Science and Technology Cooperation Between the Muslim World and the West

Science and technology cooperation has the unique ability to bridge the cultural chasm between the Muslim World and the West. Via a common scientific ground and the spirit of collaboration that exists in the worldwide academic community, it is possible to bring two diverse cultures closer together.

Through bilateral and regional collaboration, it is possible for all parties to benefit from science and technology cooperation. Consequently, a careful examination of the quantitative measures of the makeup of the international Muslim scientific community can set the stage for a global effort of scientific outreach to the Muslim world.

In order to fully explore the potential for collaboration, it is necessary to gauge the extensiveness of science and technology in the Muslim world. Specifically, we need to examine where linkages exist already, and to identify areas that are open for further cooperation.

In order to do this, it is necessary to compare the number of scientists, engineers, and technicians engaged in research and experimental development in the Muslim countries to similar numbers in developed nations. On the whole, Muslim countries have one-tenth of scientists, engineers and technicians compared with the nations in the developed world.

A further look at the distribution of R&D scientists and engineers by field has shown a considerable disparity between developed countries and nations of the OIC. Developed countries have their maximum number of scientists and engineers working in the fields of natural sciences and engineering and technology, whereas in the case of the Muslim countries, maximum number is concentrated largely in agriculture.

For the effective utilization of science and technology resources in the new millennium, the Muslim world must formulate science and technology policy backed fully by goals, deliverables, priorities, and most importantly, infrastructure if their S&T and R&D enterprise is to be productive.

Some areas of interest:

Implementation

In the Muslim world, in contrast to the West, the implementation of science and technology policy takes place at a national, and not at a regional level. While states have established councils to oversee the development of science and technology, and in many cases drafted national plans, these plans can vary widely from one nation to the next. While the Turkish have achieved the most cooperative research between the public and private sector, Egypt has a cumbersome research system heavily laden with bureaucracy, and the diffusion of practicable result is infrequent. The Pakistanis have directed their research efforts with a priority towards nuclear energy and other state-centric endeavors, but their progress has been stunted and slow, at best. Malaysia has a sophisticated applied research program focused on electronic export, and the Indonesian government has opted for a high-tech bent with some focus on aerospace, both of which offer rewards at the high probability of significant risk.

The oil-rich nations of Saudi Arabia and Kuwait, as well as the United Arab Emirates have invested large amounts of funding into state-of-the-art research facilities, but unfortunately, the science they produce does not match the grandeur of their laboratories. Thus, there is still an intense focus on the importation of science and technology rather than its production. The North African states of Morocco, Algeria and Tunisia each operate their own centralized national research centers in the imitable style of the French, but a lack of linkages to the private sector greatly affects their overall productivity.

The fundamentalist regimes such as those in Iran and Sudan have shown little if any interest in the development of science and technology research. Consequently, these nations have been examples of the so-called 'brain drain' that has plagued so many nations of late. The exodus of scientists and engineers from Iran after 1979 mirrors the exodus of knowledge from Sudan since the late 1960's.

Demographics, Language and Education

The numbers of research scientists and engineers in the Muslim world is considerably less than that of the wealthy nations in the Americas and Asia. Science and engineering students are typically drawn from urban backgrounds; while there are far greater numbers of poorer students, few of these can afford to pursue research careers. Overall participation in science remains low, and few have enough exposure to science and technology to foster successful careers. Access to technology in the Muslim world roughly parallels a similar disparity in qualify of life in a broader sense.

Language training is another barrier to Muslim science. 80 percent of the world's scientific literature appears first in English. Consequently, instruction solely in Arabic, Persian, Urdu and other endemic languages may be inadequate for training students and researchers. Muslims lag behind students of other backgrounds in the reading, writing and comprehension of English, such as the Chinese and Brazilians .

And while effective science instruction may be available in the urban and private schools of many nations, the legacy of the Qur'anic schools still places an emphasis on rote learning, and university and technical instruction emphasize teaching rather than research.

Research and Resources

While the Muslim world may have no shortage of scientists and engineers, there is a considerable shortage in the number of researchers. While several nations may have an outstanding and exemplary project or individual researcher, there is little inherent ability in these institutions to train the next generation of young researchers. Additionally, many graduates in science and technical fields are employed in bureaucratic, not scientific posts. There is little incentive to publish, nor ability to develop one's research capabilities. Inadequate access to data and equipment only compounds this problem, as does a lack of financial resources.

