiqui, J. H., Bitsch, J. Á., & Alizai, M. H. (2016, November). Incremental Checkpointing for Interruptible Computations: Poster Abstract. In Proceedings of the 14th ACM Conference on Embedded Network Sensor Systems CD-ROM (pp. 350-351). ACM



information management systems.

**Title:** Making IT Systems Resilient Using Automated Program Analysis

**PI:** Dr. Junaid Haroon Siddiqui

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 940,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Technology

**Description:** The motivation of this research is to use automated verification techniques to make widely deployed database management systems more resilient. This project proposes to use a state of the art program analysis technique called symbolic execution. This project intends to extend symbolic execution to analyze complex



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**Profile:** Dr. Awais received his PhD from Imperial College, University of London. Prior to joining LUMS, Dr. Awais conducted European Union research and development projects for a UK based SME. His PhD work was related to the development of on-line models for parametric estimation of solid fuel-fired industrial boilers. Dr. Awais has also conducted research work on a class of iterative methods pertinent to Krylov subspaces for optimisation, such as the oblique projection and implicitly restarted model reduction methodologies.

#### Selected Publications:

- Khalid, A., & Awais, M. M. (2015). Comparing distance to consensus of collective relations using OWA operators. *Journal of Intelligent and Fuzzy Systems*, 28(4), 1647-1657
- Rana, Z.A., Mian, M.A., Shamail, S. (2015) Improving Recall of software defect prediction models using association mining: *Knowledge-Based Systems*
- Javaid, M. M., Yousaf, M. A., Sheikh, Q. Z., Awais, M. M., Saleem, S., & Khalid, M. (2015, November). Real-Time EEG-based Human Emotion Recognition. In *Neural Information Processing* (pp. 182-190). Springer International Publishing
- Baig, M. M., El-Alfy, E. S. M., & Awais, M. M. (2015, November). Learning Rule for Linear Multilayer Feedforward ANN by Boosted Decision Stumps. In *Neural Information Processing* (pp. 345-353). Springer International Publishing
- Baig, M. M., Awais, M. M., & El-Alfy, E. S. M. (2017). A multiclass cascade of artificial neural network for network intrusion detection. *Journal of Intelligent & Fuzzy Systems*, 32(4), 2875-2883
- Baig, M. M., Awais, M. M., & El-Alfy, E. S. M. (2017). AdaBoost-based artificial neural network learning. *Neurocomputing*, 248, 120-126



**Title:** Knowledge Management for All - Tool (KMAT)

**PI:** Dr. Mian Muhammad Awais

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 2,429,067

**Project Initiated in:** 2015

**Duration:** 16 Months

**Category:** Technology

**Description:** Knowledge is considered a broad concept and in the decade interest in treating and processing knowledge has grown tremendously. This importance has arisen due to the emphasis on knowledge economy. The interest in KM and KM systems has given a thrust to formalizing the domain of KM. In the recent past the

competitive edge which the application of KM systems has provided to organisations has further strengthened the belief in developing such systems. KM is a multi-dimensional and faceted concept. This project aims at developing a generic knowledge management system, Knowledge Management for All Tool (K-MAT) that would have the following features: (i) readily integrate able to most common existing DIMS, and legacy systems; (ii) Adaptable for any SME sector with complete KM control; (iii) Easily manageable by SMEs without incurring specialised human resource cost.

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**Profile:** Dr. Muhammad Fareed Zaffar is an Assistant Professor of Computer Science at the School of Science and Engineering (SBASSE) at LUMS. He holds a PhD in Computer Science from Duke University, with specialisation in network and distributed systems security. Prior to joining LUMS, Dr. Zaffar worked at IBM and SRI International. He has provided technical assistance to the National Judicial Automation Commission (NJAC) in finding technology based interventions in order to facilitate transport and efficient management of the judicial system in Pakistan. Dr. Zaffar's research interests include Network and Distributed Systems Security as well as in networking, storage systems, computer architecture, as well as performance evaluation and distribution systems.

#### Selected Publications:

- Amjad, H. A. R., Naeem, U., Zaffar, M. A., Zaffar, M. F., & Choo, K. K. R. (2016, June). Improving Security Awareness in the Government Sector. In Proceedings of the 17th International Digital Government Research Conference on Digital Government Research (pp. 1-7). ACM
- Yousaf, S., Iqbal, U., Farooqi, S., Ahmad, R., Shafiq, Z., & Zaffar, F. Malware Slums: Measurement and Analysis of Malware on Traffic Exchanges
- Kazmi, H., Lakhani, H., Gehani, A., Tahir, R., & Zaffar, F. (2016, October). To route or to secure: Tradeoffs in ICNs over MANETs. In Network Computing and Applications (NCA), 2016 IEEE 15th International Symposium on (pp. 367-374). IEEE
- Khaliq, A., Ravindran, R., Hussainy, S. F., Krishnan, V. V., Ambreen, A., Yusuf, N. W., & Chaudhry, M. N. (2017). Field evaluation of a blood based test for active tuberculosis in endemic settings. PLoS one, 12(4), e0173359



**Title:** Access to Justice for Poor and Vulnerable Groups through Support to Legal and Civil Society Organisations and Judiciary in Punjab, Pakistan

**PI:** Dr. Muhammad Fareed Zaffar

**Sponsor:** Global Development Services International (GDSI)

**Funding Amount:** PKR 3,079,560

**Project Initiated in:** 2015

**Duration:** 10 Months

**Category:** Law & Policy

**Description:** The proposed scope of work for this project includes documentation of up to date statistics and the preparation of flow-charts to understand existing processes in courts of Multan, Bahawalpur and Muzaffargarh. It will also include analysis of the

documented material with an aim to streamline laws and procedures to highlight service delivery gaps which can serve as foundation for any future interventions. More specifically, proposed scope of our project can be divided into the following parts: Documentation of up-to-date statistics as well as the parallel assessment of caseload and case processing times in prosecutor office.



**Title:** Learn While You Teach

**PI:** Dr. Muhammad Fareed Zaffar

**Sponsor:** Society for Advancement of Higher Education (SAHE)

**Funding Amount:** PKR 2,620,365

**Project Initiated in:** 2015

**Duration:** 13 Months

**Category:** Education

**Description:** The project seeks to develop an android based application which will allow record attendance of teachers per visit as well as provide a video browsing menu for DTE to videos filtered by school, teachers and class. In addition to this, the android application will provide the facility to update videos to the tablet using cards, submit

data from the application to a central server and collect data in a manageable format. The android application will contain both English and Urdu Language support.



**Title:** Re-Development of Software (Prosecution Case Flow Management System) For Public Criminal Prosecution Services (PCPS) In Punjab

**PI:** Dr. Muhammad Fareed Zaffar

**Co-PI:** Dr. Sohaib Ahmad Khan

**Sponsor:** Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

**Funding Amount:** PKR 2,924,995

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Law & Policy

**Description:** In order to propose a model to improve the overall prosecution process, Prosecution department facilitated a pilot effort in 2014 supported by GIZ to automate

the process flow to encourage maintenance of a live database to address these dated challenges. The technical support was provided by Technology for People Initiative at Lahore University of Management Sciences. The initiative was successful in highlighting the importance of IT-based systems in the department and the rollout in the field provided necessary lessons learnt by exposing shortcomings and challenges in its adoption in daily prosecutorial work. The steep learning curve during the pilot implementation provides a foundation for a redesign of the system, while incorporating the up-dated needs and requirements of the reforming prosecution department. This project highlights the Scope of Engagement by Technology for People Initiative, the technology partner, in the next phase of implementation, which concentrates on redesign and adaptation on current redefined needs based on lessons during first phase of pilot implementation.



**Title:** Statistan

**PI:** Dr. Muhammad Fareed Zaffar

**Co-PI:** Dr. Tariq Mahmood Jadoon, Dr. Suleman Shahid

**Sponsor:** United States Institute of Peace (USIP)

**Funding Amount:** PKR 7,858,630

**Project Initiated in:** 2016

**Duration:** 16 Months

**Category:** Development Management

**Description:** In this project Dr. Muhammad Fareed Zaffar under Technology for People Initiative (TPI), propose to develop an innovative data platform called Statistan: an open-access web tool that would allow users to visualize structured datasets using

maps and charts along with a sub-platform that aims to stimulate a culture of civic engagement with data and research by tracking the mood of the country across different times and after historic events.



**Title:** Statistan and Moodistan

**PI:** Dr. Muhammad Fareed Zaffar

**Co-PI:** Dr. Suleman Shahid

**Sponsor:** Center for Economic Research in Pakistan (CERP)

**Funding Amount:** PKR 1,885,410

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Development Management

**Description:** Dr. Fareed Zaffar along with TPI-LUMS will be developing a two-part data innovation platform that aims to expose policymakers, young researchers, NGOs and the public to high quality data and research in useful, interesting and compelling ways

as a means of increasing the demand and ability to use this information. The first platform, called Statistan, targets policymakers, researchers, journalists and NGOs to increase the availability of meaningful data and research on the specific issue areas in which they work. The second platform a mood analyser, Moodistan, which will be able to evaluate how different media agencies report same news items and how the citizens' mood can be gauged from it.



**Title:** Computational Modeling of Active Tuberculosis using Clinical, Immunological data

**PI:** Dr. Muhammad Fareed Zaffar

**Co-PI:** Dr. Imran Khan - University of California, Davis

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 960,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Sciences

**Description:** The fundamental aim of this project is to integrate biomarker data, clinical data, and patient information by the use of computational modeling to improve TB healthcare capacity in Pakistan (and TB-endemic countries). The resulting models will

not only improve understanding of the TB disease and its progression but also enable the development of rapid and cost-effective measures to detect TB allowing simultaneous, bench-top analysis of thousands of samples per day. Developing, testing and implementing automated diagnostic algorithms can be helpful in overcoming infrastructural and human-resource constraints in poorly resourced countries.



**Title:** Improve Efficiency, Reliability and Trenchancy of the School Education Department by Automating HR Processes

**PI:** Dr. Muhammad Fareed Zaffar

**Sponsor:** Adam Smith International (ASI)

**Funding Amount:** PKR 5,344,979

**Project Initiated in:** 2015

**Duration:** 10 Months

**Category:** Development Management

**Description:** The overall objective of the project is to improve efficiency, reliability and transparency of the school education department by automating the HR processes. This system will enable the authorities to make informed decisions based on reliable

information, in a timely manner.



**Title:** Measuring and Mitigating OAuth Access Token Abuse by Collusion Networks

**PI:** Dr. Muhammad Fareed Zaffar

**Sponsor:** Facebook

**Funding Amount:** PKR 879,900

**Project Initiated in:** 2016

**Duration:** 41 Months

**Category:** Technology

**Description:** In this research project, Dr. Muhammad Fareed Zaffar and Dr. Zubair Shafiq discovered a major Facebook loophole. Together the dynamic team unfolded a collusion network formed on Facebook which is used to generate millions of fake likes and comments. The team endeavours to reduce the issue with the help of Facebook.

The findings will be published at the 17th Internet Measurement Conference (IMC) in London.

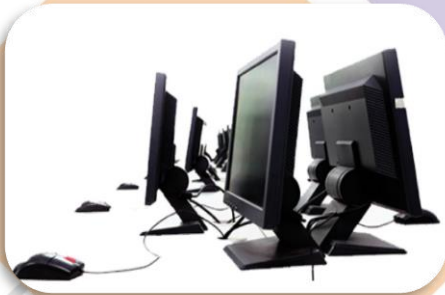
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**Profile:** Dr. Muhammad Hamad Alizai completed his B.Sc. Computer Engineering from UET Peshawar, and his MSc in Software Systems Engineering and PhD in EE and CS from RWTH Aachen University, Germany. Dr. Alizai has over 10 years of experience in Germany and Pakistan as a researcher, software engineer, and technical lead both in industrial and academic settings. He has authored book, book chapters and published numerous scientific papers, while abroad and indigenously from Pakistan, several of them in top flight ACM SIG sponsored venues. He is experienced in leading innovative research projects in pervasive computing technologies such as Internet of things, sensor and delay tolerant networks, ICT4D, and mobile computing. He was employed as a software engineer in several European Union projects and has a wealth of experience in teaching/training cutting edge technologies and courses in theoretical and practical computer sciences at grad, post grad and professional level. He is also a visiting researcher at alma mater - ComSys, RWTH Aachen, Germany - due to his post graduate research excellence.

#### Selected Publications:

- Bhatti, N. A., Syed, A. A., & Alizai, M. H. (2015). Laser Based Energy Distribution Architecture for Decoupling Energy and Sensing Planes in WSN. International Journal of Distributed Sensor Networks, 2015
- Munawar, W., Alizai, M.H., Landsiedel, O., Wehrle, K. (2015) Modular remote reprogramming of sensor nodes., International Journal of Sensor Networks
- Bhatti, N. A., Alizai, M. H., Syed, A. A., & Mottola, L. (2016). Energy Harvesting and Wireless Transfer in Sensor Network Applications: Concepts and Experiences. ACM Transactions on Sensor Networks (TOSN), 12(3), 24
- Khan, S. A., Moosa, M., Naeem, F., Alizai, M. H., & Kim, J. M. (2016). Protocols and Mechanisms to Recover Failed Packets in Wireless Networks: History and Evolution. IEEE Access, 4, 4207-4224
- Ahmed, S., Khan, H., Siddiqui, J. H., Bitsch, J. Á., & Alizai, M. H. (2016, November). Incremental Checkpointing for Interruptible Computations: Poster Abstract. In Proceedings of the 14th ACM Conference on Embedded Network Sensor Systems CD-ROM (pp. 350-351). ACM
- Alizai, M. H. Practical and Self-Configurable Multihop Wireless Infrastructure—A Functional Perspective. Int. J. of Ad Hoc and Ubiquitous Computing (IJAHUC), In Press, IF 0.91, 5, 3-4



**Title:** iCompute

**PI:** Dr. Muhammad Hamad Alizai

**Co-PI:** Prof. Klaus Wehrle, RWTH Aachen University

**Sponsor:** German Pakistani Research Cooperation Program (DAAD) | RWTH Aachen University

**Funding Amount:** PKR 8,945,976

**Project Initiated in:** 2015

**Duration:** 24 Months

**Category:** Technology

**Description:** Miniaturized self-powered devices are transforming the way we interact with everyday physical objects. These devices, as part of the Internet of Things (IoT),

embed computing in the physical world and deliver their data over a low-power, wireless mesh network. As these devices become smaller and more numerous, possibly the next billion, plugging them in to provide power is unfeasible. Computing at such scales is thus difficult to realize until these devices either find their own energy, possibly by harvesting ambient sources or charged wirelessly from a remote location, excluding the need for intrusive power infrastructure. However, ambient and wireless energy sources are both intermittent and unpredictable. Thus there is a need to adapt computing and communication to this new constraint of unpredictable and intermittent supply of energy: this requires revisiting basic assumptions about system start up, state check pointing across activation cycles, discovering and communicating with neighbours, predicting future energy availability, and scheduling operations under energy uncertainty. The key idea of this project is to develop a new computing paradigm that will enable IoT devices to resume their operation, not restart from scratch, across different activation cycles.



**Title:** Intermittent Computing for the Intermittently Powered Internet of Things

**PI:** Dr. Muhammad Hamad Alizai

**Co-PI:** Dr. Tariq Mahmood Jadoon

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** The scope of this project is to investigate the challenges and implement a prototypical solution along the first dimension (system software) of IoT operation. The objective is to start a new research initiative at LUMS in this area, ultimately seeking

funds from national and international funding agencies for further investigations along the other two dimensions.



**Title:** Error Tolerant Communication Stack in Low-Power Wireless Networks

**PI:** Dr. Muhammad Hamad Alizai

**Co-PI:** Dr. Laiq Hasan , UET Peshawar

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 3,453,108

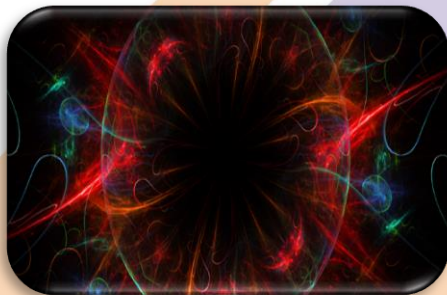
**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Telecommunication

**Description:** This project proposes to develop error tolerant wireless networking protocols specifically for intermittently power embedded networks. Existing protocols only process information if it is received correctly and drop it otherwise. The objective

is to develop a network stack that is best suited for the volatile environment offered by such networks. The underlying idea is to create an adaptive communication environment that can tune the reliability requirements on the network.



