Technology Scouting and Deployment
for Sustainable Development

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The World Intellectual Property Organization (WIPO) Regional Bureau for Asia and the Pacific, in cooperation with the Global Solutions Summit and the ASEAN Committee on Science, Technology, and Innovation, convened a virtual Conference on Technology Scouting and Deployment for Sustainable Development. The conference consisted of two, two-hour virtual panel discussions – one on Technology Scouting on Tuesday, November 10 and one on Technology Deployment on Thursday, November 12. The Program, and other meeting documents are available here. This report synthesizes the panelists' remarks during the two sessions as well as their written responses to audience questions.

I. Why Technology Scouting and Deployment?

Irrespective of a country's current level of development, its national development strategy generally encompasses five fundamental goals:

1. Transforming the economy by developing smarter, more productive, and competitive factories, farms, and service companies
2. Promoting sustainable, inclusive, and affordable access to potable water, off grid, renewable energy, internet connectivity, housing, food security, health care, and other essential services
3. Generating income, promoting inclusive growth, and creating well-paying formal sector jobs
4. Preventing and mitigating climate change
5. Addressing the current pandemic and preventing future pandemics

Technology scouting and deployment are indispensable tools for achieving these goals. Without technology scouting and deployment, many potentially useful solutions will sit idle, unable to improve the lives of the tens of millions of people in thousands of rural and urban communities scattered across dozens of countries. If R&D is the quest for new knowledge and innovative solutions, technology scouting and deployment are essential tools for converting those solutions into practical results on the ground.

II. Technology Scouting

Technology scouting rests on four fundamental premises:

- Most of the R&D relevant to any country's national development objectives is likely to have been conducted and patented by scientists in some other country. As Dr. Cung Vu noted during his

presentation, global R&D expenditures totaled more than $2.3 trillion in 2019. The US and China were the two largest countries in terms of R&D expenditures, but their shares of global R&D expenditures were "only" 27.2% and 22.5% respectively. In other words, nearly 73% of R&D expenditures took place outside the US and 77% occurred outside China. If the vast majority of global R&D occurred outside the US and China, the amount taking place outside every other country is substantially greater. Under these circumstances no country or region acting on its own will be able to innovate or research its way to sustainable development. Instead, they need to employ technology scouting to sift through research findings and new discoveries emanating from scientists in other countries and incorporate the most relevant information into their own national development programs.

- Many of the development solutions that countries need to meet their development challenges are already in widespread use in other countries.[1] This latecomer[2] status gives Asian countries spanning the gamut from low to upper middle income a distinct advantage, if they can build the relevant scouting capacity to exploit it: Instead of devoting scarce time and resources to of reinventing the wheel, technology scouting can help them leapfrog over older technological solutions and find, adapt, adopt, learn to use, and deploy the latest available solutions that have already been developed and deployed elsewhere by others. In addition to identifying existing solutions, technology scouting can also help countries identify NEW and EMERGING technological solutions that are market ready but not yet widely applied in developing countries.

- Precisely because there has been such a proliferation of potentially useful, transformative development solutions, business, government, community, and NGO decision-makers do not have the capacity to evaluate the relative cost and benefits of competing technological solutions. Which are the most cost effective and affordable? Will they deliver the expected benefits? Are they tailored to the needs and customs of a specific company, country, or region? What skills do companies and employees need to acquire to use these technologies effectively? Finally, what are the requirements for successfully deploying this technology at scale on a financially and operationally sustainable basis? A well-designed, robust technology scouting program will help countries and companies answer these questions. Once this scouting capacity is in place, government agencies, the private sector, community groups, local universities, and other stakeholders will be better able to identify and evaluate potential solutions available around the world, build a business case to support the deployment of that solution, and learn how to incorporate them into their daily operations.

[1] These include (i) off-grid electricity for small island states, remote rural areas and large urban centers; (ii) advanced manufacturing technology local companies need to master if they are to become second or even third tier suppliers in smart value chains; (iii) robotics and AI for smarter agriculture and manufacturing; (iv) nano-filters for potable water; (v) ICT technologies for telemedicine and digital solutions to deliver low-cost, high quality health care; (vi) food processing, and (vii) ICT connectivity especially in more remote regions.