The United States and Japan, along with Germany and other Western nations, spend upwards of 2 percent of their gross domestic product on research, but nary a Muslim nation spends more than one half of one percent. Not only is the money scarce, but it is also sporadic, contrary to the long-term financial commitments which fuel research. When funds do become available, they are often poorly managed.

The establishment of further professional societies in nations of the Islamic world could aid in some of the managerial aspects of research, but those that do exist seldom have structures or resources for experimentation. They are principally concerned with the production of journals, and often opt for a narrow focus to avoid scrutiny.

Governmental Involvement and Regional Cooperation

Industrial importation of Western technology still often relies on foreign maintenance. Such wholesale importation and foreign dependence stymies the ability of local Muslim firms to develop adaptive research capabilities. Particularly in the Muslim world, state-owned corporations can play an ever-increasingly important role yet have been thus far quiet to scientific cooperation. With the exception of state oil companies, there is little incentive for collaboration or quality control. As discussed previously, many of these oil companies are mere concessionaires, not fully entitled operators of technology.

Authoritarian regimes provide another stumbling block for Islamic science and technology progress. The lack of freedom for inquiry or dissent, for example, cripple the cooperative spirit of science that could be fostered via university collaboration or professional societies. A striking case study is the US National Academy of Sciences detailing of the long-term and wholesale destruction of the scientific community in Syria by a nationalist and fundamentalist regime.

These regimes also reinforce the dependence on the importation and copying of foreign technology. Distrustful of their own domestic institutions, they would prefer to purchase technology than to generate innovations of their own . Indigenous research capability is thus crushed by the view that science and technology are commodities to be purchased rather than avenues of exploration. This is made worse by the ill-equipped and bureaucratically hampered applied-research institutions of government ministries, often the playthings of political appointees with no interest or capability for appropriate research.

Regional cooperation, though it has a mediocre past in the Muslim world, makes a great deal of sense in principle, given that a handful of countries are oil-rich and research-driven, while other countries export such commodities. The similarity, too, of applied-research priorities, such as solar-energy and desalinization, should lend credence to a cooperative spirit. Too often, however, the time that should have easily lent itself to cooperation has yielded more rhetoric than results.

R&D Scientists/Engineers by Discipline (FTE)

	Natural Sciences	Engineering	Medical	Agriculture	Social Science
Egypt	9,620	7,726	3,677	7,157	16,366
Indonesia	5,317	3,285	1,615	4,083	4,233
Jordan	310	340	118	92	381
Libya	230	198	130	221	321
Pakistan	2,095	998	172	2,128	67
Qatar	160	53	2	5	N/A
Tajikistan	677	2,058	429	210	595
Turkey	891	1,040	1,350	1,590	531
Uzbekistan	6,841	13,993	3,736	1,927	9,292

Distribution of R&D Scientists/Engineers by Sector (FTE)

	Production	Higher Education	General Services
Egypt	12,968	61,124	20,091
Jordan	23	255	140
Kuwait	298	448	1,645
Libya	200	800	100
Pakistan	N/A	5,580	N/A
Qatar	N/A	185	N/A
Senegal	285	826	837
Tunisia	N/A	5,446	1,755
Turkey	2,509	8,768	3,692
Uzbekistan	1,461	18,969	2,499

Intellectual Property

	Applications Filed	Patents Granted	Patents in force
USA	177,388	96,514	1,157,241
Germany	109,187	43,190	244,488
Japan	380,453	36,100	579,695
Russia	30,180	1,215	6,956
Algeria	139	617	N/A
Bangladesh	113	78	597
Egypt	787	403	N/A
Indonesia	1,336	N/A	N/A
Iran	427	286	N/A
Iraq	332	101	913
Libya	47	N/A	N/A
Malaysia	2,427	512	N/A
Morocco	356	303	N/A
Pakistan	524	N/A	N/A
Saudi Arabia	519	N/A	N/A
Sudan	4,411	37	N/A
Tunisia	1,280	180	4,090
Turkey	1,205	694	6,351

