Technology Transfer: High-Level Perspective from Developed Countries

WIPO Expert Forum on Technology Transfer

February 16, 2015



Knowles Intellectual Property Strategies

Bridging US and South Africa





Project on Intellectual Property and Technology Transfer/Common Challenges/Building Solutions

CDIP Project Paper approved May 2012



- Five Regional Technology Transfer Consultation Meetings (2012-2013)
 - Asia, Africa and Arab, Transition, Developed and Latin America/Caribbean
- Six Peer-reviewed Analytic Studies (2014)
- High Level Expert Forum (February 2015)



What is Technology Transfer? Committee on Development and IP (9th session)

- "Series of processes enabling and facilitating flows of skills, knowledge, ideas, know-how and technology among different stakeholders such as universities and research institutions, international organizations, IGOs, NGOs, private sector entities and individuals, as well as international technology transfer among countries"
- "Transfer of technology, which is often considered to include the absorption of new technologies, is sometimes also considered to involve the transfer of concrete knowledge for the manufacture of products, the application of a process or for the rendering of a service granting the improvement of domestic as well as the international competitiveness in the economic market."

Status of Global Innovation?







The Global Innovation Index 2014

The Human Factor in Innovation



2014 Global Innovation Index

Global Innovation Index (average) **Innovation Efficiency Ratio** (ratio) **Innovation Input Innovation Output** Sub-Index **Sub-Index** Knowledge and Human Market capital and Business technology sophistication sophistication Institutions research Infrastructure Intangible Political Knowledge Knowledge ICTs Credit workers environment Education creation assets Regulatory Tertiary General Innovation Knowledge Creative goods infrastructure linkages impact and services environment education Investment