[2] For a discussion of the latecomer advantage see, John A. Mathews, "Competitive Advantages of the Latecomer Firm: A Resource-Based Account of Industrial Catch-Up Strategies," **Asia Pacific Journal of Management**, 19, 467–488, 2002. Also, Alfred Watkins and Michael Ehst (eds.), Science, Technology and Innovation: Capacity Building for Sustainable Development and Poverty Reduction, World Bank, 2008, Session 3: Latecomer Strategies for Catching Up: The Role of STI Capacity Building, available at: https://openknowledge.worldbank.org/handle/10986/6418?locale-attribute=en

- With technology scouting in its toolkit, national innovation strategies should no longer focus exclusively on commercializing new-to-the-world inventions generated by each country's national R&D facilities. Instead, via well-designed scouting and deployment programs, latecomers have the potential to reap even greater benefits by deploying the latest solutions that are already in use elsewhere but which are new to the country or new to at least some firms in the country.

New-to- the-world, new-to-the-country, and new-to-the-firm technologies are distinct targets for technology scouting. The speakers on the technology scouting panel explained how countries can design their technology scouting strategies to hit each of these targets.

Dr. Cung Vu focused on two technology scouting programs operated by the US Office of Naval Research Global (ONRG):

- Technology awareness programs that keep the US abreast of innovative, new-to-the-world technologies
- Science diplomacy programs that help countries use and deploy new-to-the-country technologies tailored to their specific development priorities.

Vu explained that ONRG currently operates "technology awareness" offices in seven cities – Sao Paolo, Santiago, London, Prague, Tokyo, Singapore, and Melbourne – and plans to open an additional office in India. The primary purpose of these offices is to discover technologies, research results, new products, and novel solutions developed by scientists and engineers in different countries that may be of relevance to the US. In addition to meeting with scientists in their home universities and research labs, ONRG finances workshops, conferences, and symposia around research topics of interest to both ONRG and the recipient. To further explore areas of mutual interest, ONRG invites scientists to the US to meet their counterparts to discuss potential collaborations. ONRG also directly funds research on topics of special interest to both ONRG and the recipient.[3]

ONRG conducts these technology awareness programs primarily in countries with a sophisticated scientific base. In other countries, ONRG's science diplomacy programs help scientists adapt, adopt, and learn to use "specific technologies to solve their own problems, whether environmental problems or energy needs for remote islands or mountainous areas." For example, ONRG helped researchers from the Chiang Mai Rajabhat University build the Chiang Mai World Green City. This "living lab" consists of sustainable housing, agriculture, and retail space powered by a solar mini grid. It helps scientists, engineers, and community stakeholders understand:

- The advantages of using DC current as versus AC current in the normal grid system.
- The safety aspects of using DC current.
- How to combine battery storage with intermittent solar energy.
- How to convert biomass and other waste into energy to supplement solar power.

[3] Vu noted that since 1946, sixty recipients of ONRG research funding went on to win Nobel Prizes.

- The energy efficiency implications of different housing models.

Students and professors are now incorporating these insights into other Thai Royal projects. In addition, they are traveling across Thailand, helping to disseminate this know-how to officials and stakeholders in other Thai cities and regions.

> *Countries with more advanced scientific and engineering capability may wish to organize a network of technology scouting and awareness outposts. Each country could organize its own network, or they could create a regional scouting consortium to manage these technology awareness outposts. These outposts could emulate ONRG's technology awareness approach which emphasizes new-to-the-world technologies and know-how or related models that other countries have developed.*
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> *Countries may also wish to explore the possibility of developing living labs around other high priority themes including smarter cities, smart agriculture, vertical farming, smart factories, etc. Each living lab would focus on disseminating information regarding the adaptation, adoption, and deployment of new-to-the-country development solutions pertinent to a specific sector.*

Living labs are one mechanism for supporting the adaptation, adoption, and deployment of new-to-the-country development solutions. Leena Thomas, founder and CEO of GBI explained how India's Central Highlands Restoration Project (CHiRP) employs a different approach to accomplish similar scouting and deployment objectives.

The CHiRP program, which GBI designed and now implements in alliance with Commonland from the Netherlands, The Nature Conservancy (TNC), Samerth Charitable Trust, and the IKEA Foundation, seeks to identify solutions for improved landscape restoration and agro-forestry practices that can potentially improve agricultural yields, add value to the local agriculture and food processing sectors, and improve the livelihoods of rural communities in the Indian State of Chhattisgarh.