**Title:** Extending the Cyberphysical Systems R & D Paradigm using Energy Transference

**PI:** Dr. Muhammad Hamad Alizai

**Co-PI:** Dr. Syed Affan Ahmed – Director Engineering, PLUMgrid Inc.

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 5,207,031

**Project Initiated in:** 2016

**Duration:** 21 Months

**Category:** Energy

**Description:** The objective of this project is to explore and expand the capability of cyber-physical systems using in-network energy transference. Current embedded sensor and cyber-physical systems are severely limited by the availability of energy.

This project intends to explore extending this capability by arguing a modified version of the Robin-Hood argument “take energy from the (energy)-rich and give it to the (energy)-poor”.



**Title:** Old is Gold: Synthesizing Energy Efficient Use of Legacy Devices for Thermal Comfort in Older Buildings

**PI:** Dr. Muhammad Hamad Alizai

**Co-PI:** Dr. Tariq Mahmood Jadoon

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Energy

**Description:** The main objective of this project is to achieve human comfort and energy efficiency by enabling HVAC-like functionality in older buildings through aggregate

usage of distributed air conditioning elements. This project has proposed to retrofit a Software Defined Air Conditioning system, namely SODAC, using the Internet-of-things (IoT) technology to transform the older building lot in the developing world to behave similarly to their modern and expensive HVAC based counterparts. With the addition of a few low cost sensors, actuators, and a server enabling centralized policies and control can optimize the usage of building-wide distributed air conditioning elements for safe living and energy efficiency.

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**Profile:** Dr. Taj earned his PhD and MSc degrees in electronic engineering and computer science from Queen Mary University of London (QMUL), United Kingdom, in 2009 and 2005, respectively. He received his BE (IT) degree (with distinction) in Engineering from Hamdard University, Pakistan, in 2003. Currently, he is holding the position of Visiting Assistant Professor at Lahore University of Management Sciences, Pakistan. His research interests are object detection and tracking using multimodal sensors. He has served as a reviewer for the IEEE Transactions on Circuits and Systems for Video Technology and the International Workshop on Content-Based Multimedia Indexing.

#### Selected Publications:

- Taj, M., Hassan, A., & Khalid, A. R. (2014). 2D Human Pose Estimation and Tracking in Non-overlapping Cameras. In Human Behavior Understanding in Networked Sensing (pp. 261-281). Springer International Publishing
- Bajwa, R., Gilani, S. R., & Taj, M. (2016, June). 3D Architectural Modeling: Coarse-to-fine model fitting on point cloud. In Proceedings of the 33rd Computer Graphics International (pp. 65-68). ACM
- Nasir, A. K., Taj, M., & Khan, M. F. (2016). Evaluation of Microsoft Kinect Sensor for Plant Health Monitoring. IFAC-PapersOnLine, 49(16), 221-225



**Title:** Enabling 3D Vision on Hand-held devices

**PI:** Dr. Murtaza Taj

**Co-PI:** Dr. Sohaib Ahmad Khan

**Sponsor:** Ignite

**Funding Amount:** PKR 9,193,137

**Project Initiated in:** 2016

**Duration:** 18 Months

**Category:** Computer Vision

**Description:** This research aims to change the way people do daily activities by developing more core vision technologies for embedded platforms. The purpose of this research is to enable technology for three key applications; group photo, art

preservation and augmented sharing. Such application development can earn significant economic gains through sales in international market via online market places.

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**Profile:** Dr. Naveed Arshad completed his PhD from University of Colorado at Boulder, USA. Before joining LUMS, he has worked with ABN AMRO Global IT Systems, Pakistan International Airline. He is a part of the Software Engineering Research Group (SERG) at LUMS which undertakes research in various areas of software engineering such as engineering of autonomic systems, conceptual modelling, large scale systems development, etc.

#### Selected Publications:

- Arshad, N., & Ali, U. (2017). An analysis of the effects of residential uninterpretable power supply systems on Pakistan's power sector. *Energy for Sustainable Development*, 36, 16-21
- Tariq, Z. B., Khalid, Q., Ikram, J., & Arshad, N. (2017). An approach to operate high-powered legacy electrical appliances on small scale solar PV systems. *Renewable Energy*, 104, 238-247
- Khalid, Q., Ikram, J., & Arshad, N. (2017). A Collaborative Approach to Operate High Powered Devices on Small-scale PV systems. *Energy Procedia*, 111, 895-903
- Khalid, Q., Ikram, M. J., & Arshad, N. (2017). Harvesting maximal PV energy with fine grained energy distribution: An alternative to traditional PV systems in buildings. *Energy and Buildings*, 148, 355-365



**Title:** Towards Developing a Smart Electric Grid in Pakistan with 100% Renewable Energy Sources

**PI:** Dr. Naveed Arshad

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Energy

**Description:** The main objective of this project is to develop a Deeply Intelligent Distribution System (DIDS) model of energy Demand Side Management (DSM) and Economic Dispatch (ED) using 100% renewable sources for electricity supply. In most

renewable sources, electricity production is contributed from numerous smaller production units. The electricity produced from some renewable sources is intermittent and thus sometimes not really schedulable or controllable due to climatic and environmental factors. In this project, goal is to comprehensively look at the electricity supply and demand in Pakistan with 100% renewable sources. This project aims to develop a simulation model to generate myriad number of renewable electricity supply and demand scenarios that can be tested using DIDS.



**Title:** Simulation Modeling, Analysis and Forecasting of Electricity Generation and Consumption in Pakistan Using System Dynamics Approach

**PI:** Dr. Imran Mahmood - National University of Science and Technology (NUST)

**Co-PI:** Dr. Naveed Arshad

**Sponsor:** USAID | National University of Science and Technology (NUST)

**Funding Amount:** PKR 2,980,200

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Energy

**Description:** The main objective of this research is to develop a macro-level dynamic simulation model for predicting electricity demand in Pakistan and to analyse the role of various means of electricity production (Fossil fuel, hydro, nuclear & renewable

sources etc.) in Pakistan. The motive is to study and analyse different policies and regulations and other factors such as prices/tariffs and investments and capital in the demand and supply of the electricity to support future energy planning in Pakistan. This project has proposed the development of a hierarchical, multi-scale, multi-resolution SD model. A hierarchical model is based on composition of sub-models in a hierarchical order. The successful execution of this project will help the decision makers to adopt optimal choices for future electricity energy planning in the country.



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**Profile:** Dr. Suleman received his PhD in Human Computer Interaction in 2011 from Tilburg University, Netherlands and PDEng (Professional Doctorate in Engineering) in 2007 in User System Interaction program from Eindhoven University of Technology, Netherlands. Since 2015, he is working as an Assistant Professor at Lahore University of Management Sciences (LUMS). He has received numerous teaching awards throughout his career that depicts his proficiency in the field of research and academics.

#### Selected Publications:

- Khan, V. J., Bonn , D., & Shahid, S. (2017). Interactive Advertisements in an IoT Era. In Intelligent Technologies for Interactive Entertainment: 8th International Conference, INTETAIN 2016, Utrecht, The Netherlands, June 28–30, 2016, Revised Selected Papers (pp. 106-111). Springer International Publishing
- Pereira, M. S., Cozjin, R., Postma, E., Shahid, S., & Swerts, M. (2016). Comparing a Perceptual and an Automated Vision-Based Method for Lie Detection in Younger Children. *Frontiers in Psychology*, 7
- Abid, S., Javed, S., Naseem, M., Shahid, S., Basit, H. A., & Higo, Y. (2017, February). Codeease: harnessing method clone structures for reuse. In *Software Clones (IWSC), 2017 IEEE 11th International Workshop on* (pp. 1-7). IEEE
- Abdul Ghafoor, M., Abbasi, A., Zaidi, M. F., Arshad, F., & Shahid, S. (2017, May). LiveDliver & HepOrganizer: A Digital No to Hepatitis in Pakistan. In *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (pp. 2307-2313). ACM



**Title:** Designing Digital Aids for Children with Autism in Pakistan

**PI:** Dr. Suleman Shahid

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Health

**Description:** The aim of this project is to design technological aids that assist autistic children (4 to 8 years old) in Pakistan to improve their verbal communication skills. More specifically, this project aims at developing two different but related solutions for teaching autistic children their native language i.e. Urdu. The core focus of this

project will be the development of a mobile application platform that will consist of four modules. One of the key objectives of this project is to understand the need of such technology in Pakistan, as no digital solution has been developed to rehabilitate the autistic kids in the Pakistani context. Another goal is to design a comprehensive mobile application platform to improve the language skills of autistic children in Pakistan, thus helping them to come to the mainstream society.



**Title:** PeaceTech Exchange (PTX) Workshops in Pakistan

**PI:** Dr. Suleman Shahid

**Sponsor:** PeaceTech Lab

**Funding Amount:** PKR 12,008,278


**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Education

**Description:** The fundamental objective of this project was to organize and implement a series of PeaceTech Exchange (PTX) workshops in Pakistan. PTX workshops are three to five day, highly interactive conferences in which participants are brought together with local technology experts to explore ways to apply technology to peace

building. PeaceTech Exchanges also foster project design - guiding participants in how to define their problems, developing solutions, and creating projects that implement technologies learned at the workshop.



**DEPARTMENT OF ELECTRICAL  
ENGINEERING**

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**Profile:** Dr. Abubakr received his PhD in Electrical Engineering from Georgia Institute of Technology (2005). As a graduate student, he also got a Masters degree in Mathematics (2005) and a Masters degree in Electrical Engineering (2002) from Georgia Tech. He completed his B.Sc. in Electrical Engineering from the University of Engineering & Technology Lahore, Pakistan (2000). Before joining LUMS, he has taught and done research as a postdoctoral fellow at McGill University Canada (2007-2008) and at the University of Pennsylvania, USA (2006-2007). Dr. Abubakr Muhammad does fundamental research at the interface of systems engineering, applied mathematics and applied physics, on various problems in robotics, and distributed sensing, network dynamics and quantum information sciences. His interests span the study of connections and complexity in large-scale distributed networks; topological methods for information discovery in massive data sets; and communication, computation & control issues in the physics of information. He has also worked and consulted for the industry on the design of air traffic control systems, radar & sonar systems, communication equipment and medical instrumentation. His current research focuses on the development of cyber-physical systems for development and critical infrastructures in Pakistan, in particular issues related to water.

#### Selected Publications:

- Abubakar, M. B., A Hussain, R Bibi, Z.Gul, A Bashir, Z Arshad, S.N Uppal, M.A Chaudhary, S.U. (23 February 2016). Towards providing full spectrum antenatal health care in low and middle income countries. HEALTHINF 2016 - 9th International Conference on Health Informatics, Proceedings; Part of 9th International Joint Conference on Biomedical Engineering Systems and Technologies, BIOSTEC 2016, 2016, Pages 2478-2483
- Manzoor, T., Rovenskaya, E., & Muhammad, A. (2016). Game-theoretic insights into the role of environmentalism and social-ecological relevance: A cognitive model of resource consumption. *Ecological Modelling*, 340, 74-85
- Muhammad, A. (2016, July). Managing river basins with thinking machines. In *Norbert Wiener in the 21st Century (21CW)*, 2016 IEEE Conference on (pp. 1-6). IEEE
- Rehmat, C. A., Muhammad, A., & Hassan, N. U. (2016). Comparative Frameworks for Risk Mitigation in Canal Networks. *Procedia Engineering*, 154, 1414-1423
- Muhammad, A., Haider, B., & Ahmad, Z. (2016). IoT Enabled Analysis of Irrigation Rosters in the Indus Basin Irrigation System. *Procedia Engineering*, 154, 229-235
- Riaz, W., Ahmad, Z., & Muhammad, A. (2016). A Smart Metering Approach towards Measuring Flows in Small Irrigation Outlets. *Procedia Engineering*, 154, 236-242
- Khan, M. M., Ali, H., Berns, K., & Muhammad, A. (2016, October). Road Traversability analysis using network properties of roadmaps. In *Intelligent Robots and Systems (IROS)*, 2016 IEEE/RSJ International Conference on (pp. 2960-2965). IEEE



**Title:** Safe Roadmaps: Vehicle-specific Traversability & Safety Verification of Broken-Roads and Off-Road Pathways

**PI:** Dr. Abubakr Muhammad

**Co-PI:** Dr. Haider Ali, German Aerospace Center (DLR), Munich, Germany

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 963,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Development Management

**Description:** The need to build and improve on transportation facilities and road networks is an important pillar of Pakistan's development strategy and a prime driving

force for industrial development, agricultural productivity and improvements in education, healthcare and other services. In Pakistan, roads undergo rapid deterioration due to various economic, social and technical reasons. The uncertainty and unavailability of road safety information has become a major issue in reliably transporting agricultural produce to markets, movement of heavy machinery and oversized cargo to remote localities, transport of people and materials to/from disaster areas and in even giving plain guarantees for safe traversability of a road that is good on paper. In this project the aim is to propose a revolutionary approach towards reducing this uncertainty. Instead of asking qualitative questions about whether a road network is generally traversable for a general class of vehicles, the focus is on providing a solution that will give precise quantitative answers as a distance modulated roadmap and confirm whether a particular segment of the road is traversable for a particular type of vehicle.



**Title:** Water Informatics & Technology - Center of Water Research at LUMS

**PI:** Dr. Abubakr Muhammad

**Sponsor:** Nestle

**Funding Amount:** PKR 10,000,000

**Project Initiated in:** 2015

**Duration:** 60 Months

**Category:** Development Management

**Description:** Pakistan is facing rapid large-scale environmental changes unleashed by climate change; historical forces driven by social, political and demographic changes; and global transitions triggered by new technologies and changes in living style. The impact of these changes is felt most in the water sector in poor management of

irrigation networks, depleting groundwater, deterioration in water quality, poor sanitation and difficulties in preservation of eco-systems. Engineers, scientists, economists and policy makers must pay attention to understanding these issues in developing new technologies, solutions and institutions under integrated frameworks for tackling the governance issues of participatory management, water entitlements and accountability. In this context, the aim of this project is to establish an interdisciplinary centre for research on water at LUMS with a particular focus on areas of systems analysis and hydro-informatics.



**Title:** DyMASH (Dynamic Mapping and Sampling for High Resolution Hydrology)

**PI:** Dr. Abubakr Muhammad

**Sponsor:** German Pakistani Research Cooperation Program (DAAD)

**Funding Amount:** PKR 8,124,019

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Water

**Description:** This project proposes to tackle some outstanding challenges related to monitoring of surface water resources in the Indus basin using robotics technologies. The difficulties in collection of water samples from remote or inaccessible locations, the challenges in continued structural monitoring of natural and engineered resources and

the need to incorporate high-resolution sensor data into hydrodynamic models has prompted to propose robotic sensing solutions. The objective is to develop and deploy semi-autonomous sensor floats that will produce surveys of water channels using standard techniques of simultaneous mapping and localization.

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**Profile:** Dr. Ahmad Kamal Nasir is director of Engineering Laboratory at LUMS and he is an assistant professor (IPFP) of electrical engineering at LUMS. He received his PhD in Mobile Robotics in 2014 from University of Siegen Germany on Cooperative SLAM. As a graduate student, he also obtained two masters degrees in Mechatronics from Uni-Siegen and UET Lahore. Before that, he completed his B.Sc. in Mechanical Engineering from UET Lahore, Pakistan. He has also worked in industry as product development manager at research and development department of MicroTech Industries, Lahore, Pakistan. In 2014, he joined LUMS and affiliated with CYPHYNETS, the Laboratory for Cyber Physical Networks and Systems at LUMS. He does research in mobile ics, computer vision and embedded control systems. Dr. Nasir's students are developing visual-inertial navigation devices and control systems for aerial robots.