Trade &

competition

Knowledge

absorption

Knowledge

diffusion

Online

creativity

Ecological

sustainability

Research &

development

Figure 1: Framework of the Global Innovation Index 2014

Business

environment



Benchmarking Global Innovation

Global Innovation Index rankings

Country/Economy	Score (0-100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank	Median: 0.74
witzerland	64.78	1	н	1	EUR	1	0.95	6	
Inited Kingdom	62.37	2	HI	2	EUR	2	0.83	29	
weden	62.29	3	HI	3	EUR	3	0.85	22	
inland	60.67	4	HI	4	EUR	4	0.80	41	
letherlands	60.59	5	н	5	EUR	5	0.91	12	
United States of America	60.09	6	н	6	NAC	1	0.77	57	
Singapore	59.24	7	HI	7	SEAO	1	0.61	110	
Denmark	57.52	8	HI	8	EUR	6	0.76	61	
Luxembourg	56.86	9	HI	9	EUR	7	0.93	9	
Hong Kong (China)	56.82	10	HI	10	SEA0	2	0.66	99	
reland	56.67	11	HI	11	EUR	8	0.79	47	
Canada	56.13	12	HI	12	NAC	2	0.69	86	
Germany	56.02	13	HI	13	EUR	9	0.86	19	
Norway	55.59	14	HI	14	EUR	10	0.78	51	
Israel	55.46	15	HI	15	NAWA	1	0.79	42	
Korea, Republic of	55.27	16	HI	16	SEAO	3	0.78	54	
Australia	55.01	17	HI	17	SEAO	4	0.70	81	
New Zealand	54.52	18	H	18	SEAO	5	0.75	66	
celand	54.05	19	н	19	EUR	11	0.90	13	-
Austria	53.41	20	н	20	EUR	12	0.74	69	
lapan	52.41	21	HI	21	SEA0	6	0.69	88	
France	52.18	22	HI	22	EUR	13	0.75	64	
Belgium	51.69	23	HI	23	EUR	14	0.78	55	
Estonia	51.54	24	HI	24	EUR	15	0.81	34	
Malta	50.44	25	HI	25	EUR	16	0.99	3	
Czech Republic	50.22	26	н	26	EUR	17	0.87	18	
Spain	49.27	27	HI	27	EUR	18	0.76	60	
Slovenia	47.23	28	н	28	EUR	19	0.78	53	
China	46.57	29	UM	1	SEAO	7	1.03	2	
Cyprus	45.82	30	HI	29	NAWA	2	0.77	56	
Italy	45.65	31	HE	30	EUR	20	0.78	52	
Portugal	45.63	32	HI	31	EUR	21	0.74	73	
Malaysia	45.60	33	UM	2	SEAO	8	0.74	72	
Latvia	44.81	34	HI	32	EUR	22	0.82	32	
Hungary	44.61	35	UM	3	EUR	23	0.90	15	
United Arab Emirates	43.25	36	HI	33	NAWA	3	0.54	127	
Slovakia	41.89	37	HI	34	EUR	24	0.79	45	
Saudi Arabia	41.61	38	HI	35	NAWA	4	0.74	70	_
Lithuania	41.00	39	HI	36	EUR	25	0.68	89	
Mauritius	40.94	40	UM	4	SSF	1	0.75	65	1
Barbados	40.78	41	HI	37	LCN	1	0.69	87	
Croatia	40.75	42	HI	38	EUR	26	0.81	36	
Moldova, Republic of	40.74	43	LM	1	EUR	27	1.07	1	
Bulgaria	40.74	44	UM	5	EUR	28	0.84	25	-
Poland	40.64	45	HI	39	EUR	29	0.72	76	
Chile	40.64	46	HI	40	LON	2	0.68	92	
Chile	40.64	46	HI	40	NAWA	5	0.60	114	
Thailand	39.28	48	UM	6	SEA0	9	0.76	62	-
Russian Federation	39.14	49	HI	42	EUR	30	0.79	49	
Greece	38.95	50	HI	43	EUR	31	0.70	85	
Seychelles	38.56	51	UM	7	SSF	2	0.74	74	
Panama	38.30	52	UM	8	LCN	3	0.85	20	
South Africa	38.25	53	UM	9	SSF	3	0.68	93	
Turkey	38.20	54	UM	10	NAWA	6	0.93	11	
Romania	38.08	55	UM	11	EUR	32	0.84	24	
Mongolia	37.52	56	LM	2	SEAO	10	0.68	94	
Costa Rica	37.30	57	UM	12	LCN	4	0.81	38	-
Belarus	37.10	58	UM	13	EUR	33	0.83	27	
Montenegro	37.01	59	UM	14	EUR	34	0.62	106	
TFYR of Macedonia	36.93	60	UM	15	EUR	35	0.70	82	
Brazil	36.29	61	UM	16	LCN	5	0.74	71	
Bahrain	36.26	62	HI	44	NAWA	7	0.60	117	
Ukraine	36.26	63	LM	3	EUR	36	0.90	14	
lordan	36.21	64	UM	17	NAWA	8	0.80	40	- 10
Armenia	36.06	65	LM	4	NAWA	9	0.83	28	-
Mexico	36.02	66	UM	18	LCN	6	0.71	79	
Serbia	35.89	67	UM	19	EUR	37	0.79	46	
Colombia	35.50	68	UM	20	LCN	7	0.63	102	
Kuwait	35.19	69	HI	45	NAWA	10	0.78	50	
Argentina	35.13	70	UM	21	LON	8	0.79	43	
riet Nam	34.89	71	LM	5	SEAO	11	0.95	5	
Uruguay	34.76	72	HI	46	LCN	9	0.73	75	

Global Innovation Index rankings (continued)