Thomas explained that the CHiRP technology scouting process entails more than identifying and licensing a single patent, finding and deploying a single, new-to-the-country technology, or engaging experts to peruse technology databases for available solutions. Effective technology scouting, she explained is a multi-step, multi-dimensional process encompassing the following activities:

1. Identify the widest possible range of stakeholders in the local community and work closely with them throughout the entire scouting and deployment process. As Thomas emphasized, in addition to comparing technical specifications of individual technologies, technology scouting should also consider how a specific technology will interact with the community's customs, habits, perceived needs and viewpoint as well as the deployment capacity of the local ecosystem. This consultation process entails understanding how the local community is living and sharing ideas about how technology can improve lives and help to create a brighter future.
2. Define a specific project or problem via workshops and continuous dialogue with the community, local NGOs, government and private sector officials, potential financiers, and other relevant stakeholders. In the case of CHiRP, the consensus goals emerging from this community

engagement process included adding value to the local food processing sector and increasing livelihood opportunities for the local community.

3. Establish a Technology Working Group (TWG) consisting of experts from local and national universities, research institutes, and the business community.
4. Conduct a Needs Assessment in collaboration with the TWG and local stakeholders. In the CHiRP project, for example, the Needs Assessment identified the following needs as being integral to the success of the project: improving water and sanitation, adding nutritional value to local produce, increasing internet bandwidth for improved market access, expanding access to clean cooking and other environmental technologies, enhancing energy access, improving supply chain traceability, adding value to local produce, and developing local capacity for processing, storing and packaging local agricultural produce.
5. For each item in the Needs Assessment, develop a comprehensive roadmap of what will be required to meet that objective.[4] In the case of CHiRP, this inventory included such items as the business procedures, government enabling activities, financing requirements, skills, and new technologies required for adding value to local agriculture produce, monitoring soil conditions, and deploying mini or micro-grids.
6. Launch a widely publicized series of global Calls for Proposals. Each annual call for proposals would invite companies to propose solutions to the specific issues enumerated in the call. Ideally, the call should also specify what assistance the winning proposals can expect to receive. The CHiRP call for proposals, for example, specifies that, "Selected technology companies / applicants will be provided with support on the ground by a technology working group to facilitate localization [and] development of sustainable business models within the local ecosystem."
7. Select the "winning" proposals and begin the deployment process.

In her discussion of the CHiRP program, Thomas outlined a series of generic processes and procedures for scouting, identifying, and attracting new-to-the-country technologies. These ranged from ensuring community, stakeholder consultation and participation in all phases of the scouting exercise to the ultimate step of helping the "winning" innovators deploy their solutions at scale. Thomas noted that there is nothing sector-specific about these general processes and procedures. Governments and stakeholders can use similar procedures to scout for development solutions in other sectors ranging from potable water in distant rural communities to smart factories in large cities.

Theresa Kotanchek added explained that technology scouting, is more complex than matching the technical attributes of a particular development solution (i.e., a nanofilter's capacity to eliminate specific pollutants) with the technical details of a specific development problem (i.e., pollutants in a community's water supply). Before a solution can be deployed at scale, countries also need to develop the institutional capacity and cultivate behavioral patterns to support these deployment initiatives.

[4] In virtually all cases, this list will include more than a single patent or technology. As the deployment discussion will explain, it will, at a minimum, include a bundle of related technologies along with many other indispensable items. Technology databases can facilitate the search for relevant technologies, but they are one tool among many others in the technology scouting toolkit. They are not a substitute for the scouting processes that Thomas outlined.

Institutional capacity, for example, is the indispensable bridge between technology scouting and successful technology deployment. As an example, Kotanchek cited the Manufacturing USA Initiative, which the US Congress initially authorized in 2014 as the National Network for Manufacturing Innovation (NNMI) program. This program authorized the establishment of a network of research and development centers for different advanced manufacturing technologies.[5] The initiative brings "together industry, academia and federal partners within a growing network of advanced manufacturing institutes to increase U.S. manufacturing competitiveness and promote a robust and sustainable national manufacturing R&D infrastructure."

To date, 16 manufacturing innovation institutes have been established. Although each institute focuses on different technological issues, they all share a common set of objectives which are to enhance U.S. manufacturing capability and competitiveness, develop the skilled technical workforce, build robust supply chains by helping smaller suppliers adopt these advanced technologies into their shop floor operations, and develop the local innovation ecosystem.