#### Selected Publications:

- Ahmad Kamal Nasir, Hubert Roth. (2012). Pose Estimation by Multisensor Data Fusion of Wheel encoders, Gyroscope, Accelerometer and Electronic Compass. 1st IFAC Conference on Embedded Systems, Computational Intelligence and Telematics in Control
- Ahmad Kamal Nasir, Aiman Hsino, Klaus Hartmann, Cheng Chen, Hubert Roth. Heterogeneous Capability Multi-Robots Cooperative Framework. 1st IFAC Conference on Embedded Systems, Computational Intelligence and Telematics in Control, 2012 Würzburg, Germany
- Ahmad Kamal Nasir, Christof Hille, Hubert Roth. (2012). Data Fusion of Stereo Vision and Gyroscope for Estimation of Indoor Mobile Robot Orientation. 1st IFAC Conference on Embedded Systems, Computational Intelligence and Telematics in Control
- Ahmad Kamal Nasir, Christof Hille, Hubert Roth. (2012). Plane Extraction and Map Building Using a Kinect Equipped Mobile Robot. Workshop on Robot Motion Planning: Online, Reactive, and in Real-time, IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS 2012, Vilamoura, Algarve, Portugal
- Cheng Chen, Wennan Chai, Ahmad Kamal Nasir, Hubert Roth. (2012). Low Cost IMU Based Indoor Mobile Robot Navigation with the Assist of Odometry and WiFi Using Dynamic Constraints. IEEE Position Location and Navigation Symposium, Myrtle Beach, South Carolina, USA
- Nasir, A. K., Taj, M., & Khan, M. F. (2016). Evaluation of Microsoft Kinect Sensor for Plant Health Monitoring. IFAC-PapersOnLine, 49(16), 221-225
- Hassaan, O., Nasir, A. K., Roth, H., & Khan, M. F. (2016). Precision Forestry: Trees Counting in Urban Areas Using Visible Imagery based on an Unmanned Aerial Vehicle. IFAC-PapersOnLine, 49(16), 16-21



**Title:** Precision Forestry: GreenDrone -Deforestation and Forest Degradation Estimation using an Unmanned Aerial Vehicle

**PI:** Dr. Ahmad Kamal Nasir

**Co-PI:** Dr. Mian Muhammad Awais, Prof. Hubert Roth - University of Siegen, Germany,  
**Sponsor:** German Pakistani Research Cooperation Program (DAAD) | University of Siegen, Germany

**Funding Amount:** PKR 9,016,218

**Project Initiated in:** 2015

**Duration:** 24 Months

**Category:** Robotics

**Description:** This research cooperation focuses on the installation of a long-term

research cooperation between the University of Siegen and the Lahore University of Management Sciences. The joint research collaboration will explore the possibilities of development of low-cost robotic systems for aerial mapping of forests using Unmanned Aerial Vehicles (UAV(s)) in order to estimate carbon sink and/or stock in forest vegetation.



**Title:** Development of a Low Cost High Resolution Aerial Mapping System for Carbon Sequestration: Potential of Trees In and Around Lahore City

**PI:** Dr. Ahmad Kamal Nasir

**Co-PI:** Dr. Mian Muhammad Awais

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 965,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Robotics

**Description:** The proposed research project will explore the possibilities of development of low-cost robotic systems for aerial mapping of areas using Unmanned

Aerial Vehicles (UAV(s)) in order to estimate carbon sink and/or stock and vegetation. The system can be used as a monitoring, reporting and verification tool for Reducing carbon Emission of Deforestation and forest Degradation (REDD). Since the research topic has a big impact on the environmental sustainable development, therefore, we focus of the project would also be to evaluate the possibilities to apply it for bigger funds such as United Nation REDD+ Program.



**Title:** Development of a Long Endurance Hybrid UAV for Agricultural and Forestry Applications

**PI:** Dr. Ahmad Kamal Nasir

**Co-PI:** Dr. Mian Muhammad Awais

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Agriculture

**Description:** The main objective of this project is to explore the possibilities of indigenous development of a long endurance system for aerial mapping using a hybrid

Unmanned Aerial Vehicles (UAV). The proposed system shall be able to vertically take-off and land autonomously within confined spaces. Furthermore, it can also be used to survey large forest areas in order to manage forest resources. The goal of this research project is development of a high resolution but inexpensive autonomous aerial mapping system to survey large areas. The outcome of the research work can be used by the government departments and private farm owners to remotely gather the field data such as crop health, water stress index, soil analysis, and metrological condition for agricultural fields and forest areas.

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**Profile:** Dr. Farasat Munir received his B.S. in electrical engineering from University of Engineering and Technology, Lahore, Pakistan. Following that he worked in the industry in the field of Image processing, Machine vision, and Communication system design. He later received Fulbright scholarship and went to Georgia Institute of Technology, Atlanta, USA, where he earned his Masters and PhD in electrical engineering. His PhD work focused on the design of highly sensitive and selective biosensors for cancer diagnosis and prognosis. After PhD, he joined Emory University, USA as a Post-Doctoral Fellow where he worked on the design of a biomedical system for radiation compatible ultrasonic image acquisition and processing. Since 2014 he is working as an Assistant Professor in the department of electrical engineering at SBA School of Science and Engineering LUMS, Pakistan. At LUMS his focus is on multidisciplinary experimental research involving areas of Physics, Electrical engineering and Biomedical engineering. His research interests include biosensors, biomedical instrumentation, MEMS, RF and Microwave circuits and Microelectronic fabrication. He has published in several peer reviewed international journals and conferences.

#### Selected Publications:

- A Novel Technology for Automatically Obtaining Digital Facial Photographs Near-Simultaneously with Portable Radiographs. S Ramamurthy, P Bhatti, F Munir, T Ng, K Applegate, S Tridandapani Journal of digital imaging 28 (3), 259-263 2015
- Thin-film bulk acoustic wave delay line A Wathen, W Hunt, F Munir, KS Davis, JG Maloney, RS Westafer US Patent App. 13/530,029 2012
- Omer, M., & Munir, F. (2016). Interference cancellation for higher harmonics of supply-modulated efficient RF power amplifier systems. International Journal of Microwave and Wireless Technologies, 1-11



**Title:** Development of an Ultrasonic Test Bed For Biomedical and Detection Applications

**PI:** Dr. Farasat Munir

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** The purpose of this project is to develop a test bed that can be used to train students and develop an understanding of various aspects of the ultrasonic system design. Our approach in the design of this platform is the development of modular software and hardware components. Moreover we are aiming to have the

hardware system in particular to be configurable and will explore the approach of software defined radio (as in communication systems). This platform will allow us to develop and test not only novel algorithms but also develop ultrasonic systems for a variety of applications due to the configurability of the hardware.



**Title:** Through Wall Intrusion Detection System with Wifi for Security Applications

**PI:** Dr. Farasat Munir

**Sponsor:** Pakistan Air Force (PAF)

**Funding Amount:** PKR 990,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Telecommunication

**Description:** The purpose of this research is to build an extremely novel surveillance systems, which goes way beyond the current systems offering 360 degree field of view, night time visions, vision through the walls and around corners, along with wide area mapping, easy deployment, and reduced infrastructure layouts. The objective of the

plan is to use radio waves based sensing to perform intrusion monitoring and detection over large open and close spaces.



**Title:** Wide Area Surveillance System for Security and Infrastructure Monitoring Via a Sophisticated Radio Channel Modeling and Detection System

**PI:** Dr. Farasat Munir

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 5,328,074

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Technology

**Description:** The main objective of this project is develop a novel low cost wide area surveillance system for monitoring of secured facilities or large infrastructures. It aims to develop a platform which will employ radio waves for sensing the environment by

modelling and detecting minute changes in the radio channel due to the changing environment. Under the current social conditions of increased terrorism activities such a system which is low cost and widely deployable can prove to be a game changer. In future, the proposed system can be developed further to suit medical applications such as tumor detection and for agricultural applications such as crop monitoring and canal silt monitoring.



**Title:** Research and Development of Low Cost Ventilator

**PI:** Dr. Farasat Munir

**Sponsor:** Central Park Medical College

**Funding Amount:** PKR 1,612,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Health

**Description:** The principal aim of this project is to come up with a design of low cost ventilator which can be mass produced and deployed in Pakistan. The approach in this design is to use off the shelf components to come up with a prototype in the shortest possible time. The objective is to develop the hardware portion of mechanical ventilator

that aids in breathing patients in various modes of ventilation and to develop software for the precise control of delivered breaths to the patients under various modes of ventilations.



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**Profile:** Dr. Khan received a BEng degree in electronic engineering from GIKI, Pakistan in 2005. From 2005 to 2010, he was with School of Electrical Engineering, The University of Manchester, UK where he first received his MSc (with distinction) and then PhD in electrical and electronic engineering. His doctorate thesis was on characterisation of GaAs and InP based devices for optoelectronic applications. His current work is on the research and development of solar cells through low cost techniques and optimised conversion and transmission of the generated energy to diversify power systems. His research work has been published in top tier journals such as IEEE Quantum Electronics, IEEE Electron Device Letters, Journal of Applied Physics, IET Optoelectronics, European Physical Journal and Renewable & Sustainable energy reviews.

#### Selected Publications:

- Sanaullah, A., & Khan, H. A. (2015, June). Design and implementation of a low cost Solar Panel emulator. In Photovoltaic Specialist Conference (PVSC), 2015 IEEE 42nd (pp. 1-5). IEEE
- Usama, M., Qaiser, M. N., & Khan, H. A. (2015, June). Solar irradiance, wind and temperature monitoring for residential PV applications. In Photovoltaic Specialist Conference (PVSC), 2015 IEEE 42nd (pp. 1-4). IEEE
- Nasir, M., Zaffar, N. A., & Khan, H. A. (2016, March). Analysis on central and distributed architectures of solar powered DC microgrids. In 2016 Clemson University Power Systems Conference (PSC) (pp. 1-6). IEEE



**Title:** Decentralized Electric Power Delivery Model for Rural Electrification in Pakistan

**PI:** Dr. Hassan Abbas Khan

**Co-PI:** Mr. Nauman Ahmad Zaffar, Dr. Husnain Fateh Ahmed

**Sponsor:** International Growth Centre (IGC)

**Funding Amount:** PKR 2,331,034

**Project Initiated in:** 2015

**Duration:** 18 Months

**Category:** Energy

**Description:** The main objectives of this project are to study both the feasibility of DC microgrids in Pakistan and to study the dynamics of the take-up of new technology and its effects on the socio-economic wellbeing and aspirations of off-grid

communities. A solar microgrid in the context of Pakistan, will present a completely novel disruption to traditional behaviour. The prime focus of the project is to study both its direct socioeconomic impact in rural communities, its rate of take up, based on interventions on pricing mechanisms and by making the design schematics open source, the effect of lowered RnD fixed costs on market viability.



**Title:** Optimized Solar PV Energy Integration to Weak-Grids for Developing Countries

**PI:** Dr. Hassan Abbas Khan

**Co-PI:** Dr. Mohammad Jahangir Ikram

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Energy

**Description:** This project proposes an optimum hardware architecture which allows Efficient self-generation (solar PV resource), Efficient power processing (through power electronic converters and interconnects) and Monitoring (internet based) to

integrate produced power into the energy mix of the country. The Prime beneficiaries of this technology will be domestic consumers and small/medium scale enterprises who are disproportionately affected from the current electricity shortage. This project will also lay foundation through intelligent electronic infrastructure for future smart grid deployments with emphasis on indigenous development power electronics for solar PV based systems in the country. Dr. Hassan Abbas Khan will also implement low-cost Irradiance (to measure sunlight potential) and wind speed to assess performance of local systems with emphasis on long term monitoring for net-metering and feed-in-tariffs when allowed by the government .



**Title:** Conversion Kit for UPS to A Pseudo-Hybrid Converter with Scalable Architecture for Neighborhood Level Distribution Capability

**PI:** Dr. Hassan Abbas Khan

**Co-PI:** Mr. Nauman Ahmad Zaffar, Dr. Syed Husain Imran Jaffery - NUST

**Sponsor:** National University of Science and Technology (NUST) | USAID

**Funding Amount:** PKR 3,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Technology

**Description:** The main objective of this project is to develop a low cost, high efficiency, scalable system which will ensure optimal utilization of Solar PV panels with energy

utilization in a flexible manner with provision of sharing with neighbours to allow maximum utilization for usage diversity. The purpose is to develop a cost-effective scalable Solar Integrator (SI) unit that utilizes solar energy to charge UPS batteries and thus effectively lowers this huge load from the national grid. The scope of this project includes design, prototyping and detailed testing of the solar integrator. Technology development as a part of this project will be productized by a startup or an established company which could further the role of local industry in power electronics based technologies. This work will strengthen research activities on applied aspects of renewable energy and power electronics in Pakistani academia with results shared through workshops and other forums.



**Title:** Solar Photovoltaic Integrated Hybrid Distribution Architecture for Next Generation Buildings

**PI:** Dr. Hassan Abbas Khan

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Energy

**Description:** The main theme of this project is to develop a prototype of hybrid AC/DC distribution architecture. The purpose of this project is to develop novel hybrid distribution architecture via AC/DC micro grid for efficient building level distribution in

new-generation buildings with a goal of self-sufficient with lower reliance on utility grids. This work will expand the role of building industry in weak grid environments for efficient, reliable and clean power generation and utilization and will lay foundations for implementation of future smart zero energy buildings in the country through intelligent power electronics infrastructure.

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**Profile:** Dr. Ijaz Haider Naqvi received his B.Sc. Electrical Engineering from University of Engineering & Technology Lahore (2003), Masters in Radio Communications degree from SUPELEC Paris (2006) and PhD degree in Electronics and Telecommunications from IETR-INSA Rennes, France (2009). He has been a recipient of prestigious ministerial scholarship of French Ministry of Research to pursue his PhD and HEC overseas scholarship for his Masters. Dr. Ijaz has several years of research experience in the wireless communications and wireless sensor networks. His current research focuses on ultra-wideband communications, system level aspects in wireless sensor networks and RF optimisation and network management issues in wireless mobile networks. He has published several refereed papers in international journals and peer reviewed international conferences.

#### Selected Publications:

- Ali, K., Anwaro, T., Naqvi, I. H., & Jafry, M. H. (2015, June). Composite event detection and identification for WSNs using General Hebbian Algorithm. In Communications (ICC), 2015 IEEE International Conference on (pp. 6463-6468). IEEE
- Zubair, A., Tariq, Z. B., Naqvi, I. H., & Uppal, M. (2015). SHARF: A Single Beacon Hybrid Acoustic and RF Indoor Localization Scheme. In Cognitive Radio Oriented Wireless Networks (pp. 499-510). Springer International Publishing
- Ali, K., Ali, S. B., Naqvi, I. H., & Lodhi, M. A. (2015, December). Distributed Event Identification for WSNs in Non-Stationary Environments. In 2015 IEEE Global Communications Conference (GLOBECOM) (pp. 1-6). IEEE
- Ali, K., & Naqvi, I. H. (2016, April). EveTrack: An event localization and tracking scheme for WSNs in dynamic environments. In Wireless Communications and Networking Conference (WCNC), 2016 IEEE (pp. 1-6). IEEE
- Chattha, M. A., & Naqvi, I. H. (2016, September). PiLoT: A Precise IMU Based Localization Technique for Smart Phone Users. In Vehicular Technology Conference (VTC-Fall), 2016 IEEE 84th (pp. 1-5). IEEE



**Title:** Design and Development of an RF Coverage Optimization System using Spatio-Temporal Mobile User Densities and Autonomic Network Management Approach

**PI:** Dr. Ijaz Haider Naqvi

**Co-PI:** Dr. Ahmad Shabbar Kazmi

**Sponsor:** LUMS Faculty Initiative Fund (FIF) | Ignite

**Funding Amount:** PKR 9,080,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** The aim of this project is to develop a prototype SW application for data measurement, transmission, storage and analysis of the spatio-temporal user information for system capacity enhancement purposes in mobile networks, to test the developed prototype application in the field and to motivate industry to use this system for performance enhancement of call and network services through industrial partners.