Country/Economy	Score (0-100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank	Median: 0.74
Peru	34,73	73	UM	22	LCN	10	0.62	107	
Georgia	34.53	74	LM	6	NAWA	11	0.68	90	
Oman	33.87	75	H	47	NAWA	12	0.58	121	
ndia	33.70	76	LM	7	CSA	1	0.82	31	
ebanon	33.60	77	UM	23	NAWA	13	0.59	119	
unisia	32.94	78	UM	24	NAWA	14	0.66	98	
azakhstan	32.75	79	UM	25	CSA	2	0.59	118	
vyana	32.48	80	LM	8	LON	11	0.74	68	
osnia and Herzegovina	32.43	81	UM	26	EUR	38	0.65	101	
imaica	32.41	82	UM	27	LCN	12	0.65	100	
ominican Republic	32.29	83	UM	28	LCN	13	0.85	21	-
lorocco	32.24	84	LM	9	NAWA	15	0.70	83	
rnya	31.85	85	U	1	SSF	4	0.84	26	
hutan	31.83	86	LM	10	CSA	3	0.60	112	
donesia	31.81	87	LM	11	SEAO	12	0.96	4	
runei Darussalam	31.67	88	н	48	SEAO	13	0.43	139	
raguay	31.59	89	LM	12	LON	14	0.75	63	
inidad and Tobago	31.56	90	HI	49	LON	15	0.63	103	
ganda	31.14	91	U	2	SSF	5	0.71	77	-
janda otswana	30.87	92	UM	29	SSF	6	0.50	133	
satemala	30.75	93	LM	13	LON	16	0.68	95	
bania	30.47	94	UM	30	EUR	39	0.50	131	
	30.39	95	UM	31	SEA0	14	0.34	141	
nana	30.26	96	LM	14	SSF	7	0.81	37	
ibo Verde	30.09	97	LM	15	SSF	8	0.55	126	
negal	30.06	98	LM	16	SSF	9	0.85	23	
ypt.	30.03	99	LM	17	NAWA	16	0.76	59	
nilippines	29.87	100	LM	18	SEAO	15	0.81	35	2
zerbaijan	29.60	101	UM	32	NAWA	17	0.58	120	
vanda	29.31	102	U	3	SSF	10	0.46	137	
Salvador	29.08	103	LM	19	LCN	17	0.60	116	
embia	29.03	104	U	4	SSF	11	0.76	58	
Lanka	28.98	105	LM	20	CSA	4	0.87	17	
mbodia	28.66	106	Ш	5	SEAO	16	0.74	67	
lozambique	28.52	107	u	6	SSF	12	0.57	124	
amibia	28.47	108	UM	33	SSF	13	0.55	125	
urkina Faso	28.18	109	U	7	SSF	14	0.71	78	
igeria	27.79	110	LM	21	SSF	15	0.94	8	
olivia, Plurinational State of	27.76	111	LM	22	LON	18	0.70	84	
	27.75	112	LM	8	CSA	5	0.46	136	
rgyzstan alawi	27.61	113	U	9	SSF	16	0.46	96	
arawi	27.52	114	LM	23	22F	17	0.80	39	
			UM						
cuador	27.50	115		34	LON	19	0.63	104	
ite d'Ivoire	27.02	116	LM	24	SSF	18	0.93	10	
sotho	27.01	117	LM	25	SSF	19	0.40	140	
onduras	26.73	118	LM	26	LON	20	0.53	128	
ali	26.18	119	U	10	SSF	20	0.83	30	
an, Islamic Republic of	26.14	120	UM	35	CSA	6	0.57	122	
embia	25.76	121	LM	27	SSF	21	0.79	44	
nezuela, Bolivarian Republic of	25.66	122	UM	36	LON	21	0.95	7	
nzania, United Republic of	25.60	123	U	11	SSF	22	0.60	113	
adagascar	25.50	124	U	12	SSF	23	0.62	105	
caragua	25.47	125	LM	28	LCN	22	0.53	129	
hiopia	25.36	126	U	13	SSF	24	0.67	97	
vaziland	25.33	127	LM	29	SSF	25	0.57	123	
bekistan	25.20	128	LM	30	CSA	7	0.61	108	
ingladesh	24.35	129	U	14	CSA	8	0.68	91	
mbabwe	24.31	130	U	15	SSF	26	0.79	48	
ger	24.27	131	U	16	SSF	27	0.50	132	
yer enin	24.21	132	U	17	SSF	28	0.60	115	
enin geria	24.20	133	UM	37	NAWA	18	0.53	130	
						9			
kistan	24.00	134	LM	31	CSA		0.89	16	
ngola	23.82	135	UM	38	SSF	29	0.82	33	
pal	23.79	136	U	18	CSA	10	0.49	134	
jikistan	23.73	137	U	19	CSA	11	0.45	138	
rundi	22.43	138	U	20	SSF	30	0.46	135	
sinea	20.25	139	U	21	SSF	31	0.61	109	
yanmar	19.64	140	U	22	SEAO	17	0.71	80	
men	19.53	141	LM	32	NAWA	19	0.60	111	
go	17.65	142	U	23	SSF	32	0.25	142	
udan	12.66	143	LM	33	SSF	33	0.09		