Each institute operates as a public private partnership. The US Government provides start-up funding (which decreases over time) for 5 years and requires a minimum one-to-one cost share. As of 2018, the institutes had 1,291 members, comprised of "844 manufacturing firms, 297 educational institutions (universities, community colleges, and other academic institutions), and 150 other entities, including federal, state, and local government, federal laboratories, and not-for-profit organizations." Sixty-five percent of the member manufacturers were small businesses with 500 or fewer employees. In 2019, these institutes leveraged $133 million in federal funds to attract $355 million in state and private investment and supported over 560 major projects involving more than 1,920 different organizations.

Recent evaluations indicate that the Manufacturing USA Institutes are generally achieving their objectives and working well in the US context. Other countries have achieved comparable results with slightly different organizational models.[6]

> *Irrespective of the precise organizational arrangements, similar networks of institutes could potentially help low and middle-income developing countries identify, adapt, adopt, and disseminate smart manufacturing and smart agriculture technology as well as new-to-the-country and new-to-the-firm technologies for potable water, off-grid electricity, low-cost health care, and other essential services.*

However, technical expertise is only one key to their success. Equally important, Kotanchek explained, is their recognition that:

[5] Details about the Manufacturing USA Institute program and each of the individual institutes operating under the auspices of this program are available here. The National Academies of Science organized Workshops in 2017 and 2019 to assess the progress of this program. Free downloads of the Proceedings of these workshops are available here and here. The discussion in this report of the Manufacturing USA Institute program draws from all three sources as well as Dr. Kotanchek's presentation.

[6] For details of some of these alternative models, see the discussion on Panel IV: Advanced Manufacturing Around the World in the Proceedings of the 2017 Workshop available here.

- Innovation seldom depends on discovering obscure or subtle elements, but in seeing obvious needs with fresh eyes. As Noble Laureate Albert Von Szent-Gyorgyi famously observed, "discovery consists of seeing what everybody has seen and thinking what nobody has thought."

- Innovators operate at intersections of cultures and disciplines. This enables them to pursue a massive number and combination of different ideas. Innovators also leverage extensive internal and external networks, and in so doing, integrate diverse perspectives -- customers, suppliers, entrepreneurs, National Laboratories, universities, students, etc. – during the process of expanding and refining their ideas.

- Public private partnerships, and especially networks of PPPs, are essential for accelerating innovation. The key ingredients for successful public private partnerships are:

    1. Focused Target: focus investments on a small number (one, two, three maximum) of big spaces, e.g., water, energy, heathcare, etc., which are growing significantly faster than GDP. If a government ministry for economic development exists, it should work in partnership with the network to identify, define and prioritize the target areas.
    2. Develop a Partnership Mindset: invest in people who have a partnership mindset and the skills necessary to identify, develop and launch new business opportunities. While technical skills are important, business and relationship skills are equally important.
    3. Act Quickly, Leverage Others, and Establish Win-Win Partnerships: Successful people act quickly, learn, adapt, and deliver results. They recognize that they can deliver results faster by leveraging others and establishing win-win partnerships. This requires putting systems in place to enable and support partnerships. Tech scouting and deployment are contact sports. Success is totally dependent on one's ability to establish, build, and maintain trusting relationships. It is about listening, identifying, connecting, engaging, adapting, and delivering results. All too often, leaders believe that success relies entirely on mastering technical details. These are essential, but personal relationships are essential too. If you are unable to establish, mutually beneficial (true win-win) strategic partnerships then the effort will not be successful.
    4. Prototype Rapidly: This allows you to learn and co-develop products with others, especially potential customers. By getting the prototype in circulation, customers can interact with it, use it, and tell you what they want. Customers who might have been all too quick to toss a development group's hard-won prototype in the trash are far more reluctant to do so with prototypes that they have helped develop.

- In addition to depth and breadth of technical knowledge, successful technical scouts should exhibit the following traits:

    - Cross cultural sensitivity: the ability to decipher the values of others.
    - Cultural humility: the ability to see one's own values as no better or worse than someone else's.
    - Proactive problem-solving orientation: the conviction that issues can be resolved.
    - Personal flexibility: the ability to adopt responses and approaches as needed.