**Title:** Indoor Localization: Improvements in Accuracy and Range

**PI:** Dr. Ijaz Haider Naqvi

**Co-PI:** Dr. Sohaib Ahmad Khan

**Sponsor:** Umm Al Qura University

**Funding Amount:** PKR 832,661

**Project Initiated in:** 2015

**Category:** Technology

**Description:** The aim of this consultancy is to provide independent advisory services to the Company for Research and Innovation of projects at GISTIC-Um Al Qura University. The tasks of the Consultant shall consist of collaboration with regards to the Navi Bees project for localization of mobile node using beacon signals of BLE radios, an improved

accuracy of this localization solution, an improved robustness of this localization solution with regards to multi paths which results in large fluctuations in the received signal strength over very small distances and thus result in arbitrary location of mobile nodes, a reduced node density with satisfactory performance and an improved accuracy even with large number of localization nodes.



**Title:** Validation and Testing of Next Generation MIMO Radar Systems

**PI:** Dr. Ijaz Haider Naqvi

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 990,000

**Project Initiated in:** 2017

**Duration:** 12 Months

**Category:** Technology

**Description:** In this project, the main objective is to move a step closer toward a test bed for research on next generation radars. There is a consensus among scientific community that the multi-antenna system is the technology that would be used in next generation radar systems. The purpose is to implement MIMO functionality to improve

the capacity of the radar with regards to the quality of target information. This project intends to investigate novel signal processing algorithms for MIMO radars and prototype it using high frequency RF equipment like Vector Signal generator and digitizer etc. Radar technology is improving rapidly. The proposed project would contribute towards the development of next generation radar systems with a reduced cost and time.



**Title:** Millimeter-wave Techniques for 5G Mobile Communications

**PI:** Dr. Ijaz Haider Naqvi

**Sponsor:** Carleton University

**Funding Amount:** PKR 411,058

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Telecommunication

**Description:** In this project, the fundamental objective is to investigate the use of 3D beamforming in the millimeter wave communication channel as a potential solution for 5G systems requiring both high latency and high reliability at the same time. Since there's a lot of spectrum available in the millimeter wave range (30 to 300GHz),

achieving high data rate should also not be a concern for such systems. However signals in this range experience an order of magnitude increase in path loss as compared to conventional microwave systems. The use of large antenna array combats this path loss. The shorter wavelength of mm-wave signals enables fabrication of a large antenna device with very small form factor. A typical massive MIMO system consists of large number of antennas at the base stations and distributed users with one or more antennas. These extra antennas help in focusing energy in very small regions to bring improvement in throughput and radiated energy efficiency. The focused energy can also be used to improve the reliability of the system. In this project, the aim is to investigate hybrid schemes in a massive MIMO system where some of the available dimensions used for achieving diversity would give a huge boost to the reliability of the message.

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**Profile:** Dr. Momin Uppal received his BS degree in electronic engineering with highest distinction from GIK Institute of Engineering Sciences and Technology, Pakistan, in 2002. He then received his MS and PhD degrees in electrical engineering from Texas A&M University, College Station, in 2006 and 2010, respectively. Dr. Uppal spent the summers of 2009 at NEC Labs of America, Inc., Princeton, New Jersey as a Research Assistant, and the summers of 2012 at Texas A&M University Qatar as a Visiting Researcher and has been associated with the LUMS School of Science and Engineering (SSE) since October 2010.

#### Selected Publications:

- Chattha, J., & Uppal, M. (2016). Layered Multiplexed-Coded Relaying in Wireless Multicast Using QAM Transmissions. IEEE Communications Letters, 20(4), 760-763
- Shah, M. A., Sheikh, A. A., Sajjad, A. M., & Uppal, M. (2015, December). A Hybrid Training-Less Brain-Machine Interface Using SSVEP and EMG Signal. In 2015 13th International Conference on Frontiers of Information Technology (FIT) (pp. 93-97). IEEE
- Mazher, K., Javed, F., Farooq, U. B., Chattha, J. N., & Uppal, M. (2015, December). Layered Multiplexed-Coded Relaying: Design and Experimental Evaluation. In 2015 IEEE Global Communications Conference (GLOBECOM)(pp. 1-6). IEEE
- Ullah, I., Din, F. U., Chattha, J. N., & Uppal, M. (2016, September). Compress-and-Forward Relaying: Prototyping and Experimental Evaluation Using SDRs. In Vehicular Technology Conference (VTC-Fall), 2016 IEEE 84th (pp. 1-5). IEEE



**Title:** Wireless Sensors Integrated Mobile Decision Support System for Antenatal Healthcare in Rural Settings

**PI:** Dr. Momin Ayub Uppal

**Co-PI:** Dr. Safee Ullah Chaudhary, Dr. Salman Noshear Arshad, Dr. Zahid Bashir - Shalamar Medical and Dental College

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 835,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Telecommunications

**Description:** In this project the aim is to improve antenatal healthcare access in LMICs

by developing a mobile antenatal diagnostics platform powered by an intelligent and automated decision support system (DSS) that is supplemented by clinical data seamlessly acquired from a wide range of portable healthcare sensors. The proposed platform is envisaged to be deployable in rural areas through local healthcare workers, thus constituting a mobile pointofcare diagnostics system for pregnant women in LMIC settings. The salient objective of this project is to develop a technology demonstration platform for providing antenatal health care in rural settings of Pakistan.



**Title:** Non-Orthogonal Multiple-Access for 5G Networks: Theory, Design, Prototyping, and Experimental Evaluation

**PI:** Dr. Momin Ayub Uppal

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 4,065,374

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Telecommunication

**Description:** The main objective of this project is to develop novel physical-layer NOMA strategies for 5G networks. Drawing insights from information theoretical analysis, the purpose is to develop next-generation NOMA schemes that are effective, robust,

energy-efficient, and practically feasible. In addition to evaluating the developed strategies using extensive simulations, a distinguishing feature of the project will be its strong emphasis on experimental prototyping and evaluation using software-defined radios.

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**Profile:** Dr. Muhammad Adeel Pasha received his B.Sc. Electrical Engineering degree from UET Lahore in 2004 and his M.S. Research in Embedded Systems degree from University of Nice Sophia-Antipolis in 2007. He then received a merit scholarship from government of France to continue his research work and received his PhD degree from University of Rennes-1 in 2010. His research interests include low-power micro-architecture, energy-efficient WSN node platforms, hardware specialisation & electronic design automation tools, LED-based optical communication & localisation, and smart power grid (algorithms and hardware development).

#### Selected Publications:

- Siddiqui, B., Pasha, M. A., Naeem, A., Hassan, N. U., & Jadoon, T. (2015, December). LED-based Visible Light Communication System for Low Data Rate Point-and-Grab Applications. In 2015 13th International Conference on Frontiers of Information Technology (FIT) (pp. 258-263). IEEE
- Rauf, A., Pasha, M. A., & Masud, S. (2016, September). A Novel split radix fast fourier transform design for an adaptive and scalable implementation. In Wireless Systems within the Conferences on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS-SWS), 2016 3rd International Symposium on (pp. 116-121). IEEE
- Ashraf, N., Ahmadsimab, A., & Pinkse, J. (2017). From Animosity to Affinity: The Interplay of Competing Logics and Interdependence in Cross-Sector Partnerships. Journal of Management Studies



**Title:** GreenComm: Toward Developing an Energy-Efficient Platform for Internet of Things (IoT)-Enabled Devices

**PI:** Dr. Muhammad Adeel Ahmed Pasha

**Co-PI:** Dr. Momin Ayub Uppal

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 930,000

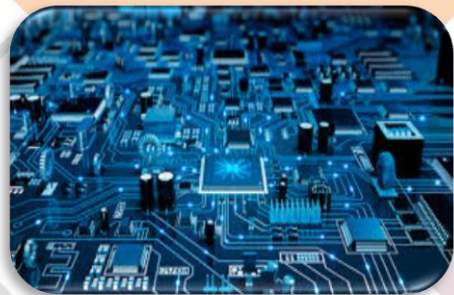
**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Energy

**Description:** System-level energy trade-offs have already been studied in other wireless communication paradigms such as WSN systems and hardware acceleration of

computational subsystem has shown great promise in bringing down the overall system energy. The same idea should be explored in a relatively less explored area of IoT where computational challenges are more severe than simple WSN. But they could lead to larger power/energy savings through dedicated hardware. The prime objective of the project is to eventually be an important step towards developing energy efficient platforms for future IoT-enabled devices (such as embedded industrial sensors, actuators, smart-phones, tablets, personal health-monitoring devices, etc.



**Title:** Framework for High-level Power Estimation of Embedded Soft-Core Processors

**PI:** Dr. Muhammad Adeel Ahmed Pasha

**Co-PI:** Dr. Shahid Masud

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 615,695

**Project Initiated in:** 2017

**Duration:** 18 Months

**Category:** Technology

**Description:** In this project a setup will be designed to estimate the power consumption of a software code at higher abstraction level. It aims at reducing the time and difficulty involved in software power estimation while at least maintaining the accuracy also

provided by the existing software tools. The research and the developed framework will benefit the Embedded Systems designers and code writers. This project will increase the knowledge base of Embedded Systems and Computer Aided Design (CAD) tools in Pakistan. It will add a new tool in the domain of Embedded Systems and will be beneficial for both students and researchers alike.

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**Profile:** Imran Cheema obtained his PhD in Electrical Engineering with emphasis on Photonics Systems from McGill University, Montreal, Canada in 2013. During the PhD research, he developed novel theoretical and experimental techniques for bio-optical sensing applications. He received his BS and MS in Electrical Engineering from UET Lahore and University of Colorado, Boulder USA, respectively. He also worked as an Optical Engineer in Oerlikon Optics Inc., USA after his MS. During his industrial experience he worked on laser based RGB head up display units, infrared lasers, and laser based miniature projectors for cell phones.

#### Selected Publications:

- Cheema, M. I., & Kirk, A. G. (2013). Accurate determination of the quality factor and tunneling distance of axisymmetric resonators for biosensing applications. *Optics express*, 21(7), 8724-8735
- Cheema, M. I., Mehrabani, S., Hayat, A. A., Peter, Y. A., Armani, A. M., & Kirk, A. G. (2012). Simultaneous measurement of quality factor and wavelength shift by phase shift microcavity ring down spectroscopy. *Optics express*, 20(8), 9090-9098
- Cheema, M. I., Shi, C., Armani, A. M., & Kirk, A. G. (2014). Optimizing the signal to noise ratio of microcavity sensors. *IEEE Photonics Technology Letters*, 26(20), 2023-2026
- Cheema, M. I., & Kirk, A. G. (2015). Analytical expressions for waveguide-coupled phase shift microcavity ring down spectroscopy. *JOSA B*, 32(2), 355-362



**Title:** A Rapid and Portable Optical Sensor Array for Detection of Salinity, Fluoride, and Arsenic in Water

**PI:** Dr. Muhammad Imran Cheema

**Co-PI:** Dr. Falak Sher

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 6,368,125

**Project Initiated in:** 2017

**Duration:** 30 Months

**Category:** Water

**Description:** The main objective of this project is to develop an optical sensor array. In the proposed sensor, light from laser sources will be coupled into three fiber cavities.

The light from each cavity will be detected by a separate detector followed by a microcontroller to display the result. The sensor will also be extensively tested in the standard laboratory setting with state-of-the-art equipment available at Pakistan Council of Research in Water Resources (PCRWR) Lahore. This process will provide a real time, accurate, sensitive, and portable water sensor array.



**Title:** Towards a Real Time TB Optical Biosensor Based Upon a Combination of Raman and Cavity Ring Down Spectroscopy

**PI:** Dr. Muhammad Imran Cheema

**Co-PI:** Dr. Muhammad Sabieh Anwar

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Sciences

**Description:** The main theme of this research project is to build a prototype instrument that is applying Raman spectroscopy and CRDS to analyze gaseous or liquid samples particularly organic compounds. This project will be a stepping stone towards combining expertise of engineers and professionals in health care sector for solving health problems faced by our society. This project will be extended to other liquid phase applications including detection of fake antibiotics (a major problem of our society) and determination of milk fat in an environmental safe way (a problem currently faced by Nestle Pakistan).



**Title:** Milk Contamination Sensor Based on Optical Fiber Cavity Ring Down Spectroscopy

**PI:** Dr. Muhammad Imran Cheema

**Co-PI :** Dr. Alper Kiraz Koç University, Istanbul , Dr. Rahman Shah Zaib Saleem

**Sponsor:** Pakistan Science Foundation (PSF)

**Funding Amount:** PKR 3,997,688

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Agriculture

**Description:** The fundamental aim of this project is to develop an optical sensor that will employ principle of phase shift cavity ring down spectroscopy (PS-CRDS) in optical fiber cavities for rapid AFM1 detection in milk. The major outcome of this highly

interdisciplinary project is to demonstrate an easy to use optical sensor that provides AFM1 detection in a solution without the aid of specialized laboratory personnel. This sensor will provide real time AFM1 detection with minimum sensitivity of 50ng/L. Moreover, it is anticipated that the research activity will lead towards a universal solution that can be extended to other applications such as detecting drinking water contamination due to bacteria and arsenic.



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**Profile:** Dr. Muhammad Tahir received the Bachelor of Science in Electrical Engineering in 2007 from University of Engineering and Technology, Lahore and the Master of Science in Electronic Engineering in 2009 from Politecnico di Torino, Italy. In April 2013, he obtained his PhD degree also from Politecnico di Torino, Italy in the field of Electronics and Telecommunication. His research activity is focused on the development of novel algorithms for satellite navigation receiver technology. His research interests include receiver baseband signal processing algorithm design and development, Bayesian signal processing, detection and estimation theory, channel coding in communication networks, machine learning and sequential Monte Carlo methods.

#### Selected Publications:

- Tahir, M., Khurram, U. M., & Salman, A. (2015, October). GNSS carrier tracking loop: Stability analysis and some improvements. In 2015 IEEE International Conference on Signal and Image Processing Applications (ICSIPA) (pp. 16-21). IEEE
- Mazher, K., Tahir, M., & Ali, K. (2016, March). GNSS pseudorange smoothing: Linear vs non-linear filtering paradigm. In 2016 IEEE Aerospace Conference (pp. 1-10). IEEE
- Tahir, M., & Mazher, K. (2016). Singular Spectrum Based Smoothing of GNSS Pseudorange Dynamics
- Ahmed, H., & Tahir, M. (2016, May). Terrain-Based Vehicle Localization Using Low Cost MEMS-IMU Sensors. In 2016 IEEE 83rd Vehicular Technology Conference (VTC Spring) (pp. 1-5). IEEE



**Title:** Development of a Software Defined Radio Test-bed utilising GPS Signals for Navigation Applications

**PI:** Dr. Muhammad Tahir

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 990,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Telecommunications

**Description:** Global navigation satellite system (GNSS) provides position, velocity and time information in all weather conditions, anywhere on or near the earth, where there is an unobstructed line of sight to four or more GNSS satellites. This research project

deals with the design and development of a basic software GNSS receiver. The main objectives of the research are to develop a basic GNSS fully reprogrammable receiver prototyping platform based on the software radio technology, which would provide basic foundation for future research activities. Moreover, digital signal processing involved within GNSS receiver is a mixture of signal detection, estimation and optimisation problems. During this research activity, novel algorithms within these domains will be explored which will provide a deep understanding in the theoretical and fundamental research problems in this domain.



**Title:** A Low Cost, High Accuracy and Improved Integrity Cooperative Driver Assistance Platform for Enhancing Traffic Safety and Road Networks Efficiency

**PI:** Dr. Muhammad Tahir

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 2,171,283

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Telecommunication

**Description:** The proposed research aims to develop a platform to be deployed inside vehicles which are connected with each other over a wireless link. In this cooperative scenario, each vehicle can sense and perceive its environment more intelligently and

can alert the drivers about a possible event. This event could be safety critical e.g. chance of a collision with nearby vehicle or could be efficiency critical e.g. traffic jam in next round-about. The main objective is to propose a low cost, highly accurate solution with an extra degree of robustness in the form of integrity and reliability of all the information.



