Towards a World-Class Research University in Science and Technology-
Money is Critical but Not Enough

By
Nabeel A. Riza
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Boston, USA

N. A. Riza is Full Professor at College of Optics/CREOL, University of Central Florida, USA and Founder of Nuonics, Inc.
# PAK-Millennium Conference 2002

**Higher Education in Pakistan - Challenges for Reform**

Hariri Auditorium  
Boston University School of Management  
595 Commonwealth Avenue, Boston, MA 02215  

Sunday, April 14, 2002

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<td>8:30 - 9:00 a.m.</td>
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| 9:00 - 10:30 a.m. | Setting the Stage                   | Dimensions of the crisis: Dr. Tariq Banuri  
Senior Research Director, Stockholm Environment Institute-Boston  
Current reform efforts: Dr. Shams-Kassim Lakha  
President, Aga Khan University and Chair, Steering Committee on Higher Education  
Moderator: Hasan Usmani  
Axim Systems |
| 10:30 - 12:15 p.m. | Reform at the University Level     | People: Dr. Pervez Hoodbhoy  
Professor of Physics, Quaid-e-Azam University, Islamabad  
Money: Dr. Nabeel Riza  
Professor of Optics and Electrical Engineering, University of Florida and CEO, Nuonics, Inc.  
Governance: Dr. Hamid Kizilbash  
Ali Institute of Education, Lahore and Former Professor of Political Science, Punjab University, Lahore  
Management of Reform: Dr. Tahir Andrabi  
Associate Professor of Economics, Pomona College  
Moderator: Durriya Farooqui  
Research Associate, Kennedy School of Government, Harvard University |
## PKM Conference 2002

### Lunch

**Introduction**

Bilal Zuberi  
Doctoral Candidate, MIT, and  
President, Pak-Millennium Conference  
Professor Dr. Atta-ur-Rahman  
Minister of Science and Technology,  
Government of Pakistan

### Reform at the System Level

| People          | Dr. Sohail Naqvi  
                  | Vice-President, Enabling Technologies and Former Dean, Faculty of Electronics, Ghulam Ishaq Khan Institute, Topi |
|-----------------|------------------|
| Money           | Dr. Ishrat Hussain  
                  | Governor, State Bank of Pakistan |
| Governance      | Dr. Henry Rosovksy  
                  | Dean Emeritus, Harvard University |
| Management of Reform | Dr. S. T. K. Naim  
                           | Chairperson, Pakistan Council on Science and Technology |
| Moderator:      | Dr. Atif Mian  
                  | Assistant Professor of Finance, Graduate School of Business, University of Chicago |

### Challenges in Implementation

**Panel discussion:**

- Dr. Syed Zulfiqar Gilani  
  Vice-Chancellor, Peshawar University  
- Dr. Zafar Saied Saify  
  Vice-Chancellor, Karachi University  
- Dr. Najma Najam  
  Vice-Chancellor, Fatima Jinnah Women's University, Rawalpindi

**Moderator:**

Dr. Adil Najam  
Professor of International Relations, Boston University

**Closing Remarks:**

Syed Babar Ali  
Pro-Chancellor, Lahore University of Management Sciences
Educating the Technology Leaders and Sustainers: An Education/Output Model

- High School Diplomas
- 2 Yr – College Diploma
- 4 Yr – College Degree
- 2 Yr – Masters
- 5 Yr – Ph.D

New Knowledge Creators and Leaders
Engineering Management
Engineers / Designers
Testers / Machinists
Assemblers

Degrees by Area Size
Model of a Sustainable Research Engine

The Research University ↔ Institute of Science & Technology

• Leadership – Management → Active or Former Successful Scientist/Engineer

• Low Classroom Teaching Load
  (e.g., 1 course per semester)

• High Research Output Load
  (patents, publications, $$, M.S./Ph.Ds)

• High Student, Staff (Research), Faculty Quality Control

↓

JEWEL OF THE NATION AND WORLD TECHNICAL COMMUNITY
Financial Engine of a Research University

Traditional Sources of Money
Federal, State, Industry

$$

Equity Positions

Joint Research Projects

Donations

Qualified Professionals
New Ideas
New Companies

Output of University Research

Direct

Incubator Spin-off Companies

Taxes
Jobs

Regional Economic Growth

Technology Transfer Patent Income
Research $$ For

Basic
- Long Time Lines
  - 5-15 Years
  - Fundamental Changes in Science
    e.g. Gravity Waves via LIGO
    Inv. > $ 300 M.

Applied
- Short Time Lines
  - 1-5 Years
  - Advances in Technology and Applications
Common Research Program Types

• Name: Multi-Year Balanced Programs
  Sponsor: US DARPA
  Level: $1-10 M over 4 years

• Name: SBIR: Small Business Innovative Research Program
  Sponsor: DOD, NASA, NSF
  Level: Phase I $ 100K 6-9 months.
  Phase II $ 500K – 1000 K 2 years
  These are Phased Accelerated $$ Programs.

OBJECTIVE

Balance $$ Risk vs. Time Used to Get Results
Other Types of Grants

• Money for Scholarships in a Focus Area:
  e.g. Optical Communications.

• Cost Sharing Grants between University and Industry/Government Laboratory
  → University and Industry/Government Laboratory both providing matching funds to enhance budget of the project.

• Industry Sponsored Scholarships for Graduate Research
  e.g. GE, IBM.
Business of Applied Research

BIG Investment $$ Need to Convert to Concrete Results

• Meet Government Mission
  e.g., Develop Wideband Radar Technology

• Meet Commercial Mission
  e.g., Develop Telecom Switches

• Meet Dual-Uses
  e.g., Image Analysis for Cancer Detection
  e.g., Image Analysis for Missile Target Detection
Multi-University Research Center

Focus on An Area of Technology
(Imaging, Biomedicine, Robotics)

Lead University

Disadvantaged University
Industry and Govt. Labs (for Review only)
Other Major Research Universities
Where are the Research $$ Spent?

• Better Military
• Better Health

For the US/Western World.

Indirect Benefits of This Research

Internet          Unmanned Space Exploration

DARPA / ARPA-net  NASA / JPL /
Military Network  Air Force Rocket Programs
Spend $$ to make $$

Marketing of:
• University Technical Strength – Focus Center e.g. Optics
• Faculty International Awards
• Presence of International Conferences
• Attendance @ Govt. Sponsored Meetings
• Membership of Govt. Industry Research Review Panels
• Marketing Office / Lobbying Presence Near Sources of Power and Money – Washington D.C.
• Leveraging Precious Research Success Stories

Raising Research $$ ← A Business Like-Approach is Required
Research $$ - Never Enough

Focus on Specific Area

Vital to Set the Right Initial Conditions:
• Choose the Right Qualified Leaders with Technical Vision
• Quality Attracts Quality
• Let the Technical Leaders Build the Institution
• Small in Size – More $$ Per Person → Giant Outputs
• Provide Seed Funds for 10 Year Period

TIME IS REQUIRED TO BUILD A GREAT TECHNICAL UNIVERSITY
Status of Proposed Vision: An Example

“The LUMS School of Science & Engineering (SSE)”

Author Note:
Today, Mr Syed Babar Ali (LUMS Founder) and LUMS SSE Project Director Dr. Khurram Afridi are leading the way for Pakistan to build such a proposed research oriented university.

See http://sse.lums.edu.pk/