- Negotiation skills: the ability to explore differences creatively.
- Interpersonal and cross-cultural tact: the ability to work diplomatically with others.
- Visioning skills: the ability to envision options that others cannot see and to then articulate how to implement that option.
- Business acumen: the ability to identify, assess and articulate the potential value of unmet needs.
- The ability to understand the value of intellectual assets and hidden assets, not just published intellectual property.
- Strong strategic partnering relationship skills
- The ability to identify, define, and establish win-win partnerships.

III. Technology Deployment

Scouting for innovative solutions is not the same as getting those solutions to the residents of tens of thousands urban and rural communities and factories. On the contrary, harnessing innovative solutions to achieve the SDGs is a two-step process. Technology scouting is the first essential step. But the indispensable – and frequently overlooked -- second step entails embedding these innovations in businesses and government institutions that will adapt and deploy them, not merely on a small-scale pilot basis but on a scale commensurate with the size of the problem. In the abstract, these two steps follow logically and inexorably from one to the other. But in the real world, there is frequently a chasm hindering the seamless transition from scouting to deployment. Building a bridge across this chasm is the so-called "deployment challenge."

This chasm is due to several factors, but two are particularly important. First, many of the scientists and engineers who developed smart phones, photovoltaic cells, sensors for the internet of things, and nano filters for water purification did not go into the lab with the explicit goal of solving problems for low and middle-income developing countries. They had other objectives in mind – in the case of water purification, for example, providing drinking water for astronauts on the International Space Station, cleaning water in resort swimming pools, or reducing the toxicity of wastewater discharge from fracking operations. Deployment in these instances was relatively straight-forward since NASA, international resort hotel companies, and international oil companies all have the internal organizational, operational, and technical capacity and know-how to deploy these technologies.

Many of these same filters can also produce potable water in urban settlements and rural communities in low and middle-income developing countries. But deployment, in this case, is not so straight-forward. A patent or technological solution is not a product and a product is not a sustainable business. In other words, inventing an effective filter is not the same as building a sustainable, efficient organization to purify and distribute potable water to local consumers. Someone must build that business. And someone must connect the scientist who patented the nano filter or the technology vendors selling nano filters with entrepreneurs attempting to organize financially viable enterprises producing and selling affordable, potable water.

Unfortunately, this is easier said than done, which is a second reason for the chasm. Consider for example, all the independent and uncoordinated actors, activities, and tasks required to provide potable water to rural villages and urban settlements in Africa and elsewhere.

- A nano filter cannot produce potable water without pumps, hoses, cisterns, a power supply (grid, solar, bicycle, diesel), water quality monitoring equipment, a retail distribution system, and a payment collection mechanism. Who will organize this supply chain in thousands of communities?
- Those same innovators and equipment suppliers who are selling nano filters to resorts and oil companies may not have sales contacts in developing countries nor do they have the personnel, financial resources, and inclination to search for potential customers in numerous distant countries.
- The customer for this filtration technology is not always obvious. Is it a ministry? A community-based coop? Private sector investors? Village officials? Individual households? An international foundation or social enterprise? Young local entrepreneurs who just graduated from a start-up weekend or local incubator? Who will figure this out?
- Who will take responsibility for managing local procurement, organizing construction, maintaining and repairing the equipment, obtaining the necessary permits, registering and operating the business, and handling all the other mundane but essential tasks associated with providing potable water in a single community, let alone thousands of communities?
- In other words, who will figure out how to incorporate this game-changing technology into a financially sustainable, efficient, game-changing organization? The scientist who invented the nano-filter may be an expert in new materials, but she may not have the expertise, business acumen, organizational skills, and personal inclination to take time away from the lab to handle these other tasks. Similarly, a technology vendor may be interested in selling technology, but not in owning and operating water kiosks in thousands of villages in dozens of countries.
- NGOs and social enterprises may have the organizational and operational capacity to handle these tasks in one country. But they do not necessarily have contacts to replicate their efforts in neighboring countries let alone more distant countries. And even if they develop the necessary contacts, they may not have the organizational capacity and personnel to operate programs in additional locations.
- Humanitarian organizations are present in numerous countries, but they are not necessarily in the business of owning, operating, managing, maintaining, and repairing water enterprises in every community where they are present.
- Impact investors and foundations may be willing, in principle, to finance these deployment activities. But impact investors and foundations are not project developers. They expect someone to approach them with a package of “bankable deals" that explain, at a minimum, how the borrower or project organizer plans to address each of these operational issues.
- Households and communities may know in broad general terms what they need, but they do not necessarily know where to find it, how to evaluate competing technological solutions, how to organize so many dispersed actors and mundane tasks, how to organize a village enterprise or coop, and how to negotiate terms and conditions with potential partners who are vastly more experienced and sophisticated.