**Title:** Acoustically Green Zones: Design and Development of an Active Sound Control System for Acoustic Noise Reduction in both Open And Closed Spaces

**PI:** Dr. Muhammad Tahir

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 910,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Technology

**Description:** This project aims to develop a working system and related theory for acoustic quiet zone generation by cancelling undesirable noise and acoustic interference over a volumetric region in open or closed spaces. Traditional systems

towards acoustic noise reduction attenuate the noise power in some finite points in space where acoustic field is measured hence their application to real world scenarios is very limited. The system developed from this project is expected to underpin the future development of acoustic signal processing research and will have a broad range of applications such as reduction of noise inside cars, creation of individual quiet zones in passenger planes and mitigation of acoustic noise made by industrial plants to neighbouring suburbs *etc.* The outcomes from this project will also have economic importance as it can reduce the health risk posed to people working or living in noisy environments.

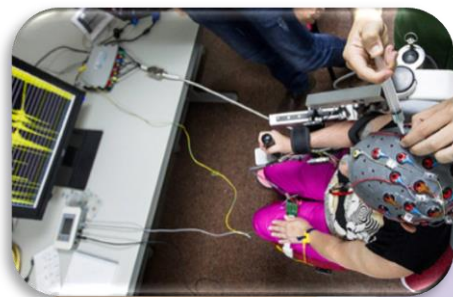
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**Profile:** Dr. Nadeem Khan received his PhD from the Eindhoven University of Technology. Dr. Khan Joined LUMS in May 2002. Earlier, he worked at Streaming Networks (Pvt) Ltd, Islamabad where he performed several projects related to image processing and video compression in the context of multimedia products. His PhD research work was on minimal training dependent and robust text recognition systems. This research work and rest of his graduate study have been in close association with Philips especially with its facilities of Philips Research Lab (LEP), France, Centre for Manufacturing Technology, The Netherlands and Philips International Institute, The Netherlands. In between his degrees he had worked both locally and abroad including teaching at University of Engineering and Technology, Lahore and working as a Hardware Design Engineer at Philips Industrial Automation Systems, Eindhoven, the Netherlands.

#### Selected Publications:

- Ahmad, M. A., Ayaz, Y., Jamil, M., Omer Gillani, S., Rasheed, M. B., Imran, M., Javaid, N. (2015). Comparative analysis of classifiers for developing an adaptive computer-assisted EEG analysis system for diagnosing epilepsy. *BioMed research international*, 2015
- Ahmad, M. A., Majeed, W., & Khan, N. A. (2014). Advancements in computer aided methods for EEG-based epileptic detection. Paper presented at the BIOSIGNALS 2014 - 7th Int. Conference on Bio-Inspired Systems and Signal Processing, Proceedings; Part of 7th Int. Joint Conference on Biomedical Engineering Systems and Technologies, BIOSTEC 2014



**Title:** Enabling EEG Signal Technology for Home Health Care

**PI:** Dr. Nadeem Ahmad Khan

**Co-PI:** Dr. Mumtaz Ali Sheikh

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 878,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** To investigate and develop techniques for multichannel EEG signal enabling its use from the perspective of home health care through the use of portable and wearable (preferably wireless) headsets for the purpose of diagnose, prediction

and early detection of important neurological disorders like epilepsy, autism etc. Aspects on specific focus will be (i) R&D on real-time compression methods for multichannel EEG with quality acceptable for use in prediction and detection tasks like epilepsy and autism (ii) to explore and extend earlier collaboration with local health care sector (iii) to explore collaboration with Technical University of Madrid (UPM) in their ongoing project on linguistic disorder screening in children with special focus on autism cases.



**Title:** Adaptive Intelligent Epilepsy Management System

**PI:** Nadeem Ahmad Khan

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 893,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Sciences

**Description:** This project aims to investigate various claims made in literature regarding seizure prediction and to make best technologies available indigenously. Moreover, the project intends research in introducing adaptivity to such system with respect to patients and devices used and to advance the research in forecasting and

summarization of abnormal neuronal activity. The fundamental aim of this research is to combine signal processing techniques with new emerging neuro-evolutionary algorithms for efficient prediction and forecasting of epileptic seizures leading to the development of low cost and user friendly tools to assist neurologist and patient for management and treatment of epilepsy.

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**Profile:** Mr. Nauman Ahmad Zaffar received his BS (1990) and MS (1991) in Electrical Engineering from University of Pennsylvania. He then continued his work at the Electro-Optic / Magneto-Optic Labs at the University on development of a high resolution frequency swept microwave diversity imaging system in multiple simultaneous bands from 2GHz-60GHz. His areas of work include understanding business needs, proposing and designing solutions and carrying out development, rollout and support lifecycle of the solutions in the domains of Electric Utilities, Telecom and Manufacturing. He has worked with Techlogix to establish and extend practice areas of Business Process Management, ERP implementation, Enterprise Architecture and Software Product Engineering. Mr. Nauman joined LUMS School of Science and Engineering (SSE) in 2010 as full-time faculty member in the department of Electrical Engineering. He is now part of LUMS Energy Optimisation Committee and is working on establishing a research base at SBASSE in the area of Power Electronics, Smart Grids and Renewable Energy. His current areas of interest include AC/DC converters for Solar PV applications, dc/ac inverters for grid-tie distributed energy sources and VFDs for industrial, off-grid and automotive applications. He has also worked with PEPCO and various Distribution Companies in Pakistan to propose solutions for Power Distribution management and smart solutions for load management.

#### Selected Publications:

- Aslam, W., Soban, M., Akhtar, F., & Zaffar, N. A. (2015). Smart meters for industrial energy conservation and efficiency optimization in Pakistan: Scope, technology and applications. *Renewable and Sustainable Energy Reviews*, 44, 933-943
- Ibrahim, S., Hassan, M.S., Zaffar, N.A. (2015) Networked control of single-phase induction motor air conditioners for constrained power systems: IEEE International Symposium on Industrial Electronics
- Farooq, R., Mateen, L., Ahmad, M., Akbar, S. Q., Khan, H. A., & Zaffar, N. A. (2014). SMart DC microgrids: Modelling and power flow analysis of a DC Microgrid for off-grid and weak-grid connected communities. Paper presented at the Asia-Pacific Power and Energy Engineering Conference, APPEEC
- Shabbir, H., Ur Rehman, M., Rehman, S. A., Sheikh, S. K., & Zaffar, N. (2014). Assessment of harmonic pollution by LED lamps in power systems. Presented at the 2014 Clemson University Power Systems Conference, PSC 2014
- Ramzan, N., Khan, Z. J., Naseer, P., Akbar, A., & Zaffar, N. (2017, March). Grid tied solar micro-converter with optimizer-mode operation for weak-grid operation. In *Applied Power Electronics Conference and Exposition (APEC), 2017 IEEE* (pp. 2068-2075). IEEE



**Title:** Measurement of Noise Levels in LT Distribution Network of LESCO to Assess Viability of Narrowband Over Power Line Communication in 95 Khz – 500 Khz Bands

**PI:** Mr. Nauman Ahmad Zaffar

**Co-PI:** Dr. Asim Loan, UET Lahore

**Sponsor:** Lahore Electric Supply Company (LESCO) | University of Engineering and Technology, Lahore

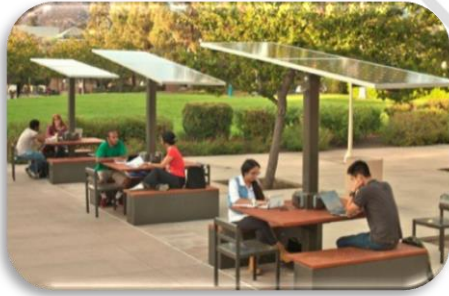
**Funding Amount:** PKR 1,800,000

**Project Initiated in:** 2015

**Duration:** 2 Months

**Category:** Energy

**Description:** This project seeks to undertake the assessment of noise level and signal propagation on the LT network at carefully sampled and selected locations on the distribution network that will cover the diversity of load, operating conditions and variations in the network. The work will be divided into two phases. First phase will cover the measurement of noise levels under ambient and different load conditions. The scope of load conditions to be created on the network will be finalised with LESCO once the project is initiated. The second phase will work with a subset of locations to insert modulated PLC signal conforming to the power level output of the standard transmitter. It will then be observed on the neighbouring locations of the network to tabulate signal to noise ratio and understand signal propagation.



**Title:** Design and Development of a 1000W Solar Charge Controller

**PI:** Mr. Nauman Ahmad Zaffar

**Co-PI:** Dr. Hassan Abbas Khan

**Sponsor:** PakShine (Pvt.) Ltd.

**Funding Amount:** PKR 985,000

**Project Initiated in:** 2015

**Duration:** 4 Months

**Category:** Energy

**Description:** The aim of this project is to develop the solution of the Solar UPS to not only charge the backup battery unit but also to provide direct power for the AC appliance to reduce grid electricity cost of the end customer. This engagement is

considered to be the first of other R&D initiatives that PakShine plans to undertake in Pakistan with the collaboration of LUMS.



**Title:** Strategic Consulting

**PI:** Mr. Nauman Ahmad Zaffar

**Sponsor:** Microtech Industries (Pvt.) Ltd

**Funding Amount:** PKR 300,000

**Project Initiated in:** 2015

**Duration:** 2 Months

**Category:** Energy

**Description:** The project involves holding weekly discussions between MicroTech and Mr. Nauman Ahmad Zaffar on Smart grids, Advanced Metering Infrastructure, structuring of the comp for hardware, firmware and software requirements of AMI and on dealings and discussions with strategic clients of MicroTech when need arises.



**Title:** High Power Density Inverter for Intermittent Grid and Electrical Drives with Enhanced Efficiency and Low Switch Stresses

**PI:** Mr. Nauman Ahmad Zaffar

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Energy

**Description:** The proposed work aims to develop power electronic topologies for a high power density, reliable and efficient DC-AC inverter, operating at a very high switching frequency. The input voltage is 450 VDC with a 50Hz, 220 Vrms sinusoidal output to

drive 2kVA AC-loads. As the size of the inverter becomes smaller and the frequency becomes higher, a number of problems arise in the design of the inverter that have to be addressed. An additional design objective will be to design the inverter with a control over output voltage and frequency to drive motor loads from power constrained systems.



**Title:** Strategic Consulting Phase 2

**PI:** Mr. Nauman Ahmad Zaffar

**Sponsor:** Microtech Industries (Pvt.) Ltd

**Funding Amount:** PKR 600,000

**Project Initiated in:** 2016

**Duration:** 5 Months

**Category:** Energy

**Description:** The project involves holding regular discussions between MicroTech and Mr. Nauman Ahmad Zaffar on Smart grids, Advanced Metering Infrastructure, structuring of the company for hardware, firmware and software requirements of AMI and on dealings and discussions with strategic clients of MicroTech as and when the

need arises.



**Title:** Measurement of Noise Levels in LT Distribution Network of LESCO to Assess Viability of Broadband over Power Line Communication (BPL)

**PI:** Mr. Nauman Ahmad Zaffar

**Sponsor:** Huawei

**Funding Amount:** PKR 2,000,000

**Project Initiated in:** 2016

**Duration:** 2 Months

**Category:** Telecommunications

**Description:** This consultancy project proposes to undertake the assessment of noise level and signal propagation on the LT network at carefully sampled and selected locations on the distribution network that will cover the diversity of load, operating

conditions and variations in the network. These nodes will be chosen to match the points where previous phase assessment was done for NB-PLC network to ensure a judicious comparison. The work will be divided into two phases. First phase will cover the measurement of noise levels under ambient and different load conditions. The second phase will work with a subset of locations to insert modulated PLC signal conforming to the signals produced by standard Huawei BPL modem based transmitters.

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**Profile:** Dr. Nauman Z. Butt did his PhD in Electrical Engineering from Purdue University in 2008 and B.S. in the same field from University of Engineering & Technology, Lahore in 2002. From 2008 to 2012, he was a member of technical staff in Semiconductor Research & Development Center (SRDC) in IBM Microelectronics Division, Hopewell Junction, New York. Dr. Butt's research interests include investigating physics and technology of microelectronic and optoelectronic devices through theory, compact modelling, simulations and experiments. His PhD thesis was on computational study of scaling and radiation damage in nanoscale memory devices. In IBM, he has been involved in the development of embedded DRAM and dense SRAM devices in 32nm and 14nm SOI technology.

#### Selected Publications:

- Imran, H., & Butt, N. Z. (2015). Computational Study of Hybrid Nanomaterial/Insulator/Silicon Solar Cells. *Electron Devices, IEEE Transactions on*, 62(10), 3111-3116
- Imran, H., Sarker, B. K., Chen, Y. P., Alam, M. A., & Butt, N. Z. (2015, June). The role of substrate in the photoresponse of graphene transistors. *In Device Research Conference (DRC), 2015 73rd Annual* (pp. 107-108). IEEE
- Imran, H., Abdolkader, T. M., & Butt, N. Z. (2016). Carrier-Selective NiO/Si and TiO<sub>2</sub>/Si Contacts for Silicon Heterojunction Solar Cells. *IEEE Transactions on Electron Devices*, 63(9), 3584-3590
- Saad, R., & Butt, N. Z. (2016). Role of Carrier Mobility and Band Alignment Engineering on the Efficiency of Colloidal Quantum Dot Solar Cells. *arXiv preprint arXiv:1602.04236*
- Imran, H., & Butt, N. Z. (2016, June). Investigation of dominant hysteresis phenomenon in perovskite solar cell. *In Photovoltaic Specialists Conference (PVSC), 2016 IEEE 43rd* (pp. 0776-0780). IEEE



**Title:** Optimization of Contacts for Silicon Solar Cell Technology for Efficiency Enhancement

**PI:** Dr. Nauman Zafar Butt

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 727,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** This project aims to design the contacts that eliminate the aforementioned problems by exploring alternate materials such as emerging transparent conducting oxides. An optimal cell structure with alternate contacts will be demonstrated for

commercial silicon solar cells. The project involves physics based modelling to identify the material/physical requirements for an optimal contact. The model based design will then be fabricated using the equipment available at SBASSE, LUMS. Finally, the fabricated solar cells will be characterized using optical and electrical measurements and the results will be compared with the benchmark commercial solar cell.



**Title:** Graphene Based Microfluidic Biosensors for Early Detection of Breast Cancer

**PI:** Dr. Nauman Zafar Butt

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 950,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Sciences

**Description:** The main objective of this project is to develop and optimize a graphene (atomic sheet of carbon atoms) based biosensor for early detection of breast cancer. The broader vision of this project is to open up a highly interdisciplinary area of research on biosensors and microfluidics at SBASSE where scientists and engineers

could work together to improve the health care diagnostics and drug development in the country. The goal of this project is to investigate a new type of lab on a chip microfluidic sensor which incorporates one of the emerging nanomaterials called graphene.

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**Profile:** Dr. Naveed Ul Hassan received his B.E. degree in avionics engineering from the College of Aeronautical Engineering (CAE), Risalpur, Pakistan, in 2002 and his M.S. and PhD degrees in electrical engineering, with specialization in digital and wireless communications, from the Ecole Supérieure d'Electricité (Supelec), Gif-sur-Yvette, France, in 2006 and 2010, respectively. In 2011, he joined as an Assistant Professor at the Department of Electrical Engineering, Lahore University of Management Sciences (LUMS), Lahore, Pakistan. Since 2012, he has also been a visiting Assistant Professor at Singapore University of Technology and Design (SUTD), Singapore during the months of June-August. He has several years of research experience and has authored/co-authored numerous research papers published in refereed international journals and conference proceedings.