Note: World Bank Income Group Classification (July 2013): L1 = low income; LM = lower-middle income; LM = upper-middle income; and H1 = high income. Regions are based on the United Nations Classification: EUR = Europe;

2014 Global Innovation Index

Summary of Conclusions

- Top 25 Countries are all in high-income group
 - Switzerland, UK, Sweden, Finland,
 Netherlands, US, Singapore, Denmark,
 Luxenbourg, Hong Kong



- China (29) and Malaysia (33) are only upper-middle income countries getting close
- Sub-Saharan Africa has the most improvement
- BRIC Countries are diverging:
 - > China (29) improving while India (76) declining
 - Russia (49), South Africa (53) and Brazil (61)



2014 Global Innovation Index

Summary of Conclusions

- Economies that are catching up are more dependent on technology transfer than original R&D
- Toxic cycle
 - Low economic development is linked to low education
 - Education is linked to innovation
 - Innovation is linked to economic development
- Brain drain: Highly skilled workers from China, India, and ZA are emigrating to other countries

TRIPS Article 7:Objectives



The protection and enforcement of IP rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of produces and users of technological knowledge and in a manner conducive to social and economic welfare and to a balance of rights and obligations





TRIPS Article 66.2



Developed country members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging transfer of technology to least developed country members in order to enable them to create a sound and viable technology base

Not compulsory

Only addresses LDCs

High Level Perspectives

Developed Country Initiatives

United States





Reporting on Implementation of Article 66.2 United States October 23, 2014



- US committed to continually enhancing 66.2 assistance
- Reports annually
- US has \$40 Billion budget for R&D, includes research that can assist LDCs
- Asks for "Self-identified Tech Transfer Interests"
 - > TRIPS Council Secretariat to organize requests
- Tech Transfer is most effective when technology is requested by the group that will be using it
- President Obama (Oct 2011) issued memo to all federal R&D labs to improve TT programs
 - Federal Lab Consortium for TT
 - Connects to 300 federal labs

U.S. Gov't Assistance under 66.2

- Partnership for Enhanced Engagement in Research ("PEER")
 - Joint project of USAID, NSF and NIH
- UN Framework Convention on Climate Change
- U.S. Science and Technology Agreements
- U.S. Department of Agriculture
- National Science Foundation
- USAID' Feed the Future
- Power Africa (\$7B over 5 years, Presidential initiative)
- South Asia Regional Initiative for Energy
- Contributor to Medicines Patent Pool
- WIPO Re:search
- National Institute Standards and Technology
 - (Hosted 37 from LDCs)



Technology Transfer: U.S. Education

- U.S. Higher Education 2013
- > 8% increase in foreign students
 - China (235,597); India (96,754); South Korea (70,627)
 - LDCs: Nepal (8,920), Bangladesh (3,828)
 - U.S. Dept of State High School Scholarships
 - Flex Program (15-17 year olds from Eurasia)





High Level Perspectives

Developed Country Initiatives

Large Corporations





Traditional Corporate Social Responsibility

Safety in the workplace

Ethical Management

Fair Treatment of Employees

Good Products

Not Polluting the Environment

Charitable Giving



Does "Corporate Social Responsibility" Include Technology Transfer?