- Last, but not least, government officials may support the generic concept of providing affordable access to potable water to all communities. But individual ministries and agencies may not stop to consider how their individual decisions and policies could support or hamper the government's potable water objective. A related question concerns the appropriate role of the government: What is the appropriate linkage between the national and local government, on the one hand, and those nongovernment entities that are actually in the field providing vital services (off grid power, potable water, Wi-Fi connectivity, etc.) to unserved communities, on the other hand?[7]

Speakers on the Technology Deployment Panel offered some preliminary answers.

Speaking from the private sector perspective, Randy Welsch, the Co-founder and past President of Jibu explained that since its founding in 2012, Jibu has launched 145 potable water franchises with more than 2100 retail points to provide "affordable access to drinking water and other necessities" to consumers in Kenya, Rwanda, Tanzania, Uganda, Burundi, Zimbabwe and DRC Goma. In that time, Jibu has distributed more than 174 million liters of water to the middle 70% (excluding the top 10% and bottom 20% of the income distribution) "of the underserved population within walking distance of the store, who typically drink boiled or untreated water as they cannot afford to regularly purchase safe water." Jibu is currently developing mechanisms to provide subsidized service to the bottom 20% who cannot afford Jibu's price.

In the Jibu franchise model, the local franchisee makes only a small down payment to Jibu. In exchange for the down payment, Jibu provides the franchisee with equipment, training, marketing, and other business services. Jibu, in other words, finances the franchisee who repays Jibu over time with an agreed share of sales revenues. An equity injection from Jibu's owners financed Jibu's initial operations. Going forward, Jibu expects to finance further expansion with a combination of (i) revenues from existing franchisees; (ii) a series of Master Franchise Agreements[8] whereby local investors become franchisors in new markets, using their own funds to provide the upfront capital to franchisees in the countries in which they operate, while Jibu provides the know-how, expertise, and lessons of experience; and (iii) the proceeds from a $7 million Series B financing round which will enable Jibu "to accelerate its launch of 1,000 drinking water franchises in at least a dozen new countries by 2022."

Welsch noted that Jibu, and not the host country government, selects the purification and other technologies employed by its franchisees. "We have engineers on staff always researching the best solutions and then our management makes decisions on what to deploy. It is always evolving and different per location— our water filtration solutions are highly customized to filter the exact water at the site most efficiently and cost-effectively. Our core IP is our franchise agreement on which we have spent a lot of time and money to standardize the best roles and responsibilities between us and our franchisees in ways that enable scaling to happen. Our bottles are the only patented inventions."

[7] For a deeper discussion of this issue, see the discussion beginning on Page 15 of Global Solutions Summit 2019: Synthesis and Policy Recommendations, available here.

[8] A detailed set of Jibu FAQ's is available here. Case studies of Jibu generated by the University of New Hampshire's Center for Social Innovation and Enterprise are available here and here. Also see here for an interesting explanaton of how Jibu is different from other social enterprises and water companies.

Welsch also noted that, "Jibu has never asked for or received financial help from the governments in which we operate. We did receive a matching grant from USAID when starting up, but that is the only direct government financial assistance that we ever received. However, it is vitally important to establish good govt relationships from the start. When we go to a new country, one of the first things we do is meet with as many government agencies and officials as we can. We do that to understand the government's desires and to learn. We explain how we are partners, reaching a segment of their population on their behalf, and we are glad if they want to take credit for that politically. We expect to pay taxes and do not ask for special favors. We just ask the government not to make our job harder by putting unnecessary obstacles and roadblocks in our way, including over-zealous regulators and lower-level tax agents who sometimes try to take advantage of our franchisees."