#### Selected Publications:

- Wang, X., Yuen, C., Hassan, N. U., An, N., & Wu, W. (2017). Electric vehicle charging station placement for urban public bus systems. *IEEE Transactions on Intelligent Transportation Systems*, 18(1), 128-139
- Rehman, A., Bashir, N., Hassan, N. U., & Yuen, C. (2016, November). Impact of home appliances on the performance of narrow-band power line communications for smart grid applications. In *Region 10 Conference (TENCON), 2016 IEEE* (pp. 3511-3514). IEEE
- Chai, B., Tushar, W., Hassan, N. U., Yuen, C., & Yang, Z. (2016, November). Managing energy consumption in buildings through offline and online control of HVAC systems. In *Region 10 Conference (TENCON), 2016 IEEE* (pp. 3368-3373). IEEE
- Hassan, N. U., Tushar, W., Yuen, C., Kerk, S. G., & Oh, S. W. (2017). Guaranteeing QoS using unlicensed TV White Spaces for smart grid applications. *IEEE Wireless Communications*, 24(2), 18-25



**Title:** Experimental Validation of Smart Grid Technologies by Building a Test Bed at LUMS

**PI:** Dr. Naveed Ul Hassan

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 920,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Technology

**Description:** The objective of this project is to develop a scalable test bed for residential smart grids, equipped with necessary automation and communication capabilities. The test bed will mainly consist of a software simulator and a single actual 'home'

environment created inside the lab (referred as a lab-home). The lab-home will consist of physical appliances (loads), e.g., lights, fans etc., which will be connected to a Home Control Center (HCC); responsible for controlling and monitoring their electricity consumption. HCCs of the simulated homes and lab-home will be connected to the grid operator, modelled in our test bed as a Grid Control Center (GCC). Due to interactive nature of the smart grid, an efficient and reliable communication infrastructure with low latency will be established for bi-directional communication between various nodes.



**Title:** Location Based Services (LBS) for Mobile Devices

**PI:** Dr. Naveed Ul Hassan

**Co-PI:** Dr. Muhammad Adeel Ahmed Pasha

**Sponsor:** Ignite

**Funding Amount:** PKR 10,231,432

**Project Initiated in:** 2016

**Duration:** 18 Months

**Category:** Telecommunication

**Description:** This project aims at developing two prototype LBS applications for LUMS campus. The first application, targets the campus-wide display of relevant POIs and outdoor navigation. The second application will be specific to LUMS library building. The

objective is to develop scalable LBS prototype systems where changing the databases which contain location maps (indoor, outdoor, fingerprinting), POIs, product information etc. would result in a new application for any specific location.





**Title:** Towards Energy Efficient Commercial Buildings through Consumer Behavior Considerations Using Internet of Things (IoT) and Machine-To-Machine (M2M) Platforms

**PI:** Dr. Naveed Ul Hassan

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Energy

**Description:** The main objective of this project is to use IoT and cloud-enabled M2M communication platforms for the development of a scalable and easily deployable

building energy management system for commercial buildings that provide easy interface and connectivity. The purpose is to integrate human tracking techniques to link energy usage with individual consumers and then perform energy management and predictions based on human activity. This system will help to quantify the amount of wasted energy and its impact on overall energy bill, effectiveness of behavior change interventions and identification of challenges and opportunities for further improvements.



**Title:** Targeting Consumer Behavior for Resource Optimization in Buildings using Internet of Things and Machine to Machine Communications

**PI:** Dr. Naveed Ul Hassan

**Co-PI:** Dr. Muhammad Irfan Khattak - Gomal University

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 3,972,404

**Project Initiated in:** 2017

**Duration:** 18 Months

**Category:** Energy

**Description:** In recent years, Internet of Things (IoT) and Machine-to-Machine (M2M) communication platforms have gained tremendous popularity and research interest.

The objective of this project is to use IoT and cloud-enabled M2M communication platforms for the development of a scalable and easily deployable resource conservation and management system for buildings. This project aims to develop novel control and scheduling algorithms for resource management and a user interface to engage consumers. The most important feature of this project will be the provision of customized feedback to individual consumers in order to encourage behaviour change towards resource conservation. This project will provide a platform that would allow us to determine resource wastage and identify important behaviour change interventions for resource conservation in buildings.

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**Profile:** Dr. Shahid Masud received B.Sc. Electrical Engineering from EME College, Rawalpindi, Pakistan in 1990, MSc in Electronics from the University of New South Wales, Sydney, Australia in 1992 and PhD in Electrical Engineering from Queen's University, Belfast, UK in 1999. He has been a recipient of prestigious AIDAB EMSS scholarship (Australia) and Commonwealth scholarship (UK). He was a Senior Design Engineer at Amphion Semiconductor Ltd. (later Conexant / NXP Semiconductor) before joining LUMS in 2002. His research interests include design and implementation of DSP Systems and computer architecture.

#### Selected Publications:

- Yousaf, A., & Masud, S. (2016, April). Stochastic model based dynamic power estimation of microprocessor using Imperas simulator. In Systems Conference (SysCon), 2016 Annual IEEE (pp. 1-8). IEEE
- Rauf, A., Pasha, M. A., & Masud, S. (2016, September). A Novel split radix fast fourier transform design for an adaptive and scalable implementation. In Wireless Systems within the Conferences on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS-SWS), 2016 3rd International Symposium on (pp. 116-121). IEEE



**Title:** Automated Testbed for Spatially Distributed Wireless Real Time Monitoring System of Large Scale Waterways Auto Test Wireless Water (ATWW)

**PI:** Dr. Shahid Masud

**Co-PI:** Dr. Muhammad Adeel Ahmed Pasha, Prof. Dr.-Ing. Axel Sikora - University of Offenburg,

**Sponsor:** German Pakistani Research Cooperation Program (DAAD) | University of Offenburg

**Funding Amount:** PKR 8,140,498

**Project Initiated in:** 2016

**Duration:** 24 Months

**Category:** Technology

**Description:** In Pakistan, the world's largest irrigation system which covers 90,000 km of channels needs to be monitored and managed on different levels. The need for improvement in efficiency and productivity of the irrigation water has become one of key issues for the irrigation and the agriculture sector. Monitoring of the waterways is a key element for efficient and fair water distribution. After specific prototypes in hardware and software for energy efficient wireless sensor nodes have been developed in the project.



**Title:** A Re-Configurable System-on-Module for Industrial Controls with IEEE 1588 IP Core Demonstrator

**PI:** Dr. Shahid Masud

**Co-PI:** Dr. Shahbaz Assad

**Sponsor:** Ignite

**Funding Amount:** PKR 35,379,531

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Telecommunication

**Description:** The main idea of this project is to come up with a System-on-Module (SoM) Intellectual Property (IP) that can fit into a wide range of FPGA based electronic systems as there are hundreds of modern applications that rely on FPGAs as main computing elements. In this project an in-house reconfigurable SoM will be developed that can integrate into any existing embedded system resulting in upgrading the computing resources in terms of processing speed, processing elements (PE), memory and user IOs.

Dr. Wasif Tanveer Khan  
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**Profile:** Dr. Wasif Tanveer Khan received the B.Sc. degree in electrical engineering from the University of Engineering and Technology, Lahore, Pakistan, in 2005, the M.S. and PhD degrees in electrical and computer engineering from the Georgia Institute of Technology, Atlanta, USA in 2010 and 2014, respectively. From January 2006 to December 2008, he was a Lecturer with the National University of Computer and Emerging Sciences-FAST, Lahore, Pakistan. He was awarded M.S. Leading to PhD Fulbright scholarship, in 2008. In 2009, he joined Professor John Papapolymerou's research group "Microwave Circuit Technology" at the Georgia Institute of Technology. During his PhD He authored/co-authored more than 30 research papers in peer-reviewed conferences and journals. Since January 2015, he has been working as an Assistant Professor at the department of Electrical Engineering of the Lahore University of Managements Sciences (LUMS), Pakistan.

#### Selected Publications:

- Khan, W.T., Ulusoy, A.C., Schmid, R., Chi, T., Cressler, J.D., Wang, H., Papapolymerou, J.(2015) A D-band (110 to 170 GHz) SPDT switch in 32 nm CMOS SOI:2015 IEEE MTT-S International Microwave Symposium, IMS 2015
- Khan, W. T., Sitaraman, S., Vera, A. L., Pulugurtha, M. R., Sundaram, V., Tummala, R. R., & Papapolymerou, J. (2015, September). A V-band end-fire Yagi-Uda antenna on an ultra-thin glass packaging technology. In Microwave Conference (EuMC), 2015 European (pp. 618-621). IEEE
- Ahmad, W., Ali, A., & Khan, W. T. (2016, June). Small form factor PIFA antenna design at 28 GHz for 5G applications. In Antennas and Propagation (APSURSI), 2016 IEEE International Symposium on (pp. 1747-1748). IEEE
- Ahmad, W., & Khan, W. T. (2017, March). Small form factor dual band (28/38 GHz) PIFA antenna for 5G applications. In Microwaves for Intelligent Mobility (ICMIM), 2017 IEEE MTT-S International Conference on (pp. 21-24). IEEE



**Title:** MM- Wave Integration and Embedded Antennas in System-In-Package

**PI:** Dr. Wasif Tanveer Khan

**Sponsor:** Sony

**Funding Amount:** PKR 11,582,911

**Project Initiated in:** 2015

**Duration:** 53 Months

**Category:** Technology

**Description:** The aim of this consultancy project is to conduct and supervise research activities related to the mm-wave integration and embedded antennas System-in-Package planned within the framework of the mm-wave System-in-Package project. In particular, the focus of the consultancy is simulation and evaluation of proposed novel

antenna / integration designs using a full-wave EM simulator and organization of weekly-based video conference meetings. This mega project is divided into six phases. Phases are termed as work package. The combined duration and allocated funds of all the phases are stated above.



**Title:** Design and Development of RF front-end of a UHF Band Software Defined Radio

**PI:** Dr. Wasif Tanveer Khan

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Technology

**Description:** The objective of the proposed research is to indigenously develop an RF-frontend of a Software Defined Radio in the UHF band and develop the research base to carry out research in the area of RF and Microwave front-end design in the future. Since RF and microwave is an elusive research area in Pakistan, given the complexity

of the task to be undertaken, the professional development of students, which are well versed with the electronic design and hardware prototyping, is a foreseeable outcome of this project. At the very basic infrastructure level, this project will set a precedent for carrying out hardware electronics development in related areas of digital, analogue, RF integrated circuit design in Pakistan.



**Title:** Design and Simulate Miniaturized and Highly Efficient T/R Modules for Phased Array Radar (phase 1)

**PI:** Dr. Wasif Tanveer Khan

**Co-PI:** Dr. Akbar Ali

**Sponsor:** Pakistan Air Force (PAF)

**Funding Amount:** PKR 990,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Technology

**Description:** The project is divided into three main phases. It will take 3 years to complete the project. At the end of the project, there will be indigenously developed

highly efficient, low cost and miniaturized T/R modules, which will be integrated in Ground-based Air surveillance radar. The objective is to develop beam-forming circuitry(6 bit phase shifters, 6 bit attenuators, down conversion circuitry, pre-driver amplifiers) integrated on a Single Silicon chip and high power amplifiers, LNAs and T/R switch will be designed using GaN and GaAs technology.



**Title:** Design a Miniaturized Spiral Antenna for Ultra-wideband (2-18 GHz) Applications

**PI:** Dr. Wasif Tanveer Khan

**Sponsor:** Re-engineering With Research (RWR) Private Ltd.

**Funding Amount:** PKR 1,000,000

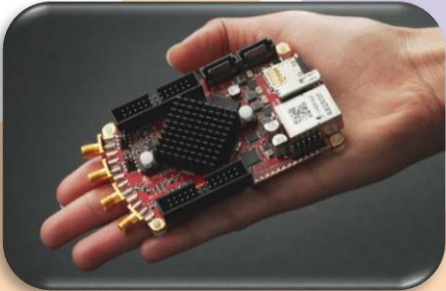
**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Telecommunication

**Description:** The proposed antenna approximate circular spiral at higher frequencies and then gradually transforms its geometry into square spiral at lower frequencies. Due to rapid progress in computer and personal communication systems, the need for integration of more than one communication systems into a single compact module

has been increased.



**Title:** Design and Development of UHF/VHF Band Software Defined Radio

**PI:** Dr. Wasif Tanveer Khan

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 13,999,000

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Technology

**Description:** The proposed research and development project aims to indigenously develop a complete prototype of software defined radio and lay down the research base to carry out R&D activities in this domain in future. The project will be completed as a joint collaboration between the academia and industry and has great prospects of

being commercialized. At the end of the project a low-cost, indigenously developed and fully functional RF Front-end of VHF/UHF SDR (30-512 MHz) will be developed by LUMS and integrated with the digital/base-band section developed by CARE.

**Title:** GPS Interference Mitigation



**PI:** Dr. Wasif Tanveer Khan

**Sponsor:** National Engineering and Scientific Commission (NESCOM)

**Funding Amount:** PKR 14,250,000

**Project Initiated in:** 2016

**Duration:** 18 Months

**Category:** GIS

**Description:** The main objective of this project is to develop pre-correlation & post-correlation mitigation to mitigate interference or jamming. Post-Correlation techniques deal with signals after being digitized and achieve 20dB of rejection by using different signal processing algorithms. However, these techniques are only effective against narrowband interferers. Pre-correlation techniques, on the other hand, can be

employed for broadband as well as narrowband interference mitigation.

# EARLY WARNING SYSTEM

**Title:** Development of a Low-Cost Paper-based Wireless Early Warning System using Ink-jet Printed Carbon Nanotube Loaded Antenna-based Sensors for Detecting Gases and Improvised Explosive Devices (IEDs)

**PI:** Dr. Wasif Tanveer Khan

**Co-PI:** Dr. Ijaz Haider Naqvi

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 10,855,379

**Project Initiated in:** 2017

**Duration:** 30 Months

**Category:** Technology

**Description:** The main objective of this project is to develop an accurate and efficient

target localization scheme, similar to GPS triangulation scheme, to accurately detect and locate a potential threat wirelessly. The purpose is to develop optimized energy solution to meet the power requirements of the proposed system and achieve the goal of making zero-power sensors. The proposed research project will allow the security personnel in Pakistan and around the globe to identify and locate a potential IED threat at a distance wirelessly enabling them to take preventive measures before an unfortunate accident happens. This will help to save many precious lives and avoid the destruction caused by such incidents. The Ink-jet printing technology will have far reaching effects in the infrastructure and economic development of Pakistan. Using this technology, many other low-cost applications in the form of smart skin, smart packaging, smart textiles and RFID enabled sensors can be developed for IoT applications, which will greatly improve the cognitive intelligence and knowledge of the environment around us in real time and will greatly help us in making Pakistan a smarter and safe place to live.



**Title:** Design and Development of Filter Bank

**PI:** Dr. Wasif Tanveer Khan

**Sponsor:** Pakistan Air Force (PAF)

**Funding Amount:** PKR 1,500,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Technology

**Description:** In common radio communications, a wide bandpass filter is used after antenna to pass the desired band of communication and reject others. This approach, however, is prone to failure of communication in case of hostile environments where a hostile interferer may jam the communication. In such circumstances, narrowband pass

filters, accompanied with frequency hopping techniques, are required. 'Narrowness' of these filters set the basis of frequency selectivity which means the more selective the system is, the more rejection a 'close' interferer undergoes. In this research project, a multi-phase approach is adopted to design an indigenous RF filter bank. The proposed project plan is divided into three sequential phases. Each phase will contribute to next phase. This project has proposed to make 4, 8 and 16 channel RF filter banks in phase 1, 2 and 3 respectively. Successful completion of these phases will lead to the development of even narrower band filters.

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**Profile:** Dr. Zartash Uzmi received his PhD in Electrical Engineering from Stanford University, California in 2002. His graduate research focused on Multi-user Detection for CDMA systems in which he devised schemes and algorithms for practical implementation of multi-user detectors. He has held positions at Nokia Research Centre, Bell Laboratories, and Hewlett Packard Company. He is a part of the LUMS faculty since 2002. At LUMS, his research is focused on scalable network design for wide-area deployments and wireless applications.