▶ Voluntary Licensing? **Ø** GILEAD









Education and Training?



IT Supplies?







- Collaborations?
- Manufacturing?





Practical Tips: Motivating Corporate Tech Transfer

- Be Specific!
 - "We need a formulation that is stable without refrigeration for a year for the active drug X"
- Group entity who would use it should ask
- Carrot (part of a worthy effort) v. Stick (threats, bad PR)
- Approach in the right way through the right channels
- Ask for something that they likely have

High Level Perspectives on Tech Transfer

Developed Country Initiatives:

Universities Non-Profit Organizations





Association of University Technology Managers®

Advancing Discoveries for a Better World®



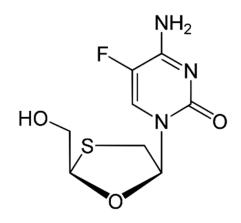
www.betterworldproject.org



Emory University HIV Research















ROYALTY PHARMA

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FOR IMMEDIATE RELEASE

GILEAD SCIENCES AND ROYALTY PHARMA ANNOUNCE \$525 MILLION AGREEMENT WITH EMORY UNIVERSITY TO PURCHASE ROYALTY INTEREST FOR EMTRICITABINE

University Innovation Global Outreach

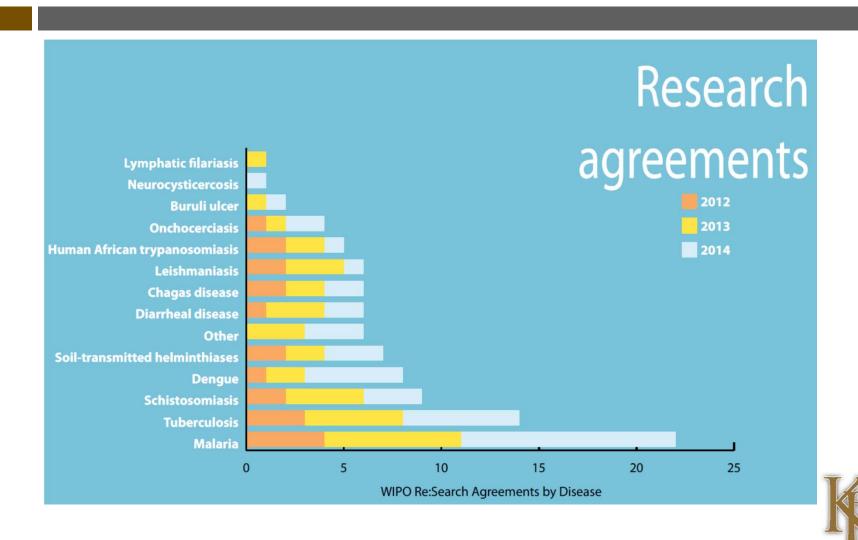


Sharing Innovation in the Fight Against Neglected Tropical Diseases

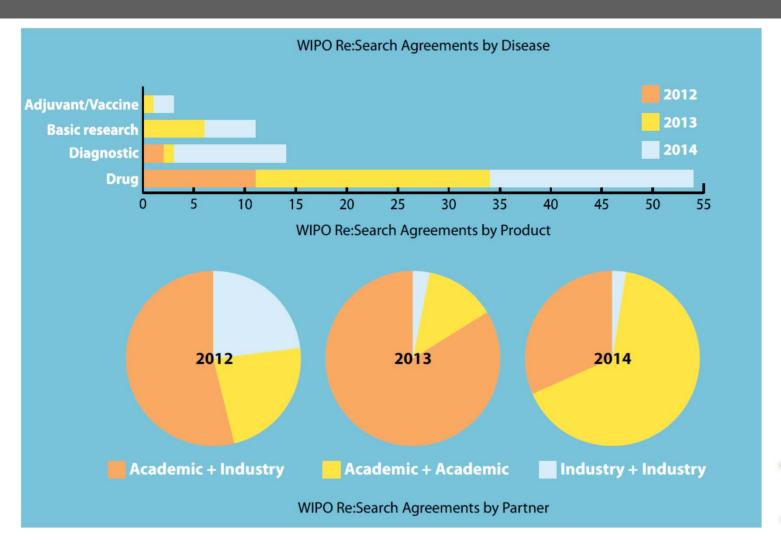
76 Users and Providers



WIPO: ReSearch Agreements by Disease