> *Welsch conveyed the views and experiences of one private sector participant in the potable water sector. What generic lessons can we glean from his experience? What can local and national governments do to facilitate the entry of more companies like Jibu in the potable water sector as well as similar companies in the power, health, and ICT sectors, etc. What are the do's and don'ts for other private sector operators who want to get into this business?*
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> *How does the fact that Jibu selects the water purification technology deployed in each locale affect the technology scouting process?*

Welsch called on the government not to put "unnecessary obstacles and roadblocks in our way." But as Chris Tan explained, obstacles and roadblocks can arise suddenly, despite the government's best intentions. However, dedicated performance management and delivery units located in the office of the President or Prime Minister can prevent their appearance in the first place and remove them promptly if they do crop up unexpectedly.

Governments announce priority programs, Tan explained, at the strategic 30,000-foot level, which glosses over tactical implementation details. But if the devil is truly in the details, these plans will amount to little more than hollow rhetoric unless they are supported by multi-year budget allocations and a laser-like focus on mundane, nitty gritty implementation details. Hence the need for performance management and delivery units "dedicated to driving diligent execution, relentless monitoring, and real time problem solving." Potable water, for example, may be a government priority. But when it comes to the budget, the President or Prime Minister must decide what budget items will be reduced if the government shifts scarce resources to a national potable water program. "The problem for governments," said Tan, "is how to make tough decisions about the deployment of finite resources in light of the plethora of choices that have been thrown in front of them."

But the problem does not end with the budget. "The hardest part," according to Tan, is getting things done in the context of ministerial silos. Take the case of a hospital project. Presumably, the Minister of Health is responsible for delivering the new hospital on time and within budget. But the Minister of Health does not have jurisdiction over water, power, construction, finance, education, and customs. In addition, none of these ministries and agencies think about how their day-to-day decisions will support or hinder the government's hospital program. The only one with jurisdiction across all silos is the President or Prime

Minister who is often too busy to consider how each ministry's decisions will affect the implementation of a Government priority program.

To confront these issues, the Malaysian Cabinet authorized the creation of a Performance Management and Delivery Unit (PEMANDU) targeted at "high impact National Projects (which mandated multi-agency collaboration) as opposed to narrower Ministerial Projects (which can be executed by a singled ministry.) According to Tan, "It was painful medicine to take but it was viewed as imperative given the citizenry's growing impatience with the pace of delivery of key social and economic reforms. High impact projects require a radical program management process anchored on clear accountability, frequent monitoring, and real-time problem solving by TOP LEADERSHIP (i.e., the PM)." To deliver these accountability, monitoring and problem solving services, the Cabinet authorized PEMANDU to operate like a bank, "borrowing the influence of the President or Prime Minister and lending it to the minister who needs it [to facilitate implementation] at that moment."

Tan went on to note, "The secret to getting anything done is to ensure that people have a clear vision and a clear implementation path that enables them to take very precise actions slowly but definitively toward the end vision. A major transformation cannot take place in one fell swoop or in a single step. The Government needs to pace implementation according to the needs of budget cycles. Not everything needs to be done this year." From this perspective, Tan explained, implementation is akin to a triple jump -- a series of small discrete actions that take place in a specific sequence to achieve a specific longer-term objective.

To facilitate these "triple jumps" Tan outlined an 8-Step methodology for efficient performance management and project delivery:

1. Set the strategic direction by organizing workshops with key government decision makers
2. Organize multi-stakeholder "Labs" to prioritize initiatives and establish a detailed implementation plan
3. Solicity citizen feedback via a series of "Open Days"
4. Develop and publish a detailed roadmap explaining precisely what will be done to tackle a particular problem and how it will be done.
5. Publish detailed KPI targets for monitoring and tracking progress
6. Implement and monitor performance against the published KPIs
7. Organize third party audits
8. Publish annual reports outlining the Implementation Unit's progress and accomplishments

In the wake of PEMANDU's success, the governments of Tanzania, India, South Africa, Saudi Arabia, Oman, Russia, and Nepal asked the Malaysian Government to help them establish similar units. Tan believes that the key to success for any government wishing to follow in Malaysia's footsteps is for the government to conclude that business as usual is no longer acceptable and then to ask, "which areas are most critical to reform at this moment in time." The answer will vary from country to country, but the process of asking uncomfortable questions and engaging in societal and governmental introspection will be the same across countries.

How can government's begin the process of asking uncomfortable questions that are a prelude to establishing performance and implementation units modeled after Malaysia's PEMANDU? What is the process of moving from uncomfortable questions to establishing an institution that can support a country's technological transformation?