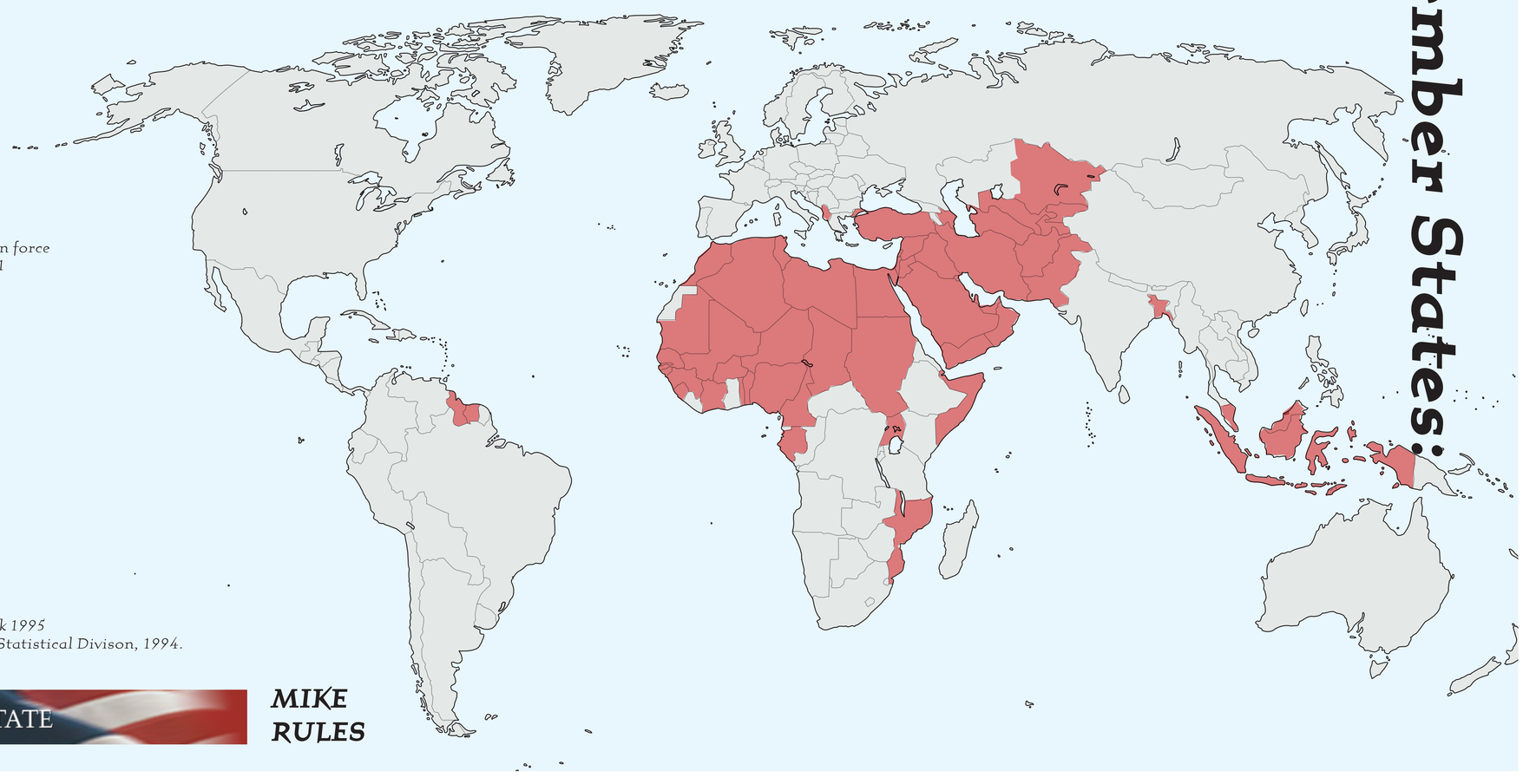
R&D data from "Science and Technology", Section 5. UNESCO Statistical Yearbook 1995
IP data from UN Dept. for Economic and Social Information and Policy Analysis, Statistical Divison, 1994.

A Map of Member States:

The Organization of Islamic Conference Member States

Currently, the OIC has 57 member and 3 observer states

The Organization of the Islamic Conference (OIC) is an international organization grouping fifty seven states which have decided to pool their resources together, combine their efforts, and speak with one voice to safeguard the interests and secure the progress and well-being of their peoples and of all Muslims in the world.



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