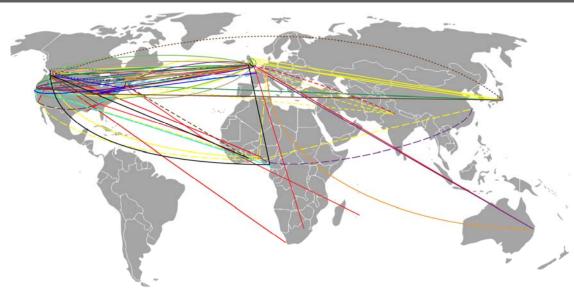


Re:Search by Disease and Partnership





Technology Transfer for Global Health



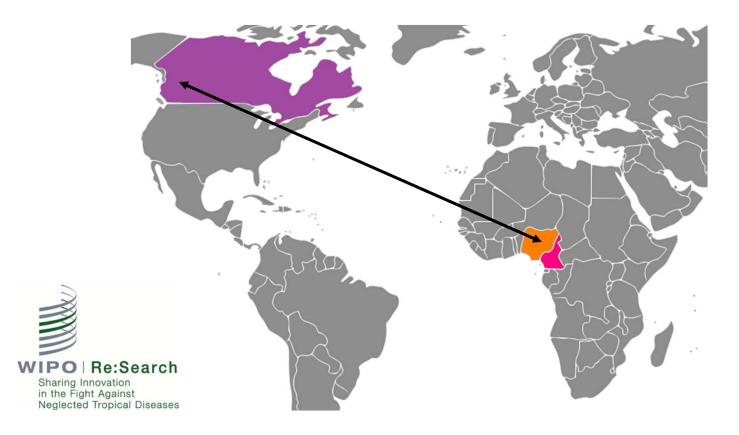
Universities have shared the following assets through collaborations:

- Neglected disease medium-throughput screening platform
- Clinical samples
- Natural product extracts
- Lateral flow dipstick diagnostic platform
- Phage display technology
- Activity-guided fractionation expertise
- Environmental sample filtration device



Universities Sharing Capabilities

The University of British Columbia is elucidating the structures of antituberculosis and anti-malarial natural products identified by the University of Ibadan (Nigeria) and anti-onchocercal natural products identified by the University of Buea (Cameroon).





Universities Sharing Expertise

A McMaster University researcher is developing a filtration device capable of concentrating particulates from environmental samples.

A University of South Florida researcher will assess the device's ability to concentrate *Ascaris* eggs from soil and sewage samples.





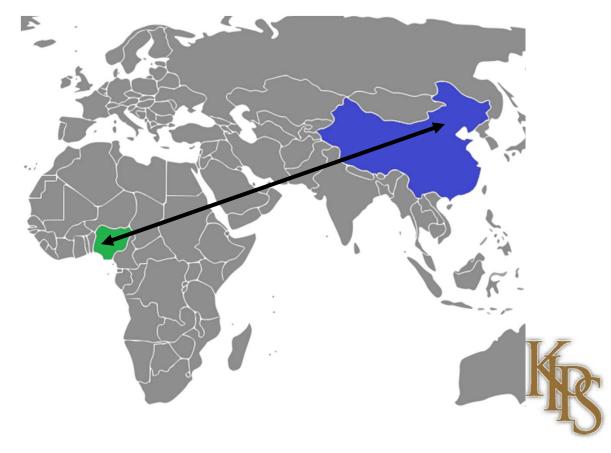


Universities Sharing Platform Technologies

The National Institute of Parasitic Diseases, Chinese CDC, provided a researcher at the University of Ibadan with a lateral flow *S. japonicum*

dipstick diagnostic.