#### Selected Publications:

- Mushtaq, A., Ismail, A. K., Wasay, A., Mahmood, B., Qazi, I. A., & Uzmi, Z. A. (2015). Rethinking buffer management in data center networks. Paper presented at the Computer Communication Review
- Hllyas, M. S., Raza, S., Chen, C. C., Uzmi, Z. A., & Chuah, C. N. (2014). RED-BL: Evaluating dynamic workload relocation for data center networks. *Computer Networks*, 72, 140-155
- Nisar, A., Kashaf, A., Uzmi, Z. A., & Qazi, I. A. (2015, November). A Case for Marrying Censorship Measurements with Circumvention. In *Proceedings of the 14th ACM Workshop on Hot Topics in Networks* (p. 2). ACM
- Khattak, S., Javed, M., Khayam, S. A., Uzmi, Z. A., & Paxson, V. (2014, November). A look at the consequences of internet censorship through an ISP lens. In *Proceedings of the 2014 Conference on Internet Measurement Conference* (pp. 271-284). ACM
- Ilyas, M. S., Qazi, I. A., Rassool, B., & Uzmi, Z. A. (2016). Low-Carb: A practical scheme for improving energy efficiency in cellular networks. *Computer Communications*, 94, 72-84



**Title:** A Scalable Platform for Internet Censorship Measurements

**PI:** Dr. Zartash Afzal Uzmi

**Co-PI:** Dr. Ihsan Ayyub Qazi, Prof. Vern Paxson

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 960,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Telecommunications

**Description:** The aim of the project is to carry out three important tasks related to C-Saw: (a) To design and implement C-Saw and carry out a public release of the built software, (b) Design techniques to analyse censorship data from the C-Saw platform to detect different types of censorship and improve C-Saw's design, and (c) Collect Internet censorship measurements from C-Saw users and carry out a longitudinal study of Internet censorship and its impact on various stakeholders.

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**Profile:** Dr. Zubair received his B.Sc. in Electrical Engineering from the University of Engineering & Technology (UET), Lahore, Pakistan in 2008. He received his PhD in Engineering from the Australian National University of Canberra, Australia in August 2013. Previously, he was working as an Assistant Professor in the Electrical Engineering Department, UET Lahore. Prior to that, he worked as a Research Fellow (Postdoc) with Prof. Rodney A. Kennedy in the Research School of Engineering, Australian National University (ANU), Canberra, Australia. He was awarded University Gold Medal and Industry Gold Medals from Siemens and Nespak for overall outstanding performance in Electrical Engineering during the undergraduate studies.

#### Selected Publications:

- Bates, A. P., Khalid, Z., & Kennedy, R. A. (2015, December). On the use of Slepian functions for the reconstruction of the head-related transfer function on the sphere. In Signal Processing and Communication Systems (ICSPCS), 2015 9th International Conference on (pp. 1-7). IEEE
- Alem, Y., Khalid, Z., & Kennedy, R. (2015). Spherical Harmonic Expansion of Fisher-Bingham Distribution and 3D Spatial Fading Correlation for Multiple-Antenna Systems
- Bates, A., Khalid, Z., & Kennedy, R. (2016). Slepian Spatial-Spectral Concentration Problem on the Sphere: Analytical Formulation for Limited Colatitude-Longitude Spatial Region. IEEE Transactions on Signal Processing
- Bates, A. P., Khalid, Z., & Kennedy, R. A. (2016). An optimal dimensionality sampling scheme on the sphere with accurate and efficient spherical harmonic transform for diffusion MRI. IEEE Signal Processing Letters, 23(1), 15-19
- Khalid, Z., Durrani, S., Kennedy, R. A., Wiaux, Y., & McEwen, J. D. (2016). Gauss-Legendre sampling on the rotation group. IEEE Signal Processing Letters, 23(2), 207-211



**Title:** Development of Anisotropic, Fast, Robust and Sparse Spherical Signal Processing Methods with Application to Hydrology and Diffusion Tensor Imaging

**PI:** Dr. Zubair Khalid

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 1,991,883

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Sciences

**Description:** The main objective of this project is to develop advanced algorithms that exploit the anisotropy and sparsity of signals to improve the signal recovery accuracy, reduction complexity, provide the capability to deal with huge data sets, and permit

real-time processing. This project develops the theory and tools which permit the processing of spherical signals and through collaboration engage with leading national and international research efforts.

The background features a central arrangement of overlapping diamonds in various colors: a large purple diamond in the center, a smaller red diamond above it, an orange diamond to the left, a light blue diamond to the right, and a pinkish-purple diamond below it. Light gray lines form a network of interconnected zig-zag patterns across the page.

# DEPARTMENT OF MATHEMATICS



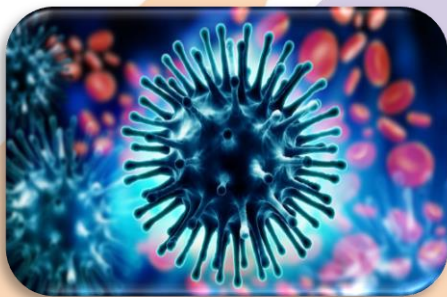
Dr. Adnan Khan  
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**Profile:** Dr. Adnan Khan was awarded his PhD from Rensselaer Polytechnic Institute in NY in 2007. His thesis was titled 'Parameterization for Some Multiscale Problems in Biology and Turbulence'. The work involved studying approaches to coarse graining of multiscale systems with applications to turbulent diffusion and protein dynamics. Prior to his doctoral work, he obtained a BE in Electrical Engineering from NED University of Engineering & Technology, Karachi in 1998 and an MS in Applied Mathematics from the University of Delaware in 2002. His current research interests involve modelling and analysis of biological systems, multiscale modelling and asymptotic analysis. Prior to joining LUMS, Dr. Khan has taught at the Rensselaer Polytechnic Institute and University of Delaware. Besides his usual academic interests, he is also interested in reading on a variety of topics including economics, philosophy, and history and world literature.

#### Selected Publications:

- Imran, M., Malik, T., Ansari, A. R., & Khan, A. (2016). Mathematical analysis of swine influenza epidemic model with optimal control. *Japan Journal of Industrial and Applied Mathematics*, 1-28
- Kakalia, S., & Khan, A. (2016). Oxygen saturation of children in Pakistan's high mountain pastoral communities. *Archives of Disease in Childhood*, archdischild-2016
- Ahmad, M. D., Usman, M., Khan, A., & Imran, M. (2016). Optimal control analysis of Ebola disease with control strategies of quarantine and vaccination. *Infectious Diseases of Poverty*, 5(1), 72
- Khan, A., Naveed, M., Dur-e-Ahmad, M., & Imran, M. (2015). Estimating the basic reproductive ratio for the Ebola outbreak in Liberia and Sierra Leone. *Infectious diseases of poverty*, 4(1), 13
- Imran, M., Khan, A., Ansari, A. R., & Hussain Shah, S. T. (2016). Modeling transmission dynamics of Ebola virus disease. *International Journal of Biomathematics*, 1750057



**Title:** Use of Isolation and Multi Vaccination for Control of Influenza

**PI:** Dr. Adnan Khan

**Co-PI:** Dr. Sultan Sial

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 720,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Health

**Description:** The main objective of this project is to assess the factors that can enhance or inhibit the spread of the flu, in particular disease caused by strains of Influenza A virus in Pakistan. Effective methods of inhibiting the spread include vaccination and isolation of infected individuals. Using deterministic ODE based models, the correlation of the model variables with the dissemination of the diseases, is going to be assessed. The purpose is to develop a mathematical model for transmission dynamics of the disease, when there are two prevalent stains. In particular, this project will cater the effects of isolation and multi vaccination on the spread of the Flu.

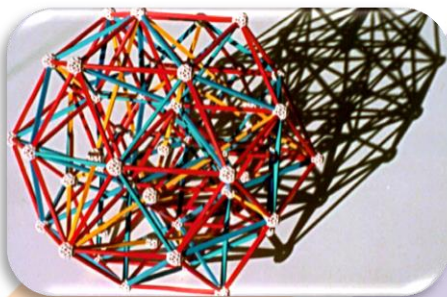
Dr. Muhammad Imran Qureshi  
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**Profile:** Dr. Qureshi has obtained his D.Phil in Mathematics from the University of Oxford, UK in 2011 and an MSc in Mathematics from the Quaid-i-Azam University in 2006. Prior to joining LUMS in 2013, he served at COMSATS, Islamabad. Previously, he has held visiting positions at the International Center of Theoretical Physics, Italy and Freie Universitat Berlin, Germany. Dr. Qureshi's research interest are in algebraic geometry and its connections with Combinatorics, Representation theory and String theory. He mainly works on the biregular classification of polarized algebraic varieties.

**Selected Publications:**

- Qureshi, M. I. (2015). Constructing projective varieties in weighted flag varieties-II. Mathematical proceedings of Cambridge Philosophical Society, Cambridge University Press, pp. 193-209
- Qureshi, M. I. (2016). Computing isolated orbifolds in weighted flag varieties. Journal of Symbolic Computation
- Qureshi, M. I. (2014). Computing isolated orbifolds in weighted flag varieties. Journal of symbolic computation, Elsevier BV
- Qureshi, M. I. Isolated 3-folds in the product of weighted projective spaces



**Title:** Geometry and Topology of Weighted Flag Varieties and Their Complete Intersections

**PI:** Dr. Muhammad Imran Qureshi

**Co-PI:** Dr. Haniya Azam

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 1,634,658

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Sciences

**Description:** The aim of this proposed research is to discover some new Gorenstein formats in order to be able to construct polarized orbifolds in higher co-dimension. This project could play an important role in making productive research

collaborations at home and abroad, and also beneficial for young researchers/ students.

The background features a complex geometric pattern of overlapping diamonds and lines. A central purple diamond is the largest and most prominent. It is surrounded by other diamonds in shades of red, orange, and blue. Light gray lines form a network of interconnected shapes, some resembling stylized arrows or paths, that intersect with the colored diamonds. A dark gray horizontal band cuts across the middle of the image, containing the text.

# DEPARTMENT OF PHYSICS

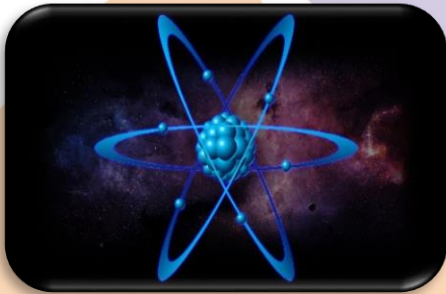
Dr. Adam Zaman Chaudhry  
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**Profile:** Dr. Chaudhry obtained his PhD in Physics from the National University of Singapore (NUS) in 2013 and continued working there as a post-doctoral fellow before joining LUMS in August 2014. His research focuses on harnessing the power of realistic quantum systems. What are these 'realistic' quantum systems and why bother studying them? The fact is that although quantum mechanics is perhaps the most successful theory ever devised and has led to many technological breakthroughs such as transistors, lasers and magnetic resonance imaging, it has been realized that quantum mechanics can be harnessed to do much more - the possibilities are endless! For instance, the power of the quantum can be used for ultra-precise measurements, for unbreakable encryption in communication and even for making computers that will make a mockery of current supercomputers. Unfortunately, there is a major hurdle in the practical large-scale implementation of these new technologies - realistic quantum systems interact with their surroundings, thereby becoming classical, and no longer retain the quantum properties which make them so useful in the first place. Understanding the problem of such realistic 'open' quantum systems is thus a key problem in modern physics, with applications in quantum optics, chemical physics, condensed matter and nanotechnology, to name a few.

#### Selected Publications:

- Chaudhry, A. Z. (2014). Utilizing nitrogen-vacancy centers to measure oscillating magnetic fields. *Physical Review A - Atomic, Molecular, and Optical Physics*, 90(4)
- Chaudhry, A. Z. (2015). Detecting the presence of weak magnetic fields using nitrogen-vacancy centers. *Physical Review A - Atomic, Molecular, and Optical Physics*, 91(6)
- Tan, D. Y., Chaudhry, A. Z., & Gong, J. (2015). Optimization of the environment for generating entanglement and spin squeezing. *Journal of Physics B: Atomic, Molecular and Optical Physics*, 48(11)
- Chaudhry, A. Z. (2016). A general framework for the Quantum Zeno and anti-Zeno effects. *arXiv preprint arXiv:1604.06561*
- Chaudhry, A. Z. (2017). The quantum Zeno and anti-Zeno effects with strong system-environment coupling. *Scientific Reports*, 7(1), 1741



**Title:** Open Quantum Systems beyond the Born-Markov regime

**PI:** Dr. Adam Zaman Chaudhry

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 1,872,324

**Project Initiated in:** 2017

**Duration:** 36 Months

**Category:** Sciences

**Description:** The broad goal of this research project is to look at the dynamics of open quantum systems while making as few approximations as possible. This will not only allow us to understand the dynamics of realistic quantum systems better, but it may also lead to novel phenomena and application. By tackling fundamental and important

questions on open quantum systems, the research project will increase the visibility of Pakistan in the international research community. The project can then also serve as a launching pad for research collaborations with universities in the region.

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**Profile:** Dr. Muhammad Sabieh Anwar completed his DPhil from the Department of Physics, Oxford University (UK) in 2004, where he studied as a Rhodes Scholar from Pakistan. His dissertation was titled, "Quantum Information Processing using Para-Hydrogen NMR" and revolved around the preparation of pure quantum states for quantum computing. His post-doctoral experience at the University of California, Berkeley (USA) involved the demonstration of hyperpolarized NMR using heterogeneous catalytic systems, microfluidic and "lab-on-a-chip" NMR, synthesis of precise magnetic fields for ex-situ NMR, algorithmic cooling, polarization lifetime studies and hypersensitive nanoparticle MRI. Prior to his doctoral studies, Sabieh received his B.Sc. (Honours) degree in electrical engineering (electronics and communications) from University of Engineering and Technology, Lahore.

#### Selected Publications:

- Khan, M. F., Siraj, K., Anwar, M. S., Irshad, M., Hussain, J., Faiz, H., ... & Rafique, M. S. (2016). 700keV Ni<sup>+</sup> 2 ions induced modification in structural, surface, magneto-optic and optical properties of ZnO thin films. Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms, 368, 45-49
- Saleem, M., Manzoor, A., Zaffar, M., Hussain, S. Z., & Anwar, M. S. (2016). Tailoring of ZnO with selected group-II elements for LED materials. Applied Physics A, 122(6), 1-8
- Muhammad, Q. K., Waqar, M., Rafiq, M. A., Rafiq, M. N., Usman, M., & Anwar, M. S. (2016). Structural, dielectric, and impedance study of ZnO-doped barium zirconium titanate (BZT) ceramics. Journal of Materials Science, 51(22), 10048-10058
- Kamal, A., Rafiq, M. A., Rafiq, M. N., Usman, M., Waqar, M., & Anwar, M. S. (2016). Structural and impedance spectroscopic studies of CuO-doped (K<sub>0.5</sub>Na<sub>0.5</sub>Nb<sub>0.995</sub>Mn<sub>0.005</sub>O<sub>3</sub>) lead-free piezoelectric ceramics. Applied Physics A, 122(12), 1037
- Anwar, M. S. (2017). Effective Oscillator Strengths of Tb<sup>3+</sup> Ions in a Garnet Crystal Determined from Low Temperature Magneto-Optic Rotations. In Nano-Optics: Principles Enabling Basic Research and Applications (pp. 429-429). Springer, Dordrecht



**Title:** Development of Low-Field, Low Cost, Re-configurable NMR and MRI

**PI:** Dr. Muhammad Sabieh Anwar

**Sponsor:** Pakistan Science Foundation (PSF)

**Funding Amount:** PKR 2,540,820

**Project Initiated in:** 2016

**Duration:** 24 Months

**Category:** Sciences

**Description:** The present project aims at developing a magnetic resonance system. The proposed system will be highly reconfigurable. It will be within easy access of students who must realize that "NMR machines are not frightening at all" and a large number of Pakistani researchers can enjoy access to a basic unit demonstrating the basic principles and probe highly innovative applications outside the realm of high field magnetic resonance. From a fundamental physics research perspective, the project will open up new directions in using hyperpolarized NMR with para-hydrogen for increasing the sensitivity of NMR and MRI, and that too, at low magnetic fields, possibly using only the earth's ambient magnetic field.