The University of Ibadan researcher is testing the dipstick's ability to detect *S. mansoni*.





Universities Sharing Knowledge

Stanford University researcher, Dr. Michael Hsieh, hosted Dr. Olfat Hammam, a schistosomiasis pathologist from the Theodor Bilharz Research Institute (Egypt).

Olfat gained experience using cutting-edge laboratory equipment and learning the pathology techniques used in Michael's lab.

Olfat and Michael co-authored two peer-reviewed publications based on the research performed during Olfat's visit.







Universities Sharing Technologies

University of Lagos (Nigeria) researcher, Dr. Wellington Oyibo, hosted Dr. Manu Prakash, a bioengineer from Stanford University.

Manu had developed a novel paper-based microscope (Foldscope). Costing less than \$1 and able to magnify samples over 2,000x, the Foldscope represents a transformative technology in global health diagnostics.

In Lagos, Manu tested his Foldscope on field samples, attended a microscopy training seminar, obtained insight from Nigerian microscopists, and trained microscopists how to use the Foldscope.







Universities Sharing Innovation

- Stanford University researchers, Dr. Ben Pinsky and Dr. Jesse Waggoner, hosted Chika Okangba, a graduate student at the University of Lagos (Nigeria).
- ➤ After Chika screened samples from patients from Lagos, Nigeria that presented with undifferentiated febrile illness, Chika, Ben, and Jesse developed a customized, PCR-based diagnostic targeting Lagos' most common causes of fever.







High Level Perspectives

Developed Country Initiatives

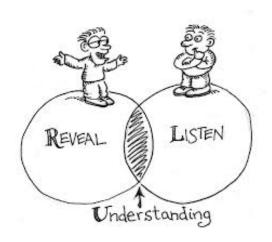
Receptivity by Developing Countries





Receptivity by Developing Countries It depends on what is being transferred!

- Know-how and capacity building
 - Economic and political stability
 - Ability to accomplish what is being transferred



- Creation of SME,Collaboration,Manfacturing Site
- Supportive legal environment
 - Regulatory
 - Strong IP Protection
- Well-developed national infrastructure

Shadow of the Leader





Unintended Consequences









Framework for Receptive Ecosystem

- Shadow of the Leader:
 - What is your government's message?
- Enact transformational patent laws
 - > If you aim for the bottom, you will get there
- Identify and support key talent
 - Rule-breakers
- Minimum ecosystem and infrastructure
- Results-based incentives
- Achievable goals for level of innovation
- Aspirational goals for amount of innovation
- Mentoring networks ("Each one teach one")





What can WIPO do to help?

- Create Technology Clearing House Board
 - > Technology needed by area
 - > Supervised so content is clear, answerable
 - Invite Large Corporations to monitor
- Connect Developed Country Gov't and Corporations with requestors
 - Help that contact comes from WIPO
 - > Able to find the right people





What Can WIPO do to help?

Encourage the concept of Corporate Social Responsibility to include Technology Transfer

- Clear definition of technology transfer
- Public Messaging
- Flashy Awards





What can WIPO do to help?

- Extend "WIPO Academy"
 - Use Patent and Trademark Attorney Program for local training





Can Developed Country Patent and Trademark Attorneys Contribute to Tech Transfer?

- Training and hosting international peers
- Accountability of retained local associates
 - Local mentoring
 - ➤ Inclusive Patent Bar
 - Responsible hiring
 - Advocating for a legal framework promotes tech transfer
 - Volunteering for school programs that teach students about inventing and technology development
- Building international bridges





What can we do personally to support international tech transfer?

- Host students from developing countries
- Create and maintain strong personal relationships that bridge developed/developing countries
- Look for bridge-building opportunities
- Be ready to volunteer
- Keep the dialogue fresh





International Conferences





Goal: Unified Technology Transfer