**Title:** Planck's Radiation from Incandescent Light Sources

**PI:** Dr. Muhammad Sabieh Anwar

**Sponsor:** National University of Sciences and Technology

**Funding Amount:** PKR 340,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Sciences

**Description:** The main objective of this consultancy project is to provide an introduction to blackbody radiation and Planck's radiation law. The experimental objective involves the determination of the numerical value of Planck's constant using incandescent light bulb as a source of blackbody. In the first step, students estimate the filament's

temperature using its electrical properties. Students will also practice uncertainty propagation and learn how to measure important parameters using weighted fits of a straight line.



**Title:** Establishment of Quantum Computing and Quantum Communication (QCQC) Laboratory at LUMS

**PI:** Dr. Muhammad Sabieh Anwar

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Education

**Description:** The proposed project aims at designing and establishing a modern laboratory of quantum computing and quantum communications at LUMS which will be used by computer science, physics, and engineering students as testbeds for quantum

mechanics, cryptography, atomic physics and quantum communications. Furthermore, it will directly enrich the principal investigator's current research themes. The QCQC Laboratory will be poised to become a valuable resource for LUMS, both in teaching and research.



**Title:** Fine Tuning of an In-house Developed Atomic Force Microscope

**PI:** Dr. Muhammad Sabieh Anwar

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

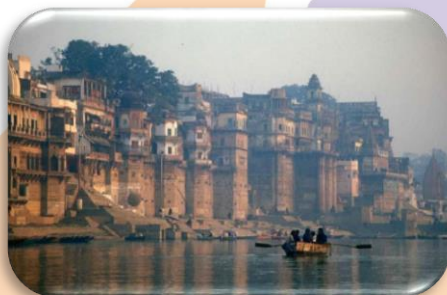
**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Sciences

**Description:** The proposed project aims at designing a close loop feedback control system, improvement, fine-tuning, testing, and calibration of a home-made atomic force microscope already developed in Dr. Sabieh's group. The microscope has demonstrated basic imaging capabilities and a proof-of-principle, being able to detect

longitudinal features on the order of 20-30 nm on area of  $50 \times 50$  micron<sup>2</sup>. This project not only harbours immense potential for research and teaching, but can also be commercialized in the near future.



**Title:** Fog Monitoring in the Indo-Ganges Plain

**PI:** Dr. Muhammad Sabieh Anwar

**Sponsor:** National University of Sciences and Technology (NUST)

**Funding Amount:** PKR 200,000

**Project Initiated in:** 2016

**Duration:** 5 Months

**Category:** Sciences

**Description:** The Consultancy Services to the Client will include, Sample collection on 12 hour basis as per provided protocols, Proper maintenance and care of the deployed instruments, provision of logistic support and electricity and working space and Indigenous design and manufacture of fog monitoring station for future usage.

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**Profile:** Dr. Mumtaz Ali Sheikh completed his B.Sc. (Honours) degree in Computer Science from LUMS in 2004, graduating on the Dean's Honour List. He then joined the College of Optics and Photonics (CREOL), University of Central Florida from where he completed his PhD degree in Optics in 2009. His PhD work was in the area of extreme environment high temperature optical sensors in which he demonstrated novel temperature sensing techniques using Silicon Carbide. His technical contributions have been reported in several international journals and conference proceedings in the areas of optical sensors, confocal microscopy and laser beam analysis. His academic achievements include receiving the Society of Photo-Instrumentation Engineers (SPIE) Scholarship in 2009, LUMS Merit Scholarship from 2001-2004 and world distinction in A-Level Mathematics.

#### Selected Publications:

- Khan, S., Khan, S., Chawla, T., & Murtaza, G. (2014). Harmonic scalpel versus electrocautery dissection in modified radical mastectomy: a randomised controlled trial. *Annals of surgical oncology*, 21(3), 808-814
- Sheikh, M., & Amin, M. J. (2012). Flat spectral response digital micromirror device-based variable fibre optic attenuator. *Photonics Technology Letters, IEEE*, 24(23), 2175-2178
- Sheikh, M. (2012). Flat spectral response all-digital broadband variable fibre optic attenuator. In *SPIE MOEMS-MEMS* (pp. 82540P-82540P). International Society for Optics and Photonics
- Reza, S. A., Khwaja, T. S., & Sheikh, M. (2016). A Tunable Focus Lens-Based Variable Optical Delay Line for Free-Space and Fiber-Optic Applications. *IEEE Photonics Technology Letters*, 28(21), 2423-2426



**Title:** Space Division Multiplexing In Optical Communication

**PI:** Dr. Mumtaz Ali Sheikh

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 2,773,883

**Project Initiated in:** 2017

**Duration:** 24 Months

**Category:** Telecommunication

**Description:** The primary focus of this project is to work on the problem of efficiently detecting/decoding OAM beams in free-space optical communication systems. While methods of detecting modes of OAM beams do exist, universal detectors that can efficiently detect any unknown incoming OAM beam, as required in communication

systems, are still proving elusive for researchers. The primary objective is to build such a universal detector.



**SAHSOL**

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**Profile:** Dr. Azeem completed his B.Sc. Electrical Engineering, from the University of Engineering and Technology, Lahore. Being involved in activism against child labour at the time, he became impressed by the media writings of Asma Jahangir and others. He started writing in the media and completed an LLB, at the University of the Punjab, Lahore. He practiced law and public interest litigation around issues concerning workers and peasants in the lower and High Court for 6 years. He wrote three books which were quite popular in Pakistan. At Osgoode Hall Law School, Toronto, He completed an LLM writing on the topic: "The Collapse of the WTO and Rethinking of Development Theory". In 2014, he successfully defended his PhD in Law, from Osgoode Hall Law School on the topic: "The weaknesses of the 'good governance' paradigm: a study of the judiciary in Pakistan".

**Selected Publications:**

- "Law and Social Change", Law and Society Annual meeting, New Orleans, USA, June 2016
- Historians conference, Metropolitan Club, Lahore, March 2016
- "Structural Analysis of 'Institutionalism'" at National University Singapore Law School, May 22-June 06, 2013
- Structural Analysis of "New Governance" at Institute for Global Law and Policy, Harvard Law School, June 3-4, 2013
- "On and Daily Life in the British Colony and Postcolony: From Colonial Modernity to Modernization" at Law and Society annual Conference, Boston, dated May 30 to June 3rd 2013

**Title:** Labour Law Jurisprudence in Pakistan: A Critical Perspective

**PI:** Dr. Muhammad Azeem

**Co-PI:** Dr. Sadaf Aziz



**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 920,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Law & Policy

**Description:** The main objective of this project is to analyze the corpus of labour laws and their accompanying jurisprudence in the context of state-building and consolidation for the Pakistani state. The primary purpose is to develop some theoretical insights on how particular juridical forms and categories are carriers of accumulative and authoritarian logics and thus aid strategies for the legal and non-legal redressal of the heightened immiseration of labour in this country. The study will turn on an analysis of cases and procedure, primarily from the Federal area, Punjab

and Sindh. The cases will be taken from the relevant National Industrial Relations Commission, Labour Appellate Tribunals, High Courts, and the Supreme Court of Pakistan.

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**Profile:** Mr. Uzair teaches Torts, Commercial Law, and Law & Economics. Tort liability distributes the costs of social and economic harms to those parties that can best prevent, bear, or insure against them. Commercial law sets default rules for market exchange (sales, negotiable instruments, and securities), and market participants (partnerships, corporations, and hybrid forms). Economic analysis of law applies microeconomic insights (primarily price theory, game theory, and social choice) to study the incentives created by law and other forms of regulation. Mr. Uzair studied social choice and game theory with Professors Elizabeth M. Penn and John W. Patty at Washington University in St. Louis. He studied law and economics with Professor Richard Epstein, Judge Richard Posner, Professor William Landes, and Professor Douglas Baird at the University of Chicago. Earlier, He studied political philosophy, literature, and the Classics at Middlebury College (Vermont) and Deep Springs College (California).

#### Selected Publications:

- Kayani, U. (2016). International Trade Law: Strategies, Pitfalls, and Controversies. Government Officers' Fellowship Programme, Research Society for International Law, Pakistan, Lahore, Pakistan
- Kayani, U. (2015). Human Rights and Constitutional Protection. American Bar Assoc. Rule of Law Initiative, Islamabad, Pakistan
- Kayani, U. (2015). The Convention Against Torture. Human Rights Commission of Pakistan, Quetta, Karachi and Islamabad, Pakistan



**Title:** International Human Rights Law Clinic for Law Students

**PI:** Mr. Uzair Kayani

**Co-PI:** Dr. Sikander Ahmed Shah

**Sponsor:** American Bar Association (ABA)

**Funding Amount:** PKR 1,526,325

**Project Initiated in:** 2016

**Duration:** 9 Months

**Category:** Law & Policy

**Description:** This initiative will be headed by Professor Sikander Shah and Uzair Kayani. A dedicated team of students will work under their tutelage. In recent years, the Punjab Bar Council, which is required to make provisions for free legal aid for underprivileged litigants under its constitution, has been woefully inadequate in taking adequate measures to realize this goal, especially in matters of human rights abuse. Over the past few years, students at LUMS have taken an active interest in doing pro-bono work, both as a way of giving back to the community and in order to hone their newly developed skills as lawyers. There is a two-part class taught at LUMS titled 'Legal Aid' which aims to train law students in litigation by encouraging them to aid underprivileged litigants in their legal matters.



**Title:** Regulatory Incentives for Foreign Direct Investments: BIT's, Targeted Partnerships, SEZ's, and Islamic Finance

**PI:** Mr. Uzair Kayani

**Co-PI:** Dr. Khyzar Hussain

**Sponsor:** American Business Forum (ABF)

**Funding Amount:** PKR 800,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Law & Policy

**Description:** The main objective of this project is to propose ways to increase foreign direct investment. To increase or maintain FDI inflows in Pakistan, the signing of bilateral investment treaties between Pakistan and its largest FDI partners could be a step in the right direction. Special policies may also be formulated by the government that provide tax and investment benefit to individual prospective investors. The government may provide Islamic finance benefits to prospective investors. Malaysia has been particularly successful in using Islamic finance as a means to attract FDI. This model may be successful in Pakistan too.



**Title:** Alternative Legal Means for Protecting IP: Sale of Goods Act, Consumer Protection Courts, Provincial Food Authorities, and Quality Control Agency.

**PI:** Mr. Uzair Kayani

**Co-PI:** Dr. Khyzar Hussain

**Sponsor:** American Business Forum (ABF)

**Funding Amount:** PKR 800,000

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Law & Policy

**Description:** MNCs in Pakistan often complain about the lack of intellectual property

protection that takes a huge toll on their annual revenues. The main objective of this project is to propose that instead of the government indulging in the process of enacting new legislation, the existing enforcement mechanism should be improved. This can be achieved indirectly, through instruments that in their normal operation also achieve ends associated with IP protection. MNCs can obtain indirect IP protection through support of their legal institutions such as Provincial Food Authorities, the Pakistan Standards and Quality Control Authority, Consumer Protection Courts and the Sale of Goods Act.

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**Profile:** Dr. Zubair Abbasi completed his doctorate from the Faculty of Law, Oxford University. The focus of his doctoral thesis was on the transplantation of English legal system in colonial India and the interaction between Islamic law (Fiqh) and English law in this process. He conducted a case study of the developments in Islamic waqf law under the British legal system by analysing the jurisprudence developed in the judgments of the Judicial Committee of the Privy Council and various Indian High Courts. His research revealed the crucial role played by Muslim lawyers, judges, 'ulama', and politicians in the formation of Anglo-Muhammadan Law (later called Muslim Personal Law). It showed how they simultaneously negotiated and collaborated with, and resisted the colonial administrators in the making and operation of the new Indian legal system. Dr. Abbasi is currently exploring the legal process of the 'judicial islamisation' of laws in Pakistan in the historical context of the convergence of the principles of Islamic law and English law in colonial India. He is also examining the relationship between Sharia and the modern state in the larger context of the scholarship that explores the relationship between different legal systems and their impact on economic and political development of a country.

#### Selected Publications:

- Abbasi, Muhammad Zubair, Sharia and State Law: Relevance of Islamic Legal History for the Application of Muslim Family Law in the West, *Journal of Law, Religion and State*, 2(3) 2015, 124-38
- Abbasi, Muhammad Zubair, Islamic Law and Social Change: An Insight into the Making of Anglo-Muhammadan Law, (*Oxford*) *Journal of Islamic Studies*, 3 (25) 2014, 263-297
- Abbasi, Muhammad Zubair, Colonial State and Muslim Institutions: History of Regulatory Framework for Awqaf (Religious Endowments) in British India in Brown, Rajeswary Ampalavanar and Pierce, Justin, *Charities in the Non-Western World: The Development and Regulation of Indigenous and Islamic Charities* (2013 Routledge) 310-32
- Abbasi, Muhammad Zubair, the Classical Islamic Law of Waqf: A Concise Introduction, *Arab Law Quarterly*, Vol. 26, No. 2, 2012, 121-53



**Title:** Sharia and the Modern State: Judiciary and the Application of Islamic Jurisprudence in Pakistan

**PI:** Dr. Zubair Abbasi

**Sponsor:** LUMS Faculty Initiative Fund (FIF)

**Funding Amount:** PKR 1,000,000

**Project Initiated in:** 2015

**Duration:** 12 Months

**Category:** Law & Policy

**Description:** This project proposes to evaluate the contribution of the Shariat Courts in Pakistan in the application and development of Islamic law (Fiqh/Shari'a) by analysing the judgments of the Federal Shariat Court and the Shariat Appellate Bench of the

Supreme Court of Pakistan. This project will assess the way Islamic Jurisprudence (Usul al-Fiqh) is applied in Pakistan by the Federal Shariat Court and the Shariat Appellate Bench of the Supreme Court of Pakistan. It will critically analyse the contribution of case law produced by these courts in the application and development of Islamic Jurisprudence while dealing with various issues relating to property law, commercial law, contract law, penal law, labour law and family law.



**Title:** The Contribution of the Judiciary in the Application and Development of Islamic Jurisprudence in Pakistan

**PI:** Dr. Zubair Abbasi

**Sponsor:** Higher Education Commission (HEC)

**Funding Amount:** PKR 819,539

**Project Initiated in:** 2015

**Duration:** 24 Months

**Category:** Law & Policy

**Description:** In Pakistan, judicial organ of the state is employed to islamise the existing laws. This is a unique approach adopted in a Muslim country in order to indigenise transplanted colonial laws and/or to replace them with Islamic law. In this respect, the

jurisprudence produced in the judgments of the Federal Shariat Court and the Shariat Appellate Bench of the Supreme Court provides valuable material for assessing the mechanism of applying Islamic law in a modern nation state. This project proposes to assess the way Islamic Jurisprudence (Usul al-Fiqh) is applied in Pakistan by the Federal Shariat Court and the Shariat Appellate Bench of the Supreme Court of Pakistan since 1980. It will critically analyse the contribution of case law produced by these courts in the application and development of Islamic Jurisprudence while dealing with various issues relating to commercial law, contract law, penal law, labour law and family law.



**Title:** The Role of Judiciary in Protection of Women's Rights: A Case Study of Divorce Law (Khul')

**PI:** Dr. Zubair Abbasi

**Sponsor:** LUMS Faculty Initiative Fund (FIF) | Higher Education Commission (74)

**Funding Amount:** PKR 3,623,320

**Project Initiated in:** 2016

**Duration:** 12 Months

**Category:** Law & Policy

**Description:** This project proposes the first comprehensive and systematic study on the role of judiciary in Pakistan in the protection and promotion of women's right to divorce. This study will propose policy recommendations for effective disposal of divorce related

legal issues. This research project has two main objectives: first, it analyses the process of the development in women's right to dissolve their marriages without the consent of their husbands; and second, it assesses the impact of this legal change on the institution of marriage by collecting empirical data from family courts and local councils. This is a unique project that explores the impact of judge-made laws upon society by collecting data from lower courts to enhance understanding of the problems faced by litigants, lawyers and judges while dealing with legal issues regarding divorce.

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Published By:

Office of Sponsored Programmes and Research (OSPR)  
Lahore University of Management Sciences (LUMS)

Designed By:

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